Our goal is clear; we want to give people with asthma a more effective role in their own treatment – and by doing so, put them back in charge of their lives.

This is why we take our inspiration from the everyday experiences of people with asthma. And the more we understand the reality of living with asthma, whether it is mild, moderate or severe, the easier it becomes to find those pivotal points where a pragmatic change – or an innovative new solution – can support people with asthma and their treating health professionals in tackling asthma.

We want to support people with asthma in their daily battle against the disease by making available access to information and support; funding world leading research and making new opportunities possible. We want to give all Australians with asthma the best chance of reaching their personal goals, whatever those goals may be.

Our work must reflect the everyday experiences of people with asthma and their treating health professionals.

We believe the search for progress begins and ends in the intersection between the patient, the family, their community and their health professionals. We have achieved a lot in the last 50 years but we will not stop till a cure for asthma is found and the community is free from burden of the disease.

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For asthma assistance please call your local Asthma Foundation on 1800 ASTHMA Helpline (1800 278 462)

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It does this by providing the best evidence to guide critical health decisions, targeting global epidemics particularly of chronic disease and injury, focusing on vulnerable populations in both high and low income countries, and engaging with decision makers to enact real change.

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Further copies of this document can be downloaded from Asthma Australia www.asthmaaustralia.org.au or The George Institute for Global Health website at www.georgeinstitute.org.au
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Acknowledgements

Asthma Australia awarded a contract to The George Institute for Global Health Respiratory Group (Executive Director’s Division) to write the Report of Asthma Australia’s Thunderstorm Asthma Consumer Survey. This report details the findings of this consumer survey and recommendations.

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Acronyms

AAP - Asthma Action Plan
GP - General Practitioner
ACT - Asthma Control Test
TSA - Thunderstorm Asthma

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Executive Summary

Introduction

On Monday 21 November 2016 a storm swept through Melbourne from the west of the state. The result of this thunderstorm event was an outbreak of thunderstorm asthma (TSA) across the city of Melbourne and surrounding suburbs which saw large numbers of people suffer respiratory symptoms and TSA. This TSA event appears to be the largest ever recorded and resulted in large numbers of people presenting to emergency departments across the city with breathing difficulties and TSA.

TSA is a term used to describe an observed increase in acute bronchospasm cases following the occurrence of thunderstorms in the local vicinity, and while TSA is a little studied phenomenon, an increasing body of evidence shows the occurrence of severe asthma epidemics associated with thunderstorms in the pollen season. At risk groups are people with asthma but also people who are sensitised who may never have had a previous clinical asthma episode but may suffer allergic rhinitis due to pollen allergy.

While asthma epidemics are frequently associated with factors such as viral respiratory infections and most thunderstorms do not result in asthma epidemics, a common characteristic to all epidemics of TSA is a significant increase in atmospheric allergen load. In most there are also meteorologic conditions favouring the development of a cold air storm outflow. Rye grass pollen is recognised as the aeroallergen of significance in association with Australian TSA events, and fragmentation of the pollen grain resulting in highly respirable pollen grain fragments plays an important role in the development of TSA.

Study Design and Survey Dissemination

Asthma Australia developed a consumer survey as a way of reaching out to the community and to document the consumer experience of the Melbourne TSA event. The purpose of the survey was to:

- Identify who was affected and potential factors associated with the likelihood of reporting an asthma attack
- Understand the circumstances, experiences and impact of the TSA event to develop approaches to minimize the impact of these events in future, and
- Inform and complement Asthma Australia’s work focusing on consumer programs and activities, education for health care professionals, and health promotion and awareness campaigns directed at the community.

The data collection was cross-sectional, and both quantitative and qualitative data were collected to provide insights into who and how people were affected. Data were collected in the following domains:

- Diagnosis of asthma and hay fever
- Current treatment(s)
- Impact of/ and response to TSA event
- Awareness of Community Asthma First Aid steps
- National Asthma Indicators (e.g. preventer use and Asthma Action Plan (AAP) ownership)
- Asthma control (using a validated questionnaire)
- Questions devised specifically focused on the TSA event of November 2016
While the aim of the survey was to engage ‘those affected’ by the TSA event and explore their experiences of the event, the term ‘affected’ was not defined in any way. Therefore, we have assumed that all respondents were affected in some way even if they did not report experiencing an asthma “attack” as defined clinically. Further, readers of this report should be aware that the cohort of survey respondents reporting ‘no asthma “attack”’ may still have experienced asthma symptoms but did not perceive or label it as an asthma “attack”, and we were not able to validate that those who reported an “attack” truly experienced asthma symptoms or an “attack”.

The survey was designed using an online platform that connected participants to the survey page via a web link that was active from the end of November to December 21, 2016. The link was the basis for promoting the survey and was disseminated electronically through a variety of different sources.

Ethics
Asthma Australia was advised that ethics approval was not required for this data collection as the survey was non-interventional.

Key Findings
The Asthma Australia Consumer Survey identified a number of groups of people – according to self-report – who were more likely to be affected by the TSA event and experience an asthma attack.

These groups had:
- History of hay fever/allergic rhinitis
- Potentially undiagnosed or unrecognised asthma/poor recognition
- Low rates of inhaled corticosteroid (preventer) use among people with a self-reported asthma attack
- Low written AAP ownership among people with a self-reported asthma attack

And there was low awareness of the Asthma First Aid Steps in general in survey respondents.

