

Review of response to the thunderstorm asthma event of 21–22 November 2016

Final Report

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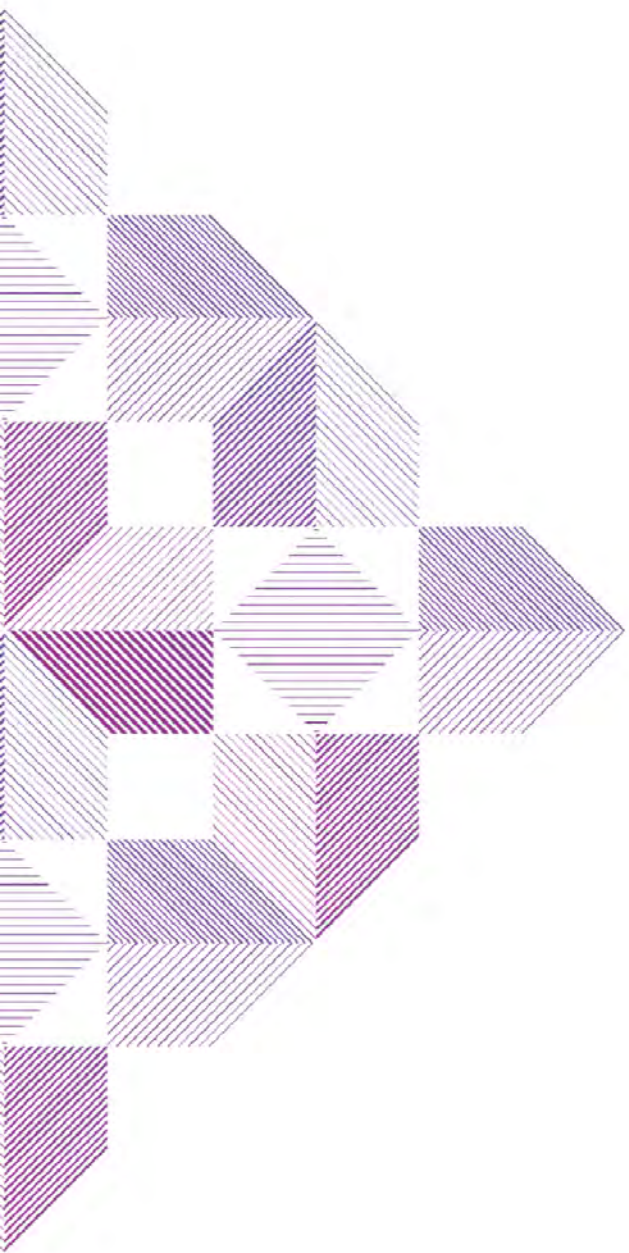
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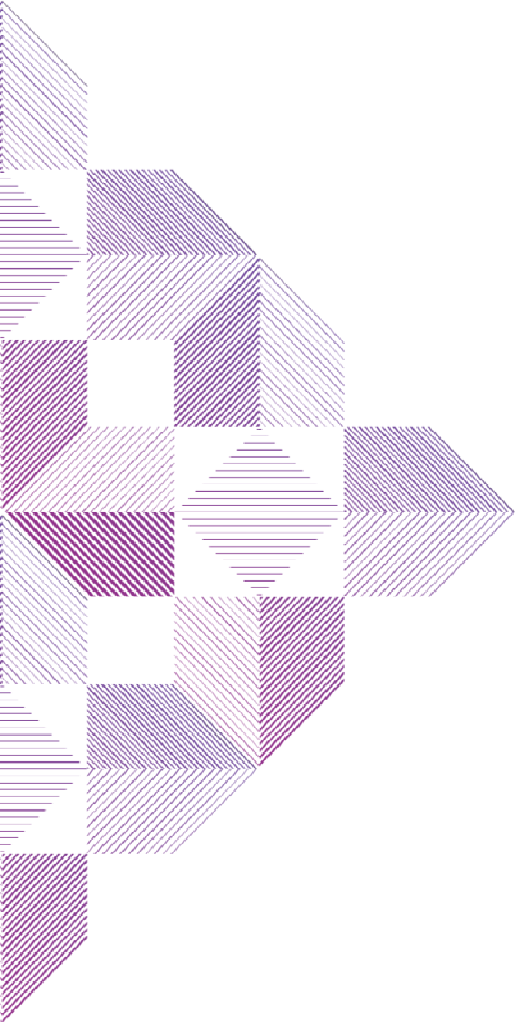
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Final Report



Preface



The thunderstorm asthma event that occurred on 21–22 November 2016 affected the health of thousands of Victorians and sadly, is thought to have contributed to the death of nine people.

While the deaths attributed to this event will be investigated by the State Coroner, the Minister for Emergency Services, and Minister for Health and Ambulance Services asked me to review the emergency response.

One of the legislated roles of the Inspector-General for Emergency Management (IGEM) under the *Emergency Management Act 2013* is to provide assurance to government and the community in respect of emergency management arrangements in Victoria.

The objective of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes my recommendations, where required, for potential improvements to future rapid-onset emergency planning and response arrangements.

The rapid onset of this emergency and the scale of its consequences were unprecedented.

Victoria's emergency management reforms have sought to encourage and enable government departments and agencies to 'work as one', and there were many signs of this in practice on 21 and 22 November 2016.

One of the key characteristics of this emergency was that at the time people were experiencing respiratory distress and seeking urgent health care, the cause was uncertain and information was limited. This highlights an opportunity for Victoria's health and emergency management sectors to consider how they respond to an unexpected, rapid-onset emergency, when the cause and scale of the event is unclear, and when emergency plans and protocols haven't been developed for such a scenario.

In the absence of complete information, the identification of triggers is critical. In this case, the rapid surge in demand experienced by the Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria (AV) and Victorian hospitals provided evidence of an emergency occurring. Such evidence provides triggers for the activation of emergency response plans at state and organisational level.

At state level, the activation of the State Health Emergency Response Plan (SHERP) would have brought together those with a role in the response to the circumstances on 21 November 2016 and aggregated the available data to provide shared situational awareness and enable effective consequence management.

The activation of state level emergency arrangements should also have triggered the use of Victoria's emergency management infrastructure and the established arrangements, regardless of whether the emergency was categorised as Class 1, 2 or 3.

Examples include the infrastructure of the State Control Centre and the arrangements that exist for the issuing of public information and warnings, which apply to all emergencies.

Based on interviews with stakeholders, I have explored opportunities to enable deployment and utilisation of all appropriate latent resources. This would have been particularly important had the surge in demand escalated or continued for a longer period.

I have also examined Victorian privacy laws which allow for the appropriate sharing of health and/or personal information, necessary for understanding the impact and potential consequences of the emergency.

Internationally, experience of thunderstorm asthma is limited, as is knowledge of the factors that enable thunderstorm asthma to be predicted. We do know there are no practical options to eliminate the risk or reduce its likelihood, making prediction, community preparedness and effective response vitally important.

The scale of this epidemic was unprecedented.

Never before have ESTA, AV or Victorian hospitals experienced this level of demand in such a condensed time period and dispersed over such a large geographical area.

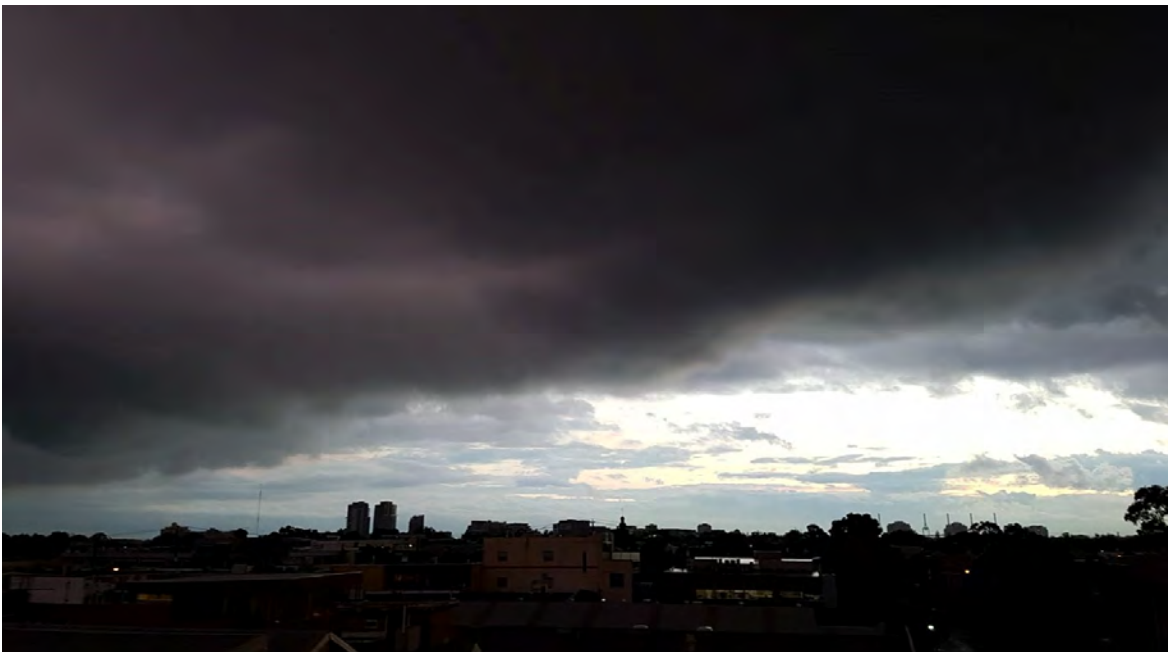
Based on the evidence analysed, ESTA, AV and hospitals acted swiftly to increase the scale of their respective operations. I commend the work of all involved in the emergency response – including the assistance of the Metropolitan Fire Brigade, Victoria Police and other agencies – in responding quickly, flexibly and professionally to the unforeseen circumstances on the evening of 21 November 2016.

Since then, many of the organisations involved – to their credit – conducted debriefs and immediately initiated work to prepare for future occurrences of epidemic thunderstorm asthma. However, both the emergency management and health sectors must also prepare for the likelihood of other unexpected, rapid-onset emergencies.

This, my final report on Victoria's 2016 epidemic thunderstorm asthma event, provides recommendations to support improved preparedness and response to emergencies. Given that this health emergency was driven by a rare combination of factors, our systems must continue to evolve, in order to be capable of responding to the unknown.

Tony Pearce

Inspector-General for Emergency Management



Thunderstorm rolls over Melbourne's skyline (Image credit: S Julia)

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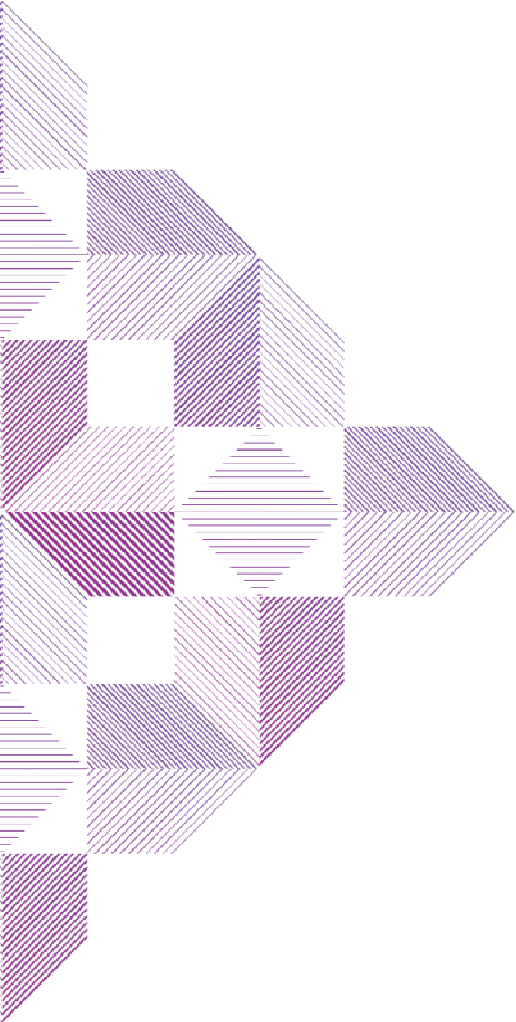
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Acronyms

ABC	Australian Broadcasting Corporation
AEOC	Ambulance Emergency Operations Centre
AFL	Australian Football League
AIIMS	Australasian Inter-service Incident Management System
AMA	Australian Medical Association
AMPDS	Advanced Medical Priority Dispatch System
AR	Allergic Rhinitis
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CAD	Computer Aided Dispatch
CEO	Chief Executive Officer
CFA	Country Fire Authority
CHO	Chief Health Officer
CIRP	Critical Incident Response Plan
COO	Chief Operations Officer
CSOP	Customer Standard Operating Procedure
CSU	Charles Sturt University
DHHS	Department of Health and Human Services
ED	Emergency Department
EMC	Emergency Management Commissioner
EM-COP	Emergency Management Common Operating Picture
EMMV	Emergency Management Manual Victoria
EMR	Emergency Medical Response
EMT	Emergency Management Team
EMV	Emergency Management Victoria
ERP	Emergency Response Plan
ESTA	Emergency Services Telecommunications Authority
FEMO	Field Emergency Medical Officers
GP	General Practitioner
HAZMAT	Hazardous Materials
IC	Incident Controller
IGEM	Inspector-General for Emergency Management
IMT	Incident Management Team
JSOP	Joint Standard Operating Procedure
LGA	Local Government Area
MFB	Metropolitan Fire Brigade
MICA	Mobile Intensive Care Ambulance

MLHD	Murrumbidgee Local Health District
NGO	Non-Government Organisation
NSW	New South Wales
PIO	Public Information Officer
PIW	Public Information and Warnings
RVA	Recorded voice announcement
SCC	State Control Centre
SCOT	State Coordination Team
SCRC	State Crisis and Resilience Council
SCT	Structured Call-taking
SEMC	State Emergency Management Centre
SEMT	State Emergency Management Team
SERP	State Emergency Response Plan
SHERP	State Health Emergency Response Plan
SHERA	State Health Emergency Response Arrangements
S-HIMT	State Health Incident Management Team
SMS	Short Messaging Service
SOP	Standard Operating Procedures
SRC	State Response Controller
VicPol	Victoria Police
VICSES	Victoria State Emergency Service

Executive Summary



Monday 21 November 2016 was Victoria's hottest day since March, earlier that year.

As the temperature in Melbourne approached its maximum of 35°C, the Bureau of Meteorology (BoM) issued a severe thunderstorm warning at 1.58pm for damaging winds, heavy rainfall and large hailstones in Victoria's Mallee, South West, Wimmera and Northern Country forecast districts.

There was no evidence to suggest that these storms and other non-meteorological factors would result in a health emergency of unprecedented scale and consequences.

The number of people affected and the severity of the consequences suggest this thunderstorm asthma event was without international precedent.

While thunderstorms have previously been linked to asthma epidemics, none have had the severity of consequences associated with Melbourne's thunderstorm asthma event of 21 November 2016.

Elsewhere in Australia, epidemic thunderstorm asthma has occurred in Wagga Wagga in 1997 and Tamworth in 1990 (New South Wales) and Canberra in 2010 (Australian Capital Territory).

Of the globally-documented episodes of epidemic thunderstorm asthma, fatalities appear rare. One verified death was recorded in the United Kingdom in 2002.

The response

On the evening of 21 November, the Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria (AV) and hospital emergency departments across Melbourne experienced an unprecedented surge in people suffering shortness of breath, with respiratory or asthma related symptoms. They were operating in an environment characterised by rapidly escalating impacts and considerable uncertainty (Figure 1, page 9 shows requests for assistance via ESTA).

Initially, the cause was unknown.

At the organisational level, ESTA and AV have internal escalation processes to meet a surge in demand for their services, however these were not formally or fully activated. Nonetheless, ESTA and AV undertook actions over and above the escalation processes to coordinate response on the evening of the 21 November 2016.

The Department of Health and Human Services (DHHS) and AV worked together to manage the event on 21 November 2016. DHHS was responsible for ensuring that the health system continued to operate as effectively as possible under the surging demand pressure, while AV's key responsibility was responding to members of the public seeking pre-hospital medical assistance.

At approximately 8.00pm on 21 November 2016 the control agency, DHHS, activated elements of the State Health Emergency Response Plan (SHERP), however state-level management and functional resourcing was only commensurate with a simple (Level 1) incident^a of less complexity.

At this time, there was no understanding of the number of people affected and the severity of the consequences.

Given the level of demand being experienced by ESTA, AV and the health system, and based on the criteria outlined in the *Public Health Control Plan 2012*, the thunderstorm asthma event was commensurate with that of at least a Level 2 incident, and would have benefited from being resourced accordingly on the evening of 21 November 2016. The incident was managed as a Level 2 incident from the morning of 22 November 2016.

According to DHHS, ambulance arrivals typically make up around one quarter of emergency department attendances. While arrivals to emergency departments on 21 November 2016 were significantly higher in overall volume, the proportion of arrivals by ambulance remained at approximately one quarter of all arrivals.

The State Health and Medical Commander / State Health Coordinator (DHHS), supported by relevant DHHS staff, also called upon the assistance of private hospitals to assist with demand overflow from the public hospital system.

This resulted in DHHS approving access to private hospital beds, where available, to public patients at no cost. As there were no formal arrangements to facilitate this type of activity, the change to procedure was authorised by the State Health and Medical Commander. DHHS has committed to creating a pre-determined and documented arrangement to facilitate the use of private hospital beds during times of extreme demand on the health system.

IGEM notes this is a positive outcome which may benefit from more formalised arrangements in future.

Over the two days of the event (21–22 November 2016), 9909 people presented at public hospital emergency departments in metropolitan Melbourne and Geelong. Of these 3270 were additional presentations compared to the previous week. There were also 231 additional presentations at private hospitals.

Hospitals responded quickly and pragmatically on the evening of 21 November 2016.

Health services noted the positive behaviour displayed by community members waiting for treatment at emergency departments. Despite the long queues, community members were respectful, which made the work of hospital staff much easier in a high-pressure environment.

Similarly, pharmacies played a significant role in providing aid to their communities during the thunderstorm asthma event.

On 21 November 2016, NURSE-ON-CALL received 313 calls from people with breathing and respiratory and allergy problems (compared with an average of 63 calls for breathing and respiratory problems over the four previous Mondays).

Command and control arrangements

A number of public health services staff had the knowledge, or at least suspected that the respiratory symptoms may be caused by thunderstorm asthma, however there was no formal channel for sharing this information with those managing the response.

Based on evidence, triggers for escalation including changes to the risk environment (as described within the SHERP) were present on the evening of 21 November 2016.

If key decision-makers had been in possession of all available intelligence and triggers, escalating the thunderstorm asthma event to a Level 2 incident^b on the evening of 21 November 2016 would likely have enabled:

- earlier establishment of a management structure commensurate to the scale and complexity of the event
- increased resourcing and functional delegation of tasks to staff
- enhanced information flows and visibility between and within relevant agencies, including hospitals, pharmacies and general practitioners
- earlier consideration regarding management of consequences of the thunderstorm asthma event
- earlier consideration regarding provision of public information and warnings and health advice, to ease demand on the pre-hospital and hospital system
- earlier consideration around leveraging the resources and systems of the State Control Centre.

Command and control arrangements for the thunderstorm asthma event were formalised on 22 November 2016. From 11.00am on 22 November 2016, the Chief Health Officer (CHO) was the Class 2 State Controller for the thunderstorm asthma event, which is a designation of the role, and recognised that it was a public health emergency.

DHHS played a role in ensuring that improvements were made quickly and mitigation strategies were put in place in relation to the thunderstorm asthma response. DHHS also took the lead in commencing the development of a communication plan.

Fortunately, no subsequent escalation of demand occurred.

^a Refer Table 6 on page 42 of this report or the *Public Health Control Plan 2012*

^b Refer Table 6 on page 42 of this report or the *Public Health Control Plan 2012*

Public information and warnings

Minimal public information, emergency warnings or health advice were issued on 21 November 2016 during the thunderstorm asthma event. This was a direct result of the initial impacts not being fully understood nor broadly shared and considered; and emergency management arrangements not being formally activated or rapidly escalated during the initial response to the rapid surge in demand for urgent healthcare.

High-level information, such as informing the public to expect delays due to the significant demand on ambulance services and hospitals, would empower the public to make their own informed decisions. This is in line with the state's preparedness goal of shared responsibility¹, which involves the emergency management sector and communities working as one to reduce the impact and consequences of emergencies.

In the case of thunderstorm asthma, there are no practical options to eliminate the risk or reduce its likelihood (i.e. the presence and interaction of thunderstorms with aeroallergens cannot be feasibly prevented or reduced).

However, a reduction in the likelihood of adverse health consequences may be achieved through:

- public education about asthma and the importance of people in the community seeking professional medical advice for themselves and their families
- good patient adherence to appropriate medication use
- good patient and carer knowledge of how to deal with respiratory issues, utilising an effective asthma action plan
- avoidance of exposure to thunderstorm outflows and therefore, aeroallergens.

Developing an effective prediction and warning system for thunderstorm asthma is a key contributor. However, developing timely and tailored community warnings for thunderstorm asthma will be dependent on an improved understanding of applicable triggers.

Defining triggers for escalation based on demand surges (ESTA, AV, hospitals, NURSE-ON-CALL) and real time monitoring of signs and symptoms (syndromic surveillance) will require considerable collaboration, research, systems improvements and ongoing refinement.

The efficient capture and dissemination of this intelligence is key to ensuring an efficient, coordinated and effective response to future rapid-onset health emergencies.

Broader considerations

Through the course of this review and based on interviews with stakeholders, IGEM has also identified themes that have broader emergency management applications beyond the health system.

The findings and recommendations outlined in this report also seek to better position Victoria's emergency management system to prepare for and respond to rapid-onset events, natural or human-induced, and regardless of hazard source.

Rapid-onset events strike unexpectedly, and have the potential to affect a large portion of the population across a wide geographic region. In order to minimise the negative consequences endured by the community, it is vital that all available resources are accessed and deployed to aid the response.

There were a number of informal activities and/or processes that were used in maximising all available resources during the thunderstorm asthma event, including agency personnel undertaking activities outside of existing agreements and protocols, which undoubtedly contributed to improved community outcomes.

There may be an opportunity for the Victorian Government and its agencies, in consultation with the relevant industrial bodies, to examine current agency enterprise agreements to ensure that they reflect and support the deployment and utilisation of all appropriate latent resources in responding to rapid-onset events.

To better prepare for future rapid-onset events, relevant departments and agencies should identify the enablers for accessing and using additional resources during the thunderstorm asthma event, and consider them for broader application to other emergencies.

Where appropriate, these enablers should then be formalised in relevant enterprise agreements, plans or operating procedures. This will enhance the sustainability of these arrangements and improve the emergency management sector's level of preparedness for future rapid-onset events.

The sharing of timely information between relevant departments and agencies before, during and after emergencies is essential to delivering an effective response. This is especially the case during rapid-onset events, where the impact and associated consequences on the community may be immediate.

Timely and open information flow between relevant organisations enables key decision-makers to effectively undertake key emergency management functions such as coordination of resources and consequence management.

Moving forward, the sector needs to ensure that appropriate information is shared between relevant organisations before, during and after an emergency.

IGEM has considered this in light of circumstances which may arise in responding to any emergency that involves the management of injured or ill persons.

Information sharing during emergencies is a challenge for the sector. However, information privacy law is not a barrier, and should not be perceived as a barrier to appropriate information sharing in emergency situations.

IGEM considers that there would be benefit in relevant departments and agencies reviewing existing information sharing provisions, in accordance with Victorian privacy laws, and ensuring that appropriate information sharing provisions are understood and embedded into practice.

The review

The Victorian Government requested the Inspector-General for Emergency Management (IGEM) to review the emergency response to the thunderstorm asthma event of 21–22 November 2016. The letter of request, outlining the review's terms of reference, is at Appendix A.

The government requested that IGEM provide an interim report to the Deputy Premier/Minister for Emergency Services and the Minister for Health and Minister for Ambulance Services. This was delivered on 30 January 2017. The final report was to be delivered on 21 April 2017.

This final report replaces in totality IGEM's preliminary report.

The review was undertaken under Section 64(1)(c) of the *Emergency Management Act 2013* which authorises IGEM to prepare advice and reports at the request of the Minister for Emergency Services.

The objective of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about improvements to public health emergency planning and response arrangements.

IGEM is grateful for the assistance of all individuals and organisations that contributed to this review. In particular, the immediate, open and honest communication of key stakeholders has greatly assisted IGEM in rapidly progressing the development of this report. IGEM acknowledges that everyone involved in managing and responding to this event did a remarkable job under pressure in dealing with unexpected and unprecedented demand.

Without knowing how many people in the community were affected or why, individuals demonstrated their willingness and flexibility to remain on duty or return to work to care for those affected, or in other ways support the management of this strain on emergency resources. Similarly, emergency response agencies and hospitals supported each other without question.

The identified risks, plans and processes of organisations and the sector more broadly were unlikely to be developed with such a scenario in mind.

IGEM is aware that multi-agency work commenced immediately following the emergency to better understand the factors that caused this event as a basis for predicting and improving the response to future emergencies.

Organisations have been reviewing their operations of 21 and 22 November 2016 to identify opportunities for improving their ability to escalate their response to such circumstances.

IGEM has identified 25 findings and made 16 recommendations in this report. IGEM is mindful that Victoria had no known experience of a rapid-onset event of this scale, together with little understanding of the cause.



RECOMMENDATION 1

The Inspector-General for Emergency Management (IGEM) acknowledges the work undertaken since 22 November 2016 and recommends that the Department of Health and Human Services (DHHS) continue to work with all relevant health services and broader health system organisations to establish and/or strengthen communication channels, processes and systems to enable effective, consistent and timely two-way information flow.

This includes convening a regular forum, bringing together hospital representatives to ensure that when emergencies occur, previously established connections are in place so that appropriate personnel are kept informed.

DHHS should also establish or utilise existing governance arrangements to enable joint planning, bringing together organisations with a role in the health system to better prepare for, respond to and recover from emergencies. These governance arrangements should consider the role of broader health system organisations, including pharmacies, NURSE-ON-CALL and general practitioners.

RECOMMENDATION 2

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) establish a centralised online system, linking all hospitals to ensure that hospitals receive timely and relevant information, including intelligence on presentations and activation of Code Brown across hospitals.

This system would significantly contribute to DHHS' situational awareness, informing response decision-making and consequence management.

In addressing this recommendation, DHHS must work collaboratively with hospitals to ensure that all appropriate DHHS and hospital staff are trained and that adequate funding is allocated to ensure the system's sustainability.

RECOMMENDATION 3

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) work with primary care providers including appropriate community pharmacy representatives to consider and define the role community pharmacies play during emergencies and where appropriate, integrate community pharmacies into future planning for emergencies.

RECOMMENDATION 4

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria (EMV) leads the development of a notification process that disseminates early information about a developing incident to all relevant emergency management organisations.

This process should leverage the existing notifications that the Emergency Management Commissioner already receives from emergency services organisations, to maximise information sharing and awareness across the broader sector.

Consideration should be given to Emergency Services Telecommunications Authority's (ESTA) existing notification capability under the Critical Incident Response Plan (CIRP) due to its unique position as a primary interface between the community and emergency services. Timely notifications from ESTA could be used as part of an early alert to the broader emergency management sector of a developing situation.

RECOMMENDATION 5

The Inspector-General for Emergency Management (IGEM) recommends that for future health emergencies, including those that occur outside normal business hours, every effort must be made to enable information and issues to be rapidly shared and discussed.

In accordance with Victoria's emergency management arrangements, the Department of Health and Human Services (DHHS) should as routine practice, coordinate face-to-face group meetings and/or conference calls between relevant parties. This will enable improved situational awareness and informed decision-making in responding to emergency events.

RECOMMENDATION 6

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) adopt a conservative approach to the early escalation of incident management arrangements for rapid-onset health emergencies. Response levels, management coordination and control centres can all be scaled down as appropriate.

RECOMMENDATION 7

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) consider, as part of revisions to the State Health Emergency Response Arrangements (SHERA), further information and guidance with respect to Code Brown plans.

This should include clear articulation of the triggers for activation, responsibilities, and escalation and de-escalation processes.

RECOMMENDATION 8

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria, Department of Health and Human Services (DHHS) and Ambulance Victoria (AV) collaborate to integrate emergency advice and warnings for Class 2 health emergencies within the Emergency Management Common Operating Picture (EM-COP) warning platform.

Public information, advice and warnings for all classes and types of emergencies should follow the Victorian Warning Protocol.

All alert/warning messages should follow a tiered structure of Advice, Warning (Watch and Act), and Emergency Warning.

RECOMMENDATION 9

The Inspector-General for Emergency Management (IGEM) recommends Emergency Management Victoria (EMV) work closely with the Department of Health and Human Services (DHHS) and other agencies to amend current systems and arrangements to ensure they effectively deliver emergency warnings and health advice for rapid onset, spatially dispersed, non-traditional emergency management events, such as thunderstorm asthma.

DHHS' current review and integration of the State Health Emergency Response Plan (SHERP) and Public Health Control Plan (PHCP) should update, as a priority, the delivery of community information, emergency warnings and health advice.

Ambulance Victoria, as first responders to health emergencies, should have access to formal channels, triggers and training to disseminate pre-hospital public information, advice and warnings in rapid-onset emergencies.

RECOMMENDATION 10

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria (EMV) work with the Department of Health and Human Services (DHHS) and partners to develop a business intelligence technology solution that will support greater situational awareness during a rapid-onset emergency.

The solution should enable the integration of existing geospatial and socio-economic data with real-time data from:

- Ambulance Victoria
- Bureau of Meteorology
- DHHS
- Emergency Management Common Operating Picture (EM-COP)
- Emergency Services Telecommunications Authority
- Environment Protection Authority Victoria
- hospitals
- pollen research stations
- other relevant organisations.

This combined information would ideally be visualised through a portal, or similar mechanism, to inform decision-making, public information and warnings, and consequence management.

RECOMMENDATION 11

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) lead collaboration between relevant partners to:

- implement a system of standardised pollen and fungal monitoring protocols and sites across Victoria
- enable improved understanding of the mechanisms involved in thunderstorm asthma to better predict occurrences
- improve accuracy and reliability of forecasting for thunderstorm asthma, informing a user centred forecast scale which ensures that it accurately conveys the expected level of risk and the level of certainty of an event occurring
- develop methods for utilising thunderstorm asthma forecasts to trigger the delivery of community information, emergency warnings and health advice.

RECOMMENDATION 12

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) lead collaboration between relevant partners to develop a comprehensive thunderstorm asthma strategy that includes a public awareness and education campaign.

The strategy should leverage existing national and international networks, principles, strategies (National Asthma Strategy) and frameworks to promote effective asthma management and improve community resilience.

The Murrumbidgee Local Health District response should be considered as a template for good practice.

RECOMMENDATION 13

The Inspector-General for Emergency Management (IGEM) recommends that Department of Health and Human Services (DHHS) devise and adopt outcome measures to monitor and evaluate the ongoing effectiveness of system integration; intelligence sharing; community information; emergency warnings and health advice, which may be included in the broader emergency management sector performance standards.

RECOMMENDATION 14

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria (EMV) consider how current available resources, infrastructure and systems for both Class 1 and Class 2 emergencies may be used and appropriately integrated to provide an effective response to all emergencies.

This includes the management of responses to rapid onset emergencies regardless of hazard type or classification of emergency.

IGEM recommends improved intelligence sharing between DHHS, AV and the relevant functions within the State Control Centre (SCC) before, during and after health emergencies. This can be achieved by DHHS and AV utilising SCC systems and infrastructure.

Implementation of this recommendation will enable improved information sharing during future health emergencies, including thunderstorm asthma and for similar rapid-onset, non-traditional emergency management events.

RECOMMENDATION 15

The Inspector-General for Emergency Management (IGEM) recommends that responding agencies identify, assess and where appropriate, formalise with relevant industrial bodies, the processes and/or response activities rapidly introduced for the thunderstorm asthma event.

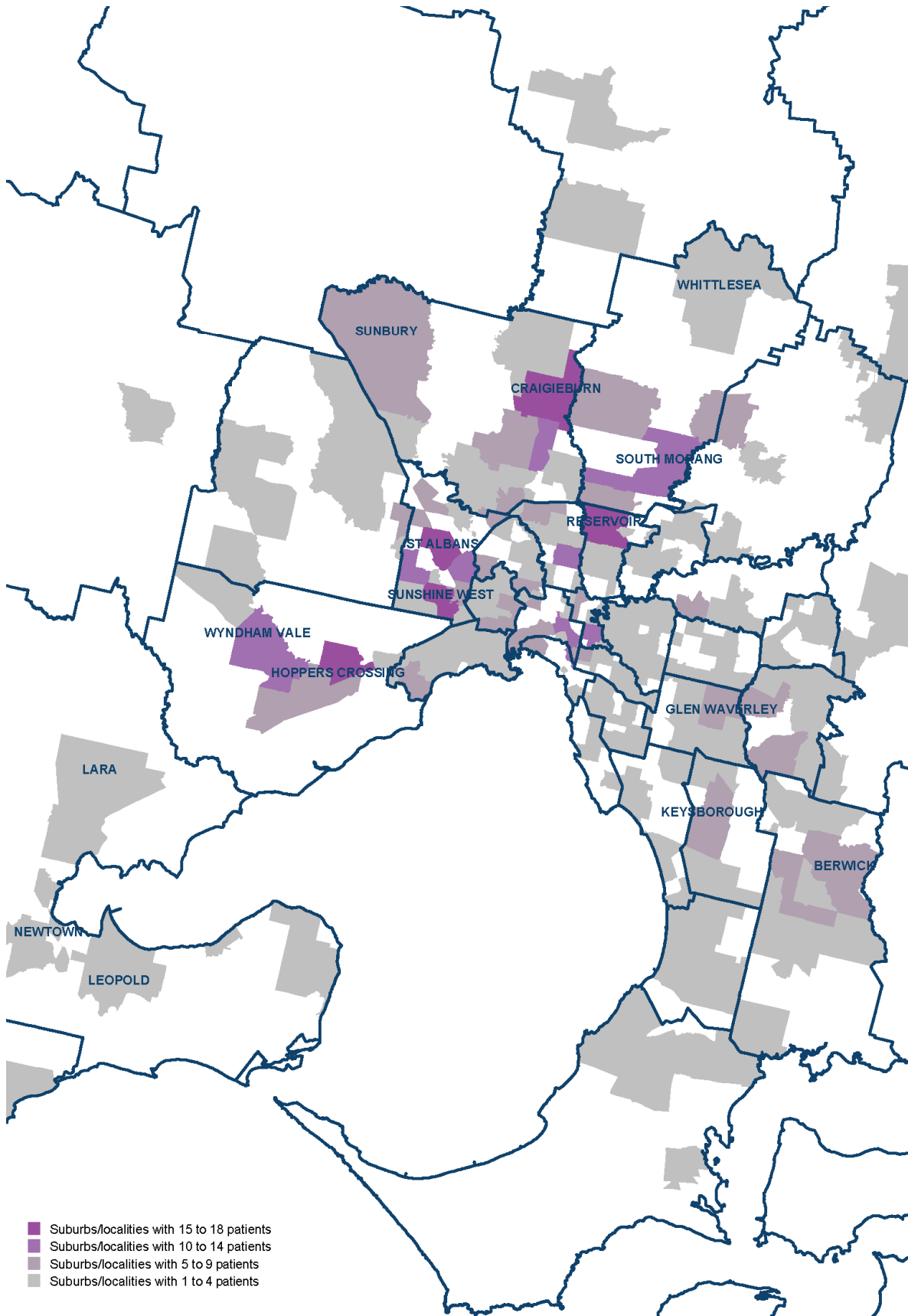
These informal processes contributed to the thunderstorm asthma emergency response. Formalising them will significantly improve the sector's capability and capacity for future rapid-onset events.

RECOMMENDATION 16

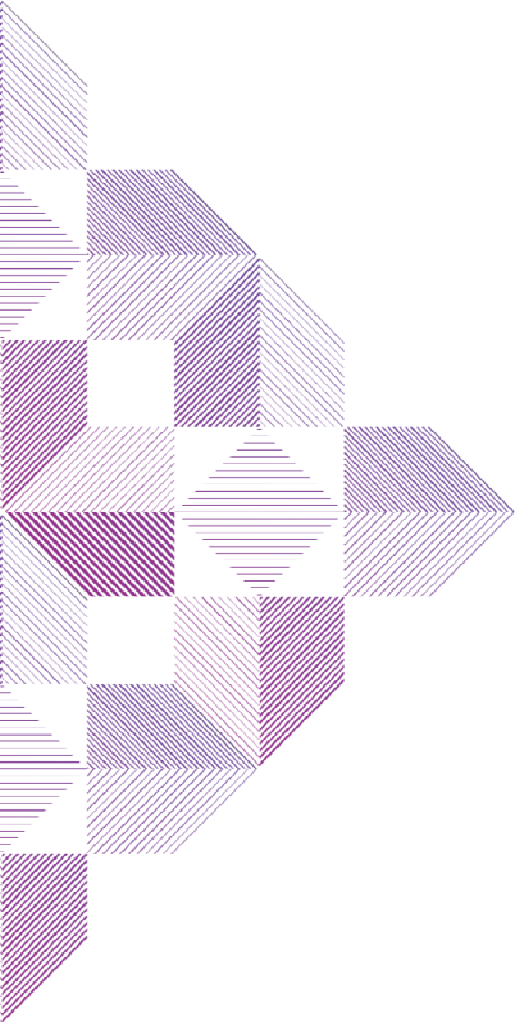
The Inspector-General for Emergency Management (IGEM) recommends that responding agencies – including health services – review existing information sharing policies, procedures and practices for emergencies in accordance with Victorian privacy laws. Appropriate information sharing provisions must be understood and embedded into practice.

Victorian privacy laws include public interest exceptions that enable sharing of health and/or personal information. Departments and agencies must incorporate the privacy principles into relevant plans, operating procedures, manuals and/or guidance materials.

Figure 1: Concentration of breathing-problem events by suburb/locality of greater Melbourne and Geelong from 3.00pm on 21 November 2016 to 6.00am on 22 November 2016 requesting assistance via ESTA.



1 Introduction



On the evening of 21 November 2016, the Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria and hospital emergency departments across Melbourne experienced an unprecedented surge in people suffering shortness of breath, with respiratory or asthma related symptoms. Initially, the cause was unknown.

While thunderstorms have been linked to asthma epidemics, none have had the severity of consequences associated with Melbourne's thunderstorm asthma event of 21–22 November 2016.

The Victorian Government requested the Inspector-General for Emergency Management (IGEM) to review the emergency response to the thunderstorm asthma event of 21–22 November 2016. The letter of request, outlining the review's terms of reference, is at Appendix A.

The government requested that IGEM provide an interim report to the Deputy Premier/Minister for Emergency Services and the Minister for Health and Minister for Ambulance Services, which was delivered on 30 January 2017. The final report was to be delivered on 21 April 2017.

The review was undertaken under Section 64(1)(c) of the *Emergency Management Act 2013* (the Act) which authorises IGEM to prepare advice and reports at the request of the Minister for Emergency Services.

1.1 IGEM's role

IGEM is a legislated appointment established under the Act to:

- provide assurance to the government and the community in respect of emergency management arrangements in Victoria
- foster continuous improvement of emergency management in Victoria.

Supporting the achievement of these objectives, IGEM undertakes system-wide reviews under the provisions of Section 64(1)(b) of the Act, and prepares advice and reports at the request of the Minister for Emergency Services under the provisions of Section 64(1)(c) of the Act.

1.2 Objective of the review

The objective of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about improvements to public health emergency planning and response arrangements.

1.3 Scope of the review

In accordance with the government's request, the review addresses the following aspects of the emergency response to the Melbourne thunderstorm asthma event of 21–22 November 2016:

- The appropriateness and adequacy of the response under the Public Health Response Plan during the events of 21 and 22 November, including the speed of escalation.
- The role of, and coordination between, the Emergency Management Commissioner, the Department of Health and Human Services, and other relevant agencies in respect of this public health event, and the adequacy of support provided to emergency and public health services.
- Consideration of the triggers for, and provision of, public warnings and information and health advice, taking account of predictability, preventive steps and methods of distribution available for this type of emergency.
- The identification of any other relevant matters or opportunities for improvement.

This review focused on identifying opportunities to improve public health and emergency management systems and processes in Victoria, as opposed to examining individual compliance or the apportionment of blame.

1.4 Approach

IGEM gathered information and analysed data from a number of sources to prepare this report and form its findings and recommendations.

These included:

- incident management records including incident logs and situation reports
- emergency response plans and protocols
- interviews with relevant government departments, agencies and individuals
- interviews with subject matter experts with relevance to thunderstorm asthma
- a literature review undertaken by disaster research and development centre Risk Frontiers – based at Macquarie University, New South Wales.