KEY FINDING 1 – People reporting an asthma attack were younger on average, more likely to have recent symptoms and treatment of hay fever, and less likely to have recent symptoms, diagnosis and treatment of asthma.

KEY FINDING 2 – Those reporting an asthma attack and a previous asthma diagnosis were: less likely to take preventer medication daily and less likely to have a written AAP.

KEY FINDING 3 – Some respondents (in the open text section of the survey) indicated having an asthma plan and knowing what to do and how to respond was helpful. These respondents often did not have attacks or managed their symptoms well, and those who gave detail on how they were prepared for the TSA event made reference to regular use of preventer medication.

KEY FINDING 4 – Many people who reported a previous asthma diagnosis had poor knowledge and understanding of their condition and how to manage it, including what their asthma treatments do, and how and when to use them. Many appeared not to be taking preventer treatment regularly.

KEY FINDING 5 – Awareness of the Asthma First Aid Steps was low among survey respondents with or without a previous asthma diagnosis and probably impacted two key outcomes:
1. Ability to recognise asthma symptoms and/or worsening asthma symptoms
2. Knowledge of how to respond to symptoms including where and how to get further information and when to seek medical assistance.

KEY FINDING 6 – There was low awareness amongst survey respondents of TSA and many called for community education about TSA and how to respond.

KEY FINDING 7 – Survey respondents called for an appropriate warning system to be put in place for future TSA events and also wanted real time alerts during future events.

Recommendations
The recommendations flowing from the key findings of the Consumer Survey are categorised into the following areas which are identified in the Ottawa Charter for Health Promotion as essential for success in health promotion:
- Build healthy public policy
- Create supportive environments
- Strengthen community action
- Develop personal skills
- Reorient health services

Recommendations for Policy Makers
1. Develop a monitoring system, reporting and communications plan system for high pollen days and risk of TSA
2. Develop a plan for full capacity ambulance response for high risk days
3. Plan triage and emergency responses based on known high risk areas
4. Focus educational efforts on high risk geographic areas and people of non-English speaking background/culturally and linguistically diverse backgrounds.
9

Asthma Australia’s Thunderstorm Asthma Consumer Survey Report I 2017

Recommendations to create supportive environments

1. Work across key stakeholder groups to achieve best outcomes, including:
   • Primary, secondary, tertiary health services
   • Pharmaceutical companies
   • Bureau of Meteorology
   • Researchers
   • Clinicians
   • State and Federal Government Institutions (e.g. Department of Health and Human Services, Victoria, Department of Health, Australian Institute of Health and Welfare)

2. Engage the emergency services and ED physicians in developing and implementing appropriate, timely community messages and coordinated responses for TSA events.

Recommendations to support community action

1. The community as a whole has easy access to consumer friendly, evidence-based asthma information to support informed decision making and increase awareness of what individuals may need and how to access necessary resources and respond in a timely manner.

2. Community members have the skills, knowledge, equipment and confidence to provide Asthma First Aid and are aware of when to seek emergency medical assistance.

Recommendations to help people with asthma and/or hay fever and their carers develop personal skills

1. If you (or your children/ family member) have a history of hay fever or asthma, past or present, you (they) are at risk of TSA.

2. Ask your doctor to assess you for asthma and/or to arrange for allergy testing, specifically for grass pollen, if appropriate.

3. Discuss with your doctor the steps to be taken if a thunderstorm is predicted, and ask your doctor to include this in your written AAP.

4. Check whether you should be taking a regular preventer medication for asthma, or if you should take it in the spring or at a particular time of the year.

5. If you have a blue reliever puffer, make sure:
   a. you know where it is
   b. it is not past its expiry date
   c. you know how to use it properly.

6. See your doctor if you had symptoms after an event that did not respond to the steps in your asthma plan.

Recommendations to enable a reorientation of health services

General Practitioners

1. Check that your asthma and hay fever patients have a full review of their diagnosis and management.

2. Write an AAP for anyone who was affected by the TSA event.

3. When you prescribe inhaled medications, take time to demonstrate and check patients’ inhaler techniques.

4. Familiarise yourself with the Australian Asthma Handbook (www.nationalasthma.org) and who should receive preventer medication for asthma.

Pharmacists

1. Keep extra supplies of Ventolin during spring and early summer.

2. Encourage customers to see their GPs for review of their asthma.

3. Encourage customers with hay fever to see their GPs for advice on TSA and for advice on what to do if they experience TSA.

Emergency Departments of Public Hospitals

1. Develop an action plan for efficient triage for TSA events.

2. Ensure you have access to pharmacy supplies of short-acting beta agonists 24/7 during spring/ summer/ high risk periods.

3. Ensure hospital pharmacies keep well stocked during these periods.

Purpose of this report

Asthma Australia acknowledges the efforts of the Department of Health and Human Services of Victoria to consult widely and collaborate across agencies and sectors in its response to this event. It is in this spirit that this report is provided - to add the human dimension to the health, emergency and monitoring planning for future events.

In considering public health strategies and supporting preparedness in the healthcare sector regarding TSA it is vital to understand the impact, fears, and reality of this event on individuals, families and the community as a whole. This will assist in providing the most relevant support to empower the community in the event of future TSA epidemics.
On Monday 21 November 2016 a storm swept through Melbourne from the west of the state. The storm hit the western suburbs of Melbourne at about 5.30pm and the centre of the city a little later. The result of this thunderstorm event was an outbreak of thunderstorm asthma (TSA) across the city and surrounding suburbs which saw large numbers of people suffer respiratory symptoms and TSA.

The magnitude of the TSA event of 2016 in Melbourne was unprecedented for Victoria but not an isolated event: events have occurred previously in Australia (including Melbourne, 1987, 1989, 2010 and Wagga Wagga, 1997) and there are reports of other TSA events in the research literature. Further, the scale of the Melbourne 2016 TSA event looks to be unprecedented in the world with the largest outbreak prior to this occurring in London coinciding with a heavy thunderstorm on 24 June 1994. The London event of 1994 saw a large increase in the number of visits for asthma to the emergency departments of London and the south-west of England. During a 30 hour period beginning at 6pm the day of the event, 640 patients with asthma or other airways disease (283 of whom were not known to be asthmatic and 357 of whom were affected only by seasonal rhinitis) attended several EDs. This was nearly 10 times the usual daily attendance for asthma (expected number of 66 patients). Further to this, 104 of these patients had to be admitted to hospital and five were placed in intensive care. The Melbourne TSA event of November 2016, however, was significantly larger in scale than the 1994 London event as detailed on the Department of Health and Human Services, Victoria, website:

“Never before had hospitals, Ambulance Victoria or Emergency Services Telecommunications Authority (ESTA) experienced such a surge in demand in such a short period of time and with such a rapid onset over a large geographical area.

The peak demand for ambulances occurred during the 15 minutes from 7.00 pm to 7.15 pm, during which ESTA answered 201 emergency calls. Ambulance Victoria had 2,036 cases on the day of the event – with 1,268 of those being the highest priority. On 21 and 22 November 2016, 9,909 people presented at public hospital emergency departments in metropolitan Melbourne and Geelong. Of these 3,270 were additional presentations compared to the previous week. There were also 231 additional presentations at private hospitals.”

What is Thunderstorm Asthma and what do we know about the phenomena

TSA is a term used to describe an observed increase in acute bronchospasm cases following the occurrence of thunderstorms in the local vicinity, and while TSA is a little studied phenomenon, an increasing body of evidence shows the occurrence of severe asthma epidemics associated with thunderstorms in the pollen season. It is now recognized that thunderstorms are a risk factor for asthma attacks in patients with asthma, and also in people who are sensitised who may never have had a previous clinical asthma episode but may suffer allergic rhinitis due to pollen allergy.

Most thunderstorms do not result in asthma epidemics. Rather, asthma epidemics are frequently associated with other factors such as viral respiratory infections. However, a common characteristic to all epidemics of TSA is a significant increase in atmospheric allergen load. Aeroallergens of significance in relation to TSA are pollen grains, mould spores and fungi. Additionally, air pollutants may act synergistically with aeroallergens in the airways leading to an increased immunologic inflammatory response.

Rye grass pollen is the commonest aeroallergen that has been identified in association with Australian TSA events. Rye grass is an introduced species planted as a pasture improvement crop by early settlers and more recently by farmers in the farmlands to the west of Melbourne. This grass is wind pollinated and produces a large pollen load, and has mostly replaced the indigenous grasses of the area which are not wind pollinated. Several varieties of rye grass hybrids are also used for lawns and grassed areas within the city of Melbourne.

Mechanism of Thunderstorm Asthma

Pollen is a recognised trigger for asthma and associated with asthma and allergic rhinitis in a number of ways; however, the whole pollen grains are generally too large to penetrate the small airways and typically cause hay fever rather than asthma in sensitive individuals. While this is the case, when grass pollen grains are exposed to moisture and rupture, secondary to rapid hydration (as occurs in certain thunderstorms), this results in the release of highly allergenic, respirable particles (≤ 5 μm). These fragmented pollen grains can exacerbate asthma as they are sufficiently small to enter the intrathoracic airways. Aside from moisture, an additional factor that may influence pollen fragmentation under special circumstances are electric fields (associated with lightning strikes) that enhance allergen release.

Sudden and severe asthma attacks are a characteristic of epidemic TSA and suggest exposure to a large allergen load on previously primed bronchial airways. People with asthma and those who have allergic rhinitis (hay fever), who are allergic to pollens and have the capacity to develop airway narrowing (airway hyperresponsiveness) are at risk even if they have never previously had asthma. In the Melbourne region in the pollen season, it is likely that rye grass pollen – in its fragmented form – is the key causative aeroallergen for TSA. However, other bronchial priming factors have been proposed in the literature including viral infections, fungal spores, elevated ozone levels and air pollution, and meteorological factors including rainfall, preceding hot weather, high humidity, high wind speed, high air pressure, low temperature, and especially cold storm outflows. Furthermore, human factors such as poor compliance with inhaled corticosteroids or low ownership and use of asthma management plans by people with asthma also play a role in incidences of asthma in TSA events.
Study Design

Asthma Australia developed a consumer survey as a way of reaching out to the community and to document the consumer experience of the Melbourne TSA event. The purpose of the survey was to:

- Identify who was affected and potential factors associated with the likelihood of reporting an asthma attack;
- Understand circumstances, experiences and impact of the TSA event to develop approaches to minimize the impact of these events in the future; and
- Inform and complement Asthma Australia’s work focusing on consumer programs and activities, education for health care professionals, and health promotion and awareness campaigns directed at the community.