IGEM interviewed individuals and representatives of the following bodies in preparing this report:

- ABC Radio, Melbourne
- Ambulance Employees Australia Victoria
- Ambulance Victoria
- Asthma Australia
- Australian Medical Association
- Australasian Society of Clinical Immunology and Allergy (ASCIA)

- Austin Health
- Barwon Health
- Bureau of Meteorology
- Community and Public Sector Union Victoria
- Coroners Court of Victoria
- Country Fire Authority
- Deakin University
- Department of Health and Human Services, including the Chief Health Officer
- Emergency Management Victoria including the Emergency Management Commissioner
- Emergency Services Telecommunications Authority
- Environment Protection Authority Victoria
- International Academies of Emergency Dispatch (IAED)
- Macquarie Media (Radio 3AW)
- Melbourne Health (The Royal Melbourne Hospital)
- Metropolitan Fire Brigade
- Minister for Health and Minister for Ambulance Services
- Murrumbidgee Local Health District
- Northern Health
- Office of the Commissioner for Privacy and Data Protection
- Pharmacy Guild
- The Royal Children's Hospital
- United Firefighters Union Victoria
- University of Melbourne
- Victoria Police
- Victoria State Emergency Service
- Victorian Telecommunications and Services Branch, Communications Workers Union/CEPU
- Western Health.

From 15 December 2016 to 30 January 2017, IGEM invited public comments and submissions in response to this review, its scope and lines of enquiry to inform its final report to government.

The views and experiences provided through submissions help IGEM identify opportunities for:

- improving the state's emergency management arrangements
- building stronger connections with communities
- enabling communities to be better prepared to respond to the consequences of emergencies.

IGEM promoted the call for public submissions through online channels (including igem.vic.gov.au, myviews.justice.vic.gov.au and vic.gov.au), social media, print and broadcast media outlets.

Appendix B reproduces the advertisement calling for written submissions placed in select metropolitan and regional print outlets.

IGEM received 45 submissions from individuals and public bodies.

1.5 Acknowledgement

IGEM is grateful for the assistance of all individuals and organisations that contributed to this review, in particular, the immediate, open and honest communication from key stakeholders that greatly assisted IGEM in rapidly progressing the development of this report.

The interviews with representatives from the health and emergency management sector were crucial in building understanding of the events, knowledge and decisions made on 21–22 November 2016.

The willingness and commitment to providing insight, information and evidence to support this review is paramount to supporting continuous improvement of the emergency management arrangements in Victoria.

2 Background

2.1 Thunderstorm gust front sweeps Geelong and Melbourne

Monday 21 November 2016 was Victoria's hottest day since March, earlier that year.

As the temperature in Melbourne approached its maximum of 35°C, the Bureau of Meteorology (BoM) issued a severe thunderstorm warning at 1.58pm for damaging winds, heavy rainfall and large hailstones in Victoria's Mallee, South West, Wimmera and Northern Country (parts of) forecast districts.

At 4.00pm BoM extended its warning to other parts of Victoria, including Geelong and Melbourne. In those warnings, the Victoria State Emergency Service (VICSES) – as the control agency for storms – provided advice on the actions people should take to protect themselves and their properties.

The advice was to:

- move vehicles under cover, or away from trees
- not drive, ride or walk through flood water
- keep clear of fallen power lines
- stay indoors, if possible
- listen to the radio for storm updates.

The thunderstorm-induced gust front reached Geelong at 5.00pm and during the next hour moved rapidly eastwards across metropolitan Melbourne, as many people were making their way home after work.

ESTA received a moderate surge in calls for VICSES assistance, answering 523 calls for the day^c, particularly in the Hobsons Bay and Wyndham municipalities in Melbourne's west.

ESTA received the vast majority of these calls after 4.00pm.

The thunderstorm front comprised several small cells, and although the storm front, producing some severe wind gusts, swept through quickly, BoM stated there was nothing remarkable about this storm.

There was no evidence, nor advice provided, to suggest that this storm would result in a health emergency of unprecedented scale and consequences.

^c ESTA typically answer less than 100 calls for VICSES assistance on a typical day. A major surge in calls for VICSES is upward of 1000 calls.

2.2 Demand surges for urgent healthcare

As the storm moved east across Geelong and Melbourne, a vastly different form of impact emerged, compared to that usually associated with severe weather such as fallen trees, roof damage and flash flooding.

From 6.00pm on 21 November 2016, ESTA experienced an increase in Triple Zero (000) calls requesting ambulance services. Specifically, ESTA answered a large number of calls in which patients complained of breathing problems and asthma attacks.

The number of Triple Zero calls continued to escalate and from 6–7.00pm, Telstra presented to ESTA 510^d statewide emergency ambulance calls.

During the 12 hours to 6.00am on 22 November 2016, ESTA answered 2332 emergency ambulance calls.

This was an unprecedented level of demand for ambulance, surpassing the number of emergency ambulance calls received during previous call surges including the 2009 heatwaves, the 2009 Black Saturday bushfires, and the surge in ambulance calls on 25 September 2010 after the drawn AFL Grand Final – the largest, previous non-forecast event (as shown in Figure 2, page 15).

As a consequence of the Triple Zero call surge, ESTA was unable to meet its emergency ambulance call answer speed performance target time of five seconds for most calls.

The longest call answer delay to Triple Zero related to a request for an ambulance at 6.49pm on 21 November 2016. This call waited four minutes and thirty-six seconds from when the caller dialled Triple Zero until an ESTA ambulance call-taker answered.

The peak demand for ambulances occurred during the 15 minutes from 7–7.15pm during which ESTA answered 201 emergency ambulance calls.

In response to this level of demand, Ambulance Victoria (AV) and ESTA implemented a number of management strategies – as it would on any busy night. AV also requested support from key partner organisations outside of normal protocols.

These included Metropolitan Fire Brigade (MFB), which attended some Code 1^e (lights and sirens) ambulance cases without ambulance support, and Victoria Police (VicPol), who attended some locations where people were waiting for an ambulance, but whom ambulance communications staff had been attempting to call back via telephone for a welfare check and received no answer.

By 8.00pm AV had more than 150 events pending dispatch, including close to 100 Code 1 cases.

AV reported that in the absence of any defined trigger or hazard, it managed the overall surge in demand as 'business as usual', albeit at an extreme response level.

The volume of calls to Triple Zero gradually decreased, however between 9.00pm and midnight, ESTA still received calls for emergency ambulance at volumes of 147 per cent above forecasted levels.

At approximately 7.00am on 22 November, Triple Zero emergency ambulance calls dropped below forecast numbers for the first time in 13 hours.

Between 3.00pm on 21 November and 6.00am on 22 November 2016, ESTA processed 2666 emergency and non-emergency ambulance events, of which 962 related to breathing problems. As shown in Figure 1, page 9, requests for assistance via ESTA were dispersed across 299 suburbs/localities. Only 20 of these events occurred between 3–6.00pm on 21 November 2016.

This level of demand for ambulance services, combined with the many additional people who self-presented to hospitals and pharmacies for urgent medical care, had an effect on hospitals and other healthcare providers.

By 7.00pm on 21 November, hospital emergency departments, particularly in Melbourne's west and north, experienced an unprecedented level of demand – estimated by some hospitals to be at least 50 per cent greater than for the same period in the previous week.

This demand resulted in hospitals implementing escalation actions to maximise the flow of patients and free-up ambulances to attend other urgent events.

On 22 November, a high number of people with breathing problems continued to present at hospitals and other health providers. DHHS subsequently received reports of deaths that might be attributable to the effects of the storm of the previous evening.

At approximately 8.00am on 22 November, DHHS implemented an incident management structure and operated from the DHHS State Emergency Management Centre (SEMC) in Melbourne.

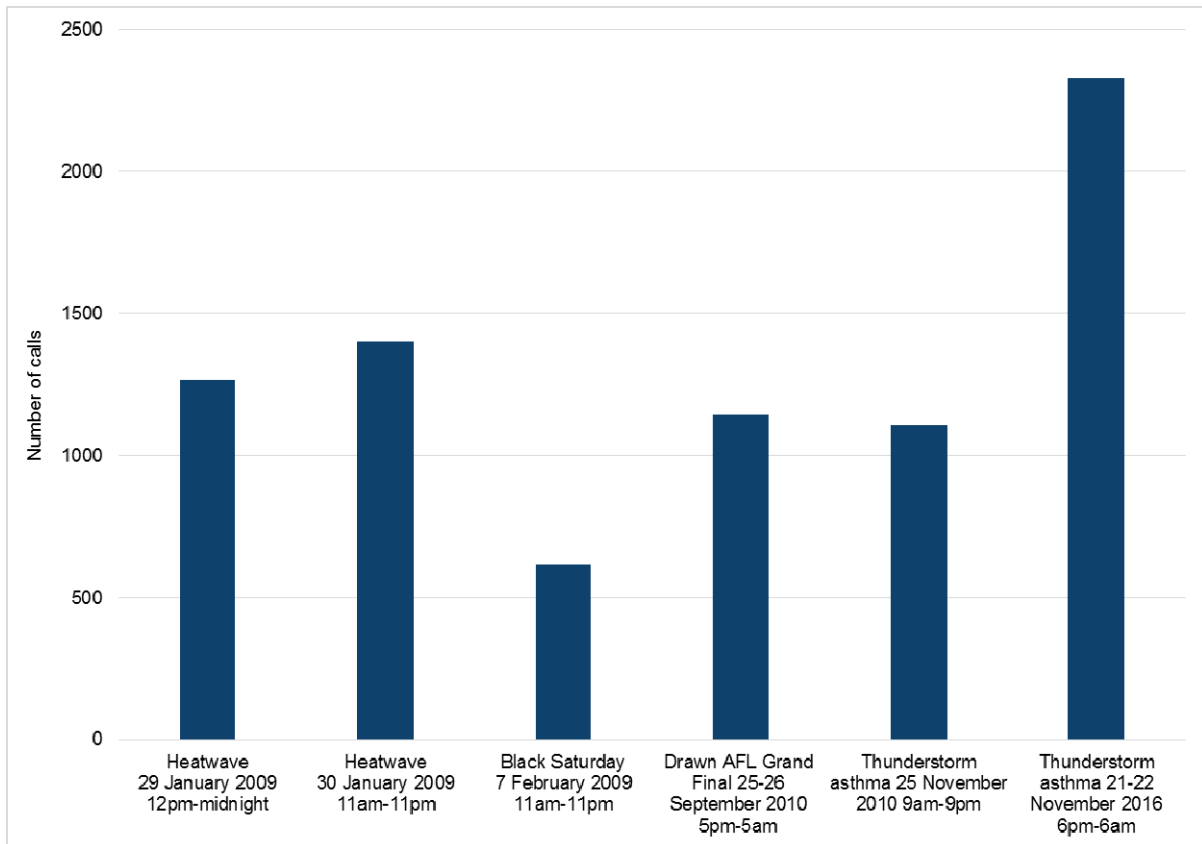
At 11.00am the Chief Health Officer (CHO) recognised the event as a public health emergency under the *Public Health Control Plan 2012*.

This structure coordinated the response and analysed the impacts on the health sector. Fortunately, no subsequent escalation of demand occurred on 22 November.

^d The Telstra Triple Zero service presents Triple Zero calls to ESTA that are answered by available call-takers. When there is no ESTA call-taker available, Telstra holds the call until an ESTA call-taker becomes free to answer. If this time exceeds 75 seconds, Telstra take back the call and re-presents it, in order to prevent disconnection. This process continues until an ESTA call-taker answers. Therefore a single call to Triple Zero may generate multiple presentations to ESTA.

^e Code 1 emergency ambulance cases are those that require a 'lights and sirens' response.

Figure 2: Comparison of six 12-hour surge periods of emergency ambulance calls to ESTA



2.3 Thunderstorm asthma identified

IGEM examined documents and conducted interviews with relevant emergency management sector representatives and found that, as the surge in demand began to unfold, there was little understanding of the cause and scale of this rapid increase in demand for urgent healthcare.

At 7.45pm on 21 November 2016, individual AV and ESTA executives and a number of public health services staff separately suspected that the cause of the increase in breathing problems may be the rare and little-understood phenomenon – thunderstorm asthma.

“...all relevant agencies need to liaise under such circumstances to provide their angle of expertise, not only to reach a conclusion of what happened, but be better equipped for the future...”

Source: public submission

Victoria had limited experience of epidemic thunderstorm asthma or the potential consequences, and had no way of predicting the likely extent or duration of the event.

Epidemic thunderstorm asthma last occurred in Victoria in 2010.

Over the last 30 years, the following^f epidemics of thunderstorm asthma have been recorded in Victoria, all in November:

- 8 November 1987
- 29 November 1989
- 25 November 2010
- 21 November 2016.

Although thunderstorm asthma is known to have occurred in Victoria prior to 2016, it has been so rare and at such a small scale that it was not an identified risk in the state’s emergency management plans.

*Emergency Risks in Victoria*² is a state-level emergency risk assessment to enable decision-makers and other stakeholders to understand, mitigate, plan and prepare for the credible major emergency scenarios that could occur in Victoria.

^f Independently verified instances known at this time

The risks are based on recent experience of emergencies in Victoria and Australia and on technical knowledge within the sector. These are risks that have potentially very severe consequences if realised.

For example, heatwave is recognised as one of the state's top risks as it is the leading cause of weather-related deaths in Australia.

Thunderstorms are recognised as a risk for their potential to cause loss of life or serious injury, as well as damage to property, infrastructure, business, agriculture and the environment.

The intensity and sudden impact of severe storms is known for causing significant spikes in the number of Triple Zero calls and requests for emergency service attendance.

Given the lack of broad awareness and understanding of epidemic asthma induced by specific thunderstorm events, epidemic asthma is not identified as a routine consequence of thunderstorms.

2.4 The international incidence and understanding of thunderstorm asthma

Global experience of thunderstorm asthma is limited.

It has been reported in academic literature since the 1980s, with epidemics identified in:

- Australia^{3 4}
- Canada⁵
- Greece⁶
- Iran⁷
- Italy^{8 9}
- United Kingdom (UK)^{10 11 12}
- United States of America¹³.

Before November 2016, two of the largest thunderstorm asthma epidemics worldwide appear to have occurred in the UK and Iran.

In June 1994, there were 640 asthma cases in hospital emergency departments – nearly 10 times the expected number – and 104 hospital admissions in the 30 hours following a thunderstorm in London, UK¹⁴.

In 2013, 2000 asthma attacks were triggered during and following a thunderstorm in Ahvaz, Iran. Most patients were aged 20–40 years, and had no history of asthma. For most patients, symptoms began while outdoors¹⁵.

Of the globally-documented episodes of epidemic thunderstorm asthma, fatalities appear rare. One verified death was recorded in the UK in 2002.

Other than the Victorian occurrences listed previously in this report, epidemic thunderstorm asthma in Australia has occurred in Wagga Wagga in 1997 and Tamworth in 1990 (New South Wales) and Canberra in 2010 (Australian Capital Territory).

As a result of Victoria's November 2016 epidemic thunderstorm asthma event, 9909 people presented at public hospital emergency departments in metropolitan Melbourne and Geelong.

Of these 3270 were additional presentations compared to the previous week. There were also 231 additional presentations at private hospitals.

Increased demand was also experienced by primary care services and NURSE-ON-CALL received 313 calls from people with breathing, respiratory and allergy problems (compared with an average of 63 calls for various reasons over the four previous Mondays).

It is possible that nine deaths may be attributed to this event and Victoria's State Coroner is investigating those circumstances.

The number of people affected and the severity of the consequences, suggest this thunderstorm asthma event was without international precedent.

There are a number of uncertainties about how epidemic thunderstorm asthma occurs – reflecting its rarity – and the difficulty of collecting and testing evidence to support an understanding of the precise mechanisms by which thunderstorms and other environmental factors may contribute to epidemics of asthma/respiratory distress.

Although much remains to be discovered about the relationship between asthma attacks and thunderstorms, there is reasonable evidence of a causal relationship between the two¹⁶.

How thunderstorms develop, mature, and subside is well-understood. BoM is able to forecast and track thunderstorms with some accuracy – although acknowledges it is a difficult process.

However, while much data about thunderstorms is available, identifying meaningful and specific indicators for predicting thunderstorm asthma remains a key priority for the sector.

There may be value in utilising a pattern recognition approach, which can be done using very small amounts of information as long as the phenomenon being recognised is already known to exist.

2.5 Situational awareness of the emergency

IGEM's interviews and examination of the available evidence indicates that emergency managers had a fragmented understanding of what was occurring in the community and across Victoria's health system on 21 November 2016, both during and following the thunderstorm.

The State Control Centre (SCC) was operating at a Tier 2 readiness level in response to the declaration of a Total Fire Ban for the Mallee region and in preparation for the potential heat impacts and the forecast thunderstorm.

In accordance with Victoria's emergency management arrangements¹⁷, major emergencies relating to fire and storm are examples of Class 1 emergencies.

These emergencies each have a specific emergency management 'control agency' to manage the appropriate response, which includes that agency typically assuming the role of Incident Controller.

The situation that had been unfolding in the evening of 21 November 2016 would be considered a health emergency, categorised as a Class 2 emergency, whereby DHHS would assume the role of control agency and appoint controllers as per Section 39 of the Act and as described in the State Emergency Response Plan (SERP).

2.6 Public information, warnings and health advice

The first information released publicly relating to this health emergency was issued at 8.40pm on 21 November 2016 through the social media platform Twitter.

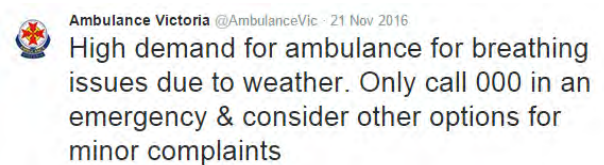
AV issued the tweet "we've seen a rise in breathing probs tonight following the weather. Follow your asthma plan or see here for advice..." referencing advice from the Better Health Channel – a DHHS-managed health information website (Figure 3).

Figure 3: Ambulance Victoria tweet from 8.40pm on 21 November 2016



AV posted a subsequent tweet at 10.08pm (Figure 4 below) and conducted a number of media interviews between 9.40pm and 11.00pm.

Figure 4: Ambulance Victoria tweet from 10.08pm on 21 November 2016



The thunderstorm asthma event had a significant impact on those affected by the emergency and those responding to it (Image credit: Ambulance Victoria)

This emergency had a significant impact on those affected by thunderstorm asthma and those responding to it. The perspective of one Ambulance Victoria paramedic is reproduced below.

A PARAMEDIC'S PERSPECTIVE

I will never forget working as a paramedic that night. I had never heard of an 'asthma storm' or had an understanding of the devastating destruction it would ultimately bring with it.

Driving back from hospital around 5pm the sky was black as far as the eye could see. I checked the radar and a huge front of thunderstorms was approaching the western suburbs. It had been a stinking hot 38 degrees and we were surprised as we didn't think the change was coming until midnight. We were dispatched to a Signal 1 job at a medical centre and off we went, oblivious to what was about to unfold.

A staff member greeted us and said, "Something strange is happening, we have just had an influx of patients presenting with respiratory problems requiring treatment". We loaded our patient and were 15 minutes out of town when I heard a distant crew dispatched to a severe respiratory-distressed male struggling to breathe. I thought 'what on earth is going on, surely there is a closer ambulance? Why is it that all of a sudden every job is respiratory?'

At hospital I was overwhelmed by the hundreds of people in the waiting room, mostly respiratory patients. There was a sense of chaos and the nurses and doctors had a look of fear and concern. All of a sudden, through the door came a stream of intubated patients, the majority of them young. My heart started to race and I realised just how sick many of these patients were. Hospital staff set up makeshift stations with oxygen bottles to deal with the sudden influx.

Then came the text message detailing 'urgent recall of all off-duty staff for an unprecedented increase in cases'. This was serious. As soon as my partner and I offloaded our patient we raced out to the ambulance and started preparing adrenaline syringes. Sure enough, we were dispatched to a severe respiratory distress. The radio traffic was constant with Code 1 respiratory cases and for the next eight hours we responded to numerous Priority Zero and Signal 1 calls.

The severe asthmatic is one of the most frightening jobs a paramedic can attend.

One of our patients was a young female experiencing the worst asthma attack of her life. When we arrived at her house she was already with a doctor from a hospital who had gone into the community to help with the massive demand. The patient was struggling to breathe and dripping with sweat. If we didn't act fast she was going to respiratory arrest on us. It was touch-and-go for a while with multiple doses of adrenaline and salbutamol having minimal effect – by far the worst case of asthma I had ever seen. The fear in her eyes was contagious however I had to remain focused. "Open your eyes for me. Stay with me. You can do this, you are doing so well. Keep going, hang in there". I repeated these words constantly whilst fearing the worst.

My heart sank when we were diverted from the closest hospital – which was struggling to cope – and a distant hospital was our next best option. On arrival there was a sea of ambulances, paramedics and patients. A wave of relief came over me when our patient received a resuscitation bed but I knew the night was not over and there were many more jobs still pending.

Despite the chaos there was an immense sense of comradeship among ambos and all medical and emergency services.

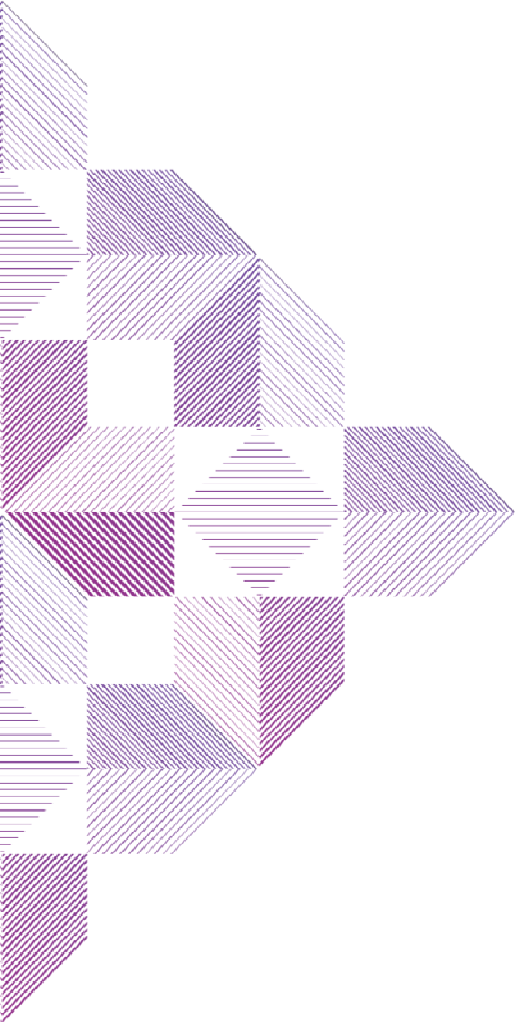
Not once did I hear someone complain about feeling hungry or fatigued but instead heard amazing stories of survival and working together as a team. Rules went out of the window and people had to make decisions on the spot that would ultimately save a person's life.

Dayshift crews worked into the night and single responders did the unthinkable by managing respiratory arrest patients on their own. Little things – like off-duty colleagues bringing hot food to starving paramedics at midnight – showed the amazing compassion we had for one another.

I've always loved my job and the ability to help others, but circumstances like these make me realise just how bloody proud I am to be a part of the ambulance family. We support each other and work towards delivering the best care we can to others.

A horrific day that will go down in Melbourne history for all affected, but also an amazing display of comradeship that I was proud to be a part of.

3 Understanding thunderstorm asthma



The thunderstorm asthma event of 21–22 November 2016 had consequences that were not typical of a thunderstorm.

The unique characteristics that differed from the more commonly occurring emergencies such as bushfire, flood and thunderstorm included:

- being largely invisible
- being geographically dispersed and widespread
- having a rapid onset
- being unfamiliar or unknown, with less practiced response protocols.

Allergy, asthma and allergic rhinitis (AR) are different conditions that often co-occur, and research is ongoing to fully understand the immune system interaction with allergens.

In simple terms, allergies result from hyper-sensitivity to an allergen (for example dust, pollen, mould) whereas AR is associated with inflammation of the nose in response to an allergen.

Asthma on the other hand is a chronic inflammatory condition located in the lower airways. There are several types of asthma, among which allergic asthma is the most common¹⁸.

Notwithstanding the rarer occurrence of epidemic thunderstorm asthma – as occurred in Melbourne on a much smaller scale in 2010 – many people with asthma are regularly affected by the combination of elevated pollens and thunderstorms. The number of people affected, and the severity of their asthma are not well documented.

Although there are uncertainties about the specific mechanisms involved, thunderstorm asthma is likely triggered by small-sized airborne allergens, such as those from pollen and possibly mould spores that are carried by thunderstorm downdrafts and outflows, and then inhaled by allergen-sensitive individuals (see Figure 5, page 20).

Some of these small-sized allergens are caused by rupturing pollen grains as a result of climatic conditions associated with the storm activity.

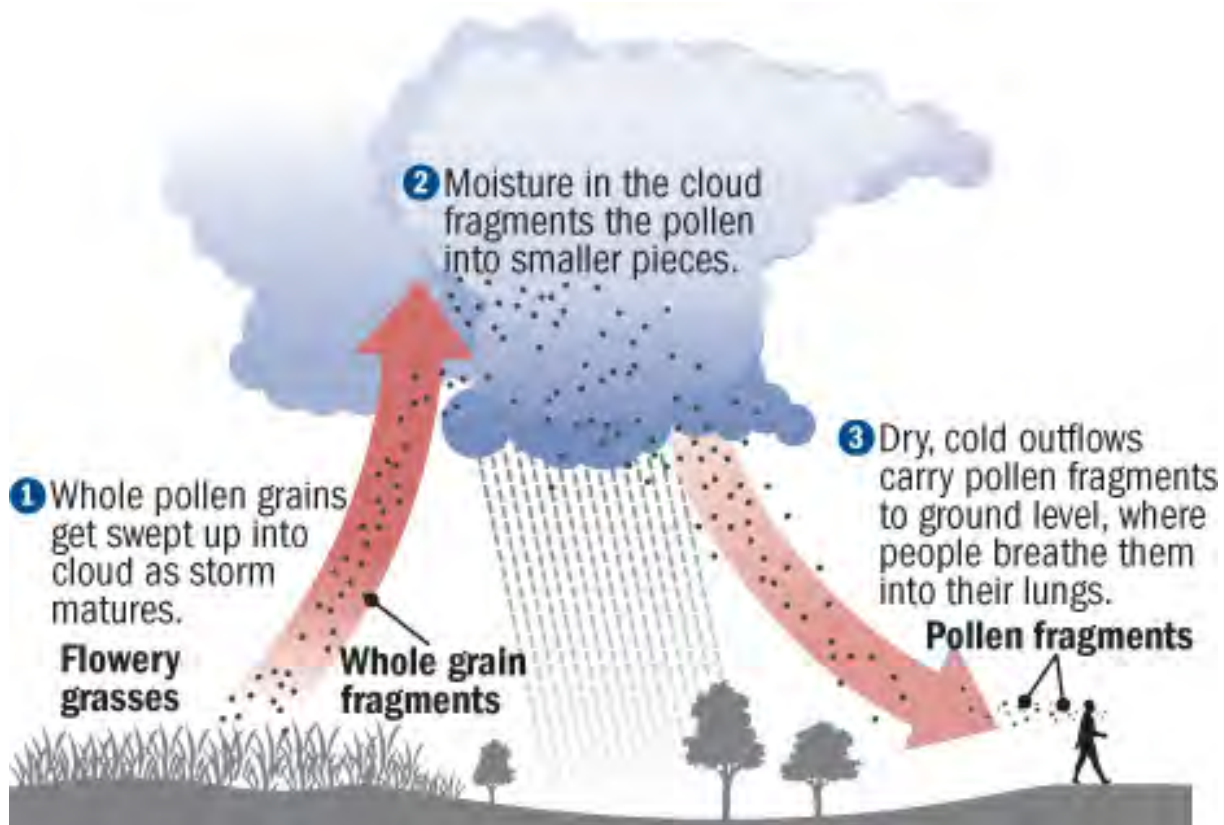
There are four proposed pre-conditions for a thunderstorm asthma epidemic:

- high concentrations of allergenic material (for example grass pollen or fungi)
- thunderstorm outflow that sweeps up bio-aerosols and suspends them near ground level in population centres
- formation of respirable-sized particles (<10 µm) via rupturing pollen grains or germinating fungal spores (see Figure 6, page 21)

- exposure of people who are sensitive to the relevant allergen and/or people who have (a propensity for) asthma to the air mass carrying allergenic particulate matter.

Members of the Environment Protection Authority Victoria (EPA) and Deakin AIRwatch noted the gusts from the thunderstorm lasted approximately 30 minutes.

Figure 5 Visual representation of one hypothesis for the mechanism of thunderstorm asthma (Illustration courtesy Alex Gonzalez)



3.1 Exposure of allergen-sensitive individuals

Thunderstorm asthma epidemics occur when allergen-sensitive individuals inhale air that is carrying a high concentration of airborne allergens.

Notably, not all people with asthma are affected by thunderstorm asthma, and many people affected do not have a known history of asthma¹⁹.

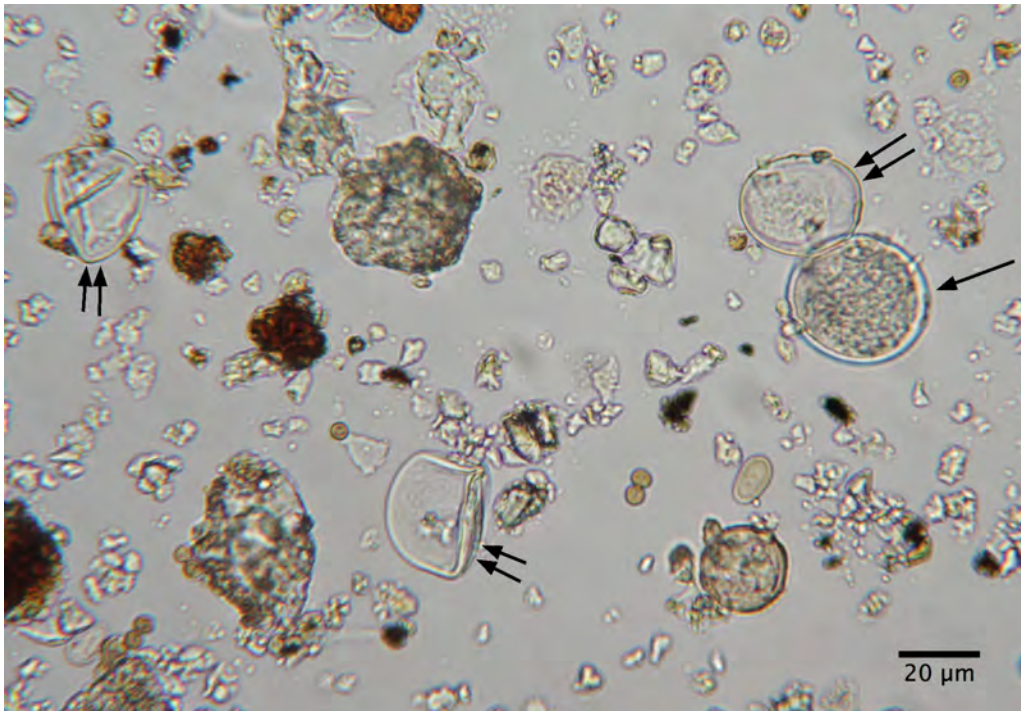
Where allergy testing of subjects with thunderstorm asthma has occurred, many have had hyper-sensitivity to certain types of pollen and/or fungi^{20 21}. In addition, many subjects with thunderstorm asthma have reported a history of hay fever, but not asthma^{22 23 24}.

Current thinking suggests that sensitive individuals are 'primed' by environmental factors prior to the thunderstorm so that their airways are already hyper-responsive, and that this causes the acute and severe reaction to the amount of allergens carried by the thunderstorm^{25 26}.

A potentially key priming factor is exposure to airborne allergens such as pollen or fungal spores prior to the thunderstorm.

Other priming factors that may be relevant include exposure to air pollution, viral infections (particularly respiratory)^{27 28} and weather factors that are known to affect asthmatics more generally, such as sudden temperature changes and high humidity²⁹.

Figure 6 Microscope image of Burwood (Victoria) air sample at 6:30 pm on 21 November 2016. Single arrow points to intact pollen; double arrow points to ruptured pollen
(Image courtesy of Dr Philip Taylor and Associate Professor Cenk Suphioglu, Deakin AIRwatch)



3.2 The impact of thunderstorm asthma

Epidemic thunderstorm asthma is a significant public health issue because of its potential to affect large numbers of people (including those with no known history of asthma), over a very short period of time across a wide geographical area and to consume and potentially overwhelm ambulance, emergency department (ED), primary care resources and pharmaceutical suppliers.

The most severe impact of thunderstorm asthma is the sudden increase in asthma cases to the point of an epidemic. This includes general practitioner (GP) visits, ED presentations, and in extreme severe acute cases, hospital admissions.

For example:

- During the June 1994 thunderstorm asthma epidemic in the United Kingdom, GP consultation rate was six times higher than normal, and an estimated 1500 people requested a GP visit for asthma^{30 31}.
- In Melbourne, 5 to 10-fold increases in asthma cases at EDs and increased ambulance calls for asthma have been observed in previous thunderstorm asthma events in 1987 and 1989³².

- In October 1997, there were 215 asthma-related ED cases, 41 of whom required admission, following a thunderstorm in Wagga Wagga³³.

Following this event, a detailed disaster plan was written as a way of mitigating potential future risks to the local health district (Appendix F: Murrumbidgee Local Health District case study).

Knowledge of who has been affected in each event is generally limited to the most severe cases as studies tend to rely on data from hospitals or GPs³⁴. It is possible that subjects with well-managed asthma are also affected by the thunderstorm, but are able to effectively resolve their symptoms alone.

Managing space, staffing, and resources within EDs during asthma epidemics is a significant issue³⁵ and there have been reports of EDs running out of medication or equipment during severe events³⁶.

Acute and severe acute asthma are the most extreme medical impacts of thunderstorm asthma.

When the highly concentrated allergenic material is inhaled by sensitive (primed) individuals, it is deposited throughout their airway. Initial symptoms of an allergic asthma reaction include airway constriction and inflammation^{37 38}.

If left untreated, continued and increasing inflammation leads to mucous secretion within the airways. This mucous, along with other damaged cells and the continued inflammatory response, causes smaller airways to become blocked^{39 40}. Breathing becomes progressively more difficult due to airway narrowing and air becoming trapped in the airways.

These events cause respiratory muscle fatigue, uneven lung ventilation, and low oxygen concentration in the blood. Prolonged asthma can also cause high levels of carbon dioxide⁴¹.

Deterioration from an untreated asthma attack, or if unresponsive to treatment, can in severe cases progress rapidly and cause respiratory failure.

“...unless you have had an asthma attack or been unable to breathe, you will not understand...”

Source: public submission

Beyond these medical impacts, thunderstorm asthma can be a particularly frightening experience for both the patient and carer, especially if access to medication or treatment is not immediately available.

Indirect costs associated with missed work and additional resourcing requirements for health and emergency services for this event are likely to be significant, but as yet are unquantified.

FINDING 1

The incidence of thunderstorm asthma is not commonly recognised as a routine consequence of thunderstorms by the health and emergency management sectors.

Epidemic thunderstorm asthma resulting in significantly increased demand on ambulance and hospital services is a rare event. Thunderstorm asthma events have been documented globally since 1983. Seven episodes of epidemic thunderstorm asthma have been documented in Australia during that time. Of the globally-documented episodes of epidemic thunderstorm asthma, fatalities appear rare, with one verified death recorded in the UK in 2002.

Affected people are likely to experience severe respiratory symptoms and asthma resulting in increased emergency calls, emergency department presentations, hospital and intensive care unit admissions, general practitioner consultations and demand for pharmaceutical products.

Accordingly, the Inspector-General for Emergency Management (IGEM) finds that the scale of the 21–22 November 2016 event in Melbourne was unprecedented in the number of affected people, the demand for urgent healthcare, and the subsequent consequences.

3.3 Predicting thunderstorm asthma

Thunderstorm asthma involves interactions between meteorological factors, airborne allergens, and human factors, therefore prediction is complex.

Four conditions must be considered in order to understand the potential for thunderstorm asthma prediction⁴²:

- **High concentrations of allergenic material**

Pollen monitoring in Australia is currently sparse, with data typically collected once per day or week. In some locations data is only collected during what is considered to be the main pollen season. In addition, not all species that produce pollen are currently monitored (and in some locations only grass pollen is quantified), with fungal spores perhaps less monitored than pollens. Weather conditions on the day, and in the preceding days and weeks are also likely to be important. For example, pollen production requires adequate rain during winter and warm, dry days prior to the thunderstorm to support elevated levels of airborne pollen.

- **Thunderstorm outflows**

Understanding how thunderstorms develop, mature, and subside is relatively well developed, and the BoM is able to predict thunderstorms and their paths with considerable accuracy. While much data about thunderstorms is available, identifying meaningful indicators for predicting thunderstorm asthma remains a key priority.

- **Respirable-sized aeroallergens**

The formation of respirable-sized (small enough to be inhaled) airborne allergens is much harder to predict and monitor, particularly as pollen fragments, broken fungal spores, and other allergenic matter is often not revealed in current pollen monitoring. In addition, real-time monitoring of airborne allergens is not currently undertaken and would likely require significant investments and trialling of new technology.

- **Exposure of sensitive people**

Using automatically generated data from emergency departments that is monitored by public health officials, a rise in asthma cases can be used to generate an alert and trigger a public health intervention⁴³. This may allow earlier identification of asthma epidemics and facilitate appropriate resourcing and management.

Factors that appear important for predicting thunderstorm asthma include:

- **seasonal:** rainfall during winter, pollen season (start, peak, and end)
- **in the preceding days:** temperature, humidity, pollen count, possibly fungal spore count
- **on the day:** temperature, humidity, wind direction, wind speed, pollen forecast
- **about the thunderstorm:** thunderstorm type, direction of movement, wind speed
- **exposure:** time of day, location of the gust front.

It is important to note that the science of predicting thunderstorm asthma is in its infancy – there are likely other variables involved, and that thresholds and triggers (for example required pollen count) will develop over time.

As others have observed^{44 45}, predictions based on current knowledge are likely to have high rates of false alarms. It may, therefore, be worthwhile distinguishing between ‘forecasts’ that an event may occur, and alerts/warnings that an epidemic thunderstorm asthma event is actually occurring based on early detection of a surge of patients into the health system.

3.4 Current monitoring and forecasting in Melbourne

Thunderstorm asthma events are well known throughout parts of Australia. They have been known by the weather forecasting community for approximately 30 years, however have only been documented sporadically.

The profile of thunderstorm asthma events is only raised following an event that affects large populations such as Wagga Wagga and Melbourne.

Victoria has three pollen monitoring stations that operate during the pollen season.

Although the season can vary in onset and duration, long-term data shows that the majority of high and extreme pollen days occur between October and December.

The Melbourne Pollen Count and Forecast service operates through the School of Biosciences at the University of Melbourne, under the AusPollen Australian Pollen Allergen Partnership^{46 47}.

The service operates during Melbourne’s peak allergy period of 1 October to 31 December. The service offers a daily pollen count and a six-day forecast.

The forecast ratings are from ‘low’ to ‘extreme’. The daily 4.00pm count is made available on the website (melbournepollen.com.au), and the forecast updated and distributed through the Asthma Australia website and networks. An App for mobile devices is available free-of-charge.

The Deakin AIRwatch service is operated by Deakin University for staff and students, and made available to the public on its website⁴⁸. This service has pollen and spore counting stations at Deakin University’s Burwood and Waurn Ponds campuses.

Operating between 1 September and 1 February, it provides a daily pollen count, a 24-hour pollen forecast and a 24-hour thunderstorm asthma forecast. The latter is based on an ‘extreme’ 24-hour pollen forecast combined with a severe thunderstorm forecast from the BoM. The high-risk period, when aeroallergens are thought to be present, does not extend to the full five months.

From an academic perspective, additional pollen monitoring stations are needed in the east and west of the state to improve Victoria’s capacity to provide pollen surveillance and intelligence.

Since the November 2016 epidemic thunderstorm asthma event, DHHS, BoM, EPA, the University of Melbourne and Deakin University have formed a thunderstorm asthma interagency working group to share knowledge and experience of thunderstorm asthma-associated events, and discuss ways to enhance the prediction of future events.

FINDING 2

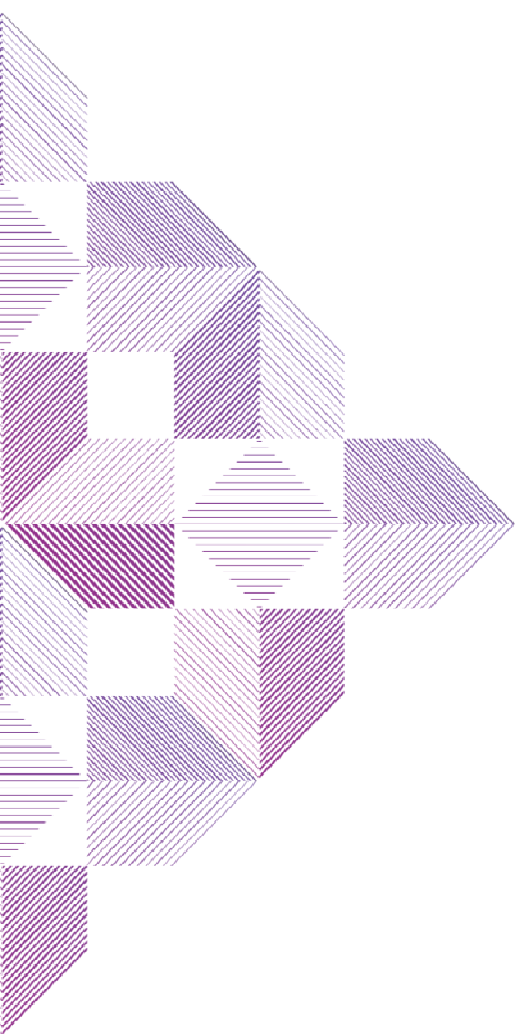
The phenomenon of thunderstorm asthma is not fully understood, although it is accepted that two factors – extreme levels of grass pollen and the occurrence of a thunderstorm – are common in many of the thunderstorm asthma incidents documented since 1983.

Although the Bureau of Meteorology is able to predict thunderstorms and their paths with some accuracy, identifying meaningful indicators for predicting thunderstorm asthma remains a key priority for the sector.

Pollen counting takes place at three sites across Victoria by university researchers however it is not publicly funded, the measurement methodologies are not consistent and results are not distributed under a planned strategy.

The Inspector-General for Emergency Management (IGEM) finds that significant effort is being made by a range of stakeholders in Victoria and across Australia to build the knowledge base and improve the evidence upon which a reliable monitoring and forecasting system can be established.

4 Response



IGEM considered the following contextual factors in assessing the appropriateness and adequacy of response to the thunderstorm asthma event on 21–22 November 2016:

- the health impacts were not predicted or foreseen
- it had a very rapid-onset
- it had broad geographic coverage
- there were no previous instances of an event of the scale or impact experienced on 21–22 November 2016.

Emergency response includes actions taken immediately before, during, and after an emergency to reduce the effect and consequences of emergencies on people, their livelihoods and wellbeing, property and the environment, and to meet basic human needs⁴⁹.

Victoria's emergency response arrangements are guided by the Act and a number of key plans.

The following are key state-level plans relevant to the thunderstorm asthma event:

- the *State Emergency Response Plan (SERP)*
- the *State Health Emergency Response Plan (SHERP)* – sub plan to the SERP
- the *Public Health Control Plan 2012*.

Refer to Appendix C for further detail on the Act and the key plans.

IGEM notes that DHHS commenced a review of the State Health Emergency Response Arrangements (SHERA) in July 2016. Refer to Section 4.12 of this report for further information.

4.1 Emergency response – key concepts

Emergency response management is based on the functions of command, control and coordination, consequence management, communications and community connection (the six Cs).

Command – internal direction of personnel and resources, operating vertically within an agency. Functional command is the integrated command of associated activities, resources and capabilities that may normally exist across a number of organisations.

Control – overall direction of response activities in an emergency, operating horizontally across agencies.

Coordination – bringing together of agencies and resources to ensure effective response to and recovery from emergencies.

Consequence management – coordination of the activities of agencies to minimise the adverse consequences of emergencies on the community.

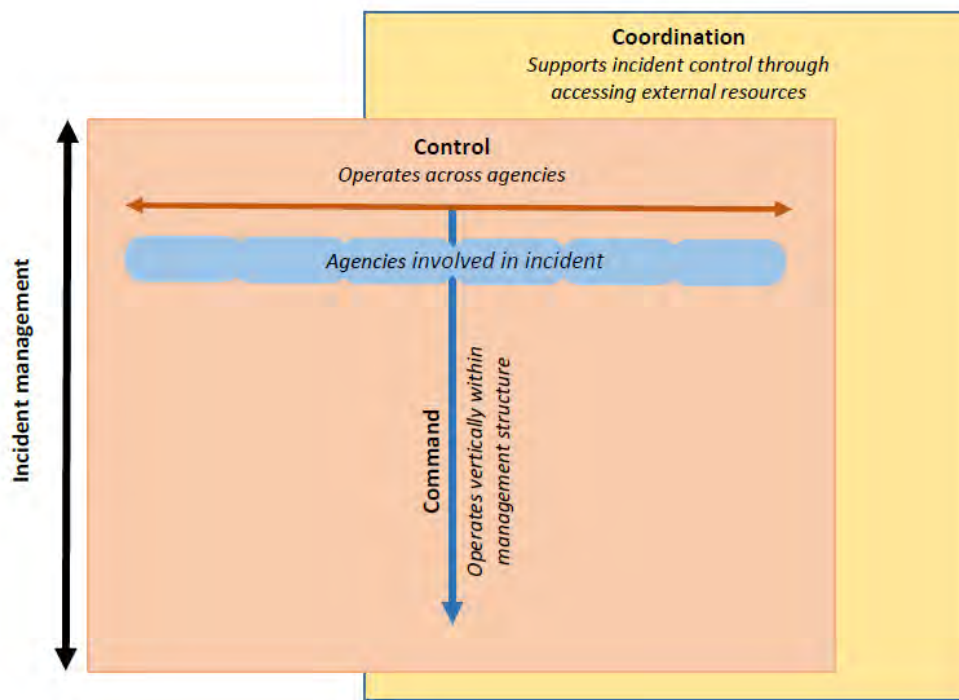
Communications – communicating with the public, reporting to government and communicating with stakeholder agencies during emergencies.

Community Connection – the relationships, systems and networks that enable individuals and communities to work together.

Figure 7 shows the relationship between command, control and coordination in emergency response.

Figure 7: Relationship between command, control and coordination in emergency response

(Source: The Australasian Inter-service Incident Management System, Australasian Fire and Emergency Service Authorities Council, Fourth edition, 2013)



4.2 Overview of key response arrangements for the thunderstorm asthma event

A major thunderstorm is classified as a Class 1 emergency, with the Victoria State Emergency Service (VICSES) typically undertaking the role of the control agency in accordance with the SERP. VICSES would take the lead role in responding to requests for assistance with the 'Line of Control' in place (Incident, Region, State).

The November 2016 thunderstorm asthma event was unique due to the significance of the health consequences it posed, in addition to the usual consequences of a thunderstorm, such as flooding or building damage.

Due to the health consequences, under the Act, the thunderstorm asthma event was a Class 2 emergency. It has also been referred to as a public health emergency.

Each type of emergency event has an assigned control agency or primary agency responsible for responding to that specific form of emergency. The *Emergency Management Manual Victoria (EMMV)* lists the responsible agency according to each type of emergency. For example, DHHS is the control agency for human disease/epidemics, food/drinking water contamination and incidents involving radiological substances and biological releases.

As the thunderstorm asthma epidemic event was considered a human disease event, DHHS was the designated control agency.

The CHO was the Class 2 State Controller, which is a designation of the role, and was responsible for managing and leading the overall operational response of the thunderstorm asthma event.

Health incident responses may be structured around the three tiers of control – state, regional, and incident. The tiers at which the health response operates will vary according to the impact on the health system and the tiers where control is exercised. The thunderstorm asthma event was managed only at the state tier.

Table 1 below depicts the key state tier roles and functions for a public health emergency in accordance with the Act, the SERP and the SHERP.

Table 1: Key roles and functions for a public health emergency in accordance with the Act, the SERP and the SHERP

ROLE	AGENCY	KEY FUNCTIONS
Emergency Management Commissioner	EMV	<ul style="list-style-type: none"> • Ensure control arrangements are in place for Class 1 and Class 2 emergencies • Response and recovery coordination • Consequence management • Communication (supported by DHHS)
Chief Health Officer (Class 2 State Controller)	DHHS	<ul style="list-style-type: none"> • Establish control structure for the Class 2 emergency as appropriate and monitor to ensure it suits the circumstances • Consider and apply the State emergency management priorities (including the protection and preservation of life and issuing of community warnings) • Issue warnings and information to the community in relation to the Class 2 emergency
State Health and Medical Commander	DHHS	<ul style="list-style-type: none"> • Direct state health and medical resources • May form a State Health Incident Management Team to coordinate a whole-of-health response to an emergency at a strategic level • Ensure functional command is established and operating effectively through the State Health Incident Management Team when an incident is likely to overwhelm the Victorian health sector • Maintain strategic oversight of health consequences and contribute to the State Risk and Consequence Plan⁹ via the Class 2 State Controller and the Emergency Management Commissioner
State Health Coordinator	DHHS	<ul style="list-style-type: none"> • Resource and implement the State Health Incident Management Team • Advise the Class 2 State Controller on health sector readiness, capability and operational activity • Brief the State Health and Medical Commander on health sector response, capability and potential vulnerabilities • Approve requests for additional clinical and physical resources • Ensure regular and appropriate health-related communication with internal and external stakeholders
State Health Commander	AV	<ul style="list-style-type: none"> • Provide regular situation reports to the Class 2 State Controller, State Health and Medical Commander, and the State Health Coordinator • Assume command of the pre-hospital function of the emergency at the state tier • Contribute to the State Risk and Consequence Plan through the development of the health plan

⁹ This plan identifies the high level consequences associated with an emergency event and appropriate risk management strategies to mitigate the flow on affects to communities, businesses or the economy of Victoria.

4.3 Surge during the evening of 21 November 2016

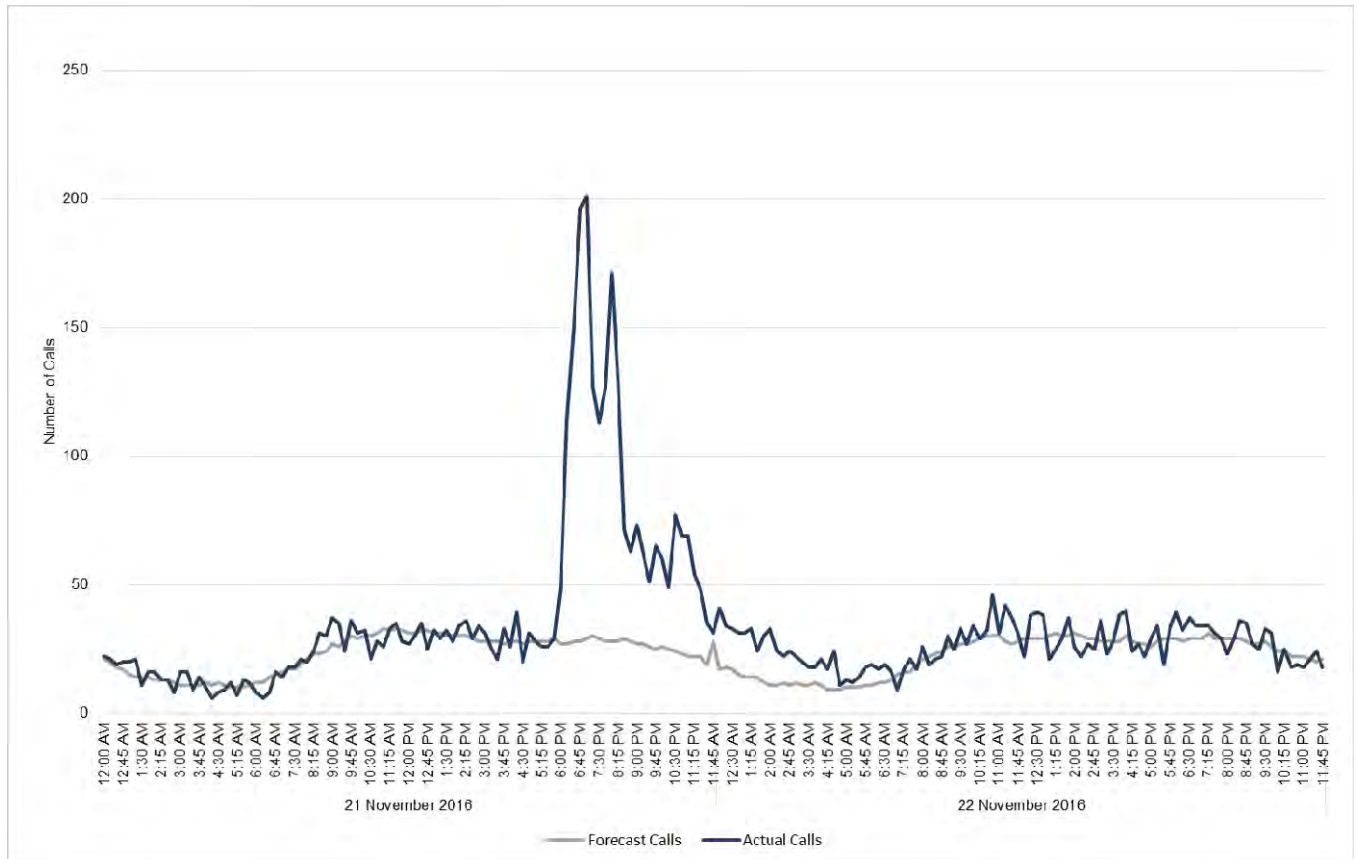
Thunderstorms were forecasted on 21 November 2016, however there was no expectation that they would generate a major health emergency.

A surge in Triple Zero calls occurred at approximately 6.00pm on 21 November 2016, predominantly for respiratory-related illness and cardiac arrest.

As shown in Figure 8, the ESTA surge peaked between 7.00pm and 7.15pm, during which time Telstra presented 201 emergency ambulance calls to ESTA. This is an increase of 593 per cent compared to the number of emergency calls that ESTA had forecast (29 calls).

ESTA rapidly responded to the surge by increasing its ambulance call-taking resources by 28 per cent during the first hour of the surge (6–7.00pm). This increased to 94 per cent by the second hour (7–8.00pm).

Figure 8: Triple Zero emergency ambulance calls presented to ESTA for 21–22 November 2016



ESTA continued to maintain its ambulance call-taker numbers well above its scheduled numbers until 1.00am on 22 November 2016.

This resource supplementation was achieved through overtime arrangements for day shift staff, reallocating resources based on need, utilisation of ‘multi-skilled’ operators^h, recalling staff from breaks, postponing breaks, and team leaders engaging in ambulance call-taking and dispatch duties.

^h ESTA’s ‘multi-skilled’ operators are those employees trained and capable of emergency communications functions for more than one agency. For example, an ESTA fire call-taker who is also trained to answer emergency ambulance calls is multi-skilled and may be deployed to either function as demand requires.

As the number of emergency calls increased, ambulance resources became increasingly stretched and were unable to immediately attend most new cases. ESTA and Ambulance Victoria (AV) continued to review and reprioritise resources to ensure that ambulances were dispatched to the highest priority cases with minimal delay.

The list of emergency ambulance cases pending dispatch peaked at approximately 8.00pm, with over 150 cases. Almost 100 of these cases required urgent paramedic and hospital care (Code 1 cases).

By 9.30pm, the number of pending cases had reduced to 40, with no Code 1 cases pending.

At that point, AV decided no further escalation of resources was required and routine arrangements were sufficient to manage remaining cases.

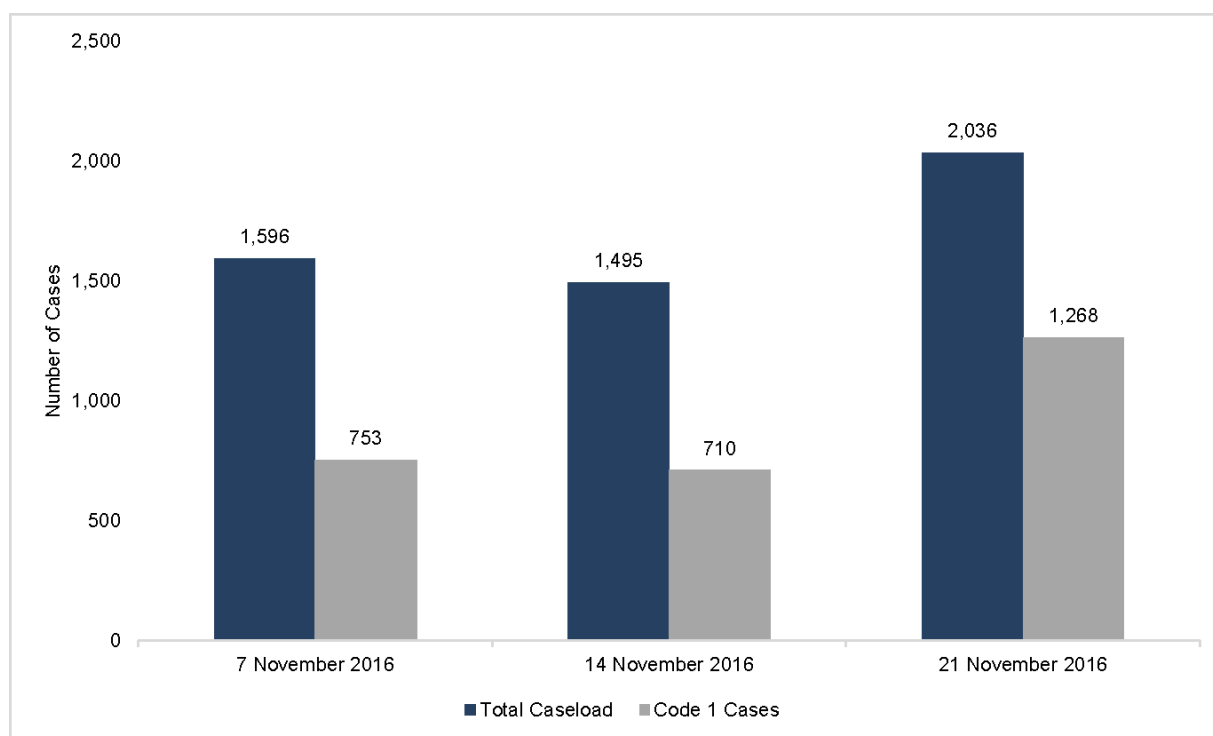
Overall, AV had 2036 cases on 21 November 2016, with 1268 of these being Code 1.

Figure 9 shows AV's caseload figures for 21 November and the two preceding Mondays in November 2016.

On 21 November 2016, there were:

- increases in total number of ambulance emergency cases of 27.5 per cent and 36.2 per cent compared to 7 November and 14 November 2016, respectively
- increases in Code 1 cases of 68.4 per cent and 78.6 per cent compared to 7 November and 14 November 2016, respectively.

Figure 9: Ambulance Victoria caseloads for 7 November, 14 November and 21 November 2016



In order to continue serving the community under such significant demand pressures, AV deployed additional resources and sought assistance from partner agencies.

Table 2 summarises the number of additional resources AV deployed on 21 November 2016 in response to the thunderstorm asthma event.

Table 2: Additional resources deployed by Ambulance Victoria on 21 November 2016

TYPE OF RESOURCE	DETAILS
Ambulance Victoria	79 additional resources deployed comprised of: <ul style="list-style-type: none"> • 74 additional advanced life support paramedics • 5 additional Mobile Intensive Care Ambulance (MICA) units.
Ambulance Victoria non-emergency contractors	17 additional non-emergency resources deployed comprised of: <ul style="list-style-type: none"> • 1 St John Ambulance resource • 6 Royal Flying Doctor Service resources • 5 Health Select resources • 4 Paramedic Services Victoria resources • 1 Wilson Medic One resource
Field Emergency Medical Officers ⁱ (FEMOs)	5 metropolitan Field Emergency Medical Officers provided medical support to AV

ⁱ The FEMO program enables medical doctors to provide assessment, leadership, advice and support during disasters in conjunction with other on-ground paramedic and health providers. This DHHS funded program is activated by the State Health Incident Management Team (usually via AV's State Health Commander in consultation with DHHS' State Health Coordinator) and reports to the State Health Commander.

Both the Metropolitan Fire Brigade (MFB) and Victoria Police (VicPol) provided support to AV outside usual response criteria, under arrangements agreed to during the evening of 21 November 2016.

MFB attended 11 Code 1 cases in addition to its normal responses under the Emergency Medical Response (EMR) program.

VicPol attended 17 cases related to people suffering shortness of breath, with respiratory or asthma-related symptoms. Officers primarily performed welfare checks in circumstances where AV was unsuccessful in calling back a caller or patient who was waiting for an ambulance. Police consequently transported one patient to hospital.

IGEM notes that first aid agency Chevra Hatzolah Melbourne Incorporated (Hatzolah)^j also attended seven cases of respiratory distress during the thunderstorm asthma event.

Although it was not contacted or requested to assist during the thunderstorm asthma event by AV, Hatzolah operates under a formal Memorandum of Understanding with AV.

4.4 Management and decision-making during the evening of 21 November 2016

Under state health emergency arrangements, DHHS and AV worked together to manage the response to the event on 21 November 2016.

DHHS was responsible for ensuring that the health system continued to operate as effectively as possible under the demand pressure while AV's key responsibility was responding to members of the public seeking pre-hospital medical assistance.

The key decision-makers on the evening of 21 November 2016 were the State Health and Medical Commander (DHHS), State Health Coordinator (DHHS) and the State Health Commander (AV) as shown in Figure 10.

IGEM notes that the roles of the State Health and Medical Commander and the State Health Coordinator were undertaken by one person. DHHS advised IGEM that since 31 December 2015 the roles have been assigned to one person.

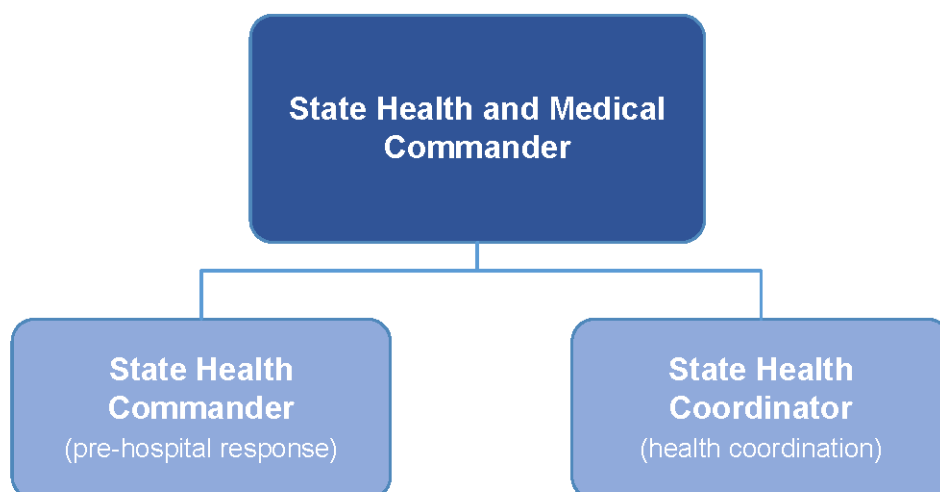
Management and decision-making between DHHS and AV on the evening of 21 November 2016 occurred remotely through telecommunications and emails.

Table 3 on page 30 provides a summary of the key actions undertaken by DHHS and AV to manage the thunderstorm asthma event on the evening of 21 November 2016.

Based on evidence collected by IGEM, AV's State Health Commander concluded response actions for the night at 12.22am on 22 November 2016 citing that the demand was settling for AV and that the role would resume in the morning.

The State Health and Medical Commander / State Health Coordinator (DHHS) – two roles being performed by one individual – continued to monitor the capacity of hospitals until 12.56am on 22 November 2016.

Figure 10: State Health Incident Management Team roles on 21 November 2016



^j Hatzolah is a community emergency medical response team operating within the Emergency Medical Response (EMR) program of Ambulance Victoria (AV).

Table 3: Key health management actions undertaken during the thunderstorm asthma event on 21 November 2016

TIME	ACTION
6.30pm	AV Duty Managers began coordinating the response to address the increase in demand. This included recalling clinicians, referral service staff, communications staff, 27 metropolitan crews, 20 rural crews, extra NETCOM resources ^k , as well as regional directors, and group managers for hospital management.
7.00pm	AV Duty Managers notified the AV Metropolitan Health Commander of over 70 pending cases as available resources had been exhausted. The AV Metropolitan Health Commander subsequently advised the State Health Commander (AV) of the situation and discussed actions that were being undertaken to manage the surge.
7.37pm	AV requested VicPol's assistance to conduct welfare checks.
7.48pm	AV's State Health Commander was advised that the total number of pending cases had increased to in excess of 120 and was requested by AV's Chief Operations Officer to assist with the coordination of the response.
7.51pm	AV's State Health Commander contacted MFB to request assistance above the standard EMR ^l protocols. MFB responded by deploying resources to support the emergency response.
7.54pm	AV's State Health Commander advised the Emergency Management Commissioner (EMC) of the current situation and how AV was managing the surge in calls, communicated plans to contact the State Health and Medical Commander / State Health Coordinator (DHHS) and communicated plans to contact media through AV's usual process.
8.10pm	AV's State Health Commander contacted the State Health and Medical Commander / State Health Coordinator (DHHS) to provide information on the surge event and requested DHHS inform hospitals to clear ambulance crews quickly to enable them to attend pending cases.
8.20pm	The EMC directed the State Control Centre (SCC) remain operating beyond the planned 9.00pm closure to provide any required support or action.
8.30pm	AV's State Health Commander contacted the Field Emergency Management Coordinator to request activation of the Field Emergency Medical Officer program to provide additional medical support to AV.
8.33pm	The State Health and Medical Commander / State Health Coordinator (DHHS) contacted the Chief Health Officer to alert him of AV demand issues and actions taken so far.
8.46pm	DHHS sent a group text message to metropolitan hospital Chief Executive Officers (excluding Peninsula Health and Western Health) informing them of the demand surge on AV and seeking their assistance to clear ambulance crews quickly.
8.52pm	DHHS sent a text message (same message as the group text at 8.46pm) to Peninsula Health and Western Health.
9.00pm	The Chief Health Officer and State Health and Medical Commander / State Health Coordinator (DHHS) discussed and agreed not to change advice to the community regarding Triple Zero calls.
9.53pm	The State Health and Medical Commander / State Health Coordinator (DHHS) received health service/public hospital information on the impact of the incident on their hospitals.
10.06pm	The State Health and Medical Commander / State Health Coordinator (DHHS) was contacted by AV's State Health Commander, notifying that demand on AV was settling and was no longer increasing.
10.52pm	DHHS approved the use of private hospital beds, if available, for public patients (at no cost to patients).

^k Non-emergency responses using contracted providers of non-emergency patient transport (NEPT).

^l The Emergency Medical Response (EMR) program was established to improve the outcome of patients in sudden cardiac arrest. This program allows MFB to respond to Priority 0 cases.

4.5 Impacts on the health system

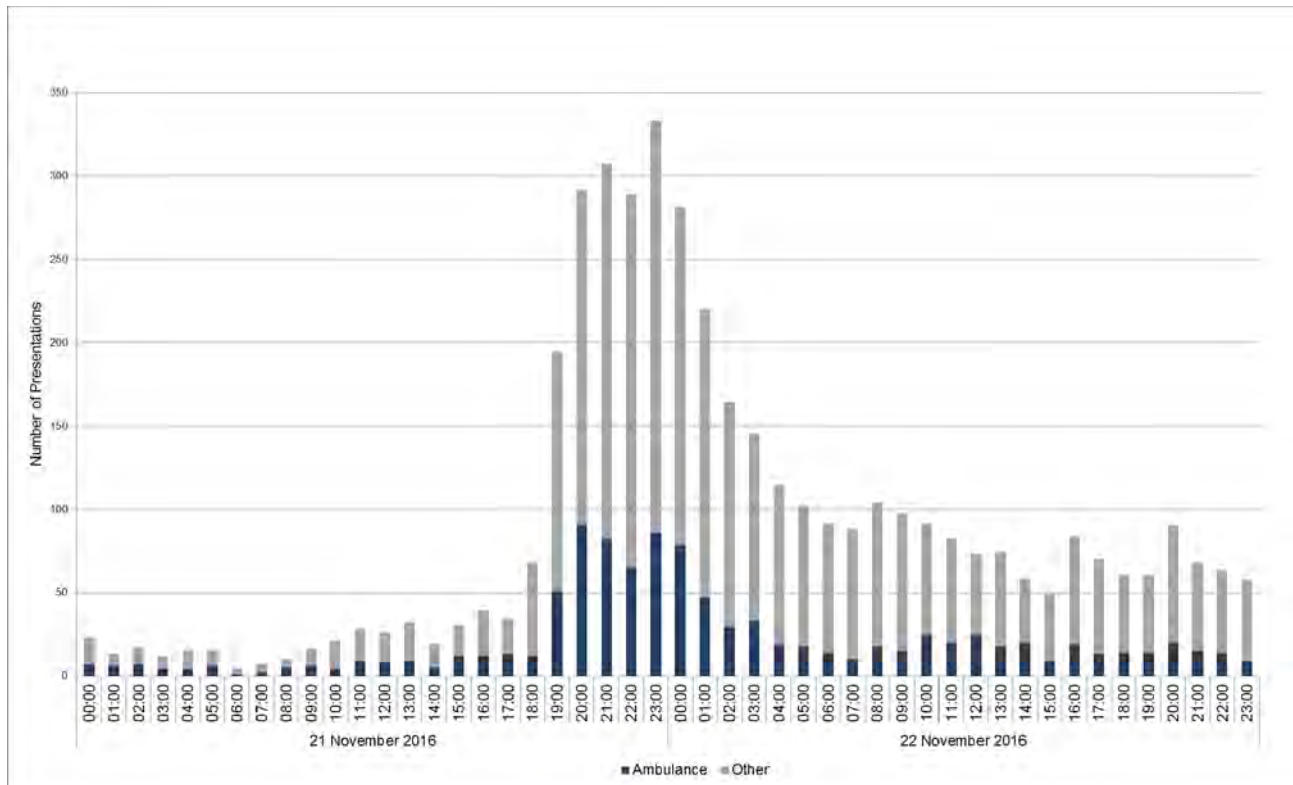
Impact on public health services

During the surge on 21 November 2016, AV transported 381 patients to public hospitals and 25 patients to private hospitals.

According to DHHS, ambulance arrivals typically make up around one quarter of emergency department attendances.

While arrivals to emergency departments on 21 November were significantly higher in overall volume, the proportion of arrivals by ambulance remained at approximately one quarter of all arrivals, as shown in Figure 11.

Figure 11: Transport type arrivals at emergency departments (Source: DHHS)



The thunderstorm asthma event resulted in a significant number of presentations at metropolitan Melbourne and Geelong public hospital emergency departments.

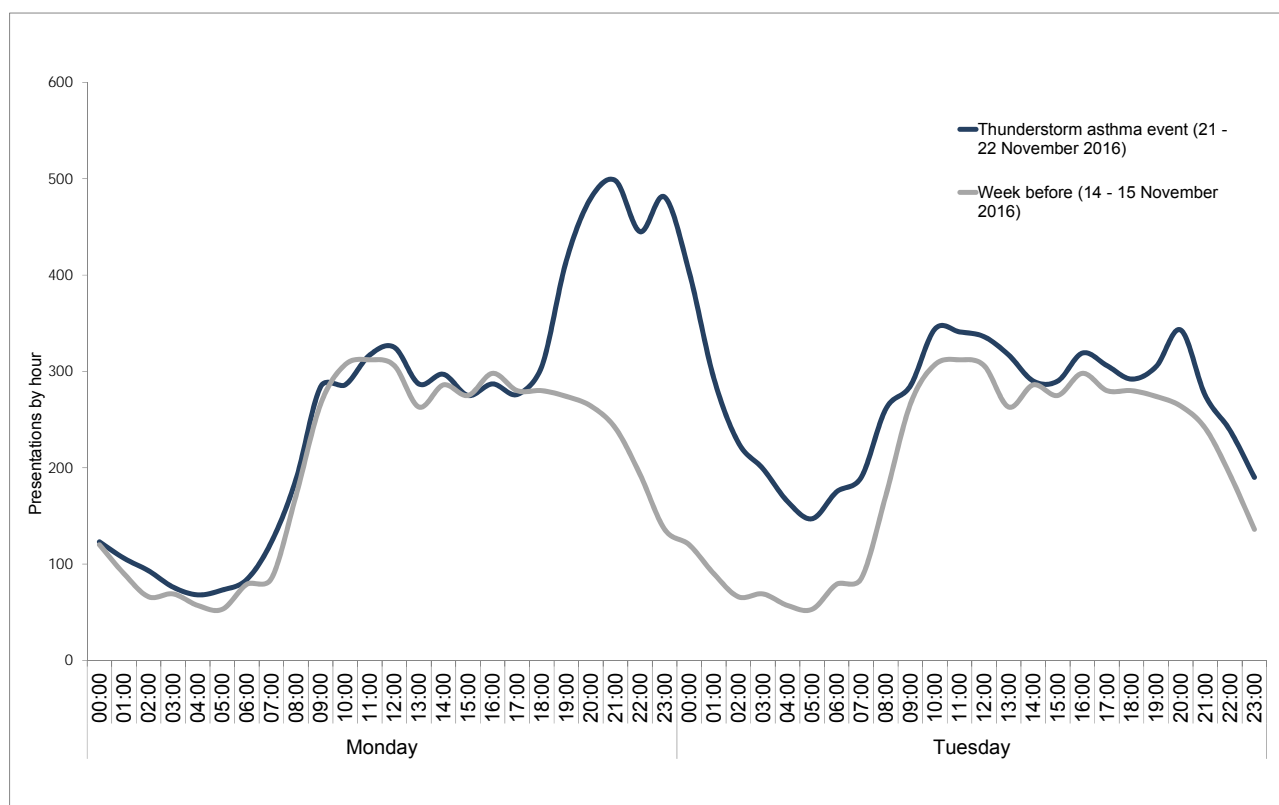
Over the two days of the event (21–22 November), there was a total of 9909 presentations at public hospital emergency departments across metropolitan Melbourne and Geelong.

As shown in Table 4 (page 32) compared to the Monday and Tuesday in the previous week (14–15 November), public hospital emergency departments across metropolitan Melbourne and Geelong saw an increase of 3270 (49 per cent) presentations.

This increase in presentations was almost exclusively as a consequence of the thunderstorm asthma event, with the peak of the presentations occurring at 9.00pm on 21 November 2016 (Figure 12, page 32).

Table 4: Number of presentations at public hospital emergency departments

	TOTAL STATEWIDE PRESENTATIONS AT PUBLIC EMERGENCY DEPARTMENTS	TOTAL PRESENTATIONS AT METROPOLITAN MELBOURNE AND GEELONG PUBLIC EMERGENCY DEPARTMENTS ^m
21–22 November 2016	12,723	9909
14–15 November 2016 (previous week)	9306	6639
Additional presentations compared to previous week (number)	3417	3270
Additional presentations compared to previous week (percentage)	37%	49%

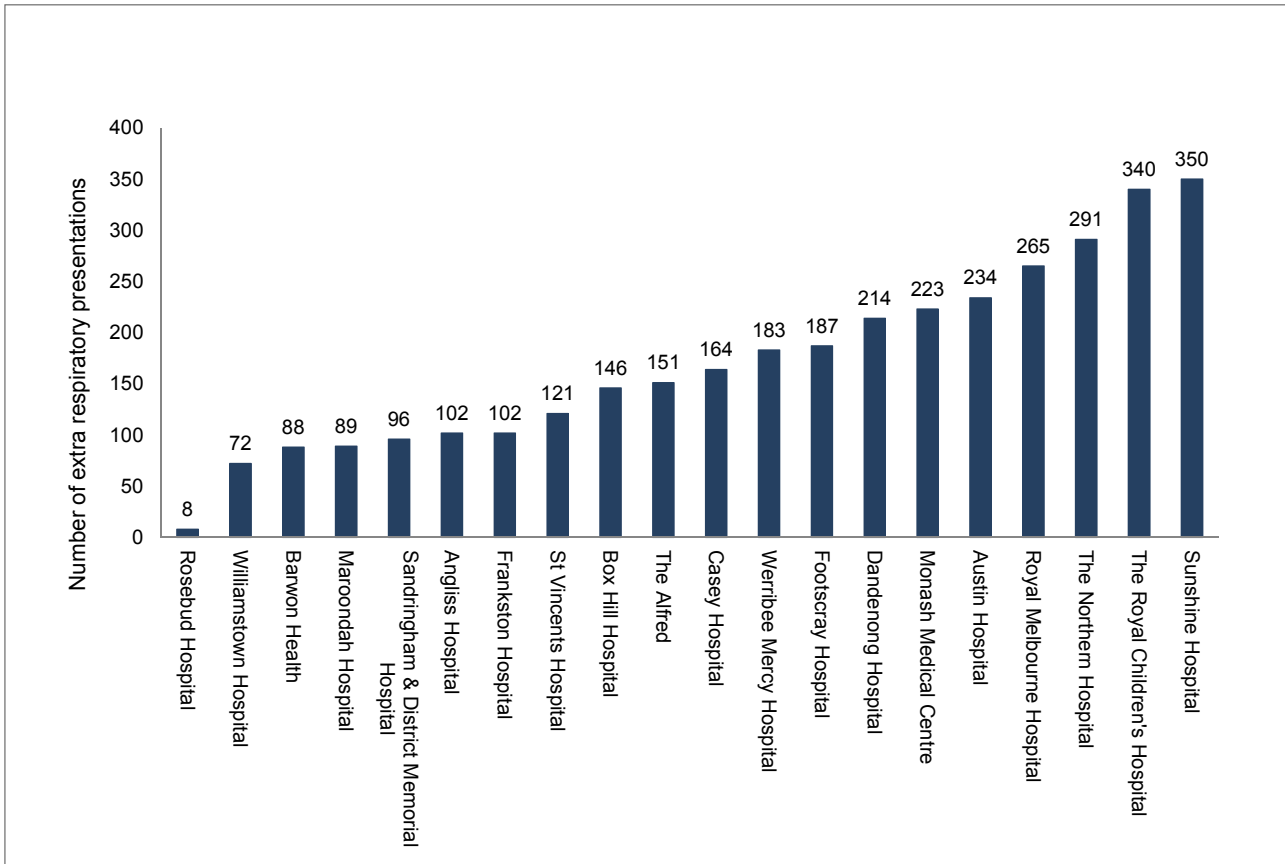
Figure 12: Statewide presentations (all public hospitals) by hour

^m Refer to Appendix D for the list of public hospitals most affected by the thunderstorm asthma event and the number of presentations across 21 and 22 November 2016.

Due to the direction of the thunderstorm front, metropolitan Melbourne public hospitals and Barwon Health in Geelong were most significantly affected by the thunderstorm asthma event.

Figure 13 shows the additional respiratory-related presentations across the 20 most affected public hospitals, as compared to the previous week in November 2016.

Figure 13: Extra-respiratory related presentations 21–22 November 2016 compared to previous week (14–15 November 2016)



Hospitals responded quickly and pragmatically on the evening of 21 November 2016.

This included:

- arranging for additional staff including medical, nursing, pharmacists, executives and non-clinical support staff
- clearing of non-urgent patients and making beds available
- rapid transfer of emergency department patients awaiting admission to ward areas
- creating additional triage and treatment spaces
- establishing respiratory or asthma assessment and management clinics.

In addition to the hospitals undergoing their own internal debriefs and reviews of the event to identify areas for improvement, IGEM interviewed seven public health servicesⁿ and examined the Alfred Hospital's public submission to this review in order to determine what worked well in this event and what could be improved at a system level.

Public health services noted the positive behaviour displayed by community members at emergency departments waiting for treatment.

Despite the long queues, community members were respectful, which made the work of hospital staff much easier in a high-pressure environment.

ⁿ Austin Health, Barwon Health, Melbourne Health, Monash Health, Northern Health, the Royal Children's Hospital, Western Health.

FINDING 3

The Inspector-General for Emergency Management (IGEM) finds that the rapid onset, escalation and scale of the event created unprecedented demand on the pre-hospital and hospital system.

IGEM commends the dedication and effort of Emergency Services Telecommunications Authority (ESTA) management, call-takers and dispatchers; Ambulance Victoria (AV) management and paramedics; partner response agencies (including but not limited to the Metropolitan Fire Brigade and Victoria Police); Department of Health and Human Services staff, and all hospitals and hospital staff involved in the initial emergency response to the thunderstorm asthma event on the evening of 21 November 2016.