The data collection was cross-sectional, and both quantitative and qualitative data were collected to provide insights into who and how people were affected. See Appendix 1 for a copy of the survey tool.

The term ‘affected’ not defined

While the aim of the survey was to engage and explore the experiences of ‘those who were affected’ by the TSA event, the term ‘affected’ was not defined in any way. As such, we have assumed that all respondents were affected in some way, even if they did not report experiencing an asthma “attack” as defined clinically. Readers of this report should be aware that the cohort of survey respondents reporting ‘no asthma “attack”’ may still have experienced asthma symptoms, however did not perceive or label it as an asthma “attack”. Further, we were not able to validate that those who reported an “attack” truly experienced asthma symptoms or an “attack”.

How the term ‘attack’ is used by consumers

Clinicians reading this report will be aware that the term “attack” is a widely and variably used term in asthma. Consumers use it to describe a wide spectrum of episodes – from daily symptoms to severe/ life threatening episodes, or even may use it to describe symptoms that were not due to asthma. As such, whether respondents self-reported experiencing an asthma “attack” or not was determined through the following question:

Did you have an asthma attack due to the Melbourne thunderstorms (e.g. a flare up of asthma symptoms - shortness of breath, chest tightness, wheeze or cough)?

Survey Design

The TSA Consumer Survey was developed by Asthma Australia to gain information from people affected by the TSA event of 21-22 November 2016 that occurred in Melbourne and areas around Melbourne. The survey was based on self-report. It collected information in the following domains:

- Diagnosis of asthma and hay fever
- Current treatment(s)
- Impact of/and response to TSA event
- Awareness of Community Asthma First Aid steps
- National Asthma Indicators (e.g. preventer use and AAP ownership)
- Asthma control (using a validated questionnaire)
- Questions devised specifically focused on the TSA event of November 2016

Ethics

Asthma Australia was advised by two human research ethics committees that ethics approval was not required for this data collection as the survey was non-interventional and no research questions were specified.

Survey dissemination

The survey period spanned 3½ weeks from November 28 to December 21, 2016.

The survey was designed using an online platform, Survey Monkey, which connected participants to the survey page via an active web link. The link was the basis for promoting the survey.

Recruitment of survey participants was conducted using Asthma Australia’s website, the contact networks and partnerships of the national, state and territory Asthma Foundations and key clinical service providers. A link to the survey was disseminated electronically through the following means and organisations:

- Asthma Australia’s website
- A media release disseminated through London Agency to key media outlets (print and electronic)
- Social Media feeds of Asthma Australia, the state-based Foundations and partner organisations

The following partners and supporters of Asthma Australia disseminated the survey electronically to their consumer/customer databases, promoted it on their websites and through applications:

- National Home Doctor Service (13SICK) 20
- MedAdvisor 21
- Dyson vacuum company

The survey was open to any person who identified themselves or a person they care for as being ‘affected’ by the Melbourne 2016 TSA event.

Data analysis

As this is a cross-sectional study, the data cannot be used to infer causality. Instead, it provides an indication of asthma symptom control of respondents before the TSA event and a variety of other metrics including whether respondents experienced an asthma attack they thought was caused by the event or not, their experience of hay fever and/or asthma symptoms in the year leading up to the event, and how people felt during the event and in the days following the event and how they responded.

Quantitative data analysis

The quantitative questionnaire data was entered into SPSS and a summary of descriptive statistics produced. As the objective of the quantitative data section of the Consumer Survey was to identify what factors were associated with respondents being more likely to have experienced an asthma attack (self-reported) due to the TSA event of 2016, the research team decided to compare the various factors considered between two groups: those that self-reported experiencing an asthma attack and those that did not.

In order to make a comparison of key factors influencing likelihood of having had an asthma attack caused by the TSA event, a fundamental assumption underpinning our analysis is that the samples within the two groups – those that experienced an asthma attack (self-reported) and those that did not (self-reported) – are representative of their respective larger groups.

This assumption is contentious as the randomness of their selection cannot be assured. It is important to consider this when interpreting the analysis results, as all statistical tests undertaken rely on the assumption of randomness.

Statistical tests performed

The statistical tests performed included descriptive statistics, t-tests testing for differences in means, z-tests for differences in proportions and chi-square tests of independence for testing differences in non-binary multi-category factors. Significance levels were determined by the convention of \( p < 0.05 \), thus \( p \)-values less than 0.05 can be considered to be statistically significant.

Qualitative data analysis

The free text questionnaire data was exported into Excel and the excel file imported into Nvivo 10 for analysis. The data was analysed using thematic analysis after a coding scheme was established by two researchers who reviewed 10% of responses independently and decided on an appropriate coding scheme. See Appendix 2 for a copy of the coding frame.

Strengths

The strengths of this survey includes its use of a validated and accepted measure of asthma control to measure asthma control before the TSA event, the short time frame within which the internet survey was open for participation following the event, and the large number of respondents.

20. The National Home Doctor Service is a service providing an after-hours bulk bill doctor service in some areas of Australia; services are provided after-hours, weeknights, weekends and public holidays (www.homedoctor.com.au).
Weaknesses

The major weaknesses of the data collection fall into two categories and relate to:

- Inability to validate whether respondents actually experienced an asthma attack or not during the TSA event (self-reporting bias)
- Inability to implement random sampling techniques that could have helped reduce selection bias
- The invitation to participate being based on being “affected” by the thunderstorm (selection bias) - those who were ‘affected’ by the TSA event were invited to participate in the survey and the term ‘affected’ was not defined; therefore, people who did not perceive themselves to be affected would have been less likely to complete the survey and our sample of survey respondents may under-represent people for whom the storm had little impact.

On the basis of these qualifying issues, caution must be exercised in considering the generalisability of the findings.

Key Findings

Quantitative Analysis

Primary objective of the quantitative component and how this impacted analysis

The primary objective of the quantitative data section of the Consumer Survey was to identify what factors were associated with respondents being more likely to have experienced an asthma attack due to the TSA event of 2016.

In order to do this, the research team decided to compare a variety of factors between the two groups: those that reported experiencing an asthma attack during the TSA event (2,500 or 79% of respondents) and those that did not (670 or 21% of respondents).

Survey responses

96% of responses included in this analysis

The survey received 3,535 responses. Of these, 139 were excluded from the analysis as only the demographic questions were completed. Accordingly, 3,396 surveys were included in this analysis. It is important to note, however, that within these 3,396 survey responses, not all questions were answered. For the purpose of this analysis only respondents who responded with definitive answers to each of the questions have been included; therefore the total number of respondents for each individual question is varied.

The large majority of respondents who experienced an asthma attack attributed it to the TSA event just under 80% of survey respondents reported an asthma attack that they attributed to the TSA event (n=2500) and just over 20% reported they did not have an asthma attack (n=670). Most people were reporting for themselves rather than someone they cared for. See Table 1 for more detail:

<table>
<thead>
<tr>
<th>Did you/ the person you care for have an asthma attack due to the Melbourne thunderstorms</th>
<th>Myself n (%)</th>
<th>Someone I care for n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>2064 (82.6)</td>
<td>436 (17.4)</td>
<td>2500 (79)</td>
</tr>
<tr>
<td>NO</td>
<td>568 (84.8)</td>
<td>102 (15.2)</td>
<td>670 (21)</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>2632</td>
<td>538</td>
<td>3170</td>
</tr>
</tbody>
</table>

1. The number of completed surveys included in the analysis is 3396; however, total counts for any particular question may be lower than this as respondents did not complete every question. Blank and unsure responses were excluded from analysis.
2. All respondents identified as being affected by TSA. The cohort of respondents reporting ‘no asthma “attack”’ may still have experienced asthma symptoms, and conversely those reporting an “attack” may not have clinically experienced an asthma attack.

Age of people responding to the survey

The average age of those reporting an asthma attack was lower than those who reported no asthma attack: 40.4 years compared to 44.8 years. The average age of people experiencing an asthma attack as reported by a care/ family member was 18.2 years and not dissimilar to those not experiencing an asthma attack (18.8 years). The age distribution of survey participants reporting as asthma attack (n=2500) is shown in Table 2 below:

<table>
<thead>
<tr>
<th>Myself</th>
<th>Someone I care for</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>6-10 years</td>
<td>0</td>
<td>127</td>
</tr>
<tr>
<td>11-15 years</td>
<td>7</td>
<td>101</td>
</tr>
<tr>
<td>16-19 years</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>20-29 years</td>
<td>386</td>
<td>35</td>
</tr>
</tbody>
</table>
Table 2 - Age distribution of participants who reported they experienced an asthma attack (continued)

<table>
<thead>
<tr>
<th>Age Distribution</th>
<th>Myself</th>
<th>Someone I care for</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-39 years</td>
<td>649</td>
<td>41</td>
<td>690</td>
</tr>
<tr>
<td>40-49 years</td>
<td>534</td>
<td>22</td>
<td>556</td>
</tr>
<tr>
<td>50-59 years</td>
<td>226</td>
<td>11</td>
<td>237</td>
</tr>
<tr>
<td>60-69 years</td>
<td>161</td>
<td>10</td>
<td>171</td>
</tr>
<tr>
<td>70 years or over</td>
<td>63</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2064</td>
<td>436</td>
<td>2500</td>
</tr>
</tbody>
</table>

Location of people who experienced asthma symptoms

The postcode with the highest number of respondents reporting that they experienced an asthma attack caused by the event was postcode 3030. Postcode 3029 also had a high number of asthma attacks reported. Both of these suburbs are west of Melbourne CBD and cover parts of Werribee. See Table 3 below for a list of the 24 postcodes with the highest self-reports of an asthma attack caused by the TSA event.