While demand for ESTA, AV and hospital services stretched or exceeded capacity, the commitment and flexibility of the emergency management sector and the health system in responding to the event contributed to minimising adverse impacts on the community.

Communication and information flows between DHHS and hospitals

There were varied levels of situational awareness between DHHS and hospitals on the evening of 21 November 2016.

DHHS gathered information typically by contacting hospital Chief Executive Officers directly rather than the emergency controller or the person in charge of the hospital emergency department who was on scene.

DHHS communicated with individuals from hospitals through mobile text messages, phone calls and emails, rather than communication methods which could have reached multiple hospitals simultaneously.

As such, comprehensive broadcasts were not made to hospitals on 21 November 2016 to inform them of the surge in people requiring medical attention relating to the thunderstorm asthma event.

IGEM's consultation with a number of selected public health services revealed that there was inconsistency in the level of information provided to hospitals by DHHS, due to the differences in communication methods. As a result, some hospitals contacted each other directly to gather intelligence.

IGEM was advised that much of the information required by hospitals about what was happening more broadly across Melbourne was being gleaned through dialogue with Ambulance paramedics in the hospital emergency departments. It was stated that individual hospitals at times felt isolated in regard to information required to ensure their situational awareness.

A number of public health services staff had the knowledge, or at least suspected that the respiratory symptoms may be caused by thunderstorm asthma, however there was no formal channel for sharing this information with those managing the response.

Public hospitals identified a need to establish rapid, consistent, accurate, and comprehensive information and intelligence sharing capability between hospitals and DHHS.

It is the health services' view that for a rapid-onset event, DHHS should activate its formal incident management arrangements to the appropriate level as soon as possible and begin coordinating the response and providing information to the hospitals through established and agreed channels.

FINDING 4

The Inspector-General for Emergency Management (IGEM) finds that effective two-way communication between the Department of Health and Human Services (DHHS) and public hospitals did not occur on the evening of 21 November 2016.

Communication was ad hoc, inconsistent across health services, and not timely.

This prevented a shared understanding by hospitals and DHHS of the surge in people requiring medical attention which limited their ability to plan their response accordingly.

RECOMMENDATION 1

The Inspector-General for Emergency Management (IGEM) acknowledges the work undertaken since 22 November 2016 and recommends that the Department of Health and Human Services (DHHS) continue to work with all relevant health services and broader health system organisations to establish and/or strengthen communication channels, processes and systems to enable effective, consistent and timely two-way information flow.

This includes convening a regular forum, bringing together hospital representatives to ensure that when emergencies occur, previously established connections are in place so that appropriate personnel are kept informed.

DHHS should also establish or utilise existing governance arrangements to enable joint planning, bringing together organisations with a role in the health system to better prepare for, respond to and recover from emergencies. These governance arrangements should consider the role of broader health system organisations, including pharmacies, NURSE-ON-CALL and general practitioners.

RECOMMENDATION 2

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) establish a centralised online system, linking all hospitals to ensure that hospitals receive timely and relevant information, including intelligence on presentations and activation of Code Brown across hospitals.

This system would significantly contribute to DHHS' situational awareness, informing response decision-making and consequence management.

In addressing this recommendation, DHHS must work collaboratively with hospitals to ensure that all appropriate DHHS and hospital staff are trained and that adequate funding is allocated to ensure the system's sustainability.

Emergency management governance within the health sector

The Health and Medical Stakeholder Reference Group^o (the Reference Group) is Victoria's peak health reference group for providing advice to government on health and medical emergency management arrangements.

Moving forward, there is an opportunity to consider strengthening the Reference Group to involve representation from general practice.

Formal governance, whether it is through the Reference Group, or a working group that reports to the Reference Group, may need to be established involving DHHS, AV, relevant health services, general practice and pharmacies to assist with rectifying identified issues, as well as to:

- enable joint planning between DHHS and health services, and better utilisation of medical expertise and integration of broader health resources such as FEMO, Victorian Medical Assistance Teams, general practices and pharmacies
- ensure agreed communication platforms, channels and protocols exist and are understood and used during emergencies
- ensure appropriate personnel are involved and informed during emergencies
- identify training or refresher training required to support people to adequately fulfil their roles in an emergency
- share learnings to foster greater preparedness and a more coordinated response.

^o *The Health and Medical Stakeholder Reference Group comprises the Chief Health Officer, the State Health Coordinator, the State Health Commander and representatives from the State Trauma Committee, the FEMO program, private hospitals, the Pharmacy Guild of Australia, Victorian Hospitals Emergency Management Association, Australasian College for Emergency Medicine and Leading Age Services Australia.*

As noted, health services have undertaken their own internal debriefing and review processes and participated in a DHHS-led debrief of public and private health services for the thunderstorm asthma event.

IGEM commends the focus on continuous improvement and learning from the thunderstorm asthma event. As noted, enhanced governance can provide a forum in which these learnings and others can be shared and actioned.

FINDING 5

The Inspector-General for Emergency Management (IGEM) finds that the thunderstorm storm asthma event highlighted the need for better integration and coordination of the Department of Health and Human Services (DHHS), public hospitals and other health system resources in responding to a rapid-onset event.

Impact on private health services

Private hospitals in metropolitan Melbourne and Geelong also saw a surge in presentation numbers across 21–22 November 2016. There were 231 additional presentations with 210 additional respiratory related presentations across affected private hospitals^p, compared to the Monday and Tuesday average.

Epworth Richmond Hospital reported that 21–22 November 2016 were its busiest and second busiest days on record.

Impact on primary care services

Primary care services generally act as the interface between the health system and the public, and are usually located in the community.

Primary care is provided in community settings by a number of different health professionals including, but not limited to:

- general practitioners
- nurses
- pharmacists
- dentists
- allied health and mental health providers
- Aboriginal and Torres Strait Islander health practitioners.

^p *Private hospitals include Cabrini Hospital (Malvern), Epworth Richmond Hospital (Richmond), Epworth Waurn Ponds Hospital (Waurn Ponds), John Fawkner Private Hospital (Coburg), Knox Private Hospital (Wantirna), Peninsula Private Hospital (Frankston), St John of God Geelong Hospital (Geelong), Valley Private Hospital (Mulgrave).*

The following sections detail the impacts on three types of primary care services, namely community pharmacies, Supercare Pharmacies and NURSE-ON-CALL.

“...I would suggest making sure GPs are updated with any and all information. I believe this would at the very least allow them to actively inform patients who present with symptoms...”

Source: public submission

Community pharmacies

Community pharmacies played a significant role in providing aid to their communities during the thunderstorm asthma event.

Pharmacists and their assistants provided advice and medication to customers to manage their condition. Anecdotal evidence suggests that a large number of customers attended community pharmacies due to lengthy wait times for ambulances and hospital emergency departments.

Most community pharmacies had a limited view of what was happening on the evening of 21 November 2016, and received no information as to the extent of the impact on the health system as a result of the thunderstorm asthma event. Nonetheless, some community pharmacies did their best to aid their community by:

- staying open later than usual, in some cases until the early morning of 22 November 2016
- contacting each other and distributing Ventolin to where it was needed
- providing advice to customers on how to use Ventolin and other medication.

The Victorian Pharmacy Guild retains the contact details for all pharmacies in Victoria and is planning to release an app in the near future that will be utilised by up to 95 per cent of the pharmacies in Australia.

IGEM believes this network is a valuable resource.

DHHS, as the control agency for health emergencies, could use this resource to send out timely information to all pharmacies to improve their situational awareness and coordinate their response, such as ensuring medicines are provided to the most affected pharmacies or hospitals. This has the potential to relieve the pressure faced by hospitals and emergency services during times of emergency.

With approximately 1200 community pharmacies spread across Victoria, they are often the first point of call for community members seeking advice and medication. There is an opportunity to better integrate community pharmacies into emergency management planning, before, during and after emergencies, given their relationship with their local communities and broad geographic coverage.

FINDING 6

The Inspector-General for Emergency Management (IGEM) finds that on 21–22 November 2016 community pharmacies played a central role in meeting community needs during the thunderstorm asthma event. Given their community focus and their geographic coverage, community pharmacies can provide valuable support to the management of health emergencies or emergencies with health impacts.

RECOMMENDATION 3

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) work with primary care providers including appropriate community pharmacy representatives to consider and define the role community pharmacies play during emergencies and where appropriate, integrate community pharmacies into future planning for emergencies.

Supercare Pharmacies

Supercare Pharmacies receive funding from the Victorian Government in a contract managed by DHHS so that they remain open 24 hours a day, 7 days a week, with a nurse in attendance between 6.00pm and 10.00pm. They provide the public with non-emergency care which includes:

- physical assessment
- support and advice for minor illness and injury
- some immunisations, including influenza and whooping cough
- health screening, assessment and advice for illness prevention, including blood pressure checks, blood sugar testing and weight management
- sexual health advice
- basic psychological wellbeing review
- referral information to a range of local services.

DHHS currently funds five Supercare Pharmacies. They are located in:

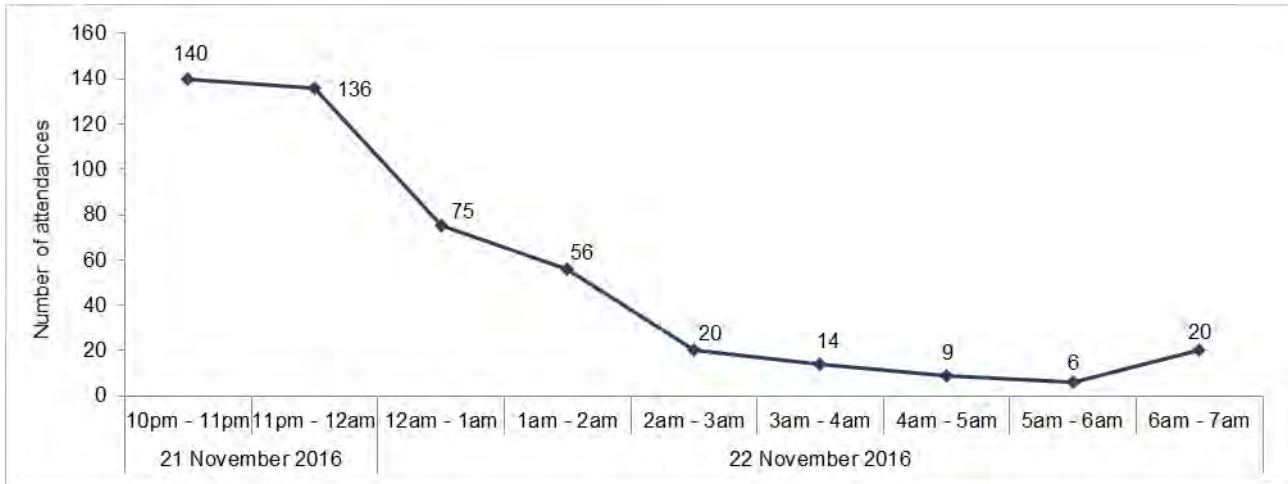
- Ascot Vale
- Ballarat
- Craigieburn
- Knox
- Yarraville.

From 10.00pm on 21 November 2016 to 7.00am on 22 November 2016, the five Supercare Pharmacies had 476 attendances. Craigieburn and Yarraville Supercare Pharmacies were most affected by the thunderstorm asthma event.

As shown in Figure 14, there was a rapid surge and decline of Supercare Pharmacy attendances which broadly mirrors that of the surge in Triple Zero calls and the surge in presentations at public hospitals.

This demonstrates the significant impact of the thunderstorm asthma event on many components of the health system concurrently.

Figure 14: Total Supercare Pharmacy attendances from 10.00pm 21 November 2016 to 7.00am 22 November 2016, by hour



DHHS advised that most attendees sought respiratory inhalers, oral steroids for asthma and anti-histamines for hay fever. The Supercare Pharmacies contacted each other during the night to source additional stock.

NURSE-ON-CALL

NURSE-ON-CALL is a Victorian Government funded phone service managed by Medibank Health Solutions aimed at providing callers with health advice from a registered nurse 24 hours a day, seven days a week.

This service is not designed to provide a caller with a full diagnosis. Instead, based on the caller's symptoms, the registered nurse may:

- suggest ways for the caller to care for themselves
- advise the caller to contact a General Practitioner (GP) within a specified time period or go to the hospital
- transfer the call to Triple Zero if symptoms require urgent clinical intervention.

On 21 November 2016, NURSE-ON-CALL received 313 calls from people with breathing and respiratory and allergy problems (compared with an average of 63 calls for breathing and respiratory problems over the four previous Mondays).

The majority of the breathing and respiratory problems were adult breathing issues (118 calls) and wheezing or asthma (97 calls).

“...my asthma escalated from coughing to within half an hour I couldn't breathe...”

Source: public submission

Table 5 shows the substantial increase in the number of callers with these two categories of symptoms as a result of the thunderstorm asthma event.

Table 5: Number of NURSE-ON-CALL calls by category

TYPE OF RESPIRATORY AND BREATHING PROBLEM	NUMBER OF CALLS ON 21 NOVEMBER 2016	AVERAGE NUMBER OF CALLS FOR THE PREVIOUS FOUR MONDAYS
Breathing problems – adult	118	12.3
Wheezing or asthma	97	4.8
Wheezing or asthma – infant or child	26	4.8
Cough	20	8
Allergic reaction	19	9.5
Cough – child and toddler	16	12.3
Breathing problems – child and toddler	11	4.3
Cough – infant	3	3.8
Breathing problems – infant	2	2
Nasal congestion – adult and child	1	0.8

The call data for 21 November 2016 showed that based on the symptoms, the majority of callers (135 calls) with respiratory and breathing problems were advised by the registered nurses to attend a hospital immediately. Some calls (22 calls) were transferred directly to Triple Zero due to the severity of the symptoms described, while others (82 calls) were advised to see a doctor within 12 hours.

In response to the significant increase in calls, the NURSE-ON-CALL service:

- notified DHHS of the unusual call activity at approximately 9.00am on 22 November 2016
- provided regular communication bulletins to its nurses and triage support staff
- implemented surge strategies to optimise the number of nurses available to respond to the uplift in call demand over 21–22 November 2016.
- provided preliminary data insights to DHHS within 24 hours of the incident occurring

4.6 Speed of escalation of response level

Decisions to escalate the response level of an event are based on its complexity, including factors such as size (for example, number of patients), resources (for example, resources needed for patient care and management), or risk to people, property, environment and/or infrastructure.

At the state tier, the State Health and Medical Commander may form a State Health Incident Management Team (S-HIMT) to coordinate a whole-of-health response to an emergency at a strategic level and may escalate the response level at which the emergency is managed.

At the organisational level, ESTA, AV and public hospitals also have internal escalation processes to meet the surge in demand for their services.

Speed of escalation – Emergency Services Telecommunications Authority

On 21 November 2016, ESTA managers and the AV Communications Duty Manager quickly recognised that the surge in Triple Zero calls had the potential to negatively affect service delivery.

Evidence suggests that managers from ESTA and AV worked collaboratively and implemented appropriate surge capacity strategies as soon as they recognised a rise in demand.

ESTA's internal lines of communication, command and control, capacity, and escalation assisted deployment of as many emergency ambulance call-taking and dispatch resources as possible. This helped to address the enormous demand across a relatively short period of time.

ESTA's ability to more than double its emergency ambulance call-taking resources within a short timeframe was linked, to a large degree, with the surge coinciding with ESTA's shift change-over, and access to a limited number of multi-skilled operators.

IGEM notes that ESTA's managers considered the welfare of its call-takers and dispatchers during the surge. Some call-takers and dispatchers worked extended periods without any break or respite from the influx of emergency ambulance calls, some of which were highly distressing in nature.

ESTA team leaders worked to counsel and comfort affected employees, and employees debriefed amongst themselves when possible. As the surge continued with some signs of slowing, ESTA's senior operations supervisors re-instated a schedule of comfort breaks that enabled staff to obtain something to eat and drink.

The dedication of ESTA's frontline staff was evidenced by the manner in which they returned to their workstations and resumed answering Triple Zero calls, or dispatching emergency ambulances, even as the surge continued to varying extents towards midnight on 21 November 2016.

"...I was told 10 minutes later I wouldn't have made it..."

Source: public submission

ESTA's Critical Incident Response Plan (CIRP) dictates how ESTA escalates its response and manages critical incidents⁹. The purpose and intent of the CIRP is to ensure adequate planning and coordination occurs to reduce the impact of demand spikes on ESTA's services, such as Code Red fire days or severe weather events.

ESTA regularly activates its CIRP in response to days in which severe weather or fire weather are forecast. The plan describes the actions ESTA should take in order to meet forecast periods of higher demand that may adversely affect its emergency call-taking and dispatch service delivery.

⁹ *The CIRP defines a critical incident as an event that is predicted to affect the public, resulting in a need for heightened emergency response requirements by one or more emergency service organisations, or an event that is predicted to have a substantial effect on ESTA's service delivery capability and requires additional staff to be rostered.*

These actions include:

- an assessment of possible increased demand and the likely effect on services
- ensuring sufficient resources (operational, support) are rostered to meet the expected increase in demand
- notifying external stakeholders of surge in demand (for example, the Minister for Emergency Services, the EMC, EMV and IGEM)
- continuing to monitor the developments or new information
- following the CIRP checklist of actions to record, and ensure all relevant escalation actions, notifications, and procedures are followed.

ESTA did not specifically activate the CIRP on either 21 or 22 November 2016. This is likely due to the unprecedented nature of the event. Ambulance surges are rare and ESTA had not written the plan with this type of event in mind.

However, ESTA did complete many of the actions described in the plan, in order to escalate its response to the surge, and supplemented call-taking and dispatch resources.

Under the CIRP, there is a requirement for ESTA to provide notification to external stakeholders using pre-formatted templates and distribution groups. IGEM notes that in this instance, ESTA did not issue notifications in accordance with the CIRP, communicating with only some of these stakeholders.

At 7.45pm on 21 November 2016, ESTA's executive leadership considered the surge in Triple Zero calls to be a significant event. ESTA's on-call Operations Duty Manager was not apprised of the surge in emergency ambulance calls until approximately 8.00pm, two hours after the surge commenced.

Following notification to the EMC and IGEM at 8.32pm, ESTA's Operations Duty Manager returned to ESTA's State Emergency Communications Centre, arriving just after 9.00pm. At approximately 9.30pm, ESTA discussed the possibility of asking the Telstra Triple Zero service to enact ESTA's major incident recorded voice announcement (RVA). An RVA is a pre-recorded message that is played to callers to Triple Zero, prior to connection with a Telstra Triple Zero operator.

ESTA's RVA for a major incident is generic in nature and simply states

"Emergency Triple Zero in Victoria is extremely busy due to a major incident. If you require police, fire, or ambulance attendance please stay on the line".

However, ESTA decided against enacting an RVA at that time because managers had observed a decline in Triple Zero calls for emergency ambulance, and while still high, demand was not at the extreme levels of calls ESTA had answered between 6.00pm and 8.00pm.

ESTA's fire RVA, for example, may assist in reducing Triple Zero calls because it provides the telephone number and website for VicEmergency. In this way, the RVA assists in re-directing non-emergency callers from the emergency fire call queues by reminding them of existing sources of information.

The Telstra Triple Zero supervisor rang ESTA at 6.39pm on 21 November 2016, to discuss the surge and offered assistance.

This call presented an opportunity for ESTA to consider implementing the RVA earlier than 9.30pm when it may have been most effective. It is possible that ESTA may have been able to better manage call volumes if it enacted its major incident RVA shortly after 6.00pm on 21 November 2016.

However, IGEM notes that given the unprecedented nature of the thunderstorm asthma surge and the fact that so many of the Triple Zero calls related to acutely ill people, it is unlikely that use of the generic RVA may have assisted in managing Triple Zero call volumes.

FINDING 7

The Inspector-General for Emergency Management (IGEM) finds that there was an opportunity for the Emergency Services Telecommunications Authority (ESTA) to activate its Critical Incident Response Plan (CIRP) in response to the extreme surge in emergency ambulance calls on 21 November 2016.

Activation of the CIRP would have given ESTA the opportunity to provide a more detailed notification to all relevant external stakeholders and provide an earlier opportunity for ESTA managers to at least consider the potential benefits of enacting the major incident recorded voice announcement (RVA).

IGEM notes that ESTA has committed to review its CIRP to ensure events requiring CIRP activation are clearly defined and activation occurs at an agreed time point.

IGEM notes that since the thunderstorm asthma event of 21–22 November 2016, ESTA has escalated its Critical Incident Response Plan (CIRP) on several occasions, including the incident on Bourke Street, Melbourne on 20 January 2017, and the Beechcraft King Air crash in Essendon, Melbourne on 21 February 2017.

On each of those occasions, ESTA sent text messages to external stakeholders (including IGEM) as an initial 'heads-up', followed by formal, detailed CIRP notifications, and subsequent updates.

ESTA sent initial text messages within 30 minutes of each incident occurring; ESTA's formal email notifications followed shortly after. For some agencies, the ESTA notification was the first advice its emergency managers received about the event, enabling them to escalate plans earlier than they otherwise would have.

RECOMMENDATION 4

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria (EMV) leads the development of a notification process that disseminates early information about a developing incident to all relevant emergency management organisations.

This process should leverage the existing notifications that the Emergency Management Commissioner already receives from emergency services organisations, to maximise information sharing and awareness across the broader sector.

Consideration should be given to Emergency Services Telecommunications Authority's (ESTA) existing notification capability under the Critical Incident Response Plan (CIRP) due to its unique position as a primary interface between the community and emergency services. Timely notifications from ESTA could be used as part of an early alert to the broader emergency management sector of a developing situation.

Speed of escalation – Ambulance Victoria

At 7.48pm, AV's State Health Commander was advised that the total number of pending cases had increased to over 120 and was requested by AV's Chief Operations Officer to assist with the coordination of the response.

On the evening of 21 November 2016, AV's State Health Commander decided early to not activate the Ambulance Emergency Operations Centre (AEOC), co-located at the State Emergency Management Centre (SEMC) within DHHS. This decision was based on the timing of the event, elimination of the travel time associated with recalling staff, as well as the availability of AV's information technology systems that enable remote access to AEOC systems.

For the remainder of the evening of 21 November 2016, AV's State Health Commander managed the event remotely.

AV's State Health Commander contacted MFB at 7.51pm to request assistance to respond to selected Code 1 cases that normally fall outside of the agreed EMR protocols. MFB agreed, and deployed EMR resources to respond to 11 Code 1 cases without AV support on the evening.

VicPol further supplemented emergency response by responding to 17 cases related to persons with breathing or asthma related symptoms. This was primarily in the form of welfare checks and transport of one non-critical person to hospital.

AV's State Health Commander advised the EMC of the situation at approximately 8.00pm on 21 November 2016, and conveyed how AV was managing the surge in calls and that AV would provide information to the community.

AV's State Health Commander then immediately notified the State Health and Medical Commander / State Health Coordinator (DHHS) of over 120 pending Code 1 AV cases, who commenced development of actions for hospital coordination and triggered the operation of elements of the SHERP.

At 8.30pm, AV's State Health Commander contacted the Field Emergency Medical Coordinator to request activation of the FEMO program to provide additional medical support – primarily in-field assessment and triage.

Support from the FEMO program concluded at around 8.00pm on 22 November 2016.

AV did not activate its internal escalation plan, called the Emergency Response Plan (ERP), during the thunderstorm asthma event on 21 and 22 November 2016.

The aim of the ERP is to enable AV to adopt a whole-of-organisation approach to managing major incidents to minimise the impact on normal operations. However, the ERP is more suited to a major incident at a single, or relatively contained emergency scene, such as the January 2017 incident in Bourke Street, Melbourne or the February 2017 civil aviation accident at Victoria's Essendon Airport, rather than a geographically-dispersed incident like the thunderstorm asthma event.

AV did not formally activate its ERP or open its AEOC because it did not consider the type of emergency presented by thunderstorm asthma to fit the criteria for ERP activation.

AV also has an alternative draft escalation plan for surges in normal business that it believed was more appropriate in this case. AV had previously drafted this escalation plan to enable its staff to manage periods when demand outstripped resource availability.

Although AV had not yet approved and implemented the escalation plan into normal business practices, AV senior management agreed to its use from approximately 7.00pm to manage the developing surge in demand.

Although AV did not activate its ERP, it took actions over and above the plan to coordinate its response to the extreme surge in demand for its resources on 21 November 2016.

These actions included:

- calling in off-duty employees
- rostered staff engaging in overtime arrangements
- utilising private non-emergency patient transport providers to respond to emergency cases
- deploying FEMOs
- engaging the assistance of the MFB and VicPol.

Throughout the evening of 21 November 2016, AV also deployed staff to assist in a number of hospital emergency departments, allowing the hospitals to better manage the flow and discharge of patients from multiple ambulances.

FINDING 8

The Inspector-General for Emergency Management (IGEM) finds that Ambulance Victoria (AV) did not escalate its Emergency Response Plan (ERP) in response to the thunderstorm asthma event. This is because AV did not consider this type of emergency – a geographically-dispersed surge in demand – met criteria for escalation in accordance with the ERP.

Nonetheless, AV undertook actions over and above the plan to coordinate its response on the evening of the 21 November 2016.

IGEM notes that in its interim debrief and review report for the thunderstorm asthma event, AV has implemented changes to enable escalation of its ERP for demand surge of Triple Zero calls and activation of its Ambulance Emergency Operations Centre (AEOC) to coordinate a whole of organisation approach during future demand surge incidents.

Speed of escalation – state level

The call from AV's State Health Commander to the State Health and Medical Commander / State Health Coordinator (DHHS) at 8.00pm preceded the commencement of DHHS coordination activities at the state level by providing support to the operations of AV and hospitals across metropolitan Melbourne and Geelong.

By this time, Barwon Health had already activated its Code Brown plan.

At 8.30pm, the State Health and Medical Commander / State Health Coordinator (DHHS) contacted the Chief Health Officer to alert him of the issues and actions related to the event.

Around this time, the EMC spoke with the State Health and Medical Commander / State Health Coordinator (DHHS) and offered the support of the SCC, and instructed the SCC to remain active on the evening of 21 November 2016.

By 10.00pm on 21 November 2016, AV's State Health Commander informed the State Health and Medical Commander / State Health Coordinator (DHHS) that demand was no longer increasing. However, hospitals continued to manage a significant surge in demand from both ambulance and self-presenting patients.

Overall, on the evening of 21 November 2016, the State Health and Medical Commander / State Health Coordinator (DHHS), supported by remotely located DHHS personnel in normal business (non-emergency) roles, focused on:

- informing hospital CEOs of the pressures on the health system due to the surge in Code 1 cases
- requesting hospitals to assist in clearing ambulance crews quickly to allow them to attend to pending cases
- ascertaining the demand on and capacity of hospital emergency departments and intensive care units.

In addition to collecting information to understand the demand on the health system, the State Health and Medical Commander / State Health Coordinator (DHHS), supported by relevant DHHS staff, also called upon the assistance of private hospitals to assist with demand overflow from the public hospital system.

This resulted in DHHS approving access to private hospital beds, where available, to public patients at no cost. As there were no formal arrangements to facilitate this type of activity, the change to procedure was authorised by the State Health and Medical Commander.

DHHS has committed to creating a pre-determined and documented arrangement to facilitate the use of private hospital beds during times of extreme demand on the health system.

IGEM notes this is a positive outcome which may benefit from more formalised arrangements in future.

In examining whether timely escalation occurred for the response to the thunderstorm asthma event, IGEM relied on the criteria outlined in the relevant state level response plans.

The incident management level required in response to an emergency event is dependent on its complexity. There are three classification levels outlined in the *Public Health Control Plan 2012* as shown in Table 6 (page 42).

Given its size and complexity and based on the criteria outlined in the *Public Health Control Plan 2012*, IGEM considers that the thunderstorm asthma event was commensurate with that of at least a Level 2 incident, and would have benefited from being resourced accordingly on the evening of 21 November 2016.

IGEM notes that the incident was managed as a Level 2 incident from the morning of 22 November 2016.

Table 6: Incident management classification levels (Source: Public Health Control Plan 2012)

CLASSIFICATION	CRITERIA	MANAGEMENT
Level 1: Small, simple with minimal threat / impact	<ul style="list-style-type: none"> Simple incident with minimum complexity Local Government Area/regional resources sufficient to manage Generally small in impact/duration Minimal threat/impact to the community Managed within normal business operations Overall risk rating 'minor consequences' 	<ul style="list-style-type: none"> Management can generally be effectively undertaken by one or two people ensuring all functional elements of incident management are addressed
Level 2: Larger in area, complex, involves multiple agencies and resources, media management is required and moderate – major consequences are possible	<ul style="list-style-type: none"> Is more complex in either size, control and/or risk factors Inter-regional resources and extended operations required A specific incident management facility will be established Multi-agency response and coordination Media management is required Overall risk rating 'moderate – major consequences' 	<ul style="list-style-type: none"> A management structure will generally be required with functional delegation of tasks to section leaders Resources may be required across multiple shifts and an action plan outlining objectives and strategies and resource allocation will be required Representation on an Emergency Management Team is likely Liaison officers may be deployed to other emergency service management centres
Level 3: High level of complexity, is long in duration, involves significant resources and agencies and may have major – catastrophic consequences	<ul style="list-style-type: none"> High levels of complexity in terms of size, risk factors and/or difficulty to control Escalating inter-regional resource requirements Long-term operations Expanded incident management structure Numerous agencies will be involved Threat or impact to the community will be large High media interest/management Overall risk rating 'major – catastrophic consequences' 	<ul style="list-style-type: none"> A full incident management structure will be established with all functional sections delegated Resources will extend across multiple shift periods with potential for 24 hour operation An action plan will be required outlining objectives, strategies and resource allocations Liaison offers will be deployed to other emergency service management centres Representation on an Emergency Management Team is required

Based on evidence, triggers for escalation including changes to the risk environment (as described within the SHERP) were present on the evening of 21 November 2016, however key decision-makers on the night were not in possession of all available information.

Within the system as a whole, the known triggers included:

- the nature and volume of metropolitan emergency ambulance calls to Triple Zero^r
- multi-agency dispatch requests
- AV's initiation of escalation protocols
- volume of presentations to public hospitals^s.

IGEM notes that although some elements of the SHERP were operating at around 8.00pm on 21 November 2016, state-level management and functional resourcing was commensurate with a simple (Level 1) incident^t of less complexity.

This was reflected in all incident management functions being undertaken by the State Health and Medical Commander / State Health Coordinator (DHHS) and AV's State Health Commander, as well as the State Health Incident Management Team being operated remotely through telecommunications.

^r The highest volume of metropolitan emergency ambulance calls to Triple Zero on record over a four-hour period.

^s Subsequently known to be in 9909 hospital presentations over 21–22 November 2016.

^t Refer Table 6 above

If key decision-makers were in possession of all available intelligence and triggers, escalating the thunderstorm asthma event to a Level 2 incident on the evening of 21 November 2016 may have enabled:

- earlier establishment of a management structure commensurate to the scale and complexity of the event
- increased resourcing and functional delegation of tasks to staff
- enhanced information flows and visibility between and within relevant agencies
- earlier consideration regarding management of consequences of the thunderstorm asthma event
- earlier consideration regarding provision of public information and warnings and health advice, to ease demand on the pre-hospital and hospital system
- earlier consideration around leveraging the resources and systems of the SCC.

FINDING 9

The Inspector-General for Emergency Management (IGEM) finds that agencies were operating in an environment characterised by an extremely rare event, with minimal warning, rapidly escalating impacts and considerable uncertainty. However, limited communication and information sharing within and across agencies prevented a shared understanding of the emerging situation and the potential consequences.

The normal out-of-hours communications processes for the management of routine business were inadequate for managing an effective response to a large scale thunderstorm asthma event. Communications were linear, between two parties only, or email based, rather than occurring through group meetings and/or conference calls.

Key personnel working on the response were doing so remotely and the opportunity to rapidly share information, discuss issues, recognise triggers and develop intelligence in order to inform decision-making was not available.

Small pieces of information about the initial impact and consequences of the thunderstorm were known by some of those responding, but were not shared consistently or widely across agencies. There was early speculation by some personnel that the asthma was a consequence of the thunderstorm, however this was not widely disseminated.

As a result, and given a lack of activation of formal incident management arrangements that would have included a situational intelligence function, there was limited capacity to rapidly piece together and share a common operating picture of the developing situation.

RECOMMENDATION 5

The Inspector-General for Emergency Management (IGEM) recommends that for future health emergencies, including those that occur outside normal business hours, every effort must be made to enable information and issues to be rapidly shared and discussed.

In accordance with Victoria's emergency management arrangements, the Department of Health and Human Services (DHHS) should as routine practice, coordinate face-to-face group meetings and/or conference calls between relevant parties. This will enable improved situational awareness and informed decision-making in responding to emergency events.

FINDING 10

The Inspector-General for Emergency Management (IGEM) finds that at approximately 8.00pm on 21 November 2016, elements of the State Health Emergency Response Plan (SHERP) were operating, however state-level management and functional resourcing was only commensurate with a simple incident of less complexity. Notably, one person from Department of Health and Human Services (DHHS) performed the dual role of State Health and Medical Commander / State Health Coordinator, supported by DHHS executives (working in their normal business, non-emergency roles). The State Health Commander (AV) also performed functions in accordance with the SHERP.

Additionally, the co-located DHHS State Emergency Management Centre (SEMC) and Ambulance Emergency Operations Centre (AEOC) were not activated on 21 November 2016, and the event was managed remotely through linear (single point to point) telecommunications.

IGEM finds there was an opportunity for DHHS at the state-level to escalate the emergency response level, activate the SEMC and AEOC, or request to utilise the State Control Centre (SCC) to enable a more effective and integrated whole of system emergency response to the thunderstorm asthma event.

Had the thunderstorm asthma event been protracted, the demand on pre-hospital response would have become increasingly difficult to sustain.

RECOMMENDATION 6

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) adopt a conservative approach to the early escalation of incident management arrangements for rapid-onset health emergencies. Response levels, management coordination and control centres can all be scaled down as appropriate.

Code Brown plan activation

Health services play a critical role in the Victorian health response to an emergency. When health services respond to an external emergency, they may activate their Code Brown plan⁵⁰.

Code Brown plans are internal, self-activated hospital-owned plans based upon Australian Standard 4083–2010 *Planning for emergencies – health care facilities*.

Hospital Code Brown plans are developed to enable hospitals to achieve a well-coordinated, entire hospital response that adequately manages resources for a surge in patients from an emergency. In essence, Code Brown plans enable the additional capacity that hospitals need to receive an influx of patients.

A well-constructed Code Brown plan will identify triggers for escalation and scaling down emergency response. These triggers will usually be determined by the number of patients presenting to the hospital, the nature of their injuries and the resources available for effective treatments.

There were varied levels of Code Brown plan activation at hospitals across the state on 21 and 22 November 2016.

Barwon Health activated its Code Brown plan at approximately 7.00pm on 21 November and Northern Health activated its Code Brown plan at approximately 5.40am on 22 November 2016.

St Vincent's Hospital and Austin Health were on Code Brown plan stand-by, without formally activating their Code Brown plans.

"...the hospitals were so busy it was scary. I waited in emergency over half an hour. I was ok because I was close by and I had an amazing paramedic taking care of me."

Source: public submission

DHHS advised that no private hospitals activated their Code Brown plans.

A number of other public hospitals escalated their response but did not activate their Code Brown plans.

Hospitals which did not activate their Code Brown plans cited the following factors:

- being aware of the immense pressure that AV and the broader system were under and not wanting ambulances to be diverted to another hospital unnecessarily
- feeling confident that it would be able to manage the increase in demand without activating their Code Brown plans
- not being aware that hospitals had the ability to activate a Code Brown plan, assumed AV or DHHS had the authority to activate based on the Springvale fire incident on 18 November 2016 – the previous week, where DHHS provided advice for Code Brown stand-by

- not being fully aware of the severity of the event due to lack of identification by internal staff and adequacy of communication from DHHS and AV about the broader system impact.

The common theme identified in IGEM's interviews with hospitals was the need for more guidance and coordination from DHHS with respect to Code Brown plan activation during the evening of 21 November 2016.

Hospitals acknowledge that under the arrangements, they are responsible for activating their Code Brown plans however would have preferred guidance and/or advice from DHHS to inform the decision. IGEM supports this concern as hospitals are reliant on DHHS to have an overview of the impact of a major emergency across the health system.

DHHS has advised IGEM that in February 2017 it distributed Code Brown guidance notes.

Under the guidance notes, the relevant regional or state health coordinator may request one or more hospitals to activate their Code Brown response in emergencies of widespread demand that are likely to impact health services and the health system.

This system-level information is considered by health services to be a key input into their decision-making for Code Brown plan activation.

A suggestion provided by one health service was for hospitals to retain the final decision of Code Brown plan activation, but enable DHHS to have an ability to call a Code Brown plan stand-by.

Under this tiered approach to Code Brown plan activation, DHHS would provide system-level information and if an agreed threshold is reached, call a Code Brown plan stand-by. The threshold would be based upon demand shocks such as a surge in Triple Zero calls or hospital presentations, rather than the hazard source.

Feedback from hospitals that activated their Code Brown plans or were in Code Brown plan stand-by, felt that the process worked to their advantage.

For example, Code Brown plan activation caused intensive care units and wards to mobilise and collect patients from the emergency department rather than wait for patients to be sent to them. It also provided a whole of organisation perspective about the current status of the emergency department. One hospital commented that activating a Code Brown plan did not require mobilising all resources, but helped to alert of the surge situation.

DHHS noted that hospitals that activated Code Brown plans were not aware of their responsibility to notify the DHHS State Duty Operations Officer.

In this regard, there appears to be a lack of clarity among some hospitals of existing Code Brown plan activation requirements under the SHERP.

FINDING 11

The Inspector-General for Emergency Management (IGEM) finds that hospitals do not have a common understanding of Code Brown plan responsibilities and triggers for escalation, including escalation and de-escalation of resources, during a significant event.

RECOMMENDATION 7

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) consider, as part of revisions to the State Health Emergency Response Arrangements (SHERA), further information and guidance with respect to Code Brown plans.

This should include clear articulation of the triggers for activation, responsibilities, and escalation and de-escalation processes.

4.7 Response on 22 November 2016

While demand for ambulance services was no longer increasing late in the evening on 21 November 2016 (Figure 15), hospitals continued to manage above average levels of ambulance arrivals and self-presenting patients overnight and into 22 November.

AV activated the AEOC, co-located at the SEMC within DHHS, at 7.00am on 22 November 2016, and continued response activities throughout 22 November.

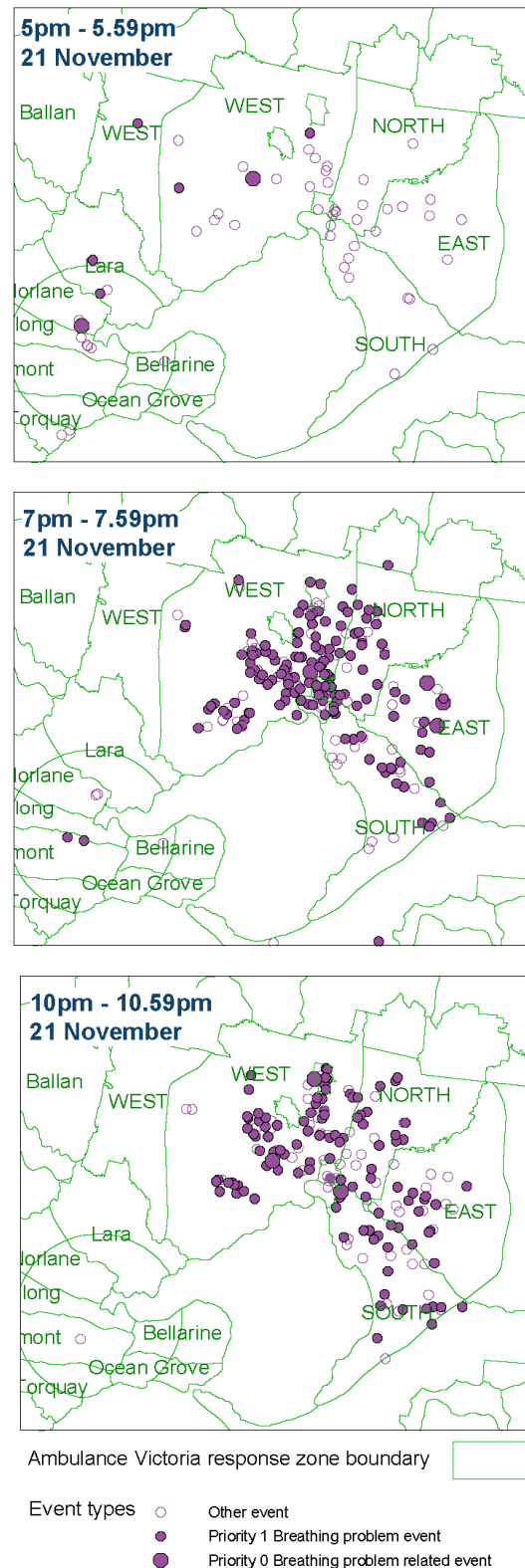
For comparative purposes, AV reported 519 breathing problem cases on 22 November 2016 and 565 cases on 21 November 2016⁵¹.

AV developed a Health Incident Action Plan which captured the situation, objectives and response activities for the thunderstorm asthma event. This plan was circulated to those at the SCC at 2.41pm on 22 November 2016.

At 4.30pm on 22 November 2016, AV’s State Health Commander approved the AV situation report which noted that there were no more pending cases at that time. The AV situation report also detailed the additional rostering plans for any further surge in cases.

These rostering plans included additional staff, extended rostered hours, and a list of available paramedics to be recalled if required.

Figure 15: Time sequence of Ambulance Victoria activity on 21 November 2016



4.8 Formalisation of command and control arrangements on 22 November 2016

Command and control arrangements for the thunderstorm asthma event were formalised on 22 November 2016.

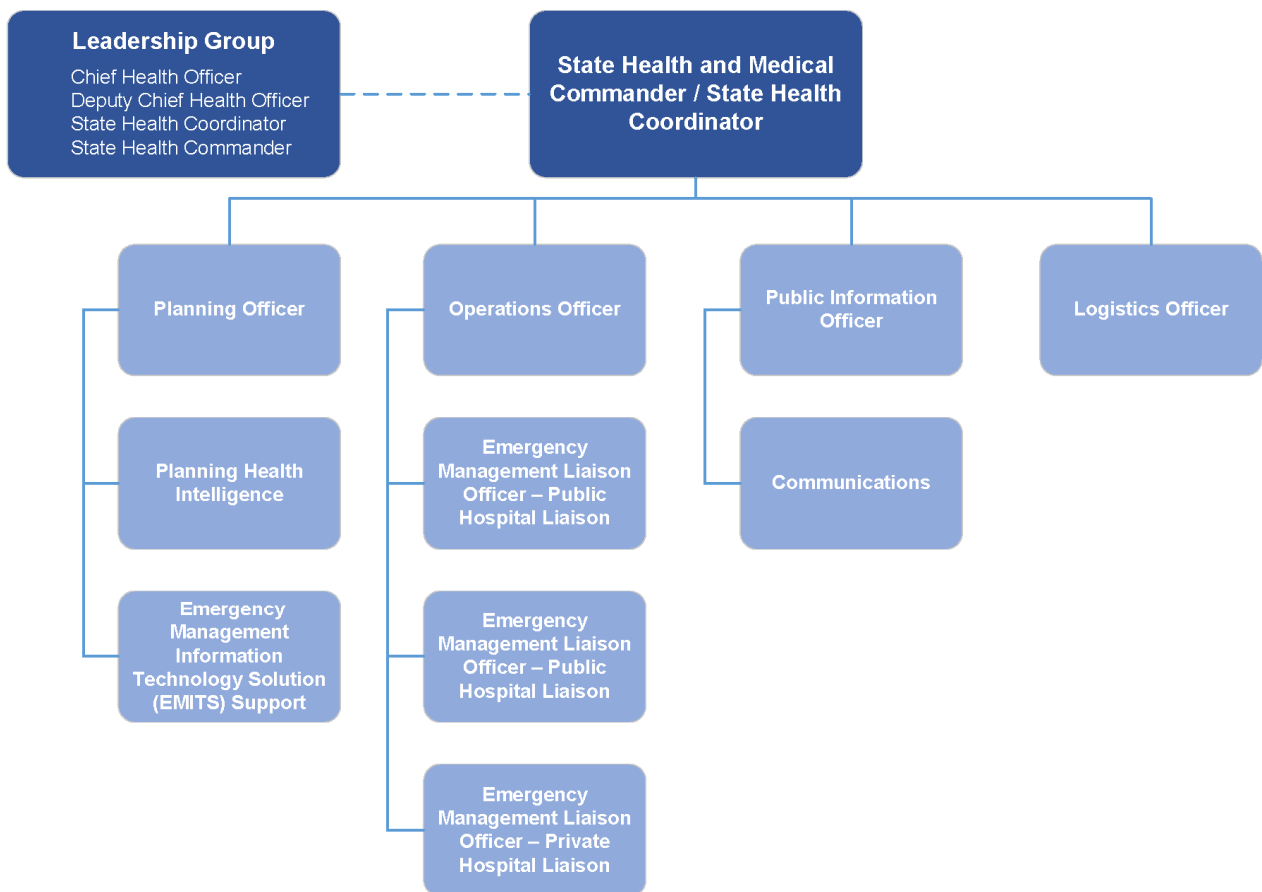
DHHS response and recovery operations of medium to larger-scale emergencies are normally managed from the SEMC.

At approximately 8.00am on 22 November 2016, DHHS activated the SEMC.

To support the functions of the State Health and Medical Commander (DHHS), a leadership group was established comprising the Chief Health Officer, Deputy Chief Health Officer, State Health and Medical Commander / State Health Coordinator (DHHS) and AV's State Health Commander.

A functional command structure was then established with specific roles for planning, operations, communications and logistics functions as shown in Figure 16 below.

Figure 16: State health operations structure as at 22 November 2016 to manage the thunderstorm asthma event



DHHS ensured that improvements were made quickly and mitigation strategies were put in place in relation to the thunderstorm asthma response. DHHS also took the lead in commencing the development of a communications plan.

Relief and recovery activities were considered from 22 November 2016.

At 9.48am, the EMC requested a State Coordination Team (SCOT) meeting following advice that two deaths had been attributed to thunderstorm asthma, and the potential requirement for ongoing response, consequence management and recovery coordination.

The EMC has a legislated responsibility for coordination, consequence management and recovery coordination.

The SCOT supports state coordination and the functions of the EMC as necessary.

The objective of the SCOT is to set the strategic context of the readiness for, response to, and recovery from major emergencies.

SCOT meetings are chaired by the EMC and include state-tier managers responsible for the coordination, control, consequence management, communications and recovery functions for major emergencies that are anticipated or are occurring.

An outcome of this SCOT meeting was the development of a State Risk and Consequence Plan.

From 11.00am on 22 November 2016, the Chief Health Officer was the Class 2 State Controller for the thunderstorm asthma event – which is a designation of the role – and recognised that it was a public health emergency.

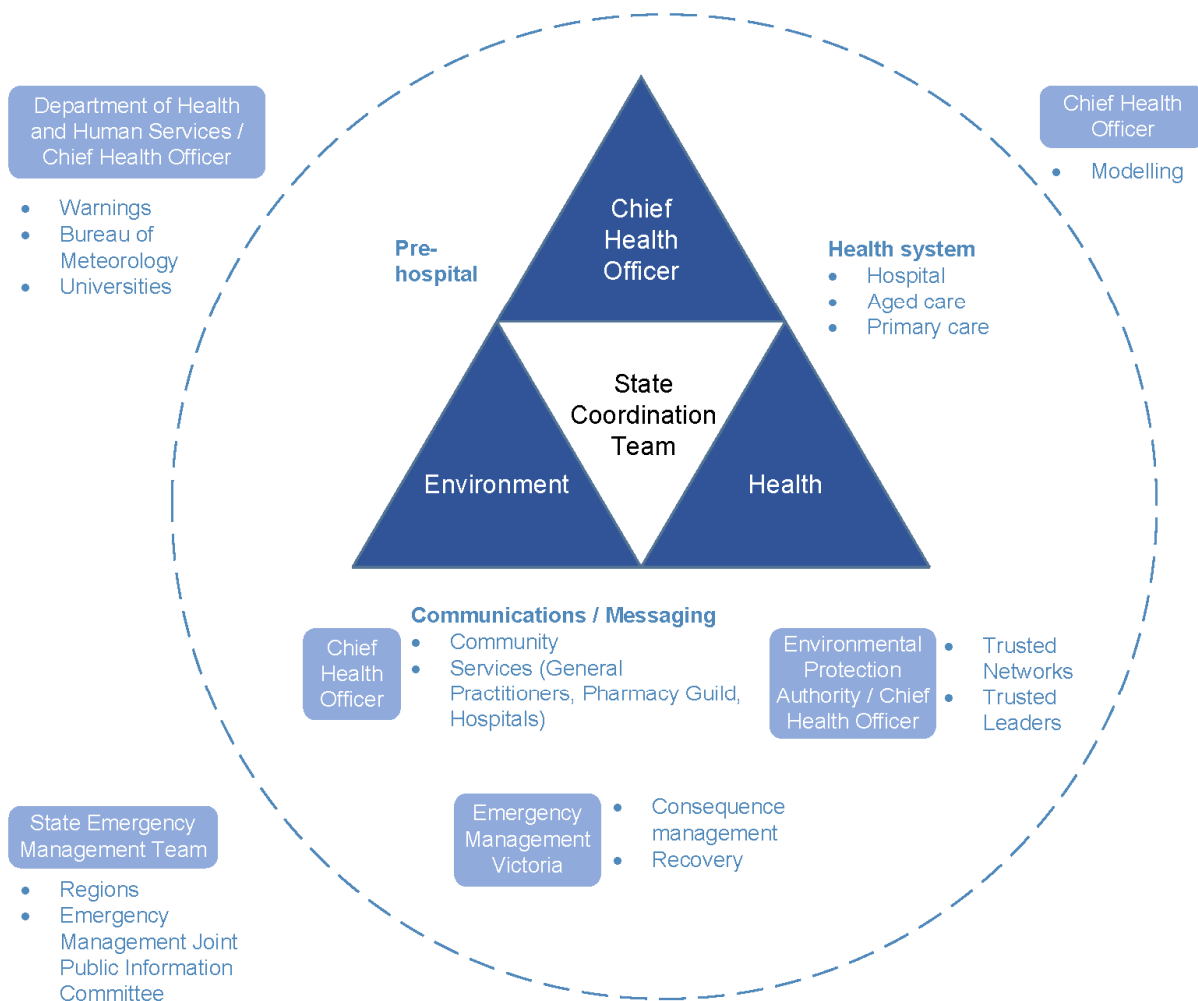
At 1.30pm on 22 November 2016, the EMC chaired the SCOT meeting to discuss the health impacts of the thunderstorm asthma event.

The purpose of the meeting was to set the strategic context of the readiness for, response to, and recovery from potential and existing impacts of the event.

There was also engagement between the SEMC and SCC on 22 November 2016. This enabled access to resources and expertise from the SCC and EMV.

Figure 17 below describes the management structure for the thunderstorm asthma event that was established at the SCOT meeting.

Figure 17: Summary of the thunderstorm asthma management structure
(Adapted from minutes of the State Coordination Team meeting held on 22 November 2016)



4.9 Consequence management

Consequence management aims to minimise the adverse consequences of an emergency event. It focuses on the level of coordination between the agencies responsible for managing the event to minimise impacts on the community⁵².

The EMC is responsible for consequence management of major emergencies⁵³, including Class 2 emergencies, which is coordinated by the State Consequence Manager.

There is evidence that some aspects of consequence management were considered during the evening of 21 November 2016.

As noted in the logs provided by DHHS, at 10.00pm on 21 November 2016 the large surge in emergency department presentations resulted in a shortage of hospital beds in public hospitals. However this information was not provided to the EMC by DHHS at that time.

By 10.30pm, the State Health and Medical Commander / State Health Coordinator (DHHS) had managed the issue by obtaining authorisation to use private hospital beds where available, for public use (at no cost), both in the intensive care and inpatient setting.

Another consequence of the event was the shortfall in medication, such as Ventolin, at health services which started to occur at approximately 10.50pm on 21 November 2016.

At approximately 8.00am the following day, the State Health and Medical Commander / State Health Coordinator (DHHS) began organising supplementary supplies of medication to be distributed to health services. They confirmed through the Pharmacy Guild that health services and community pharmacies had adequate medication supplies from 11.30am on 22 November 2016.

When the incident was recognised as a public health emergency at 11.00am on 22 November 2016, the State Health Incident Management Team met to discuss consequences and ongoing operations.

Formal and comprehensive consequence management commenced following the SCOT meeting on 22 November 2016. The State Consequence Manager coordinated with DHHS to develop a State Risk and Consequence Plan.

The purpose of the plan was to facilitate a functional and effective whole of government approach to managing the consequences of significant risks associated with the current forecasts.

The plan contained a comprehensive consequence management assessment for the event and assigned a 'high' risk rating.

The assessment identified a number of impacts and their associated consequences, such as:

- ill people and fatalities
- poor community understanding of critical health risks or issues which may delay action
- unsustainable demand on hospital system
- potential loss of community confidence in the health system to manage large scale events
- impact on medical supply chain.

Assigned as the Primary Risk Coordinator, the Chief Health Officer (CHO) was responsible for leading the planning and facilitation of the work program developed to address the incident risk. The CHO reports to the EMC on agencies' and organisations' mitigation responsibilities.

The consequence management assessment outlined a broad range of mitigation actions in place or planned, and specified the organisations responsible for implementing those actions. Furthermore, the assessment assigned a confidence rating for the mitigation actions against the risk of consequence.

Overall, the State Risk and Consequence Plan provided a robust multi-agency approach for consequence management of the thunderstorm asthma event which recognised the risk and complexity of the event.

However IGEM notes that had formal control and incident management structures been in place earlier (21 November 2016), mitigation strategies may have been implemented earlier, and some of the impacts associated with the event may have been reduced.

The initial plan was published on 24 November 2016 by EMV, with subsequent revisions during the following weeks.

FINDING 12

The Inspector-General for Emergency Management (IGEM) finds that from 22 November 2016, the state-level incident management structures implemented, coordination and support efforts, and focus on the management of consequences as a result of the thunderstorm asthma event, were appropriate and adequate.

In addition, IGEM notes that development of a formal consequence management plan commenced on 22 November 2016 and was published on 24 November 2016. The plan is comprehensive in assessing risks and consequences resulting from the thunderstorm asthma event and identifies mitigating measures and responsibilities.

4.10 Effectiveness of the Emergency Services Telecommunications Authority response

Telstra Triple Zero service and Emergency Services Telecommunications Authority

Australia's national Emergency Call Service enables the public to request emergency services assistance in life threatening situations. The Emergency Call Person is the public interface of the Emergency Call Service.

Telstra is the provider of the Emergency Call Person function, responsible for answering calls to Triple Zero and 112^u.

Telstra answers all Triple Zero calls nationally from Melbourne and Sydney. Telstra Triple Zero operators then determine which emergency services organisation (police, fire or ambulance) the caller needs, and connects the caller to the required emergency services organisation in the relevant state, and region.

Telstra's service is designed to support the national Triple Zero call load. Typically, Telstra Triple Zero operators remain on calls for a very short time – long enough to ascertain the service and location required.

In Victoria, the Telstra Triple Zero service connects all genuine calls to ESTA.

ESTA provides emergency telecommunications and other communications services to emergency services organisations and the community, pursuant to the *Emergency Services Telecommunications Authority Act 2004* (the ESTA Act). Section 29 of the ESTA Act provides for the establishment of 'administrative arrangements'.

In consultation with emergency service organisations, ESTA created administrative arrangements which detail:

- how ESTA will provide services
- the responsibilities and accountabilities for delivery of services by ESTA to the emergency service organisations
- the standards determined by the IGEM, pursuant to Section 30 of the *Emergency Services Telecommunications Authority Act 2004*.

Call-taking

Due to the significant surge in Triple Zero calls on the evening of 21 November 2016, some Telstra Triple Zero operators were on the line with callers for several minutes, as they waited for ESTA call-takers to become free to answer a new emergency call.

Although the Telstra Triple Zero service coped with the demands of the surge during the thunderstorm asthma event without the need for additional resources, the surge did affect its call answer times at various points during the evening of 21 November.

For example, the mean hourly call answer speed for Triple Zero calls between 6.00pm and 7.00pm was 18.3 seconds, compared to 2.4 seconds during the same hour on Monday 14 November 2016^v. Between 7.00pm and 8.00pm, the mean call answer speed was 11.8 seconds, compared to 3.8 seconds during the same hour on 14 November. The trend did not continue however, as the surge eased, with Telstra's mean call answer speed for the hour beginning 9.00pm on 21 November reducing to 2.1 seconds.

From 6.00pm on 21 November to 6.00am on 22 November 2016, ESTA answered an unprecedented 2332 emergency ambulance calls, resulting in 942 emergency and non-emergency ambulance events related to breathing problems.

This is the greatest number of calls for emergency ambulance assistance within a 12-hour period in Victoria's history.

The majority of these emergency calls involved high acuity patients complaining of breathing problems and asthma attacks.

The performance standard benchmark for metropolitan emergency ambulance speed of call answer is that ESTA answers 90 per cent of calls per calendar month within five seconds.

For the month of November 2016, ESTA met its metropolitan emergency ambulance call answer speed performance benchmark with 92.2 per cent of calls answered within five seconds.

ESTA provides daily performance information to IGEM for monitoring purposes and can provide data for shorter periods to assist in analysing significant events. However, the standard only requires ESTA to achieve compliance over a month.

On 21 November 2016, ESTA answered 66.4 per cent of emergency ambulance calls within the five second target time. Between 6.15pm and 6.30pm, ESTA did not answer any of the 60 emergency ambulance calls within five seconds.

^u 112 is an international standard emergency number which can only be dialled on a digital mobile phone. It is accepted as a secondary international emergency number in some parts of the world, including Australia, and can be dialled in areas of GSM network coverage with the call automatically translated to that country's emergency number.

^v Section 31 (1)(a)(b) *Telecommunications (Emergency Call Service) Determination 2009 (Cth.)* requires the Emergency Call Person (Telstra) to answer 85 per cent of Triple Zero calls in less than or equal to five seconds, and 95 per cent of calls within less than or equal to 10 seconds.

The longest call wait time for an emergency ambulance connection to ESTA during the thunderstorm asthma event was four minutes and nine seconds at 6.49pm on 21 November 2016. This does not include the time that Telstra may have taken to answer the initial Triple Zero call before attempting to connect it to ESTA.

In some cases, ESTA ambulance call-takers remained on the telephone with Triple Zero callers for longer than 30 minutes, constantly re-assessing the changing condition of patients, and providing callers with first aid advice, including cardiopulmonary resuscitation instructions.

Despite deploying 12 additional call-takers for the hour commencing 8.00pm on 21 November 2016, ESTA would have required 30 emergency ambulance call-takers above schedule, in order to have answered 90 per cent of calls within the performance target time for that period.

This demonstrates the large gap in call resource availability compared to the call demand ESTA experienced during the event.

"...I was one of the fortunate ones to get an ambulance in less than 10 minute response..."

Source: public submission

ESTA's emergency ambulance call answer speed performance improved substantially on 22 November 2016 when 96.2 per cent of calls were answered within the target time.

ESTA has the capability to employ an 'urgent disconnect' workflow, to shorten the length of time its ambulance call-takers spend on the telephone with each caller, allowing them to answer more waiting Triple Zero calls.

At the time of this event, AV had not approved ESTA to use this option but discussed the possibility of employing 'urgent disconnect' during the call surge of 21 November 2016. This did not occur due to a lack of workflows, and training for emergency ambulance call-takers to safely employ this function.

In February 2017, ESTA advised IGEM it was working with AV to develop the triggers, workflows, and scripts, in order to employ the use of 'urgent disconnect' during surges of calls. Refer to Section 5.5 in the 'knowledge and information' chapter for further information.

Dispatch

ESTA's metropolitan Code 1 dispatch speed benchmark is that it dispatches 90 per cent of Code 1 ambulance cases per calendar month within 150 seconds.

When measuring dispatch performance, measurement starts when ESTA begins to create a new event in its Computer Aided Dispatch (CAD) system and ends when it either dispatches the first ambulance resource or identifies there is no ambulance available for dispatch within a defined distance. Other measures include holding of emergency ambulance events or referring events to other AV staff for action.

Regardless of the impact of 21 and 22 November 2016, ESTA still recorded a performance improvement for the month achieving 82.6 per cent.

However excluding the activity of 21 and 22 November, ESTA achieved 83.2 per cent demonstrating that the thunderstorm asthma did have an impact in a period where its performance was trending upwards.

In the period from December 2016 to February 2017, the positive trend continued, with ESTA reporting a further increase of nearly two per cent (84.5 per cent in February 2017).

ESTA, working with AV, has been implementing a range of strategies to improve its compliance against the benchmark through initiatives developed by the government's Ambulance Policy and Performance Consultative Committee.

On 21 November 2016, ESTA dispatched 71.3 per cent of metropolitan Code 1 cases within the performance target time, below its monthly benchmark of 90 per cent. However performance improved on 22 November 2016, when it dispatched 86.2 per cent of cases within the target time in the metropolitan area, in line with previous months.

If an ESTA ambulance dispatcher is unable to dispatch a resource because there is no appropriate resource within a specified distance of the emergency location, ESTA ambulance dispatchers must then use a process to 'stop the clock' on performance target measurement for that event.

ESTA dispatchers then refer the event to AV communications staff for direction on how AV wants to address the area of resource need. ESTA calls this function 'no nearby unit' or nominal dispatch.

The 'no nearby unit' process 'stops the clock' on ESTA dispatch performance measurement because the inability to dispatch a resource to an emergency for want of available resources is outside ESTA's control but may otherwise adversely affect its ability to meet a performance target time.

At 7.30pm on 21 November 2016, demand for ambulances far exceeded resource availability, with 140 emergency ambulance cases pending dispatch.

Consequently compliance with the 'no nearby unit' process became impractical and AV agreed to ESTA suspending its use.

As a result, ESTA's reported dispatch performance for the evening of 21 November 2016 was negatively impacted.

FINDING 13

The Inspector-General for Emergency Management (IGEM) finds that during 21 and 22 November 2016, the Emergency Services Telecommunications Authority (ESTA) answered the greatest numbers of ambulance calls via Triple Zero and within the shortest timeframes in Victoria's history. As a result of demand for ambulances far exceeding availability, both ESTA's call-taking and dispatch performance were below their respective benchmarks.

IGEM notes positively the actions ESTA has taken since the thunderstorm asthma event, in reviewing its processes and procedures for activation of its Critical Incident Response Plan (CIRP).

ESTA is also working with Ambulance Victoria to develop exit scripts for use of 'urgent disconnect' to increase the availability of emergency ambulance call-takers in response to surge events, and to develop a procedure for providing better advice to callers concerning the availability of Ambulance Victoria resources during future surge events.

4.11 Effectiveness of Ambulance Victoria response

AV has a range of government and internal key performance indicators and targets that IGEM considered in assessing the effectiveness of its response to the thunderstorm asthma event.

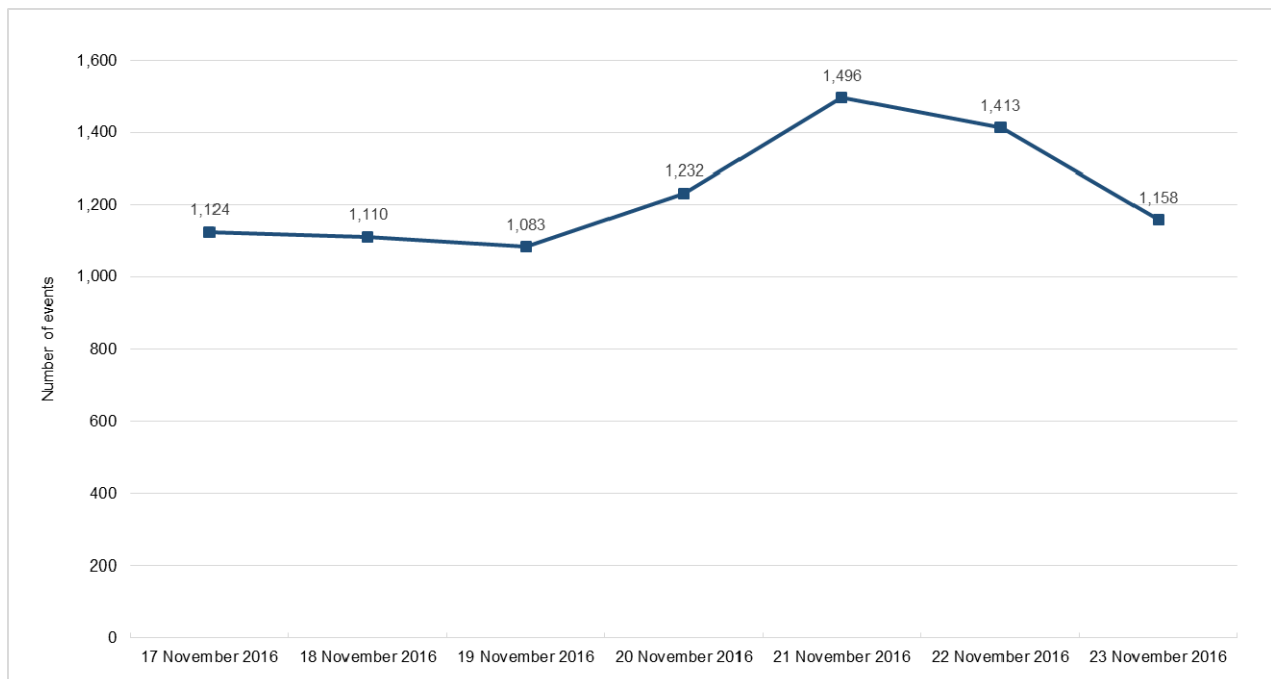
A number of these indicators and targets relate to timeliness of response.

IGEM found AV's performance against a number of these metrics degraded during the thunderstorm asthma event due to the significant demand on resources. The demand for emergency ambulance resources climbed to over 1400 on 21 November 2016 as shown in Figure 18.

In analysing AV performance metrics, IGEM considered data from the five weeks between 17 October and 20 November 2016 to establish average daily performances for a number of measures. IGEM then used this as a basis for comparison of AV's performances on 21 and 22 November 2016.

IGEM focused on key metrics and data for metropolitan ambulance cases, given the majority of Triple Zero calls to ambulance on 21 and 22 November 2016 were for the Melbourne metropolitan area.

Figure 18: Number of metropolitan emergency ambulance cases between 17 and 23 November 2016



During the thunderstorm asthma event (21 and 22 November 2016), AV received the greatest number of requests for emergency assistance within the shortest period in Victoria's history.

The total caseload of 3906 (including 2909 metropolitan cases shown in Figure 18, page 51) on 21 and 22 November 2016 included 2347 Code 1 events.

On 21 November 2016 AV received approximately 436 (41.2 per cent) more emergency cases than the average.

On 22 November 2016 AV received fewer metropolitan emergency cases than it did on the day before however AV received 353 (33.4 per cent) more cases than the average.

With respect to the number of ambulances arriving at Code 1 cases within 15 minutes (statewide performance target of 85 per cent) during the preceding five weeks, AV was five per cent below the performance target time on average.

However, on 21 November 2016, AV attended only 57.1 per cent of Code 1 cases within 15 minutes, due to the unprecedented demand. This improved to 70.6 per cent on 22 November 2016.

AV's average time at hospital was 54 minutes and 42 seconds on 21 and 22 November 2016. This was an average of only two minutes and 24 seconds longer at hospitals during the thunderstorm asthma event than for the preceding five weeks.

FINDING 14

The Inspector-General for Emergency Management (IGEM) finds that during 21 and 22 November 2016, Ambulance Victoria (AV) responded to the greatest number of Code 1 emergency cases within the shortest timeframes in Victoria's history.

These events included several dozen cardiac arrests, in addition to hundreds of cases for high acuity respiratory problems and asthma attacks. Organisationally, AV was faced with a shortage of resources following the commencement of the thunderstorm asthma event, as the demand for paramedics outstripped rostered supply in the Melbourne metropolitan and Geelong areas.

FINDING 15

The Inspector-General for Emergency Management (IGEM) finds that Ambulance Victoria (AV) has already self-identified and committed to addressing some of the issues articulated by IGEM.

In its interim debrief and review report for the thunderstorm asthma event, AV made 32 recommendations pertaining to operations, planning, logistics, communications, administration, and clinical improvements. IGEM supports these recommendations.

4.12 Review of health emergency response arrangements

DHHS commenced a review of the state's current health emergency response arrangements in July 2016. A steering committee, comprising representatives from DHHS, AV and EMV, has been working on consolidating the SHERP and the Public Health Control Plan 2012 to develop a single set of arrangements for health events, known as the State Health Emergency Response Arrangements (SHERA).

The expected outcome will be a set of contemporary arrangements to better meet the community's health needs and address consequences of emergencies that reflect developments in the emergency management, health and security sectors.

Arrangements for the 2016–17 summer and autumn period

DHHS developed a guidance note for relevant health services to provide additional information on Victoria's health emergency response arrangements for the 2016–17 summer and autumn period.

The guidance note is based on learnings from recent events and provides a high level overview of:

- the relationship between the SHERP and Public Health Control Plan 2012
- sources of information regarding health emergencies
- how to report large scale health emergencies, including Code Brown
- how health services are alerted to large scale health emergencies.

This guidance note is a useful and concise document that provides valuable information in an easy to use format to support management of large scale health emergencies, particularly in light of recent health emergencies and as work continues towards finalisation of the SHERA.

Summary of considerations for the revised health emergency response arrangements

The Terms of Reference for the development of the SHERA note that the revised arrangements will take into account the findings of IGEM's review of the thunderstorm asthma event.

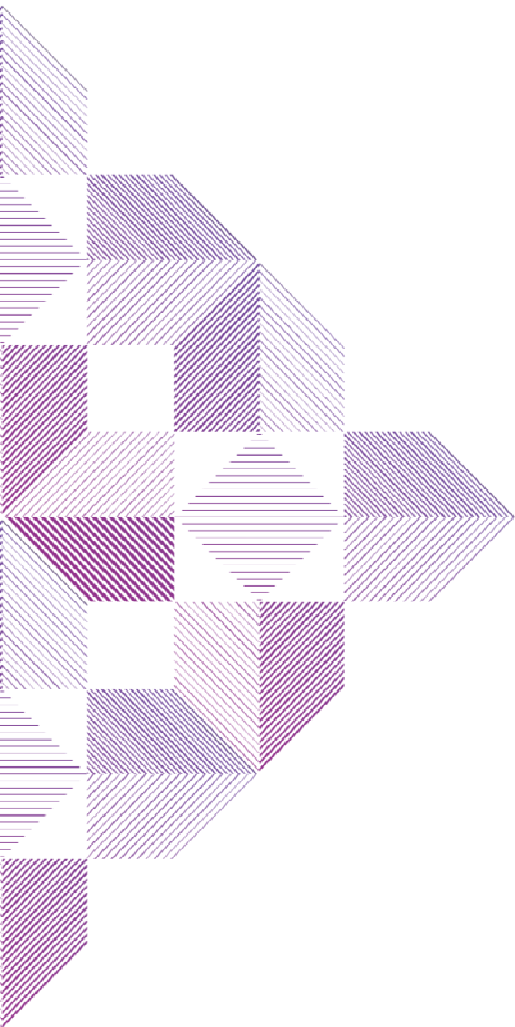
In assessing the appropriateness and adequacy of response to the thunderstorm asthma event, IGEM has identified a number of considerations with respect to the revised arrangements.

Table 7 on the following page provides a summary of these considerations and reflects recommendations made in this report.

Table 7: Considerations for inclusion in the State Health Emergency Response Arrangements (SHERA)

CONSIDERATIONS FOR THE REVISED ARRANGEMENTS
ENHANCED GOVERNANCE
<p>To improve emergency management governance within the health sector, the SHERA should strengthen and broaden participation on the Health and Medical Stakeholder Reference Group (the Reference Group) in order to provide advice to government on health and medical emergency management arrangements.</p> <p>Governance improvements would:</p> <ul style="list-style-type: none"> • ensure joint planning between DHHS and health services, including the better utilisation of medical expertise and integration of broader health resources such as FEMO, Victorian Medical Assistance Teams, general practices and pharmacies • ensure agreed communication platforms, channels and protocols exist and are understood and used during emergencies • establish points of contact so that all appropriate personnel are involved and informed during emergencies • identify training required to enable people to adequately fulfil their roles • share learnings to foster greater preparedness and coordination of response.
ESCALATION OF RESPONSE LEVEL
<p>The incident management classification levels currently in the Public Health Control Plan 2012 should be integrated with the triggers for escalation and considerations for determining the level of escalation as outlined in the SHERP.</p> <p>Triggers should not be overly prescriptive, so that they can be adapted to any hazard or event. Triggers such as changes to the risk environment and impacts on routine operations of the entire health system should be considered. Such triggers should include the volume and nature of Triple Zero calls, ambulance demand, impacts on partner agencies, public and private health services and demand on primary care services such as NURSE-ON-CALL and pharmacies.</p> <p>Emphasis should be on a flexible approach, including early escalation of response levels based on available triggers and information, which can then be scaled down as appropriate.</p>
LEVERAGING BROADER EMERGENCY MANAGEMENT INFRASTRUCTURE AND SYSTEMS
<p>The SCC is Victoria's primary emergency control centre, and can activate to support an agency that does not operate from the SCC. Established infrastructure and systems within the SCC can be used to support any emergency, including but not limited to public information and warning platforms, media, logistics and whole of government reporting, as well as linkages to other state and commonwealth control centres.</p> <p>Consideration should be given to processes and key decision points, linked to escalation of response levels, identifying when broader emergency management infrastructure or systems should be accessed to support the management of major health emergencies.</p>
INFORMATION SHARING WITHIN AND ACROSS AGENCIES
<p>IGEM considers that to prepare and respond to increasingly complex and wide-ranging emergency scenarios, the sharing of timely and accurate information between agencies and health services is essential for effective decision-making, situational awareness and consequence management. The establishment of processes and/or systems to achieve this should be a focus of the revised arrangements.</p>
PUBLIC INFORMATION AND WARNINGS
<p>Revised public information and warning arrangements should align with the State Emergency Management Priority relating to community information and warnings to empower individuals, minimise the impacts of emergencies and enable those communities to focus on their recovery as early as practicable. The revised arrangements should also integrate the Victorian Warning Protocol.</p>
CODE BROWN PLAN ACTIVATION
<p>An enhanced level of information and guidance relating to Code Brown activation should be developed in conjunction with stakeholders, providing clarity regarding triggers for escalation of response, scaling down and communicating the activation of Code Brown plan.</p> <p>Widespread Code Brown plan activation (for example, all hospitals in a region) should be given specific consideration, particularly in terms of implications for the pre-hospital system including diversion of ambulances to ensure patient outcomes are not compromised.</p>
DEMAND OVERFLOW FROM THE PUBLIC HEALTH SYSTEM
<p>Consideration should be given to a graduated approach to managing demand overflow from the public health system. This includes the role of private hospitals, primary care services and access to commonwealth resources.</p>

5 Knowledge and information



Information, warnings and health advice that is prepared and provided to communities before, during and after emergencies enable people to make informed decisions and take appropriate action.

Generally, the trigger to issue a warning is when the control agency identifies a threat or risk to person, property, environment and/or infrastructure and decides that emergency information or a warning (possibly both) needs to be issued to the community.

As thunderstorm asthma is not well understood, lack of knowledge and uncertainty created an additional challenge in the provision of warnings, information and health advice in response to the event on 21 November 2016.

5.1 Methods for issuing public information and warnings

Warnings should be timely, tailored and relevant, allowing community members to make informed decisions based on the available information.

A variety of methods exist for the issuing of public information and warnings in Victoria. These include:

- warnings issued through the Victorian warnings platform that has been built into the Emergency Management Common Operating Picture (EM-COP) system. This system disseminates warnings via the VicEmergency App, website and hotline, social media channels, email, and emergency broadcasters
- community information hotlines, such as NURSE-ON-CALL and VicEmergency Hotline
- emergency broadcasters (based on formal arrangements between the Victorian Government and media outlets)
- Emergency Alert telephone messaging
- health alerts
- social media, websites and email distribution
- media releases
- spokesperson interviews across print, electronic and digital media
- face-to-face contact such as doorknocks
- trusted local networks and leaders who can distribute information within communities.

VicEmergency Hotline

The VicEmergency Hotline was launched in early November 2016 before this thunderstorm asthma event.

This hotline brings together three previously separate emergency hotlines:

- Victorian Bushfire Information Line
- Victorian Relief and Recovery Information Line
- VICSES Flood and Storm Information Line.

The VicEmergency Hotline provides a single source of information relating to all emergencies.

EM-COP – warnings platform

EM-COP is the primary platform for issuing warnings and activating community alerting sirens. The Joint Standard Operating Procedure for Public Information and Warnings⁵⁴ states that all warnings are required to be issued from the approved state warning platform. This includes health emergency warnings.

Warnings can be issued at a number of different levels relating to the type and severity of the emergency⁵⁵.

These include:

- **Advice** – issued to notify the community that an incident is occurring or has occurred that may escalate to impact on life or property. Actions may be recommended to access information and monitor conditions.
- **Warning (Watch and Act)** – issued when an emergency is developing. Communities that may be affected are advised to take action to protect themselves and others.
- **Emergency Warning** – issued when the community is in imminent danger and needs to take action immediately.
- **Prepare to Evacuate/Evacuate Now** – issued when an evacuation is recommended or procedures are in place to evacuate.

A community information notification may be issued to provide information that is of interest or to assist the community once they have been affected by an emergency.

EM-COP has pre-prepared templates available for a range of emergency types. As an example of the use of this system to disseminate health advice, generalised smoke warning messages have been incorporated into the fire and HAZMAT (Hazardous Materials) templates.

Emergency broadcasters

The Victorian Government has signed memorandums of understanding (MOUs) with ABC Local Radio, Victorian commercial radio broadcasters, Sky News television and 10 community broadcasters who have all agreed to break into programming when necessary to broadcast emergency warning messages.

Specific protocols have been established for agencies issuing warnings to broadcasters to enable broadcasters to monitor and verify warnings.

5.2 Legislation governing the provision of emergency information

A range of legislation governs the provision of emergency information to the Victorian community, including.

- The *Emergency Management Act 2013* requires the Emergency Management Commissioner to ensure the community is both informed or warned about fires in order to protect life and property (s42(1)(2)).

Section 55 of this Act requires agencies with a role and responsibility to comply with the SERP. The SERP specifies the State Emergency Management Priorities that include the issuing of information and warnings.

DHHS is required to deliver information and health advice as part of an emergency response in accordance with the roles, responsibilities and protocols detailed in the SERP, the Victorian Warning Protocol and other relevant policies and guidance documents such as joint standard operating procedures.

- The *Public Health and Wellbeing Act 2008* describes the functions and powers of the CHO (s.21(a)-(d)) and requires the development of strategies to promote and protect public health and wellbeing (s.21(a)).

DHHS provides advice to Victoria through the Better Health Channel, NURSE-ON-CALL, social media, health alerts and media through programs such as the heatwave strategy, prevention programs and in response to many health, medical or environmental conditions.

- The *Meteorology Act 1955 (Commonwealth)* details the functions of the BoM to issue warnings and information relating to meteorological conditions (s.6(c) to (g)). This includes gales, storms and other conditions likely to endanger life or property or weather conditions likely to lead to floods or bushfires.

BoM – the federally-funded national meteorological and hydrological agency that provides forecasts and weather warnings to community members through various channels, such as its public website (bom.gov.au), and to the emergency management sector through a variety of methods, such as briefings, individual weather intelligence products and email notifications.

- The EPA has responsibility for the state of the environment, including air quality measurement and management.

The relevant policies for air quality sit beneath the *Environmental Protection Act 1970*. Under the State Environment Protection Policy the EPA is required to inform the community on air quality issues – including timely and accessible air quality forecasts (s.14(1)(2)(a)(e)(h) and (j)).

Further, the EPA must establish and operate an air quality forecasting system, with scientifically derived alert levels.

The elevated amounts of fine airborne (PM10) particles detected in the early evening on 21 November 2016 were monitored and reported in accordance with this obligation.

There are no requirements in the environment protection legislation and subordinate policies relating specifically to emergencies. However, there are clearly times when the level of pollution measured can arise from an emergency situation or can become an emergency in itself.

5.3 Protocols and plans

The obligations on emergency management organisations, derived from the legislation, are implemented through the following protocols and plans, including:

- Incident Command Systems such as the Australasian Inter-service Incident Management System (AIIMS)
- Victorian Warning Protocol
- State Emergency Response Plan (SERP), incorporating State Emergency Management Priorities
- State Health Emergency Response Plan (SHERP)
- Public Health Control Plan 2012

During periods other than emergencies, public information, warnings and health advice are issued in accordance with agency/departmental procedures.

During periods of emergency, the activation of incident management arrangements triggers the appointment of individuals to operational roles who are then charged with the responsibility for issuing public information, emergency warnings and health advice to inform the community, allowing them to make decisions and take appropriate action.