Table 3 - Most frequent postcodes to have a respondent with an asthma attack, in descending order

<table>
<thead>
<tr>
<th>Postcode #</th>
<th>Postcode #</th>
</tr>
</thead>
<tbody>
<tr>
<td>3030</td>
<td>3805</td>
</tr>
<tr>
<td>3029</td>
<td>3031</td>
</tr>
<tr>
<td>3150</td>
<td>3072</td>
</tr>
<tr>
<td>3011</td>
<td>3056</td>
</tr>
<tr>
<td>3028</td>
<td>3121</td>
</tr>
<tr>
<td>3058</td>
<td>3752</td>
</tr>
<tr>
<td>3977</td>
<td>3073</td>
</tr>
<tr>
<td>3070</td>
<td>3136</td>
</tr>
<tr>
<td>3000</td>
<td>3044</td>
</tr>
<tr>
<td>3195</td>
<td>3055</td>
</tr>
<tr>
<td>3216</td>
<td>3806</td>
</tr>
<tr>
<td>3064</td>
<td>3122</td>
</tr>
</tbody>
</table>
Figure 1 highlights the top 10 postcodes across Melbourne of respondents reporting an asthma attack.

**Figure 1 - Postcodes with the top 10 most respondents to have reported an asthma attack.**

How respondents who reported experiencing an asthma attack during the TSA event compared to those who did not

Table 4 below is a summary of asthma and allergic rhinitis features of those respondents who reported experiencing an asthma attack during the TSA event compared to those not reporting an asthma attack.

**Table 4 - Comparison between respondents who reported experiencing an asthma attack or not.**

<table>
<thead>
<tr>
<th></th>
<th>Asthma attack</th>
<th>No asthma attack</th>
<th>p-value for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Age of respondent (years)</td>
<td>40.4</td>
<td>44.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Average age of person cared for (years)</td>
<td>18.2</td>
<td>18.8</td>
<td>0.782</td>
</tr>
<tr>
<td>Hay fever symptoms in previous 12 months</td>
<td>92.4%</td>
<td>83.1%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hay fever treatment</td>
<td>59.2%</td>
<td>43.9%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asthma diagnostics</td>
<td>58.3%</td>
<td>67.8%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asthma preventer mediation</td>
<td>73.5%</td>
<td>87.3%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asthma Score (mean) - all respondents</td>
<td>20.73</td>
<td>21.03</td>
<td>0.253</td>
</tr>
<tr>
<td>Asthma Score (mean) - Diagnosed asthma</td>
<td>20.76</td>
<td>20.95</td>
<td>0.567</td>
</tr>
<tr>
<td>Visited doctor for asthma (last 6 months)</td>
<td>41.6%</td>
<td>48.4%</td>
<td>0.019</td>
</tr>
<tr>
<td>Take preventor medication daily</td>
<td>51.9%</td>
<td>64.7%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Written Asthma Action Plan</td>
<td>27.9%</td>
<td>41.4%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

1. Note that for the percentage calculations, unsure and blank responses were not considered.
2. All respondents identified as being affected by TSA. The cohort of respondents reporting “no asthma “attack”” may still have experienced asthma symptoms, and conversely those reporting an “attack” may not have experienced a clinical asthma attack.

In these two groups there were significantly different proportions of respondents:
- experiencing hay fever symptoms in the previous 12 months
- taking hay fever treatment
- previous asthma diagnosis
- prescribed asthma preventer medication
- taking daily preventer medication, and
- in possession of a written Asthma Action Plan (AAP).

The two groups were not significantly different in terms of mean asthma control score (both for all respondents and also for the subset of respondents diagnosed with asthma) or with regard to visiting a doctor for asthma in the last 6 months.
Hay fever and Hay fever treatment – and experience of TSA

Among survey respondents who had a reported attack of TSA, 92.5% had experienced hay fever in the previous 12 months. Hay fever symptoms in the previous 12 months were also reported by the majority of people who reported no TSA (83.1%). Among respondents reporting no history of hay fever in the previous 12 months 7.5% reported an attack of TSA, and 16.9% reported no TSA.

Table 5 - Experienced hay fever symptoms with in the last 12 months

<table>
<thead>
<tr>
<th>Asthma attack due to thunderstorms?</th>
<th>Hay fever symptoms in the last 12 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n (%)</td>
<td>No n (%)</td>
</tr>
<tr>
<td>YES</td>
<td>2263 (92.5)</td>
<td>186 (7.5)</td>
</tr>
<tr>
<td>NO</td>
<td>539 (83.1)</td>
<td>110 (16.9)</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>2802</td>
<td>296</td>
</tr>
</tbody>
</table>

1. The totals do not represent the total number of respondents self-reporting an attack (n=2500) or no attack (n=670) due to blank and unsure responses being excluded for analysis. Totals represent those who provided a definitive answer to this question from within each group (self-reported attack and no attack).

2. All respondents identified as being affected by TSA. The cohort of respondents reporting ‘no asthma “attack”’ may still have experienced asthma symptoms, and conversely those reporting an “attack” may not have experienced a clinical asthma attack.

People with hay fever were more likely to report an asthma attack during the TSA event than people without a history of hay fever.

Of the group of respondents who had reported experiencing an asthma attack due to the TSA event, 59.2% were taking hay fever treatment. Of the group of respondents who had reported not experiencing an asthma attack, 272 (43.9%) were taking hay fever treatment. For more detail see Table 6.

This indicates that people reporting an asthma attack were less likely to have a previous diagnosis of asthma.