The State Emergency Management Priorities underpin the planning and operational decisions made when managing the response to emergencies.

After the protection and preservation of life, the second priority is:

Issuing of community information and community warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety⁵⁶.

The Victorian Warning Protocol, based on an all hazards approach, provides emergency response agencies with coordinated and consistent direction on advice and warnings to inform the Victorian community of a potential or actual emergency event.

All signatories (Appendix E), including DHHS, undertake to comply with this protocol to the best of their ability and as far as is reasonably practicable.

As noted in part 4 of this report, the SHERP and Public Health Control Plan are being reviewed and consolidated into a single set of arrangements for health emergencies.

One of IGEN's considerations for inclusion in the State Health Emergency Response Arrangements (SHERA) relates to the provision of public information and warnings (Table 7, page 53).

Table 8 on the following page provides a summary of the key roles and their functions during emergency response regarding provision of public information, warnings and health alerts.

Table 8: Key roles and functions during emergency response (public information, warnings and health alerts)
(Source: SERP and JSOP J03.14)

ROLE	AGENCY	FUNCTIONS
Emergency Management Commissioner (EMC)		<ul style="list-style-type: none"> • Ensure warnings are issued and information is provided to the community in relation to fires in Victoria for the purposes of protecting life and property. • Declaration, in writing, of an Emergency of State Significance to: <ul style="list-style-type: none"> - acknowledge a major emergency is occurring and to emphasise the gravity of the situation - raise community awareness of the ongoing emergency and reinforce the need for whole of government and community planning • Lead the development of a state media/communications strategy for major emergencies, including the development of key messages to targeted segments of the community • Ensure the coordination, collection, collation and reporting of incident data and impact assessment processes as required.
Chief Health Officer (Class 2 Controller)	DHHS	<ul style="list-style-type: none"> • One of the principal responsibilities of the Chief Health Officer (CHO), as outlined in the Public Health Control Plan 2012, is focussed around strategies to provide community information and community warnings if required. • The role also has a focus on ensuring timely information and warnings are provided to the community and support agencies.
Incident Controller (IC)	DHHS	<ul style="list-style-type: none"> • Management of media by ensuring the timely issue of warnings and information to the community or refer these to the Regional Controller (RC), where appointed, or where the RC has not been appointed, the State Response Controller (SRC) or Class 2 state controller • The IC ensures the timely flow of information to the: <ul style="list-style-type: none"> - RC (if appointed) or the SRC or Class 2 state controller - control and support agencies - Municipal Emergency Response Coordinator - Incident Emergency Management Team - Municipal Recovery Manager
Public Information Officers (PIO)	DHHS	<ul style="list-style-type: none"> • Responsible for the provision of warnings, information, and advice to the public, and liaison with the media and affected communities.
State Health Coordinator and State Health Commander	DHHS & AV	<ul style="list-style-type: none"> • When the SHERP arrangements have been activated and the health roles are in place, the State Health Coordinator (DHHS) and State Health Commander (AV) have the role of providing information on health and medical issues to the State Health and Medical Commander (DHHS) and the CHO
State Controller (SC)	DHHS	<ul style="list-style-type: none"> • Issue warnings and information to the community in relation to the Class 2 emergency, if regional or incident tier controllers are unable to do so in a timely manner

FINDING 16

The Inspector-General for Emergency Management (IGEM) finds a lack of clarity and consistency relating to some of the designated roles and responsibilities, described in a range of legislation, policy, guidelines and procedural documents, particularly in relation to health emergencies.

5.4 Public information, warnings and health advice issued for thunderstorm asthma

21 November 2016

This section focuses on the public information and warnings and health alerts issued on 21 and 22 November 2016. The overview commences with the storm warning issued by BOM prior to and during the incident, followed by an account of the public information provided by ESTA, AV and DHHS during this period.

Bureau of Meteorology

BoM is a federally-funded weather forecasting and meteorological agency providing public forecasts and weather warnings to communities as well as intelligence via various methods to the emergency management sector.

BoM noted that thunderstorms are difficult to predict precisely in terms of location and timing. However, once thunderstorms have formed BoM can more accurately track and provide warnings of possible consequences.

BoM advised that warnings for the occurrence of severe thunderstorms can take place as little as 15 minutes prior to the event. However these are supported and foreshadowed by the routine forecasting of thunderstorm potential as far ahead as 4–5 days, with progressive refinement as the lead time reduces.

The following warnings were provided by the BoM on 21 November:

- **1.58pm** – Severe Thunderstorm Warning (damaging winds, heavy rainfall and large hailstones) – Mallee, South West, Wimmera and parts of the Northern Country forecast districts
- **4.00pm** – Severe Thunderstorm Warning (damaging winds, heavy rainfall and large hailstones) – Central, Mallee, Northern Country, North Central, Wimmera and parts of the South West forecast districts
- **5.13pm** – Severe Thunderstorm Warning – Melbourne Area (damaging winds, heavy rainfall and large hailstones) – Port Phillip, Inner, Western, Geelong and Bellarine Peninsula and parts of the Inner East, Mornington Peninsula, South East and Northern local warnings areas
- **5.19pm** – Severe Thunderstorm Warning – Melbourne Area (damaging winds, heavy rainfall and large hailstones) – Port Phillip, Inner, Northern, Western, Geelong and Bellarine Peninsula and parts of the Inner East, Mornington Peninsula and South East local warning areas

- **6.00pm** – Severe Thunderstorm Warning – Melbourne Area – (damaging winds, heavy rainfall and large hailstones) – Port Phillip, Western Port, Inner East, Mornington Peninsula, Inner, South East, Northern, Western and parts of the Outer East and Geelong and Bellarine Peninsula local warnings areas
- **6.42pm** – Severe Thunderstorm Warning – (damaging winds, heavy rainfall and large hailstones) – Northern Country, North East, West and South Gippsland and parts of the Central, East Gippsland, Mallee and North Central forecast districts. Included cancellation for South West and Wimmera district
- **6.43pm** – Cancellation of Severe Thunderstorm Warning – Melbourne Area

Emergency Services Telecommunications Authority (ESTA)

On 21 November 2016, especially at times between 6.00pm and 9.00pm, many Triple Zero callers had been waiting on the line with a Telstra Triple Zero operator for extended periods of time, prior to their calls being answered by an available ESTA ambulance call-taker.

For many callers who were reporting seriously ill patients during the thunderstorm asthma event, ESTA call-takers stayed on the line to provide pre-arrival instructions, including cardiopulmonary resuscitation instructions. However, in some of those cases and despite ESTA call-takers quickly creating Code 1 events for dispatch, there were not sufficient ambulance resources to enable dispatch within performance target times.

ESTA's Standard Operating Procedure (SOP) for dealing with a second call regarding an estimated time of arrival, states ESTA ambulance call-takers should refer such enquiries to an AV communications staff member who may then provide the caller with advice.

During the thunderstorm asthma surge, however, AV communications staff were equally overwhelmed with requests and duties and therefore, could not field all requests from ESTA ambulance call-takers.

IGEM received evidence that during the thunderstorm asthma event, many ESTA ambulance call-takers were uncomfortable with the advice they were to provide to callers when asked for an estimated time of arrival.

This was compounded by the fact that AV communications staff were often too busy managing the enormous workload, and shortage of available resources, to field telephone calls from ESTA ambulance call-takers enquiring on behalf of callers.

Although ESTA's ambulance call-takers did not know how long an ambulance may take to arrive at any given event, they did know that there were serious delays in dispatch and a shortage of available resources.

This uncertainty around how long it would take ambulances to be dispatched to events, caused anxiety and frustration for some Triple Zero callers; an experience shared by ESTA's ambulance call-takers.

IGEM is aware of several examples in which ESTA ambulance call-takers followed the correct exit script and told Triple Zero callers "...the ambulance is on the way..." when, at the time they provided this advice, there was no ambulance on the way.

In some cases, it was another 10 or 20 minutes until an ambulance became available for dispatch and was then actually on the way to the patient.

ESTA's current SOP provides the following advice to its emergency ambulance call-takers:

6.7 SCT (Structured call-taking)

To assist the call-taker in setting the caller at ease during an emergency call in relation to an ambulance being dispatched, the call-taker is to use the following phrase:

"I am organising an ambulance now".

This advice may be misleading in situations of very high demand, such as during the thunderstorm asthma event, when demand for ambulances outstrips rostered supply.

Ambulance Victoria

As the incident unfolded on 21 November 2016, AV was coordinating resources to meet escalating public demand for assistance. During the evening, AV provided some public information through social media and other news outlets.

There were also a number of attempts made by AV's media unit to obtain interviews with broadcast media outlets on 21 November.

However, as these attempts were not undertaken in accordance with the established Victorian emergency broadcaster protocols, they did not achieve the desired outcome. This was in no way the fault of the media outlet being contacted.

As AV is not a control agency, it did not have access to the state warnings platform and the emergency broadcaster network, however it could have requested SCC personnel to issue community information or advice messages through EM-COP and the emergency broadcast arrangements.

AV issued two tweets on the evening of 21 November.

The first occurred at 8.40pm and read as follows:

'We have seen a rise in breathing probs tonight following the weather. Follow your asthma plan or see here for advice [ow.ly/R9x306mSKw](https://www.facebook.com/ow.ly/R9x306mSKw)'

It was retweeted 51 times and reached a combined audience of 283,481 people including the Minister for Health and the Minister for Ambulance Services, the EMC and a range of journalists and news organisations.

Issued at 10.08pm, the second tweet was seen by 20,600 people and retweeted 35 times.

This message was more directive and read as follows:

'High demand for ambulance for breathing issues due to weather. Only call 000 in an emergency and consider other options for minor complaints'

AV's Director Emergency Management, who undertook the role of State Health Commander, spoke to a number of news agencies on the evening of 21 November including The Age, Australian Associated Press (a news service that has links across major metropolitan newspapers, radio and television) and the Herald Sun.

This resulted in an online article:

- published on Australian Associated Press website at 10.45pm
- published on the Herald Sun website at 11.09pm.

There was uncertainty during the initial escalation period around the cause of the event, and a lack of clarity around responsibilities for public messaging, in particular issuing messages with health advice.

FINDING 17

The Inspector-General for Emergency Management (IGEM) finds that Ambulance Victoria (AV) made commendable efforts to issue information to the community in response to the significant demand being made on their resources on 21 November 2016.

This is especially noteworthy given AV is not a control agency for any emergency, regardless of classification or nature. Nor does AV have immediate access to the platforms and networks that would have been available to a designated control agency responding to a Class 1 emergency through the State Control Centre (such as fire, flood, storm, earthquake, and tsunami).

Further, IGEM finds that as formal (Class 2 emergency) incident management arrangements were not put in place on the evening of 21 November 2016, this hampered the overall response to the event including the timely development and distribution of appropriate messaging to the community.

Accordingly, IGEM finds that there are inconsistencies with the development and delivery of public information and warnings dependent on the nature of emergency experienced.

22 November 2016

Initial public information message

The Incident Management Team established at 11.00am on 22 November, included the Public Information Officer (PIO) position.

Subsequently, the PIO prepared asthma advice based on the activities stemming from the event of the evening of 21 November.

The message describes the seriousness of asthma related issues, the potential threat of death, signs that are associated with asthma attacks as well as instructions on the actions that one can take in an emergency.

Evidence from DHHS incident logs show that drafting of general asthma messages took place at approximately 9.22am on 22 November and were approved by the CHO at 10.15am.

These messages were also sent to the SCC Media and Public Information Unit for inclusion in its communication resources.

At 9.34am the PIO made a request for general asthma information to be published on the Better Health Channel and health.vic websites, while general asthma information was to be posted through social media.

Chief Health Officer alert

At 10.25am on 22 November discussions were held regarding the necessity of a CHO alert, as it was believed that the incident might be easing.

Discussions from the previous evening between AV's State Health Commander and AV's Chief Operations Officer also noted that the workload was slowing and under control. The decision to issue a CHO alert was ultimately made at the 10.30am CHO briefing.

The CHO alert was completed by 2.14pm and sent to the CHO and the Deputy CHO for approval. The alert was then approved by 3.55pm and sent for publishing.

At 5.10pm the CHO alert was published on health.vic, promoted on the health.vic home page and distributed via email to the relevant subscription list and NURSE-ON-CALL. DHHS' social media channels posted links to the alert.

Ambulance Victoria updates

Following the media activity that AV had initiated the previous evening, the AV Executive Director of Emergency Operations (Executive Director) participated in interviews with radio stations 3AW, 774 ABC, Gold FM, ABC national breakfast radio and Nova/Smooth from 7–9.00am on 22 November 2016.

AV also held a press conference at 9.00am to provide an update on the thunderstorm asthma event.

Health warnings

An analysis of evidence available from 21–22 November show that AV and DHHS were the only agencies to release information pertaining specifically to the thunderstorm asthma event – both on 22 November, after the event had occurred.

An AV press release was provided at 9.00am on 22 November while a DHHS CHO alert was published and shared on social media at 5.10pm, and distributed via email to the DHHS subscription list and NURSE-ON-CALL at approximately 6.10pm.

An incident-specific webpage was drafted at 10.30am, in tandem with the development of the CHO alert. The webpage was not complete until after 22 November 2016.

Nevertheless, information about thunderstorm asthma was provided through the Better Health Channel and health.vic homepages, which updated pre-existing generic asthma advice, and information from the CHO alert was published at approximately 5.59pm.

"...public awareness should be a priority..."

Source: public submission

IGEM has reviewed and assessed multiple documents from DHHS and AV pertaining to the public information warnings and health alerts that were available on the night of the event through to the following evening.

Using this information, it has been possible to recreate a concise timeline of all the relevant communication events that took place over this period (see Figure 19, page 62).

Some of the key events on the timeline include the timing of the CHO alert, media interviews and AV's tweets through social media. The evidence used included:

- media activity reports
- communications logs
- incident management logs
- emails log entries
- operations logs
- situation reports.

It is clear from the evidence gathered that existing arrangements for DHHS warnings did not include thunderstorm asthma events, only generic asthma advice.

FINDING 18

The Inspector-General for Emergency Management (IGEM) finds that minimal public information, emergency warnings or health advice were issued on 21 November 2016 during the thunderstorm asthma event.

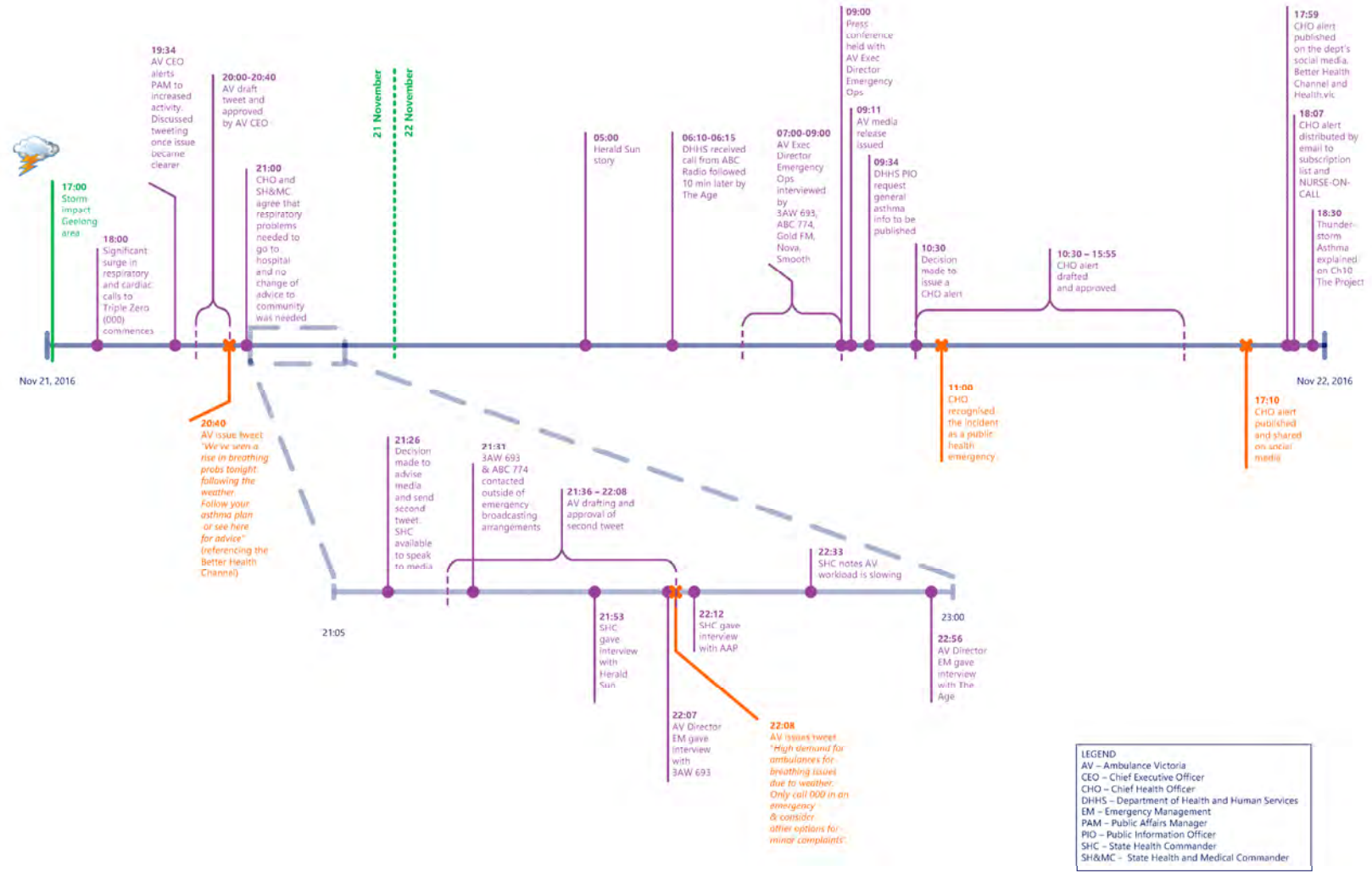
This was a direct result of the initial impacts not being fully understood nor broadly shared and considered; and emergency management arrangements not being formally activated or rapidly escalated during the initial response to the rapid surge in demand for urgent healthcare.

However, IGEM notes formal incident management arrangements were activated on 22 November 2016 and subsequently, media releases, health advice and emergency warnings in relation to thunderstorm asthma were issued in accordance with the arrangements.



VicEmergency, facebook, twitter, NURSE-ON-CALL and BetterHealth Channel are some of methods used to issue warnings and public information in Victoria

Figure 19: Timeline of health advice, public information and warnings during the Melbourne thunderstorm 21 and 22 November 2016



5.5 Public information, warnings and health advice – developments since 22 November 2016

Official warnings

Since 22 November 2016 DHHS, in collaboration with other agencies and organisations, developed an interim process for issuing thunderstorm asthma warnings for the remainder of the 2016 pollen season.

This included:

- development of a protocol to examine pollen forecasts and atmospheric conditions until the conclusion of the 2016 pollen season, as a basis for issuing warnings
- development of templates for use in issuing formal warnings via the state warning platform, EM-COP, for dissemination to the:
 - VicEmergency website
 - VicEmergency App
 - VicEmergency social media channels (Twitter/Facebook)
 - VicEmergency Hotline.

These align with the warning levels applicable to all emergencies – Advice, Warning, Emergency Warning:

- **Advice** – issued when a high risk forecast for an epidemic thunderstorm asthma event is identified
- **Warning** – issued when a rise in asthma cases is identified, that may indicate the early phase of an epidemic thunderstorm asthma event
- **Emergency Warning** – issued when a rise in asthma cases is identified AND there is a significant impact upon the ambulance and/or health system
- DHHS staff training in use of EM-COP to enable issuing of warnings with the appropriate authorisation
- provision of thunderstorm asthma information on the Better Health Channel and health.vic website
- creation of a process to broadcast SMS to all health services (public and private) including all on-call executives.

The Chief Health Officer developed the Epidemic Thunderstorm Asthma Preparedness and Response Plan in December 2016, which detailed processes for manual forecasting; early detection of possible surges in hospital demand; and an alert and warning protocol with pre-prepared templates to be uploaded on EM-COP.

CASE STUDY 1

A COORDINATED AND CONSISTENT APPROACH TO ALL EMERGENCIES

The sector's 'all communities, all emergencies' approach, as described in the State's *Emergency Management Strategic Action Plan 2016–19*, includes the use of systems and processes for all emergencies.

An example is the EM-COP Warning Platform which drives the VicEmergency website, App and Hotline.

Similarly the Victorian Warning Protocol was established to provide a coordinated and consistent direction on the provision of advice and/or warnings to inform the Victorian community of a potential or actual emergency event.

An example of a control agency of a Class 2 emergency utilising the systems of the SCC occurred in response to the tragic civil aviation accident at Victoria's Essendon Airport on Tuesday 21 February 2017.

Soon after the aircraft accident occurred, EMV issued an advice message on behalf of the incident control agency, Victoria Police.

The message advised that a light plane had crashed into the shopping centre at Essendon, that there was no threat to the community however people were advised to avoid the area.

The message also provided the following information:

- for current road closures and detours check VicTraffic Twitter
- that the VicRoads website was experiencing difficulties
- that VicRoads advised motorists travelling inbound to detour via the Western Ring Road to the West Gate Freeway.

With this advice, EMV provided people with a suggested detour, noting that a usual source of real-time information (the VicRoads website) was experiencing difficulties, and suggested an alternative source of information, enabling people to make informed choices.

Triple Zero service – recorded voice announcements

During major emergencies, Telstra Triple Zero service has the ability to put in place a recorded voice announcement (RVA) – a pre-recorded message played prior to connection with a Telstra Triple Zero operator^w.

RVAs perform a dual function: firstly, they assist in managing emergency call volumes during surge events; secondly, they provide an opportunity for the emergency services to inform the public of the surge in Triple Zero calls and provide callers with alternative sources of information.

An RVA is of little value in normal circumstances when there is no significant emergency event occurring and Telstra is answering calls within its performance target time of five or 10 seconds^x.

However, Telstra does have a default RVA that plays if a caller has waited 30 seconds before being answered. This RVA advises the caller they have dialled Triple Zero and to stay on the line for the next operator.

ESTA and its partner emergency services organisations must request the Telstra Triple Zero service to enact an event-specific RVA, and this will only be done if ESTA experiences an extreme surge in emergency calls.

Telstra, ESTA, and emergency service organisations use a specific process, and strict criteria, for activating and deactivating RVAs during and following emergencies.

At present, the Telstra Triple Zero service has three RVAs specifically for Victoria, tailored by ESTA and the emergency services organisation, to assist in the management of emergency call volumes during:

- fires
- severe weather events
- major incidents (a generic RVA for emergencies not covered by fires and severe weather events).

ESTA and AV did not request Telstra to enact the generic major incident RVA during the surge in emergency ambulance calls on 21 November 2016.

During the thunderstorm asthma event, many of the patients calling Triple Zero were acutely ill and therefore would have remained in the call queue regardless of any advice about the occurrence of a major event.

^w *During the thunderstorm asthma event, many Triple Zero calls were automatically referred the Telstra Triple Zero service's standard RVA, given the high call loads. It was activated 1114 times during 21 November, and 232 times during 22 November.*

^x *Under the regulations that govern Telstra's performance as the emergency call person, Telstra must answer 85 per cent of calls within 5 seconds and 95 per cent of calls within 10 seconds each calendar month.*

Therefore, it is unlikely that use of the generic RVA would have significantly reduced the number of calls that ESTA had to manage. However, it would have given callers an initial indication that a major emergency was occurring.

The fire and severe weather event RVAs provide additional contact telephone numbers to redirect non-emergency callers to, for example, the VicEmergency Hotline or the VicEmergency website. However, there is no mechanism currently in place for the major incident RVA to be customised so that it provides more detailed information.

On 14 December 2016, ESTA proposed to its Advisory Committee a change to the current RVA scripts in order to align with Victoria's 'all emergencies, all communities' approach to major emergencies.

ESTA proposed a single RVA script to cover all events, as follows:

A significant emergency is occurring in Victoria. If you need emergency services to attend stay on the line. If you only need information go to emergency.vic.gov.au or call the VicEmergency Hotline 1800 226 226.

This change will not only bring the RVA into alignment with the "all emergencies, all communities" approach to major emergencies, but will also direct callers to a centralised source of information for emergencies in Victoria, regardless of the hazard, or specific nature of the incident.

The ESTA Advisory Committee is considering the integration of such information within the VicEmergency website and hotline.

It is vital for the emergency management sector to keep the community informed of possible changes to its service delivery performance during major emergencies and surge events.

This will empower people affected by an emergency to make their own decisions about how best to manage their individual circumstances. This is most important during surge events in which demand for emergency assistance may mean help is unable to reach them in a manner consistent with community expectations.

ESTA advice to callers

In response to the long wait times during the epidemic thunderstorm asthma event, and community concerns about whether to wait for an ambulance or go to an emergency department by their own means, AV approved a revision of its Communications Standard Operating Procedures (CSOP) in February 2017.

Once ESTA has absorbed the CSOP changes into its own SOPs and trained its ambulance call-takers and dispatchers, ESTA ambulance call-takers will provide advice indicating they are arranging help for the patient.

During surge events, AV communications managers will authorise ESTA ambulance call-takers to use a 'surge event' script.

The proposed script will inform Triple Zero callers of extremely high demand for ambulance services and suggest the caller may consider seeking alternative medical assistance, if possible.

In all cases, ESTA ambulance call-takers will still process events for dispatch of appropriate ambulance resources unless the caller indicates they wish to cancel the event

The revisions to ambulance call exit scripts will involve the following:

1. Triple Zero callers reporting what ESTA classify as Code 1 events will no longer be advised that an ambulance is on the way as a matter of course.
2. During surge events, such as during the thunderstorm asthma event, Triple Zero callers will be advised of the high demand for ambulance resources and advised to seek alternative medical assistance, if possible.

This will empower Triple Zero callers to make informed decisions about whether to wait for an ambulance to arrive, or to pursue an alternative course of action. Those courses of action are not specified in the script and it would be up to the individual to decide on an alternative course of action, if any.

Those alternative options for medical assistance may include attending at a hospital emergency department, pharmacy, or medical general practice by one's own means, as many people did when they experienced respiratory symptoms during the thunderstorm asthma event on 21 November.

FINDING 19

The Inspector-General for Emergency Management (IGEM) finds that on 21 November 2016, during the thunderstorm asthma event, Emergency Services Telecommunications Authority (ESTA) ambulance call-takers provided advice to some Triple Zero callers indicating that ambulance resources were on the way when this was not the case. However, the advice provided to callers was in accordance with scripts approved for use by Ambulance Victoria (AV) at that time.

Ambulance Victoria

AV is developing an App for community first responders to link suitable first aiders with those needing immediate treatment⁵⁷. The potential of a similar approach being used for thunderstorm asthma events could be explored.

In AV's after-action review following the thunderstorm asthma event, it expressed the belief that additional work was needed to enable it to be better connected to the state warning platform and emergency broadcaster network, allowing it to disseminate public information and warnings.

AV has agreed to develop further protocols for issuing messages, including the need to provide earlier messages regardless of the potential to cause community concern.

One primary reason for this new approach is to enable people to be informed if there are significant delays with ambulances.

This will enable the community to make informed decisions such as whether they should make their own way to the hospital. Other important messages include enacting asthma plans, staying inside, and using air conditioners if possible.

FINDING 20

The Inspector-General for Emergency Management (IGEM) finds that for any rapid-onset health emergency – including those that may not be currently foreseen – demand for the Emergency Services Telecommunications Authority (ESTA) and Ambulance Victoria (AV) will provide early indicators that an emergency is unfolding, which could serve as triggers for escalation to a control agency.

Providing the ability for AV to disseminate public information, advice and warnings would ensure that delays to intelligence sharing, escalation, response and public communications are minimised.

5.6 Developing forecasts and warnings for thunderstorm asthma

Victorian Warning Protocol

DHHS is responsible for managing community information and warnings during a health emergency, as designated control agency under the SERP.

The Victorian Warning Protocol provides important guidance for the development of thunderstorm asthma warnings. It outlines the importance of pre-planned triggers for activation and clear lines of decision making and authorisation to enable the provision of efficient and tailored warnings.

However, because there are many unknown aspects of thunderstorm asthma, identifying and refining triggers for decision making will require ongoing collaboration, research and review.

It is important to distinguish forecasts from warnings. Forecasts can be produced on a regular basis to identify the level of risk for a particular phenomenon to occur. Warnings are issued when a pre-determined critical threshold of risk is expected to be exceeded.

Forecasts and warnings for thunderstorm asthma must carefully reflect uncertainties in forecasts and the risk of message-fatigue from false alarms.

Scientific expertise and research suggests that agencies issuing forecasts and warnings must carefully consider a number of variables in developing a forecast and warning system for thunderstorm asthma, including:

- rainfall in the preceding 6 days⁵⁸
- presence of aeroallergens in the areas likely to be affected by the thunderstorm⁵⁹
- thunderstorms forecast near an urban area, especially if outflows are observed^{60 61}
- increase in social media posts, website hits or google searches related to respiratory issues
- spikes in demand for ESTA and AV services
- self-reported symptom data through apps
- increases in emergency department presentations.

The Epidemic Thunderstorm Asthma Preparedness and Response Plan, developed in December 2016, provides a basis that can be refined as new research and data becomes available and the forecasting and response system matures.

Message construction and multi-modal dissemination

Warnings should also use a similar format to those used in other hazards and provide information such as:

- **What is happening?** What is known about the event, and the urgency, certainty and severity
- **What is forecast or predicted to happen?** Likely time to impact and duration, and locations affected
- **What are the likely consequences?** Impacts that communities may experience
- **What should people do?** Actions to reduce or prevent these consequences, where to seek more information, and where to seek help.

The development of a warning scale for thunderstorm asthma will ensure that warnings accurately convey the expected level of risk, the level of certainty and appropriate actions.

Developing a standardised categorisation scale for thunderstorm asthma warnings will be an important aspect of public warnings.

The DHHS-led Interagency Working Group established following the 21 November thunderstorm asthma epidemic used three categories: green (negligible risk), amber (low risk) and red (higher risk)⁶².

As thunderstorm asthma is an unfamiliar hazard, public warnings should include contacts for further information, to reduce the risk of overwhelming Triple Zero with callers seeking information⁶³.

5.6 Examples of health emergency warnings, information and advice

Two health emergencies share some similarities with thunderstorm asthma: heat and smoke events are also environmental and may simultaneously affect the health of many people across a large area.

Heat

Heatwaves cause more deaths in Australia than all other natural hazards combined. Heatwaves are typically large scale and slow moving weather events that can be readily predicted and monitored⁶⁴.

The BoM has developed the Excess Heat Factor methodology to identify periods of heatwave in a standardised way. This methodology allows heatwaves to be defined by locality, intensity and severity, providing a graduated forecast service⁶⁵.

DHHS issues heat health alerts, based on the temperature forecast, to key stakeholders including departments, health agencies, health service providers (for example hospitals, local government and residential aged care facilities) and AV⁶⁶.

Prior to a heatwave, the Chief Health Officer will also contact the EMC who may convene the State Emergency Management Team (SEMT) to commence whole-of-government readiness planning.

During a significant event the EMC may engage the Emergency Management Joint Public Information Committee to ensure coordination of state-level messages to the public (see Case Study 1, page 63).

Increased public awareness and education around heatwave events has helped to reduce morbidity during heat events^{67 68}.

However, despite warnings and messages, vulnerable groups – including elderly and low income communities – remain at risk^{69 70}.

Notably, heatwave forecast and warning systems within Australia and internationally are relatively new, and there is much research interest in evaluating warning systems^{71 72} and understanding risk factors and vulnerability in the context of heatwaves⁷³.

CASE STUDY 2

HEAT WARNINGS AND HEALTH ADVICE – LESSONS FROM VICTORIAN HEATWAVES

The January 2009 and 2014 Victorian heatwaves demonstrated the consequences of extreme heat on public health.

DHHS estimates that 374 deaths in 2009 and 167 deaths in 2014 may be attributed to heatwave.

Since the 2009 heatwave, DHHS developed a heatwave framework to reduce the impact of extreme heat on public health.

This includes the Heatwave Plan for Victoria, Heat Health Alert System and communications resources.

The Victorian Auditor-General's Office (VAGO) completed an audit of heatwave management practices in the *Heatwave Management: Reducing the Risk to Public Health October 2014* report.

VAGO found that while the framework was soundly based, public messaging was key to mitigating the impact of heatwaves on public health.

The VAGO audit recommendations included that DHHS:

- implement a phased approach to heat health alert warnings in line with the Victorian Warning Protocol
- develop a communications strategy for heatwaves that includes public awareness and education activities.

In line with the VAGO recommendations DHHS has developed a strategy to improve the public's understanding of extreme heat conditions and how organisations, communities and individuals can plan and respond to those conditions.

The strategy includes a communication campaign using radio, social media, community service announcements and media stories.

Print and online material on how to manage the health risks of extreme heat are now published on the Better Health Channel website and App.

High-risk groups are targeted as part of the campaign. For example, DHHS provides advice to public housing tenants over the age of 75 through the 'Keeping in Touch' program.

Heat-related communications are also coordinated with other summer specific programs, such as Sunsmart and bushfire preparedness messaging.



The Department of Health and Human Services communication campaign includes social media resources for use during extreme heat events

Smoke

Smoke events from bushfires, planned burns or industrial fires are becoming increasingly common in Australia.

These smoke events have widespread and significant health impacts, and mitigation and protection is largely reliant on public warnings and education⁷⁴.

Bushfire smoke can affect large areas including urban populations, and vulnerable groups can be affected by even small amounts of smoke⁷⁵.

Industrial fires also have significant health effects.

The 2014 Hazelwood Coal Mine fire burned for 45 days and affected the air quality throughout much of Victoria's LaTrobe Valley.

Adverse health impacts were observed during the fire and long-term health effects are expected⁷⁶.

Information and warnings relating to smoke is available from a range of sources in Victoria (see Case Study 3 below).

Information about fires is available through the VicEmergency App and website; planned burning activity is also identified on the Department of Environment, Land, Water and Planning's website; real-time information about air quality in Melbourne is available at the EPA AirWatch website.

Advice and information regarding protecting yourself from smoke is available through brochures and on various websites such as Better Health Channel.

The response to the Hazelwood Coal Mine fire has been the subject of public and political scrutiny.

The lessons learned from this event highlight the importance of having protocols in place that define roles, responsibilities, triggers and thresholds, and the importance of effective risk communication to enable communities to understand the hazard and take protective measures.

CASE STUDY 3

SMOKE WARNINGS AND HEALTH ADVICE – LEARNING FROM THE HAZELWOOD MINE FIRE

On 9 February 2014, a fire began in the Hazelwood Coal Mine as a result of embers spotting from nearby bushfires.

The Hazelwood mine fire burned for 45 days leading to significant impacts on the communities of Morwell and the wider Latrobe Valley from smoke and ash.

In March 2014 the Victorian Government announced an independent inquiry to the Hazelwood Mine Fire.

The Hazelwood Mine Fire Inquiry made a number of recommendations and affirmations to enhance the way the community receives timely, tailored and relevant public information and warnings.

In response, the Victorian Government proposed the following actions:

- develop the State Smoke Framework Community Engagement Strategy
- establish a Communications, Health and Emergency Management team at DHHS to provide strategic direction and oversight for public health and emergency management communications
- develop standard messaging templates and fact sheets to facilitate immediate responses to emergencies
- develop smoke and health advice in anticipation of fire seasons to prepare the community for the potential health impact of smoke events, with advice being made available through the Better Health Channel, Health Translations website, health.vic website and social media
- ensure DHHS smoke-related public communications material is effective through evaluation and review.

Significant progress has been made towards addressing these actions, including:

- development of health messaging containing actionable health advice for the public and vulnerable members of the community
- preparedness to issue emergency warnings for smoke through the VicEmergency website and VicEmergency App.

This case study provides important transferrable lessons of timely warning systems, early health advice and public information to support communities to make informed decisions.

The improvements better enable communities to reduce the impact of future public health emergencies

RECOMMENDATION 8

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria, Department of Health and Human Services (DHHS) and Ambulance Victoria (AV) collaborate to integrate emergency advice and warnings for Class 2 health emergencies within the Emergency Management Common Operating Picture (EM-COP) warning platform.

Public information, advice and warnings for all classes and types of emergencies should follow the Victorian Warning Protocol.

All alert/warning messages should follow a tiered structure of Advice, Warning (Watch and Act), and Emergency Warning.

5.7 Mitigation, preparedness and resilience

Mitigation and preparedness are closely related concepts.

Victoria's emergency management arrangements assume the following definitions:

- **Mitigation:** measures taken in advance of, or after a disaster aimed at decreasing or eliminating its impact on society and environment
- **Preparedness:** the establishment of structures, development of systems and testing and evaluation by organisations to perform their roles⁷⁷.

Mitigation measures should 'take account of vulnerability and seek to build resilience', and risk ownership rests with the relevant agencies and communities⁷⁸.

Examples of state and municipal level mitigation include warning systems, health surveillance, community education and awareness programs, and safety regulations⁷⁹.

Figure 20 (page 70) provides an overview of how mitigation relates to risk and emergency management more broadly.

At a national level, preparedness has been defined as: 'measures to ensure that, should an emergency occur, communities, resources and services are capable of coping with the effects'⁸⁰.

The EMMV identifies a shared responsibility held by all individual community members and government agencies to prepare and plan for the risks of emergency events⁸¹.

This aligns with the national concept of 'shared responsibility' which highlights that responsibility to prepare and respond to disasters is shared 'across the whole of society'⁸².

These concepts are particularly relevant to thunderstorm asthma, as mitigation, preparedness and resilience will require coordination and collaboration across government, non-government organisations (NGOs), the private sector and community.

Community resilience is also an important concept that is increasingly integrated into Victorian emergency management processes and planning^{83 84}.

EMV is developing an emergency management community resilience framework for Victoria which is due for completion in mid-2017^{85 86}.

EMV's website describes resilient communities as:

- connected
- healthy and knowledgeable, with the ability to assess, monitor and manage risks, while learning new skills and building on past experiences
- able to identify problems, establish priorities and act, with the support of good infrastructure and services
- flexible and resourceful, together with the capacity to accept uncertainty and proactively respond to change⁸⁷.

When considering mitigation, preparedness, and resilience in the context of thunderstorm asthma, it will be important to ensure that plans, processes and public information are consistent across emergency response agencies.

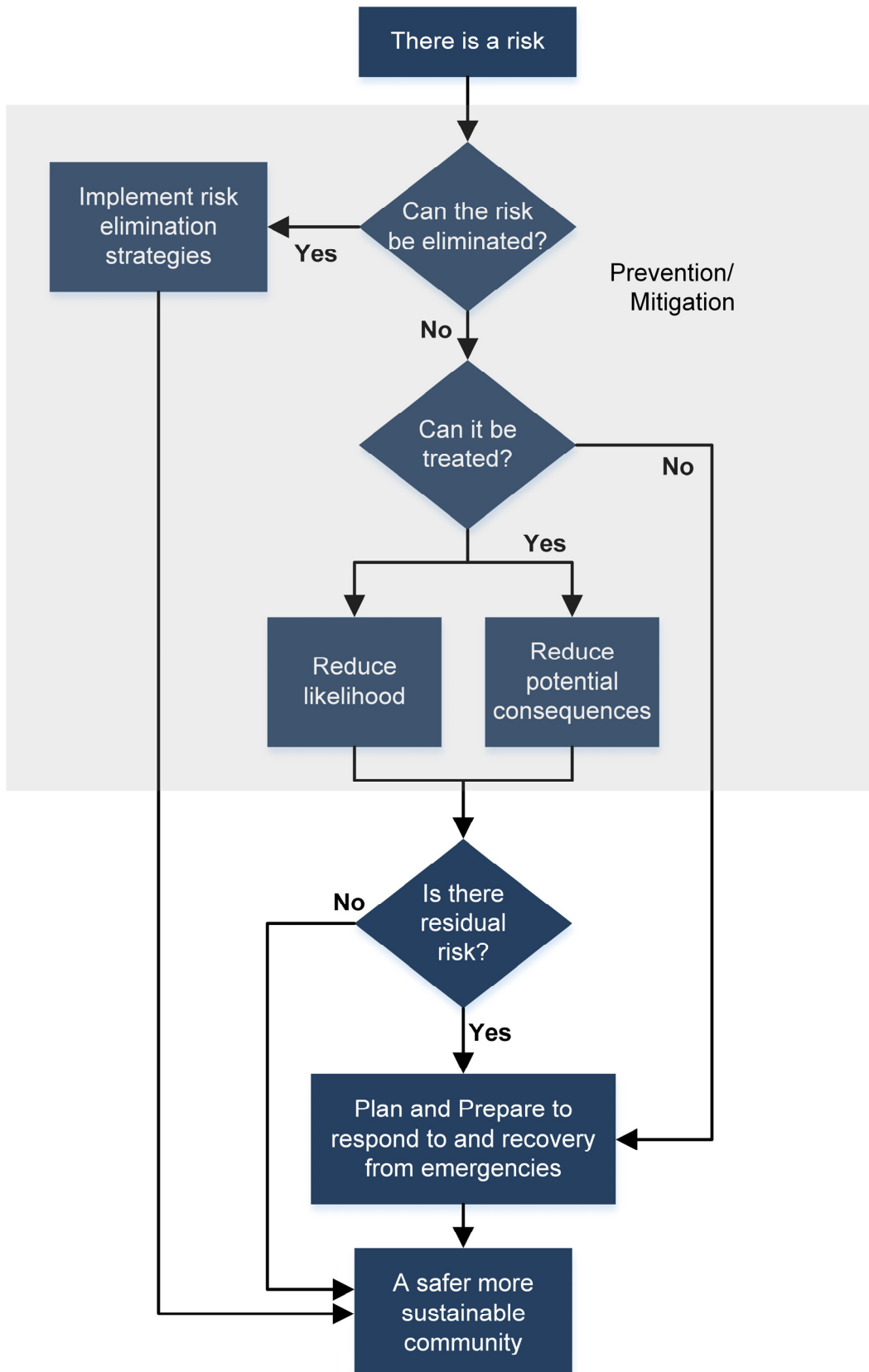
Issues to be considered for mitigation and preparedness for epidemic thunderstorm asthma

The uncertainty about the specific causes that contribute to thunderstorm asthma has several implications for mitigation and preparedness.

First, as shown in Figure 20 (page 70) mitigation measures aim to eliminate the risk, or reduce its likelihood or potential consequences.

In the case of thunderstorm asthma, there are no practical options to eliminate the risk or reduce its likelihood (i.e. the presence and interaction of thunderstorms with aeroallergens cannot be feasibly prevented or reduced).

Therefore, attention must necessarily be focused on reducing the potential consequences of thunderstorm asthma through response planning, community education, and other measures to build preparedness and community resilience

Figure 20: Risk management articulated into emergency management⁸⁸

A reduction in the likelihood of adverse health consequences may be achieved through:

- public education about asthma and the importance of people in the community seeking professional medical advice for themselves and their families
- good patient adherence to appropriate medication use
- good patient and carer knowledge of how to deal with respiratory issues, utilising an effective asthma action plan
- avoidance of exposure to thunderstorm outflows and therefore, aeroallergens.

Developing an effective forecast and warning system for thunderstorm asthma is a key contributor.

However, developing effective community warnings for thunderstorm asthma will be complicated by limited understanding of epidemic thunderstorm asthma and the lack of event triggers.

This should be informed by improved understanding of the hazard, risk and relevant thresholds at which warnings should be issued.

Additional research and collaboration is required to strengthen knowledge of this type of event to design, evaluate and improve current warning systems.

This includes identifying conditions where thunderstorm asthma is possible and identifying those conditions that warrant an emergency alert in order to limit the number of false alarms.

“...I had NO idea an event like this could happen so general education is important as well...”

Source: public submission

Thunderstorm asthma involves a combination of meteorological phenomena, aeroallergens (for example, pollen and fungal spores), and the exposure of sensitive people⁸⁹.

As previously outlined, effective mitigation and preparedness will require the involvement of multiple agencies and organisations.

Addressing gaps and disconnections to build coordination and collaboration will be key to successful warning systems and public health interventions.

While mitigation and preparedness measures that deal with the specific causes and risks of thunderstorm asthma are important, a broader public education campaign focused on the human-health impacts from aeroallergens would more effectively contribute to community resilience because:

- While this report focuses on epidemic thunderstorm asthma, thunderstorms in general can exacerbate asthma and hay fever.
- Asthma and allergies are a significant health burden in Australia^{90 91 92 93}.

Melbourne is also anecdotally known as the ‘allergy capital,’ due to the extent to which symptoms are experienced in the city and this is supported by international research⁹⁴.

These health burdens and their impacts are arguably under-recognised in both policy and public spheres.

- Climate change is influencing pollen, fungal spores, and their interaction with air pollution and meteorological factors (for example wind, thunderstorms).

Recent research indicates climate change is likely to increase the season length, species range, production, and allergenic effects of pollens and fungi⁹⁵.

- Prevention measures that individuals and communities can take to reduce the risk and consequences of thunderstorm asthma would also improve the management of asthma and allergies throughout the pollen season in general.

This is illustrated in the case study of Murrumbidgee Local Health District (Appendix F).

- Large thunderstorm asthma events are rare, and it is likely that there will be false alarms from initial forecasts and warning systems. Seasonal increases in asthma and allergies, however, are a documented phenomenon^{96 97}.

Campaigns that encourage, support, and normalise active management of asthma and allergies by individuals and communities during pollen season will support asthma management more generally and reduce the impact of thunderstorm asthma when it does occur.

FINDING 21

The Inspector-General for Emergency Management (IGEM) finds that limited options to reduce the risk and likelihood of thunderstorm asthma to communities increases the need to prepare and effectively manage consequences.

Effective mitigation, prevention and preparedness will require ongoing and broad collaboration to establish exposure thresholds, escalation triggers, community education, response planning and other measures to build preparedness and community resilience.

A reduction in the likelihood of adverse health consequences may be achieved through:

- public education about asthma and the importance of people in the community seeking professional medical advice for themselves and their families
- good patient adherence to appropriate medication use
- good patient and carer knowledge of how to deal with respiratory issues, utilising an effective asthma action plan
- avoidance of exposure to thunderstorm outflows and therefore, aeroallergens

The extensive work that has been achieved across government, private sector, academic institutions, non-government organisations and community to strengthen preparedness and resilience for a range of emergency hazards across Victoria provides a sound basis for new and previously unplanned for hazards.

RECOMMENDATION 9

The Inspector-General for Emergency Management (IGEM) recommends Emergency Management Victoria (EMV) work closely with the Department of Health and Human Services (DHHS) and other agencies to amend current systems and arrangements to ensure they effectively deliver emergency warnings and health advice for rapid onset, spatially dispersed, non-traditional emergency management events, such as thunderstorm asthma.

DHHS' current review and integration of the State Health Emergency Response Plan (SHERP) and Public Health Control Plan (PHCP) should update, as a priority, the delivery of community information, emergency warnings and health advice.

Ambulance Victoria, as first responders to health emergencies, should have access to formal channels, triggers and training to disseminate pre-hospital public information, advice and warnings in rapid-onset emergencies.



The likelihood of adverse health consequences may be reduced through good patient adherence to appropriate medication use
(Image credit: Asthma Australia)

5.8 Sharing responsibility for mitigation and preparedness

In keeping with the vision to build resilience through sharing of responsibility, and putting people at the centre of decision making, it is important that Victorians are provided – as far as is practicable – with information and advice to enable them to be more empowered to make decisions about how best to prepare for and cope with emergencies.

Responsibility to mitigate and prepare is shared amongst stakeholders^{98 99}.

This report considers three main stakeholder groups:

- government and partnerships
- health sector (general practitioners and pharmacies)
- institutions, communities and collectives; and individuals.

Government and partnerships

A coordinated and strategic approach is required to mitigate the risk of thunderstorm asthma, and the related risks and health burdens triggered by aeroallergens.

This should include consideration of the following (some of which may be most effectively addressed at a national level):

- Ongoing research to support the development of thunderstorm asthma forecasting and warning systems.
As thunderstorm asthma is an inherently interdisciplinary topic, research should consider aeroallergens, their interaction with meteorological features, and their human health impacts.
- Development of reliable forecast models that can improve the health and wellbeing of hay fever and asthma patients, and reduce the consequences of rare events like thunderstorm asthma¹⁰⁰.
A current limitation to forecast models in Australia is that pollen and fungal spore datasets are often fixed-term, limited to a few seasons or years and project-focused.

- Research to identify sites where additional aeroallergen monitoring is needed, particularly in rural and regional areas.
- The potential to facilitate a whole-system approach to forecasting that would incorporate, coordinate and standardise the relevant aeroallergens data collection required for the epidemic thunderstorm asthma forecasting process.
A whole-system approach would facilitate robust interconnectivity, quality assurance, improvement and functionality.
- Data ownership and archiving, ideally by an organisation that has no conflicts of interest¹⁰¹, would enable relevant datasets to be readily available for medical, research and risk mitigation purposes.
- Opportunities to leverage partnerships in pollen monitoring and research across government and academic institutions, including existing university pollen monitoring sites.
- The provision of improved community information and warnings for rapid-onset health emergencies and alerts to key stakeholder and partner networks
- Improved public education campaigns for thunderstorm asthma and the importance of hay fever and asthma management more generally.

CASE STUDY 4

THE MURRUMBIDGEE ASTHMA COMMUNITY COLLABORATIVE

Thunderstorm asthma has been recognised in New South Wales' Murrumbidgee Local Health District since the late 1990s. The district has a well-established system for prevention and preparedness, forecasts and warnings, response management and subsequent follow-up.

The Murrumbidgee Asthma Community Collaborative (the Collaborative) was formed after a major thunderstorm asthma event on 30 October 1997 which resulted in 215 asthma cases presented to Wagga Wagga emergency department.

The Collaborative includes public health staff, emergency department staff, primary health workers, health administrators, pharmacists, and Charles Sturt University (CSU) staff.

PREVENTION AND PREPAREDNESS

Each year the Collaborative undertakes public awareness campaigns about thunderstorm asthma, and respiratory conditions more broadly, aimed at anyone who 'wheezes or sneezes' in spring.

Each campaign has five key messages:

- See your doctor for an Asthma Action Plan.
- Use your preventer medication each day in spring
- Use a reliever if you have breathing problems.
- If you still have breathing difficulties go to hospital immediately.
- Call Triple Zero for an ambulance.

Reducing the risks and consequences of thunderstorm asthma is the focus of these campaigns, however, this goal cannot be separated from the broader public health goal of reducing and preventing the everyday health burdens of asthma and allergies.

MONITORING

The Murrumbidgee thunderstorm asthma season runs annually from late October to mid-November.

During the season, three aspects are monitored:

- **Pollen**
Pollen is monitored using a pollen and spore trap located in Wagga Wagga. This is the only pollen monitor in the district and is used as a pollen indicator region-wide.
- **Thunderstorm activity**
Local BoM staff monitor and filter thunderstorm warnings throughout the season, and ensure that relevant warnings are provided to the district's Director of Public Health.
- **Emergency department asthma presentations**
A NSW system to monitor signs and symptoms (syndromic surveillance) is used for collecting data from:
 - asthma presentations at emergency departments, particularly during thunderstorm asthma season.
 - the FirstNet Emergency Department electronic medical record, which provides an integrated view of patient information including presenting problems, test results, allergies and alerts.

This information may be taken into consideration when deciding whether to issue a thunderstorm asthma alert. It is also used to evaluate and review the thunderstorm asthma season¹⁰².

LEARNINGS

The Collaborative has brought together local and regional stakeholders to develop a process of awareness raising, monitoring, forecasting, warning, and managing thunderstorm asthma events.

This process provides a useful case study of practical measures that can be taken to reduce the risks and consequences of thunderstorm asthma, and support better management of asthma and allergic rhinitis more generally

(The full case study is at Appendix F)

Situational awareness

Human exposure and reaction to the respirable-sized aeroallergens will likely be the first indication that a thunderstorm asthma event is occurring.

Therefore, the development of surveillance systems or demand surge models that are sensitive, specific and timely is crucial to enabling real-time confirmation of thunderstorm asthma epidemics and enabling emergency and health services to respond accordingly.

The BoM may also be a valuable source of information to assist the situational awareness of decision-makers, given the extent of weather impact on many emergencies.

Defining triggers for escalation based on demand surges (ESTA, AV, EDs, NURSE-ON-CALL) and real time monitoring of signs and symptoms (syndromic surveillance) will require considerable collaboration, research, systems improvements and ongoing refinement.

However the efficient capture and dissemination of this intelligence is key to ensuring an efficient, coordinated and effective response to future rapid-onset health emergencies.

The potential of self-reporting participatory systems should also be explored.

In Europe, data from patient hay fever diaries has been used to improve and personalise allergen forecasting, and to better understand the severity of allergen loads^{103 104 105}.

The potential of using data from the AusPollen App survey for similar purposes, and to support early identification of a thunderstorm asthma event, is an option worthy of consideration.

Using social media and online sources for situational awareness and intelligence is also valuable. This should include monitoring of visits to relevant websites.

Public submissions called for as part of this review highlighted the rapid increase in online traffic to a number of peak asthma bodies on the evening of 21 November 2016.

IMPROVING EARLY DETECTION AND FORECASTING CAPABILITY

On 23 November 2016, DHHS established an interagency working group comprising representatives of DHHS, BoM, EPA, University of Melbourne and Deakin University.

The working group met weekly until early January 2017 when it had evidence that the pollen season had ended.

The purpose of the group was to:

- share knowledge and experience of thunderstorm asthma-incidents
- discuss ways and options for predicting future events for the rest of Victoria's current pollen season
- inform public health planning for the 2017 pollen season and beyond
- convene a sub-group to undertake rapid assessments of current pollen counts and thunderstorm forecasts to determine the risk of an epidemic thunderstorm asthma event similar to 21 November 2016.

In March 2017 DHHS sponsored a symposium on thunderstorm asthma, bringing together relevant experts to share knowledge on thunderstorm asthma, identify research gaps, contribute to forecasting, and the development of clinical guidance – all of which will feed into collaborative work to prepare for the 2017 pollen season.

RECOMMENDATION 10

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria (EMV) work with the Department of Health and Human Services (DHHS) and partners to develop a business intelligence technology solution that will support greater situational awareness during a rapid-onset emergency.

The solution should enable the integration of existing geospatial and socio-economic data with real-time data from:

- Ambulance Victoria
- Bureau of Meteorology
- DHHS
- Emergency Management Common Operating Picture (EM-COP)
- Emergency Services Telecommunications Authority
- Environment Protection Authority Victoria
- hospitals
- pollen research stations
- other relevant organisations.

This combined information would ideally be visualised through a portal, or similar mechanism, to inform decision-making, public information and warnings, and consequence management.

The importance of ensuring individuals know how to deal with thunderstorm asthma before the event takes place, is illustrated by the Murrumbidgee Local Health District program.

A potential seasonal approach to a public health campaign, warnings and review is shown in Figure 21 below.

The Murrumbidgee Local Health District experience, together with literature findings and interviews with key experts, suggests the following type of community preparedness messages to be promoted prior to peak pollen season.

If you wheeze or sneeze (that is, if you experience asthma or hay fever) through pollen season:

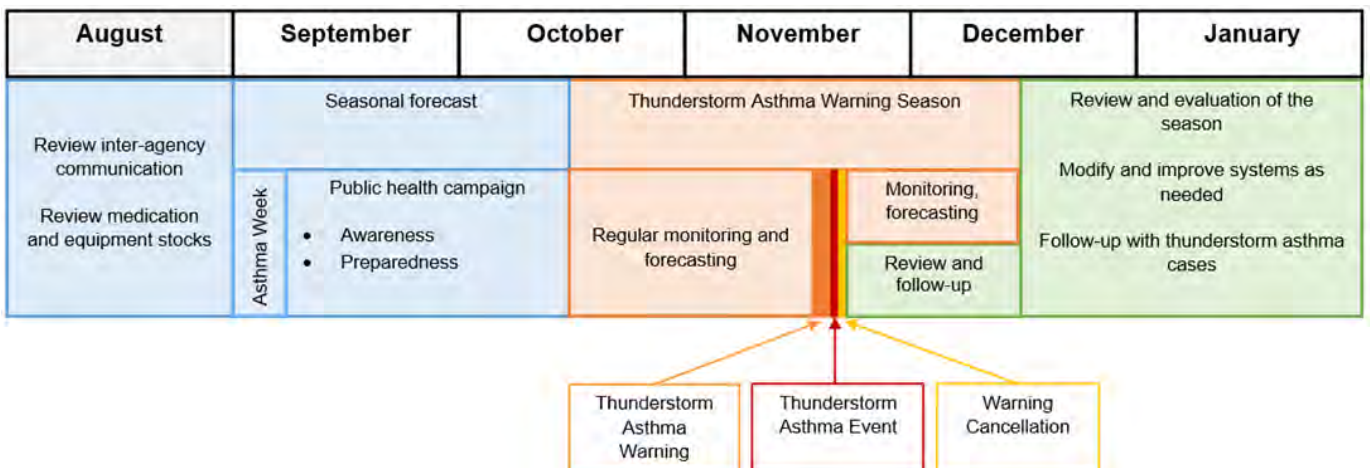
- It is important to work with your GP to manage/reduce your symptoms.
- If you have asthma, work with your GP to develop an asthma action plan.
- Make sure to take your medication as directed by your GP.
- Always carry your medication – especially during pollen season and on days when thunderstorms have been forecast.
- If you experience symptoms, follow the steps in your asthma action plan or as discussed with your GP.
- Visit the recommended website or contact the appropriate helpline for further information about thunderstorm asthma, asthma and allergies.
- Call Triple Zero if you have breathing difficulties.

Supporting community preparedness

In the context of thunderstorm asthma, public awareness and education campaigns to build understanding of the risk are crucial.

Such campaigns can be readily aligned with long-standing campaigns – such as the National Asthma Strategy – which highlight the importance of actively managing asthma and hay fever throughout the pollen season.

Figure 21: Potential thunderstorm asthma season timeline



These preparedness messages should be provided through multi-modal channels and supported by non-government organisations that have established networks with asthma and hay fever patients.

These could include:

- information on websites such as Better Health Channel, Asthma Australia and AusPollen
- posters and brochures displayed in GP surgeries and pharmacies
- fridge magnets or brochures that can be placed in workplaces and homes
- social media
- education and childcare networks
- local government
- public transport communication network
- radio and television interviews
- public events. For example, the Murrumbidgee Local Health District invites a guest speaker to the launch of its spring campaign.

Preparedness campaigns could also promote the use of existing services and tools, such as the AusPollen App.

This App provides useful information about pollen levels and allows people to track their symptoms.

If adopted more widely, this symptom data could play a key role in identifying risk days for thunderstorm asthma, and potentially early identification of epidemics, as well as supporting those with asthma and hay fever to better understand their symptoms and triggers.

Preparedness campaigns should encourage public understanding of asthma and allergies as serious health issues that should be actively managed.

Education is also needed about the warning system and actions that people should take once a warning has been issued and where to source further information.

This is particularly important given the recommendations in this report to utilise the established EM-COP warning platform.

FINDING 22

The Inspector-General for Emergency Management (IGEM) finds that appropriately tailored asthma management would reduce the significant health burden that asthma presents Australians and improve the resilience of communities to future thunderstorm asthma events.

Public awareness and education campaigns to build understanding of the risk is crucial, and can be readily aligned with long-standing campaigns that highlight the importance of actively managing asthma and hay fever throughout pollen season.

Alongside public messaging to support preparedness, communities need education about the warning system and actions that people should take once a warning has been issued.

The Murrumbidgee Local Health District (MLHD), NSW developed a long-standing response to epidemic thunderstorm asthma risk that affected many residents of Wagga Wagga and surrounding districts and stretched the local health services.

The MLHD Case Study and academic literature provide useful examples of key messages for community preparedness that could be promoted prior to peak pollen season.

Health sector (including General Practitioners and pharmacies)

General Practitioners and pharmacies have important roles in supporting public awareness, preparedness and community resilience.

It is important to note that the capacity of individual GPs, practices and pharmacies will vary, and that formal support arrangements should be considered – particularly in areas where there are vulnerable populations, or relatively few GPs and pharmacies.

The potential could also be explored for GPs and pharmacies to be involved in a system that monitors symptom data to identify increases in asthma cases on high risk days for thunderstorm asthma.

Other institutions and organisations

There are a number of non-government organisations (NGOs) and research organisations that have been actively working in the fields of allergies, asthma and aeroallergens for many years.

The development of public health campaigns and warning systems should, where possible, leverage, support and expand the networks and relationships that these organisations have with relevant stakeholders and community members, and with individual healthcare providers. Table 9 on the following page identifies a range of relevant organisations.

There is also the potential to include some of these agencies in surveillance systems, as public submissions highlighted the rapid spike in website hits and calls to helplines received on 21 November for peak bodies such as Asthma Australia.

In addition to websites, Asthma Australia has highlighted the potential to create a sophisticated mobile phone App that allows the public to access up-to-date warnings instantaneously.

It was also noted that by providing a medication replacement reminder function on the application, it is possible to create a valuable dataset which can allow researchers to monitor geographic areas to see where the highest levels of problems are occurring.

While this App may be important for asthma management, as highlighted in this review, IGEM supports the VicEmergency App as the primary source of warnings to the community when situations escalate.

Asthma Australia has noted that in working with the community of Wagga Wagga, it helped establish a general 'Wheeze and Sneeze' campaign rather than focusing solely on hay fever or asthma.

In doing so, Asthma Australia was able to reach and engage a broader audience to deliver advice on how they should be managing and treating their symptoms, and what to do if they deteriorate.

RECOMMENDATION 11

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) lead collaboration between relevant partners to:

- implement a system of standardised pollen and fungal monitoring protocols and sites across Victoria
- enable improved understanding of the mechanisms involved in thunderstorm asthma to better predict occurrences
- improve accuracy and reliability of forecasting for thunderstorm asthma, informing a user centred forecast scale which ensures that it accurately conveys the expected level of risk and the level of certainty of an event occurring
- develop methods for utilising thunderstorm asthma forecasts to trigger the delivery of community information, emergency warnings and health advice.

Table 9: Allergy, asthma and aeroallergen stakeholders

ORGANISATION	SERVICES OR PRODUCTS	WEBSITE
Allergy and Immunology Foundation of Australasia	Funding for medical research. Public awareness campaigns.	https://www.allergyimmunology.org.au/
Asthma Australia	Support and coaching, provides online resources, training for health professionals.	https://www.asthmaaustralia.org.au
AusPollen	The Australian Pollen Allergen Partnership. Pollen counts and forecasts for Melbourne (through the University of Melbourne) and other Australian locations. App with symptom diary. Developing a standardised national pollen count network.	http://www.pollenforecast.com.au/
Australasian Society of Clinical Immunology and Allergy	Peak professional body of clinical immunology and allergy in Australia and New Zealand.	https://www.allergy.org.au/
Australian Medical Association	Represents registered medical practitioners and medical students in Australia.	https://ama.com.au/
Australian Primary Health Care Nurses Association	Peak professional body for nurses working in primary health care.	https://www.apna.asn.au/
Deakin AIRwatch	Pollen counts and forecasts for Melbourne and Geelong.	https://www.deakin.edu.au/students/faculties/sebe/les-students/airwatch
National Asthma Council Australia	Network of health professionals working in the field of asthma and related conditions.	https://www.nationalasthma.org.au/
Pharmaceutical Society of Australia	Peak national professional pharmacy organisation. Supports practice improvement in pharmacy by providing continuing professional development and practice support, in order to improve the health of Australians.	https://www.psa.org.au
The Royal Australian College of General Practitioners	Professional general practice organisation and represents urban and rural general practitioners.	http://www.racgp.org.au/home
The Royal Australasian College of Physicians	Trains doctors in allergy and immunology.	https://www.racp.edu.au/
The Pharmacy Guild of Australia	National peak body representing community pharmacy.	http://guild.org.au/

Communities

Community-level initiatives could include or seek to mitigate and prepare for thunderstorm asthma and rapid-onset respiratory events by:

- building awareness of asthma and hay fever and the importance of actively and routinely managing these conditions
- building awareness of thunderstorm asthma as a seasonal hazard
- increasing collaboration and connections between NGOs, community groups, GPs, and pharmacies to support:
 - the health and wellbeing of people with asthma and allergies
 - responses to thunderstorm asthma events.

In addition to the media's role in the delivery of community information, emergency warnings and health advice, media organisations play a strong role in many public awareness and community education campaigns – both as paid media strategies and unpaid reporting of events and activities, especially at a community level.

Individuals

The preparedness actions outlined above also require individuals to recognise the importance of actively managing these conditions to support health and wellbeing.

This includes the development of asthma management plans and improved awareness of where to seek warnings, information and health advice.

RECOMMENDATION 12

The Inspector-General for Emergency Management (IGEM) recommends that the Department of Health and Human Services (DHHS) lead collaboration between relevant partners to develop a comprehensive thunderstorm asthma strategy that includes a public awareness and education campaign.

The strategy should leverage existing national and international networks, principles, strategies (National Asthma Strategy) and frameworks to promote effective asthma management and improve community resilience.

The Murrumbidgee Local Health District response should be considered as a template for good practice.

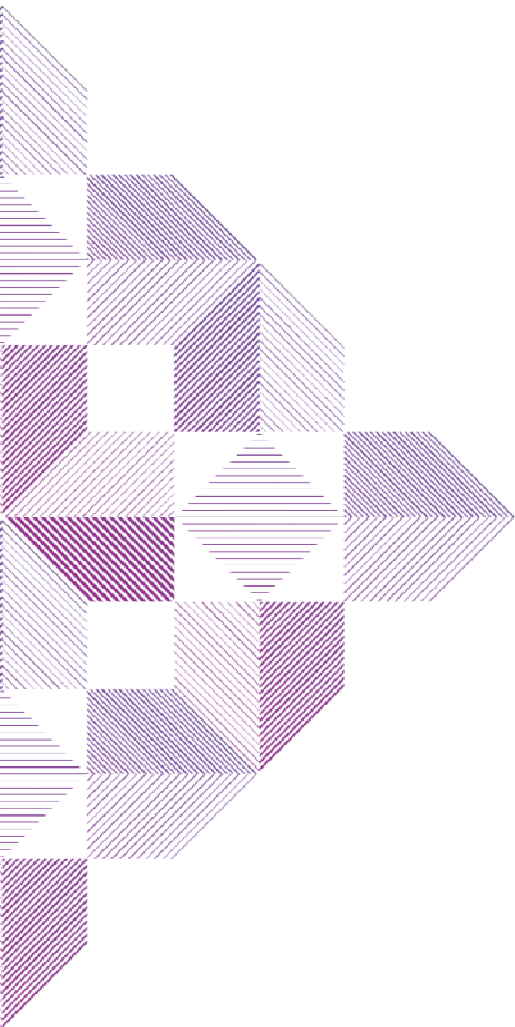
RECOMMENDATION 13

The Inspector-General for Emergency Management (IGEM) recommends that Department of Health and Human Services (DHHS) devise and adopt outcome measures to monitor and evaluate the ongoing effectiveness of system integration; intelligence sharing; community information; emergency warnings and health advice, which may be included in the broader emergency management sector performance standards.



Public awareness and education campaigns are crucial in building understanding of asthma risk

6 Broader considerations



Through the course of this review, stakeholders raised a number of systemic issues that were not necessarily an issue during the thunderstorm asthma event of November 2016 but represent opportunities to improve the management of future emergencies.

The findings, observations and recommendations outlined in this section seek to better position Victoria's emergency management system to prepare for and respond to rapid-onset events, natural or human-induced, regardless of hazard source.

6.1 Focus on consequence management and utilising all available resources

Traditionally, public health emergencies have been slow-moving and/or geographically contained. Examples include pandemic influenza, food contamination and health impacts from chemical incidents.

The thunderstorm asthma event defied the traditional characteristics of a public health emergency. It was a rapid-onset event with wide geographical reach.

Even though the immediate demand subsided during the early morning of 22 November 2016, the consequences of this event continued for many days afterwards.

Public messaging was not distributed by DHHS until the morning of 22 November 2016, when DHHS had a better understanding of the event and consequences.

While this approach may be effective for traditional public health emergencies, rapid-onset emergencies do not provide emergency managers with the luxury of time to first identify the source of the hazard, then provide public messaging accordingly.

High-level information, as basic as informing the public to expect delays due to the significant demand on ambulance services and hospitals, should be provided as soon as possible, thus empowering individuals to make their own informed decisions.

This is in line with the state's preparedness goal of shared responsibility¹⁰⁶, which involves the emergency management sector and communities working as one to reduce the impact of emergencies.

The Victorian Warning Protocol provides control agencies with a coordinated and consistent direction on advice and/or warnings to inform the community of a potential or actual emergency event.

Victoria has existing agreements and systems in place to enable wide broadcast of public messaging across various communication channels including established channels and protocols for engaging with the media for emergency broadcasts.

Furthermore, these systems have been used and tested through many other major emergencies.

Other coordination processes and infrastructure such as consequence management, logistics, whole of government reporting, as well as linkages to other state and Commonwealth control centres, such as those provided through the SCC, will benefit the management of Class 2 emergencies.

FINDING 23

The Inspector General for Emergency Management (IGEM) finds that the Department of Health and Human Services (DHHS) focused its efforts on understanding and responding to the impact on the health system and the cause of the surge in demand, before issuing public information and warnings. This approach may be suited to traditional slow-moving and/or geographically contained public health emergencies. However, rapid onset emergencies with unknown or unfamiliar sources require the provision of more immediate public information to enable members of the public to make informed decisions.

RECOMMENDATION 14

The Inspector-General for Emergency Management (IGEM) recommends that Emergency Management Victoria (EMV) consider how current available resources, infrastructure and systems for both Class 1 and Class 2 emergencies may be used and appropriately integrated to provide an effective response to all emergencies.

This includes the management of responses to rapid onset emergencies regardless of hazard type or classification of emergency.

IGEM recommends improved intelligence sharing between DHHS, AV and the relevant functions within the State Control Centre (SCC) before, during and after health emergencies. This can be achieved by DHHS and AV utilising SCC systems and infrastructure.

Implementation of this recommendation will enable improved information sharing during future health emergencies, including thunderstorm asthma and for similar rapid-onset, non-traditional emergency management events.

6.2 Factors that have the potential to impact timely access to all available resources during rapid-onset emergencies

In order to minimise the harm suffered by the community during rapid-onset events, it is vital that all available resources are accessed and deployed to aid the response.

This is aligned with the aim of the *Emergency Management Victoria Capability Blueprint 2015–2025*, specifically in relation to:

- the capability foundation of ‘maximising utilisation of capability and capacity’
- the core capability of ‘planning, provisioning, response and coordination of pre hospital and health emergency care, including triage, treatment and distribution of patients, in a timely and structured manner, using all available resources to maximise positive health outcomes’.

The response to the thunderstorm asthma event demonstrated the agility and flexibility of the health system in the face of a rapid-onset event. This was reflected in the health system’s ability to quickly access and utilise a range of different resources to meet immediate community needs.

However, as identified earlier in this report, organisations relied upon informal processes and/or activities to achieve this.

Examples included:

- AV mobilising NEPT providers to supply all available resources
- MFB attending Code 1 cases without AV support, outside of normal protocols
- VicPol transporting a patient to hospital
- DHHS approving public patient access to private hospital beds, where available, and at no cost to patients
- community pharmacies working extended hours to provide support and assistance to people experiencing breathing difficulties, effectively acting as a triage system for hospitals.

IGEM’s consultations with relevant industrial bodies indicated that existing enterprise agreements enable the deployment and utilisation of all appropriate latent resources in responding to rapid-onset events. This is reflected through mechanisms such as rostering, standby and overtime arrangements.

Nevertheless there may be an opportunity for the Victorian Government and its agencies, in consultation with the relevant industrial bodies, to examine current agency enterprise agreements to ensure that they reflect and support the deployment and utilisation of all appropriate latent resources in responding to rapid-onset events.

In conducting this work, the welfare and needs of staff should be considered, along with appropriate support mechanisms, including appropriate training and equipment.

The informal activities and/or processes used in maximising resources during the thunderstorm asthma event contributed to improved community outcomes.

To better prepare for future rapid-onset events, relevant departments and agencies should identify the enablers for accessing and using additional resources during the thunderstorm asthma event, and consider them for broader application to other emergencies.

Where appropriate, these enablers should then be formalised in relevant enterprise agreements, plans or operating procedures.

This will enhance the sustainability of these arrangements and improve the emergency management sector's level of preparedness against future rapid-onset events.

FINDING 24

The Inspector-General for Emergency Management (IGEM) finds that informal activities and/or processes contributed to the deployment and utilisation of additional resources to respond to the thunderstorm asthma event, which mitigated its impact on the Victorian community.

RECOMMENDATION 15

The Inspector-General for Emergency Management (IGEM) recommends that responding agencies identify, assess and where appropriate, formalise with relevant industrial bodies, the processes and/or response activities rapidly introduced for the thunderstorm asthma event.

These informal processes contributed to the thunderstorm asthma emergency response. Formalising them will significantly improve the sector's capability and capacity for future rapid-onset events.

6.3 Sharing of personal or sensitive information between agencies

The sharing of timely information between relevant departments and agencies before, during and after emergencies is essential to delivering an effective outcome.

This is especially the case for rapid-onset events, where the impact and associated consequences on the community may be immediate.

Timely and open information flow between relevant organisations enables key decision-makers to effectively undertake key emergency management functions such as coordination of resources and consequence management.

As identified earlier in this report, on the evening of 21 November 2016, information flow was partial or inconsistent, which limited the formation of a common operating picture.

The sector needs to ensure that appropriate information is shared between relevant organisations before, during and after an emergency. IGEM has considered this in light of circumstances which may arise in the management of health emergencies or any emergency that involves management of injured or ill persons.

Typically this would only include de-identified information such as age or gender, but depending on the nature of the emergency, appropriate information may include personal and/or health information of individuals which would assist in providing an integrated, system-wide response.

In Victoria, the lawful collection and sharing of health and/or personal information is governed by the *Privacy and Data Protection Act 2014* and the *Health Records Act 2001*.

IGEM notes that these Acts are principle-based and contain public interest exceptions that can be applied for and used in emergency response situations.

Specifically, health and/or personal information may be:

- collected where the collection is necessary to prevent or lessen a serious and imminent threat to the life, health, safety or welfare of any individual or a serious threat to public health, public safety or public welfare
- used and disclosed in an emergency response situation for the purposes of:
 - identifying those who are injured, missing, dead or otherwise involved in the emergency
 - helping individuals access services such as medical treatment
 - coordinating or managing the emergency.

In this regard, information privacy law is not a barrier, and should not be used as a barrier, to appropriate information sharing in emergency situations.

FINDING 25

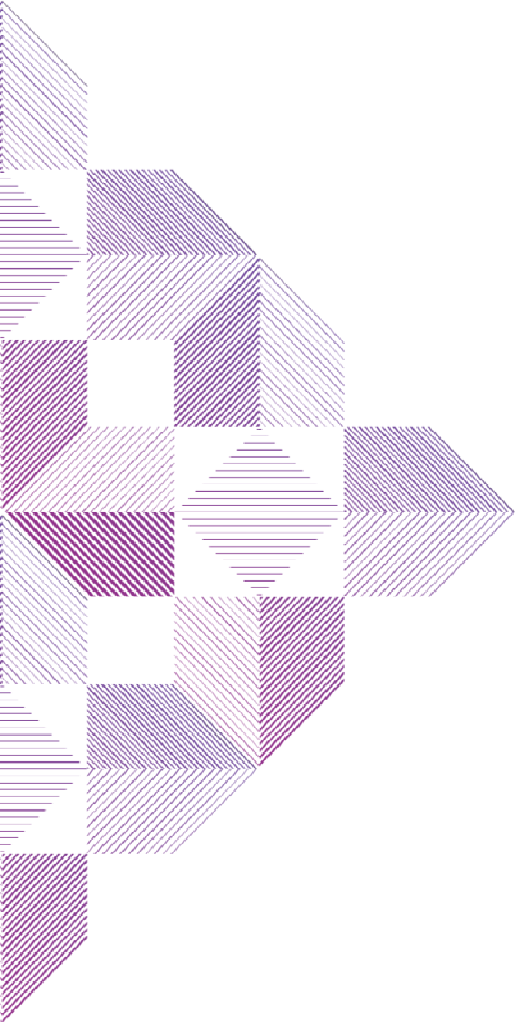
The Inspector-General for Emergency Management (IGEM) finds that Victoria's information privacy laws are principle based and are not a barrier to appropriate information sharing in emergencies.

RECOMMENDATION 16

The Inspector-General for Emergency Management (IGEM) recommends that responding agencies – including health services – review existing information sharing policies, procedures and practices for emergencies in accordance with Victorian privacy laws. Appropriate information sharing provisions must be understood and embedded into practice.

Victorian privacy laws include public interest exceptions that enable sharing of health and/or personal information. Departments and agencies must incorporate the privacy principles into relevant plans, operating procedures, manuals and/or guidance materials.

7 Summary and concluding remarks



This report details the Inspector-General for Emergency Management's review of the epidemic thunderstorm asthma event that swept through parts of Victoria on 21–22 November 2016.

The event challenged all involved and generated a collaborative, caring response, which demonstrated what can be achieved when confronted by the unexpected on a large scale, across a geographically dispersed area, with no time to prepare.

While acknowledging the flexible and professional response, the focus of this review has been on evaluating how well the system worked – that is, the activation and implementation of emergency response plans, the protocols, the planning and resourcing, and the way in which information was gathered, assessed and shared.

The review's focus has spanned both the emergency management and health sectors, resulting in IGEM's interaction extending beyond government and emergency response agencies to include hospital staff and executives, emergency broadcasters, academics, industrial bodies and peak bodies.

The insights gained have been invaluable in IGEM's evaluation of the emergency response and in the identification opportunities for improvement.

The resulting recommendations contained in this report aim to improve the relevant health and emergency management arrangements, and to enable our communities to be more resilient and prepared to respond to the consequences of all emergencies.

A key lesson is that an unexpected, rapid-onset emergency can occur and the cause may not be obvious, familiar or visible.

While overall arrangements for managing major emergencies are robust, there is a lot to be understood about predicting and preparing for thunderstorm asthma, and a broader focus is vital to develop the capability and capacity to prepare for and respond effectively to any form of unexpected emergency.

Glossary

Australasian Inter-service Incident Management System	A nationally adopted management framework for organisations working in emergency management, providing a common language and consistent approach for the effective and efficient control of incidents.
Australia's Emergency Warning Arrangements	The document that provides a high level overview of the framework governing the delivery of emergency warnings to the Australian public.
Chief Health Officer alert	Information provided by the CHO about health issues with the potential to affect the community's health and safety.
Class 1 emergency	(a) a major fire or (b) any other major emergency where MFB, CFA or VICSES is the control agency under Part 7 of the EMMV.
Class 2 emergency	A Class 2 emergency is a major emergency which is not: <ul style="list-style-type: none"> • a major fire • any other major emergency for which the MFB, CFA or VICSES is the control agency under the SERP • a warlike act or act of terrorism • a hi-jack, siege or riot.
Code 1 emergency (AV)	Code 1 incidents require urgent paramedic and hospital care, based on information available at time of call. Code 1 incidents include Priority 0 and Priority 1.
Code Brown	Hospital-recognised code for external emergency.
Control Agency	The agency, defined in Part 7 of the EMMV, assigned to control the response activities to a specified type of emergency.
Emergency Medical Response	The Emergency Medical Response (EMR) program was established to improve the outcome of patients in sudden cardiac arrest. This program allows MFB to respond to Priority 0 events.
Field Emergency Medical Officer (FEMO) program	The Field Emergency Medical Officer (FEMO) program enables medical doctors to provide assessment, leadership, advice and support during disasters in conjunction with other on-ground paramedic and health providers. This DHHS funded program is activated by the State Health Incident Management Team (usually via AV's State Health Commander in consultation with DHHS' State Health Coordinator) and reports to the State Health Commander.
Health Advice	Safe, practical health information to maintain public health, rather than targeted medical advice. Health advice is general advice, not tailored to individuals.
Incident Controller	The individual appointed to be accountable for the overall direction of response activities at an incident.
Incident Management Team	The team assembled to assist the Incident Controller perform the control function, applied using the principles of the Australasian Inter-service Incident Management System.
PM10	Airborne particles are sometimes referred to as 'particulate matter' or 'PM'. Particles can be classified on the basis of their size, referred to as their 'aerodynamic diameter'. 'Coarse particles' are those between 10 and 2.5 micrometres (μm) in diameter; 'fine particles' are smaller than 2.5 μm ; and 'ultrafine particles' are smaller than 0.1 μm .
Priority 0	Priority 0 are the highest priority incidents, including non-breathing and suspected cardiac arrests. They require a 'lights and sirens' response and usually involve sending additional resources such as a Mobile Intensive Care Ambulance (MICA). Priority 0 incidents are a subset of Code 1 incidents.
Priority 1	Priority 1 incidents are high-priority and time-critical, requiring a 'lights and sirens' response. Priority 1 incidents are a subset of Code 1 incidents.
State Response Controller	The person appointed by the EMC to exercise control over the response to a Class 1 emergency. The EMC may appoint more than one State Response Controller.
Triple Zero (000)	Telephoning Triple Zero (000) is the most common way members of the community request emergency assistance from police, fire and ambulance.
Victorian Warning Protocol	The Victorian Warning Protocol provides emergency response agencies with coordinated and consistent direction on advice and/or warnings to inform the Victorian community of a potential or actual emergency event.
Warnings	A message signalling an imminent hazard, which may include advice on protective measures.