Table 6 - Experienced hay fever and taking hay fever treatment

<table>
<thead>
<tr>
<th>Hay fever symptoms in the last 12 months</th>
<th>Asthma attack due to thunderstorms?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n (%)</td>
</tr>
<tr>
<td>YES</td>
<td>1434 (52.9)</td>
</tr>
<tr>
<td>NO</td>
<td>272 (43.9)</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>1706 (56.1)</td>
</tr>
</tbody>
</table>

1. The totals do not represent the total number of respondents self-reporting an attack (n=2500) or no attack (n=670) due to blank and unsure responses being excluded for analysis. Totals represent those who provided a definitive answer to this question from within each group (self-reported attack and no attack).

2. All respondents identified as being affected by TSA. The cohort of respondents reporting ‘no asthma “attack”’ may still have experienced asthma symptoms, and conversely those reporting an “attack” may not have experienced a clinical asthma attack.

Previous Asthma diagnosis and experience of TSA

Among survey respondents there was a statistically significant difference between the proportion of people with a previous asthma diagnosis who reported an asthma attack during the TSA event, and those that did not have a previous asthma diagnosis and experienced an asthma attack – 58.3% compared to 41.7% (p <0.001). See Table 7.

Table 7 - Proportion of people who reported a previous asthma diagnosis or not and experience of TSA

<table>
<thead>
<tr>
<th>Asthma attack due to thunderstorms?</th>
<th>Have you/ the person you care for previously been diagnosed with asthma by a doctor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n (%)</td>
</tr>
<tr>
<td>YES</td>
<td>1393 (58.3)</td>
</tr>
<tr>
<td>NO</td>
<td>411 (67.8)</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>1804</td>
</tr>
</tbody>
</table>
Table 8 - Frequency of preventer use if diagnosed and prescribed preventer medication

<table>
<thead>
<tr>
<th>How often do you/the person you care for take preventer medication?</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day</td>
<td>486</td>
<td>51.9%</td>
</tr>
<tr>
<td>1-2 days per week</td>
<td>24</td>
<td>2.6%</td>
</tr>
<tr>
<td>3-4 days per week</td>
<td>39</td>
<td>4.2%</td>
</tr>
<tr>
<td>5-6 days per week</td>
<td>21</td>
<td>2.2%</td>
</tr>
<tr>
<td>Less than 1 day a week</td>
<td>18</td>
<td>1.9%</td>
</tr>
<tr>
<td>Less than 1 day per month</td>
<td>5</td>
<td>0.5%</td>
</tr>
<tr>
<td>A few times per year</td>
<td>49</td>
<td>5.2%</td>
</tr>
<tr>
<td>Only when I am sick (e.g. asthma is flared-up)</td>
<td>285</td>
<td>30.4%</td>
</tr>
<tr>
<td>Only when I exercise</td>
<td>10</td>
<td>1.1%</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>937</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Preventer use among respondents reporting an asthma diagnosis and an asthma attack during the TSA event

Of respondents who reported they had experienced an asthma attack during the TSA event and had received an asthma diagnosis in the past (n=1393), 73.5% said they had previously been prescribed preventer medication. However, only 51.9% of these people reported taking it daily leading up to the event. A large proportion reported only using their preventer when they were sick (asthma is flared-up) (30.4%).

Preventer use among respondents reporting an asthma diagnosis and not experiencing an asthma attack during the TSA event

Respondents who reported they had an asthma diagnosis but did not experience an asthma attack during the TSA event (N=411) were more likely to have been prescribed a preventer by their doctor than those who did experience an asthma attack during the TSA event – 87.3% compared to 73.5% (p <0.001).

Interestingly, the proportion of people in this group reported taking their preventer for more than 8 weeks leading up to the event (76.9%) - and daily (64.7%) - was higher than for those who had an asthma diagnosis and experienced an asthma attack during the TSA event. People who had an asthma diagnosis but did not report an asthma attack had been taking preventer for longer and more frequently than those who reported an attack.

In summary, people who had an asthma diagnosis but did not report experiencing an attack were more likely to have been prescribed a preventer and had been taking preventer longer and more frequently.

Wordclouds: 1 sourced from: https://wordsift.org/about.html

While respondents could have been listing ‘any’ medication they were prescribed or had taken for their asthma, this Word Cloud form has identified a potential misunderstanding regarding asthma and treatment – and more specifically relievers and preventers - with a large proportion of people referencing Ventolin or another short-acting beta agonist medication. A number of people were also unable to recall the name of their medications.

1. The size of any word in a Word Cloud is determined by the number of times the word was used, so the more frequently a word is used the bigger the word will be in a Word Cloud.
Asthma Score analysis

Survey respondents were asked to complete their asthma score using the validated Asthma Control Test™ (ACT). Questions were answered based on the previous 4 weeks leading up to the TSA event and completed if they were the person with asthma. Asthma scores were collected for 73.1% of respondents (n=2,585).

As we were unable to confirm whether someone had a current asthma diagnosis, we analysed the average scores of all respondents as well as those reporting a previous asthma diagnosis.

The average ACT score among all respondents, across both groups (attack versus no attack) is within the range of ‘good control’: those experiencing an asthma attack had an average ACT score of 20.73, and those not experiencing an asthma attack had an average ACT score of 21.03. These average scores were not significantly different (p= 0.253).

This suggests that having good asthma control leading into the TSA event did not influence whether someone experienced an attack or not.

Asthma Action Plan Ownership

Among survey respondents reporting that they had experienced an asthma attack and had a previous asthma diagnosis, only 27.9% had a written AAP. This was in comparison to 41.4% of people who had a previous asthma diagnosis and did not report experiencing an asthma attack (p <0.001).