Appendix A Letter of request



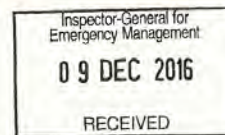
The Hon James Merlino MP

Deputy Premier
Minister for Education
Minister for Emergency Services

1 Treasury Place
Melbourne Victoria 3002
Telephone: +613 9651 1222

Mr Tony Pearce
Inspector General of Emergency Management
17/121 Exhibition Street
MELBOURNE VIC 3000

Our ref: CD/16/590169



Dear Mr Pearce *Tony*

Review of Response into Thunderstorm Asthma Event of 21-22 November

This letter is to request you, under section 64(1)(c) of the **Emergency Management Act 2013**, to review the emergency response to the Melbourne thunderstorm asthma event of 21-22 November 2016.

Your review should consider:

- The appropriateness and adequacy of the response under the Public Health Response Plan during events of 21 and 22 November, including the speed of escalation;
- The role of, and coordination between, the Emergency Management Commissioner, the Department of Health and Human Services, and other relevant agencies in respect of this public health event, and the adequacy of support provided to emergency and public health services;
- Consideration of the triggers for, and provision of, public warnings and information and health advice, taking account of predictability, preventive steps and methods of distribution available for this type of emergency; and
- The identification of any other relevant matters or opportunities for improvement.

Background

From 6pm on 21 November 2016, Ambulance Victoria and hospital emergency departments across Melbourne saw an unprecedented surge in patients with asthma and in respiratory distress. This was most likely associated with the late evening thunderstorms and high pollen levels.

Thunderstorms have been linked to epidemics of asthma, especially in late spring and summer. The conditions occurring at the onset of a thunderstorm might expose susceptible people to a rapid increase in concentrations of pollen fragments in the air that can readily deposit in the lower airways and initiate respiratory conditions such as asthma.

Review Rationale

There is a need to review the overall effectiveness of preparedness and response activities in relation to this event.

The primary goal of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about potential improvements to future public health emergency planning and response arrangements.

Review Requirements

The Department of Health and Human Services, Ambulance Victoria and Emergency Management Victoria are all key stakeholders in this review and will support the collection and provision of information to inform the data analysis phase of the review.

The review process should include a consideration of all relevant documentation, and discussions with key stakeholders.

You are requested to provide an interim report by 30 January 2017. The interim report will form part of your final report.

Your final report should be delivered by 21 April 2017.

We look forward to receiving your review of this important issue.

Yours sincerely




Hon James Merlino MP
Deputy Premier
Minister for Emergency Services



Hon Jill Hennessy MP
Minister for Health
Minister for Ambulance Services

Appendix B Advertisement calling for public submissions



VICTORIA
State
Government

Justice
and Regulation

Review of emergency response to the thunderstorm asthma event

The Inspector-General for Emergency Management invites public submissions to their review of the emergency response to the thunderstorm asthma event of 21–22 November 2016.

From 6pm on 21 November 2016, Ambulance Victoria and hospital emergency departments across Melbourne saw an unprecedented surge in patients with asthma and respiratory distress. This was most likely associated with the late evening thunderstorms and high pollen levels.

The Victorian Government has requested the Inspector-General to review the emergency response to the Melbourne thunderstorm asthma event looking at:

- the appropriateness and adequacy of the response under the Public Health Response Plan during events of 21 and 22 November, including the speed of escalation
- the role of, and coordination between, Emergency Management Commissioner, the Department of Health and Human Services, and other relevant agencies in respect of this public health event, and the adequacy of support provided to emergency and public health services
- the triggers for, and provision of, public warnings and information and health advice, taking account of predictability, preventive steps and methods of distribution available for this type of emergency
- the identification of any other relevant matters or opportunities for improvement.

The primary goal of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about potential improvements to future public health emergency planning and response arrangements.

Public submissions addressing the lines of enquiry must be received by **5pm, Monday 30 January 2017** and will be used to inform the Inspector-General's final report.

Submissions can be lodged online myviews.justice.vic.gov.au or by mail to:

Inspector-General for Emergency Management
GPO Box 4356, Melbourne VIC 3000

Z0612606

Appendix C Victoria's emergency response arrangements

Emergency Management Act 2013

The *Emergency Management Act 2013* (the Act) defines categories of emergencies, outlines responsibilities for establishing control of response activities and outlines the roles and responsibilities for the preparation, approval and updating of the SERP.

Section 39 of the Act outlines the responsibilities for establishing and/or transferring control for a Class 2 emergency.

Section 32(1)(b) of the Act states that the Emergency Management Commissioner (EMC) is responsible for ensuring that control arrangements are in place during a Class 2 emergency and Section 40 empowers the EMC, where considered necessary, to direct the officer in charge of an agency to appoint one or more controllers or assistant controllers for the Class 2 emergency.

State Emergency Response Plan (SERP)

The *State Emergency Response Plan* (SERP) forms Part 3 of the Emergency Management Manual Victoria (EMMV) and outlines the Victorian arrangements for the coordinated response to emergencies by all agencies with a role or responsibility in relation to emergency response. It was approved by the State Crisis and Resilience Council (SCRC) on 24 March 2016 and took effect on 1 August 2016.

It is the EMC's responsibility to prepare and update the SERP as required. The SERP is written in accordance with Section 54 of the Act. This includes details around emergency response context, operational roles and responsibilities, collaboration across agencies, community involvement, and state and agency capability.

Particular sub-plans are also developed to detail arrangements for managing specific emergencies. This is typically where complex arrangements apply and more detail is required.

State Health Emergency Response Plan (SHERP)

The *State Health Emergency Response Plan* (SHERP) is the key state plan for pre-hospital and hospital response for emergency incidents and is a sub-plan of the SERP.

The SHERP provides guidance at state, regional and incident tiers by outlining the arrangements for coordination of the health response to emergency incidents that go beyond day-to-day business arrangements.

The SHERP also outlines DHHS' key emergency management responsibilities which are to:

- act as the control agency for the protection of health
- manage pre-hospital and hospital responses to emergency incidents.

The primary aim of the SHERP is to reduce preventable death and permanent disability, and to improve patient outcomes by matching the needs of injured patients to an appropriate level of treatment in a safe and timely manner.

The SHERP scope is defined as the "principles, command and coordination arrangements, and roles and responsibilities for a health emergency response". This includes pre-hospital care, patient transport, receiving hospitals and other healthcare facilities.

Escalation of response levels within the SHERP is triggered when information is received about an incident or potential incident that is likely to impact normal operations of the health system or any agency that operates within SHERP. Escalation levels apply to each tier of incident management, and each tier can operate at a different level of escalation.

Information can be received through various channels such as:

- Triple Zero calls received by Ambulance Victoria
- multi-agency dispatch requests to Ambulance Victoria
- warnings and advice issued by other Control Agencies
- information disseminated by Victoria Police Emergency Response Coordinators
- planning arrangements for major public events.

As noted above, health incident responses are structured around the three tiers of control, state, regional and incident. Within each tier, the Health Commander determines the escalation level at which to manage the incident.

The SHERP is currently under review as part of the review of State Health Emergency Response Arrangements being undertaken by DHHS.

Department of Health Public Health Control Plan 2012

The *Public Health Control Plan 2012* provides internal guidance for the management of public health incidents and emergencies by DHHS.

The *Public Health Control Plan 2012* lists potential public health incidents and emergencies, and the business units that are responsible for initiating and managing a response. Although there is no specific reference to large-scale allergy-related emergencies, the plan does recognise incidents and emergencies arising from natural events.

It is important to note that the *Public Health Control Plan 2012* reflects the former Department of Health structure. On 1 January 2015, the Victorian Government established the Department of Health and Human Services (DHHS) bringing together the former Department of Health, Department of Human Services, and Sport and Recreation Victoria.

As such, the *Public Health Control Plan 2012* is currently under review as part of the review of State Health Emergency Response Arrangements.

Appendix D Number of presentations at public hospitals most affected by the thunderstorm asthma event over 21 and 22 November 2016

HEALTH SERVICE	HOSPITAL	DATE		TOTAL
		21/11/2016	22/11/2016	
Alfred Health	Sandringham & District Memorial Hospital	140	143	283
	The Alfred	261	271	532
Alfred Health total		401	414	815
Austin Health total	Austin Hospital	317	364	681
Barwon Health total	Barwon Health	239	203	442
Eastern Health	Angliss Hospital	147	168	315
	Box Hill Hospital	230	271	501
	Maroondah Hospital	211	207	418
Eastern Health total		588	646	1234
Melbourne Health total	Royal Melbourne Hospital	335	305	640
Mercy Public Hospitals Inc	Mercy Hospital for Women	57	42	99
	Werribee Mercy Hospital	184	200	384
Mercy Public Hospitals Inc total		241	242	483
Monash Health	Casey Hospital	210	309	519
	Dandenong Hospital	256	330	586
	Monash Medical Centre	305	395	700
Monash Health total		771	1034	1805
Northern Health total	The Northern Hospital	315	453	768
Peninsula Health	Frankston Hospital	233	226	459
	Rosebud Hospital	73	56	129
Peninsula Health total		306	282	588
The Royal Children's Hospital total	The Royal Children's Hospital	340	442	782
St Vincent's Health total	St Vincent's Hospital	216	193	409
Western Health	Footscray Hospital	217	173	390
	Sunshine Hospital	341	375	716
	Williamstown Hospital	95	61	156
Western Health total		653	609	1262
Grand total		4722	5187	9909

Appendix E Signatories to the Victorian Warning Protocol

The following organisations are signatories to the Victorian Warning Protocol, Version 2.0 (July 2013):

- Country Fire Authority
- Department of Health (now Department of Health and Human Services)
- Department of Human Services (now Department of Health and Human Services)
- Department of Environment and Primary Industries (now Department of Environment, Land, Water and Planning)
- Emergency Services Telecommunications Authority
- Metropolitan Fire and Emergency Services Board
- Office of the Emergency Services Commissioner
- Victoria Police
- Victoria State Emergency Service

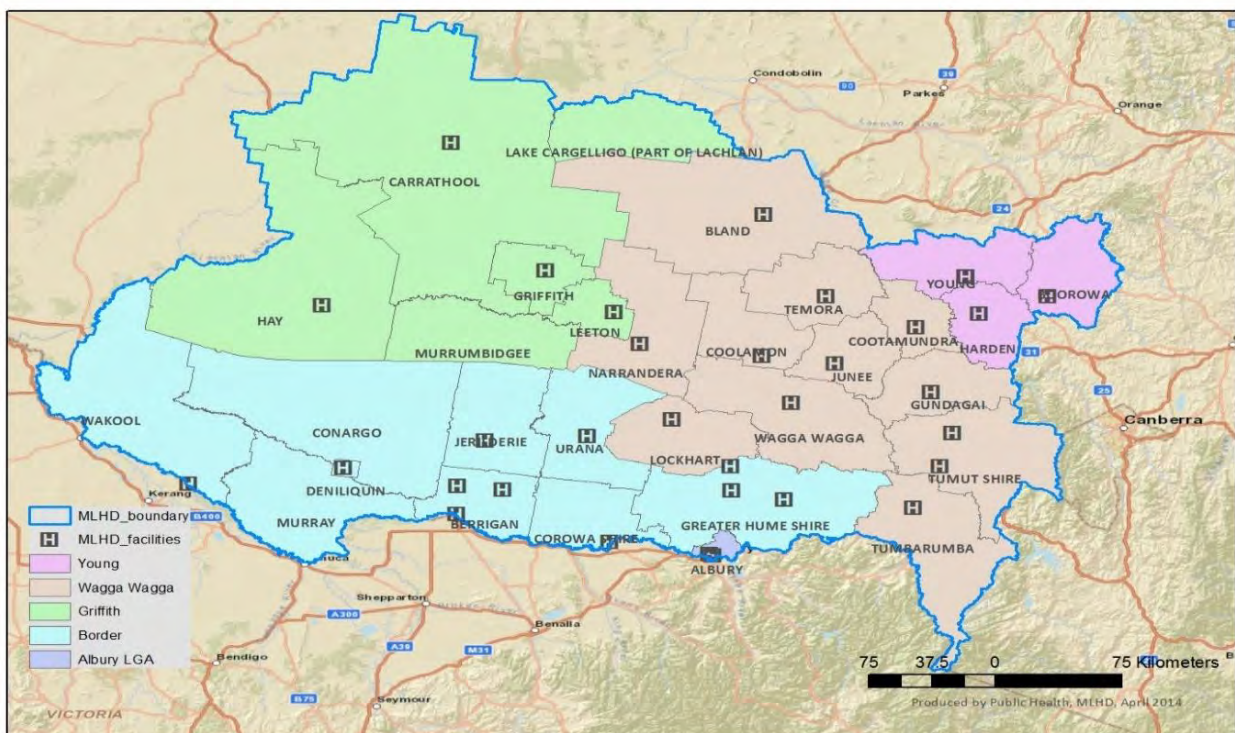
Appendix F Case Study: Murrumbidgee Local Health District, NSW

Thunderstorm asthma has been well recognised in the Murrumbidgee Local Health District (MLHD), NSW (Figure a) since the late 1990s, and a system for prevention and preparedness, forecasts and warnings, management, and follow-up is well established.

This section draws on publicly available documents, and information and materials generously shared by relevant stakeholders.

While this stage of the report focuses on monitoring and forecasting, in this case study public awareness, epidemic management and patient follow-up will also be considered due to the interconnections between each of these aspects.

Figure a: Map showing the Murrumbidgee Local Health District¹⁰⁷



The Murrumbidgee Asthma Community Collaborative^y (the Collaborative) was formed after a major thunderstorm asthma epidemic on 30 October 1997 when 215 asthma cases presented to Wagga Wagga ED, and 41 were admitted^{108 109}.

The Collaborative has worked across the MLHD (and its various former iterations) since 1998, and includes public health staff, emergency department staff, primary health workers, health administrators, pharmacists and Charles Sturt University (CSU) staff¹¹⁰.

The Collaborative seeks member contributions each year to support its activities, in particular for pollen monitoring and promotional materials, and the system of warnings and management of thunderstorm asthma has been integrated into the work of various local and district organisations and departments.

^y The Collaborative has had several names over the years; e.g., the 'Asthma Respiratory Collaborative, Riverina', the 'Asthma and COPD Collaborative of Health Professionals', and the 'Wagga Asthma Community Collaborative Committee'.

Prevention and preparedness

Public awareness

Each year, the Collaborative undertakes public awareness campaigns about thunderstorm asthma, and respiratory conditions more broadly (see Figure b and c, page 94).

Its campaign launch is aligned with the Asthma Week in the first week of September, which is organised nationally by the Asthma Foundation.

Importantly, these campaigns encourage anyone who ‘wheezes or sneezes’^z in spring to seek advice from their GP to manage their asthma, hay fever, and more recently Chronic Obstructive Pulmonary Disease.

The five key messages that occur in each campaign are:

- See your doctor for an Asthma Action Plan.
- Use your preventer medication each day in spring.
- Use a reliever (blue puffer) if you have breathing problems.
- If you still have breathing difficulties go to hospital immediately.
- Call Triple Zero for an ambulance.

While reducing the risks and consequences of thunderstorm asthma is the focus of these campaigns, this goal cannot be separated from the broader public health goal of reducing and preventing the everyday health burdens of asthma and allergies.

In this sense, there is a clear connection between mitigating the risks of thunderstorm asthma and supporting effective management of asthma and allergies every day.

The Collaborative updates and refreshes the program annually by hosting events in different locations, engaging guest speakers, and developing new promotional material and press releases.

These materials include posters that are displayed at EDs and primary health organisations, as well as ads on local radio and television¹¹¹.

Hospitals and public health

Preparations for thunderstorm asthma season begin in August.

EDs and clinics in the health district are advised of the key messages of the annual public awareness campaign. Staff are advised to remind patients to review their Asthma Action Plans and medications, and ensure that discharge education covers inhaler use, self-monitoring strategies, and appropriate referrals.

Specific thunderstorm asthma season preparations include:

- Reviewing the ‘Communication Alert Cascade’ for notifications of thunderstorm asthma
- Reviewing the disaster management process and the ‘Epidemic Triage Tool’ for responding to a large number of respiratory cases
- Reviewing stocks of oxygen, medications, spacers, nebulisers, and discharge packs. This is particularly important as additional stock is stored in Sydney.

Training to manage asthma cases, particularly in smaller, rural clinics, are also completed as needed. Staffing requirements are considered.

Additionally, the Director of Public Health, MLHD, updates contact details for all people, services, and clinics that are part of the thunderstorm asthma alert cascade.

Monitoring

In MLHD the thunderstorm asthma season runs from late October to mid-November (generally, two weeks either side of the Melbourne Cup). During this season, three aspects are monitored: (i) pollen, (ii) thunderstorm activity, and (iii) ED asthma presentations.

Pollen is monitored using a pollen and spore trap located on CSU Wagga Wagga campus.

Funding is only available for pollen counts during the thunderstorm asthma season, and counts may be completed weekly or daily, depending in part upon forecast weather activity.

Pollen counts report on rye grass pollen and ‘other’ pollens¹¹². These pollen counts are used as an indication of pollen levels throughout the MLHD as this is the only pollen monitor in the district¹¹³. Pollen count information is provided to the Director of Public Health regularly throughout the thunderstorm asthma season, or upon request by the Director of Public Health.

^z Because thunderstorm asthma often affects hay fever sufferers without a known history of asthma (Girgis et al., 2000), it is important that public health messaging targets both asthmatics and those with hay fever.

Figure b: Thunderstorm asthma alert fridge magnet calendar for 2001–02 (left) and milk carton (right).

SPRING THUNDERSTORM HEALTH ALERT

Breathing difficulties can occur suddenly with Spring thunderstorms. People with Hayfever and Asthma are most at risk.

HOW TO PREPARE YOURSELF:
If you SNEEZE and WHEEZE in Spring, please:

- See your Doctor now for an **Asthma Action Plan**
- Use inhaled Asthma preventer medication for all the weeks of Spring and use a reliever (blue puffer) to breathe easy
- If you have breathing difficulty go to hospital urgently
- Call 000 for an Ambulance

2001/2002  Danger Months

SEPTEMBER 2001 S M T W T F S 26 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	OCTOBER 2001 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	NOVEMBER 2001 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
DECEMBER 2001 S M T W T F S 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	JANUARY 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	FEBRUARY 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
MARCH 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	APRIL 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	MAY 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
JUNE 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	JULY 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	AUGUST 2002 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Message from The Wagga Community Asthma Collaborative Committee.
 Sponsored by Wagga Wagga Base Hospital Volunteers and The Rivina Division of General Practice.

Spring Thunderstorm Asthma Alert

Hayfever may lead to ASTHMA. Asthma can occur suddenly with late spring thunderstorms

HOW TO PREPARE YOURSELF IN THE SPRING

THUNDERSTORM SEASON:
 If you SNEEZE or WHEEZE in the danger period, please:

- See your doctor now for an **asthma management plan**
- Use preventer medication for the months of spring and use a reliever (eg; blue puffer) as needed to breathe easy
- If you have breathing difficulty go to hospital urgently
- Don't hesitate to call 000 for an Ambulance if required

Message from the Wagga Asthma Community Collaborative Committee and the Wagga Wagga district Division of General Practice

Figure c: Thunderstorm asthma alert poster from 2016–17

SPRING THUNDERSTORM ASTHMA ALERT

if you WHEEZE and SNEEZE in spring

See your doctor for an Asthma/COPD Action Plan
 Use your preventer medication each day in spring
 Use a reliever (blue puffer) if you have breathing problems
 If you still have breathing difficulties go to hospital immediately

BE PREPARED · BE IN CONTROL · BE SYMPTOM FREE

Call 000 for an Ambulance

LEVEL 1
 District Clinical School
 Wagga Wagga

Murrayidge Asthma & COPD Collaborative

The BoM also provides thunderstorm forecasts to the Director of Public Health during the thunderstorm asthma season.

Two forecast products are used providing 48-hour or 24-hour forecasts (see Figure d for an example).

These forecasts divide the state into four potential regions:

- no thunderstorm forecast
- chance of a thunderstorm (green)
- thunderstorm likely (orange)
- severe thunderstorm likely (red).

Local BoM staff monitor and filter thunderstorm warnings throughout the season, and ensure that relevant warnings are provided to the Director of Public Health

Syndromic surveillance (the monitoring of signs and symptoms) is also used in the MLHD to monitor asthma presentations, particularly during thunderstorm asthma season.

Health data is collected from:

- Public Health Real-time Emergency Department Surveillance System: a NSW syndromic surveillance system that includes the bigger public hospital EDs and Triple Zero calls.
- FirstNet Emergency Department electronic medical record: Provides an integrated view of patient information including presenting problems, test results, allergies and alerts¹¹⁴.

This information can be taken into consideration when deciding whether to issue a thunderstorm asthma alert. It is also used to evaluate and review the thunderstorm asthma season¹¹⁵.

Forecasts and alerts

The thunderstorm asthma protocol used by the Public Health Unit is outlined in Table i on the following page. Because thunderstorm asthma is not fully understood, the Director of Public Health must use the best information available to determine whether to issue a public health alert.

Two pieces of information are key to this decision:

- high pollen counts at Wagga Wagga
- the likelihood of a thunderstorm within the local health district.

Where these two conditions are met, an alert is provided to EDs in the area likely to be affected by the thunderstorm, as indicated by the BoM.

The alert indicates the likelihood of a thunderstorm asthma event; the wording tacitly acknowledges the inherent uncertainty of the forecast event. EDs can then implement their plans, and can ensure that appropriate medication, equipment and staffing is available.

For the general public, alerts are provided through the Public Health Unit App; sample alerts are shown in Figure e (page 96).

Warnings may also be broadcast on public radio in advance of the thunderstorm. These warnings advise people to stay indoors with the windows closed during storms and to ensure that they carry their asthma medication with them at all times¹¹⁶.

In addition to these specific alerts for a thunderstorm asthma event, CSU also provides a text message alert to subscribers when there is a high pollen count.

This information is primarily to support everyday management of asthma and allergies, but also to help people to prepare for a thunderstorm asthma event.

Figure d: Sample BoM thunderstorm forecast for 14 January 2017 for New South Wales.

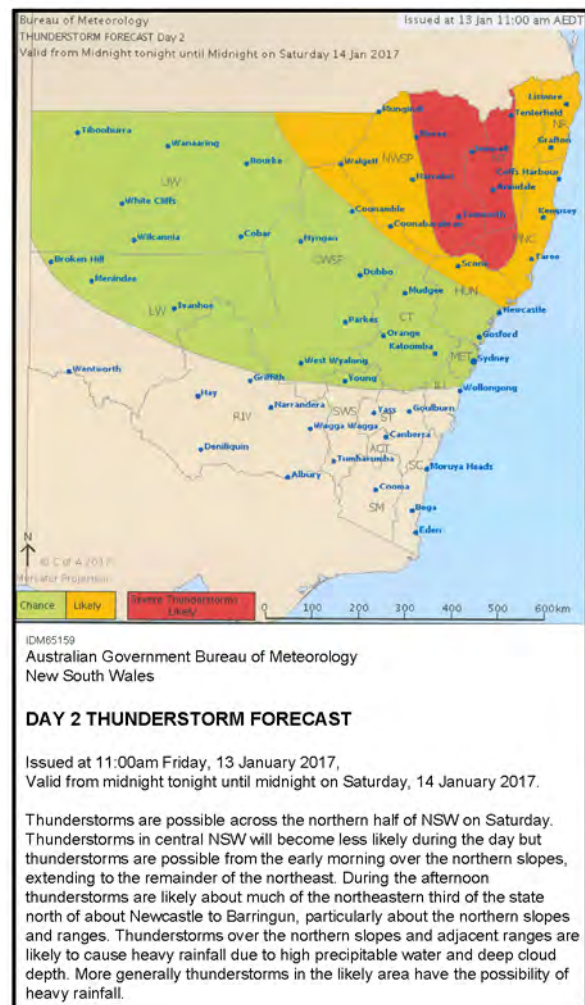
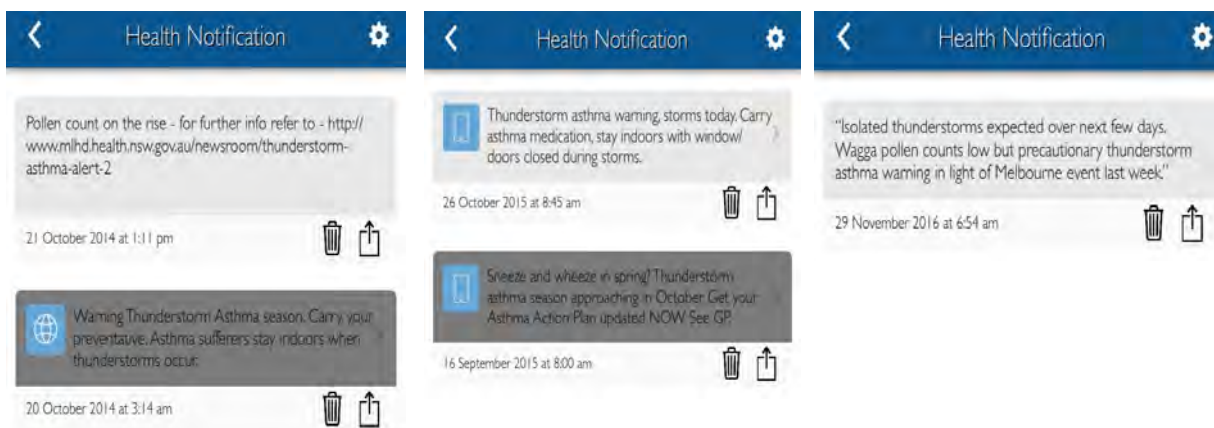


Table i: Thunderstorm asthma alert protocol in the Murrumbidgee Local Health District for 2015¹¹⁷

THUNDERSTORM ASTHMA ALERT PROTOCOL	
1	Between 19 October and 15 November 2015 a thunderstorm asthma alert will be in place.
2	Health service managers have been informed about the alert period and a list of contact telephone numbers compiled.
3	Information and advice on pollen counts provided. This information will be correlated with the advice from the BoM. It is believed that any storm during that period can trigger an asthma event. Pollen counts may therefore be of less importance than the nature of the storm but may indicate the possible severity of the event.
4	Advice from the BoM may be a two stage process. Initial advice will indicate the likelihood of a storm somewhere in the Area over the next 24–48 hours. The second stage (most likely within hours of the storm) will provide specific areas to be affected. This latter information comes from the 'Thunderstorm Section' of the BoM in Sydney and is sent to the Wagga office daily.
5	BoM contacts Public Health when a storm is predicted during the alert period. This contact could occur after hours or on weekends (On-call staff need to be aware). Prediction will usually be for storms in the next 24–48 hours.
6	Director of Public Health to be contacted [Phone number provided].
7	Decision made on need/when to alert hospitals. Director Public Health Unit will call alert for regions where thunderstorms are predicted during/after period.
8	Thunderstorm alert issued to all hospitals based on contact list. Ring the number provided and ask to speak to the person in charge of the Emergency Department. Suggested text: <i>"This is [A] calling from Public Health. Thunderstorms are forecast within the next [B] hours for the area from [C] to [D]. If a thunderstorm occurs near your town/city it is possible that some people will suffer an attack of asthma. You should put into effect the thunderstorm asthma protocol at your hospital."</i>
9	Director Public Health to inform State Health Services Functional Area Coordinator, Disaster Coordinator, CNC Respiratory, CNC Critical Care (based in Wagga Wagga) and Public Affairs Manager .
10	Director to maintain regular contact with BoM and obtain specific details on thunderstorm when available. If possible, inform sites most likely to be affected by thunderstorm. Suggested text: <i>"This is [A] from Population Health. The Bureau of Meteorology predicts that the thunderstorm is most likely to affect the area of [B] in about [C] hours. It is likely that your area will have a thunderstorm asthma event at that time."</i>
11	Community Service Announcements. Director Public Health to contact the specified radio stations and request them to play the Community Service Announcements over the period leading up to the storm; that is, in the next 24–48 hours.

Figure e: Example thunderstorm asthma alerts on the Murrumbidgee Public Health Unit Application 2014–16¹¹⁸

Management of thunderstorm asthma epidemics

EDs and clinics within this health district follow disaster management plans and a specific epidemic triage tool that have been developed since the 1997 event when responding to thunderstorm asthma.

There are several noteworthy features of the response processes:

- When the Wagga Wagga ED was redesigned, wall oxygen supply was added to the waiting room to improve treatment and outcomes when there is a surge in respiratory cases
- The Epidemic Triage Tool identifies thresholds of asthma severity and these are set up as spatial zones within the ED (i.e. green zone, amber zone, red zone). A 'pink' zone is also designated for 'business-as-usual' patients
- The use of spacers is recommended for subjects with mild to moderate asthma, and nebulised medication is recommended for patients that are hypoxic and/or distressed. Some patients are more comfortable using nebulised medication – particularly those who have not used an inhaler before
- Discharge letters to the patient's GP and medication packs have also been developed. These outline the patient's status on arrival to the ED, treatment received, status upon discharge, and recommended follow-up.

Key learnings from this case study

The Collaborative in the MLHD has brought together local and regional stakeholders to develop a process of awareness raising, monitoring, forecasting, warning, and managing events.

It is an excellent example of collaborative cross-disciplinary efforts that directly contribute to community resilience.

This process has been running since 1998 and provides a useful case study of practical measures that can be taken to reduce the risks and consequences of thunderstorm asthma, and support better management and outcomes for asthma and AR more generally.

Key learnings from this case study include:

- Thunderstorm asthma events cannot yet be accurately predicted or forecast. Therefore, it is important to address both the everyday impacts of asthma and allergies and the potentially dramatic and severe impacts of thunderstorm asthma. The coupling of these two aspects is a key part of the public awareness campaigns in the MLHD
- Public health work and campaigns have established asthma, AR and thunderstorm asthma as important health issues in this community. Annual campaigns are needed – particularly as the district has a relatively mobile population
- The MLHD covers rural and regional towns that each have only one ED, and may only be staffed by one or two nurses at any given time. The potential for a surge in acute asthma cases to overwhelm staffing levels in rural clinics is, therefore, a significant concern, particularly given the distance and time to extra medical or other support
- In this case study, the first two conditions identified¹¹⁹ – presence of aeroallergens and thunderstorms – are used to make decisions about issuing alerts
- This protocol relies on connections and information sharing across agencies and organisations. As thunderstorm asthma appears to involve meteorological, environmental, biological, and human factors, such inter-agency collaboration, in a timely manner, is crucial to issuing warnings and effectively managing events
- Issues that require further consideration were identified by key personnel involved in the Collaborative.

These include:

- Funding and sustainability for costs and skilled personnel associated with pollen monitoring need to be considered as part of the strategy – this is perhaps the area of greatest ongoing challenge.
- Pollen data from one monitor is used as a proxy for the entire health district, even though there may be local variations in pollen levels and types across the relatively large area.
- The App and text messages from the CSU are important, but do not reach everyone who might be affected – especially those who do not regularly use smartphones and those who are not aware they may be impacted by thunderstorm asthma.

Appendix G Public submissions

Peak asthma body submissions

The National Asthma Council Australia and the Asthma Foundation of Victoria provided a joint submission highlighting a small increase in contact through their Facebook page and telephone service in the days following 21 November.

While there was no dramatic increase in the number of calls, the call duration was generally longer, with many calls at least 40 to 60 minutes long, often from people affected who had not had asthma prior to this event.

The biggest increase was in social media, in particular on 30 November, likely due to the CHO thunderstorm asthma warning issued on 29 November.

The submission notes the willingness of these organisations to contribute to developing an effective response.

They provide a list of hypotheses on the cause of thunderstorm asthma, however, BoM has cautioned that a number of these causal mechanisms are theories that are not proven.

The submission also highlights the importance of consulting and advising different settings (schools, childcare and workplaces) and embedding education within these settings. They also highlight the importance of media and strategic use of social media and other tools such as mobile device applications to convey asthma management and to engage the community.

The measures suggested to reduce asthma align with the recommendations in this report.

The submission also highlights the importance of working with the Asthma Foundation Victoria (consumer level) and the National Asthma Council (for primary health professionals) to implement actions to protect the community from future thunderstorm asthma events.

The Asthma Australia submission outlines the importance of supporting people with asthma and linked conditions through education, prevention and Asthma First Aid awareness to improve asthma outcomes across the community.

The submission notes the high prevalence of asthma in Australia and the effects on people's quality of life. It also notes the low number of people (20 per cent of people over age 15 and 41 per cent of children aged 0–14) with asthma who have an asthma action plan.

Asthma Australia has surveyed people affected by the 21 November thunderstorm asthma event to understand the circumstances and experiences.

Preliminary analysis highlights important findings including:

- Those who experienced asthma symptoms were younger on average and more likely to have hay fever (90 per cent of people affected) and less likely to have had asthma (40 per cent had no previous diagnosis for asthma)
- More people previously diagnosed with asthma were aware of asthma first aid steps (47 per cent) than those who had not been diagnosed (23.5 per cent).

Asthma Australia received 1800 asthma telephone enquiries during the thunderstorm asthma period.

In addition, their website traffic started spiking around 6pm on Monday 21 November and was elevated through to about 7 December.

Traffic on Tuesday 22 November represented a single day record with 6469 sessions with a majority of people accessing through mobile devices.

The submission notes the absence of a national pollen monitoring program in Australia and highlights the importance of effective pollen monitoring.

The submission suggests that the National Asthma Strategy provide a foundation for future work.

The foundation notes that it can play a strong role in asthma education and support.

Health profession submissions

A health profession submission referred to the St John Ambulance Emergency Asthma Attack management plan as a useful online resource that could be promoted to the public¹²⁰.

A separate health profession submission advocated for more public education, information releases and warnings in high risk periods, including using an alert system for asthma sufferers ahead of anticipated high risk periods to use their [steroid inhalers] preventative medication.

Organisations such as Asthma Australia and professional medical bodies, for example the Pharmacy Guild of Australia and the Royal Australian College of General Practitioners, could help disseminate warnings and alerts at critical times via social media and SMS.

Information could also be promoted through brochures and medical websites in the lead up to spring when the levels of pollen and other allergens increases and asthma-related respiratory cases rise.

Commercial body submissions

A commercial submission proposed using a fully-automated online pollen monitoring system that will provide results every hour.

Such a system could support better real time pollen counts to inform public warning systems.

It should be noted that this business represents a German company which has developed the world's first fully-automated online pollen monitoring system.

Another commercial submission recommended providing state funding for increased data sharing systems between BoM and other agencies that would allow for better integration of resources. For example current data on pollen count and metrological warnings could be shared across the health and emergency management sectors.

General public submissions

Allergens and pollen grass

One of the main themes of the public submissions to the IGEM request, was for agencies to better monitor potential triggers for thunderstorm asthma and to share data on pollen counts that could flag a potential thunderstorm asthma event.

One of the strongest themes was that BoM should develop specific criteria to proactively identify storm conditions to trigger alerts through various media.

Alerts and warnings can be communicated by DHHS to health professional bodies such as the Pharmaceutical Society of Australia and the Australian Medical Association.

In turn they can alert their members to provide current information on precautions and use of preventative medication to patients.

Information and data sharing

Several submissions expressed concern at the lack of public information or warnings or adequate first aid information provided to the public during the thunderstorm asthma event.

A number of submissions recommended using social media platforms, such as short message service (SMS), radio and television, and websites featuring asthma organisations and medical specialists to alert the public ahead of a high-risk period for pollen and allergens.

Other public submissions suggested the use of various platforms to publicise weather or pollen warnings including:

- the Victorian public transport system to issue health warnings and updated information in the same way severe weather or fire danger period advice might be distributed

- general practitioners and other public health services to distribute information and health alerts via their professional networks
- schools, kindergartens and child care centres could use their communication platform to manage at-risk children
- education campaigns for medical practitioners to raise awareness and enhance correct diagnosis.

Personal experiences of thunderstorm asthma

Some individual submissions recounted personal experiences with asthmatic episodes exacerbated by thunderstorm asthma.

Some people did not seek medical help so were not aware of the widespread nature of the impact of thunderstorm asthma at this time, while others found that their general practitioner had not heard of thunderstorm asthma so was not aware of the risk.

Other personal submissions referred to extenuating circumstances that magnified their existing asthma related respiratory issues.

One individual, with a high level of awareness noted that despite taking preventive action he still experienced severe breathing difficulties on 21 November and long term effects on his health.

One submission detailed an asthma-prone family's recurring difficulties when attempting to call an ambulance to Melbourne's western suburbs. The mother had, in the past, resorted to driving herself to get medical help instead of waiting for the ambulance when the specified ten to fifteen wait time had elapsed.

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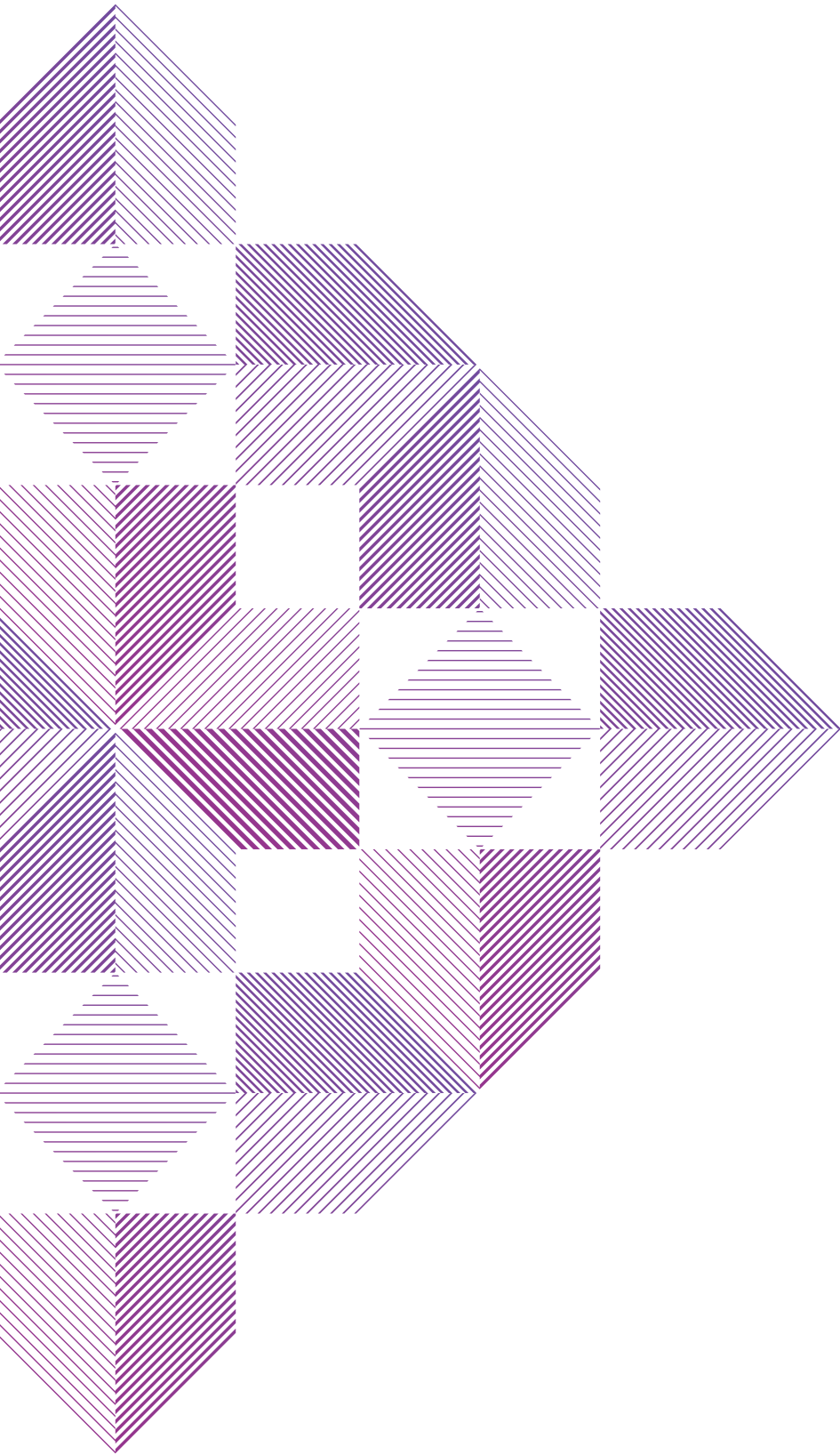
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