Table 9 - AAP ownership for respondents reporting an asthma attack and a previous asthma diagnosis

<table>
<thead>
<tr>
<th>Did you/ the person you care for have a Written Asthma Action Plan?</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>368</td>
<td>27.9%</td>
</tr>
<tr>
<td>No</td>
<td>756</td>
<td>57.3%</td>
</tr>
<tr>
<td>Never heard of one</td>
<td>196</td>
<td>14.8%</td>
</tr>
</tbody>
</table>

GRAND TOTAL 1320 100%

People who reported an asthma diagnosis and experienced an asthma attack were less likely to have a written AAP than those who reported an asthma diagnosis and did not experience an asthma attack.

Knowledge of asthma first aid

The survey asked a question to determine what proportion of respondents were aware of the Asthma First Aid steps and found that respondents who did not have a previous asthma diagnosis were less likely to be aware of first aid for asthma. Approximately half (53%) of those who reported a previous asthma diagnosis were aware of the Asthma First Aid steps, compared to 25% for those who were not diagnosed. See Table 11 below for more detail:

Table 10 - Awareness of Asthma First Aid steps

<table>
<thead>
<tr>
<th>Of people who experienced an asthma attack during the TSA event:</th>
<th>Aware of the Asthma First Aid Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosed asthma</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes (%)</td>
</tr>
<tr>
<td></td>
<td>655 (53)</td>
</tr>
<tr>
<td>No</td>
<td>No (%)</td>
</tr>
<tr>
<td></td>
<td>235 (25)</td>
</tr>
</tbody>
</table>

GRAND TOTAL 890 1294 1334

Utilisation of medical services

Table 11 below gives an overview of medical services utilised at the time of the TSA event or in the days following by survey respondents who experienced an asthma attack during the TSA event:

Table 11 - Medical services reported to be utilised

<table>
<thead>
<tr>
<th>Did you use any of the following medical services due to an asthma emergency?</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Practice</td>
<td>456</td>
<td>42.5%</td>
</tr>
<tr>
<td>Emergency Department (own transportation)</td>
<td>95</td>
<td>8.8%</td>
</tr>
<tr>
<td>Emergency Department (via ambulance)</td>
<td>39</td>
<td>3.6%</td>
</tr>
<tr>
<td>After hours doctors service</td>
<td>29</td>
<td>2.7%</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>455</td>
<td>42.4%</td>
</tr>
</tbody>
</table>

GRAND TOTAL 1074 100%
Among survey respondents who indicated they had accessed medical services, ‘General Practice’ was the most reported response followed by ‘other’. The word cloud illustrated in Figure 3 below shows the alternative medical services respondents utilised if any. It is apparent that local pharmacies were a primary access point as well as out-of-hours doctors and nurse-on-call. A number of people indicated that they did not seek medical care and/or treated themselves at home with reliever or hay fever medication or other remedies (e.g. hot showers, rest, tea), or stayed indoors with closed doors and windows.

**Figure 3 - Word cloud for those who reported attending ‘other’ medical services due to an asthma emergency during the TSA event**

Wordclouds sourced from: https://wordsift.org/about.html

1. The size of any word in a Word Cloud is determined by the number of times the word was used, so the more frequently a word is used the bigger the word will be in a Word Cloud.
Qualitative Analysis

Asthma Australia’s TSA Consumer Survey had one open text response section which said:

“Share your experience and how you felt during the thunderstorm asthma event and the days after it”

Approximately 60% of survey respondents provided a response in the open text response section (n=2074). The word count of these responses averaged 44 words.

As noted above, the free text questionnaire data was exported into Excel and the excel file imported into Nvivo 10 for analysis. The data was analysed using thematic analysis after a coding frame was established by two researchers who reviewed 10% of responses independently and decided on an appropriate coding scheme. See Appendix 2 for a copy of the coding frame.

The quotes below are the exact quote the respondent wrote, without edits.

Who was affected by the TSA event and how some were prepared and minimally affected

A large proportion of respondents had no diagnosis of asthma but suffered hay fever and many in this group responded to symptoms by using medication at hand (their regular hay fever medication or someone else’s medication) and where necessary they sought medical help.

A large proportion of respondents detailing symptoms during the event/ in the days after it stated they had never been diagnosed with asthma previously or indicated they had never experienced asthma before the event in November in 2016.

In general these respondents indicated they were hay fever sufferers.

Those who suffered relatively mild respiratory symptoms tended to cope reasonably well and quite a few responded by using their regular hay fever medication or someone else’s medication:

“I didn’t know what was happening. Luckily mine wasn’t too bad and I only contacted the GP the day after as I still had a tight chest. Still a week after I feel a little tight chested at night. I have never had any asthma symptoms before.”

Those that experienced severe symptoms and/or symptoms with rapid onset found it more difficult to cope:

“As I had never experienced asthma before I was anxious regarding the rapid onset of inspiratory wheeze and difficulty breathing. As I struggled with air hunger throughout the night I was completely exhausted by the time I presented to ED at 0730 next morning. I responded reasonably well to the 4 hrly ventolin and daily predator regarding my inspiratory wheeze but am extremely exhausted and continue to cough 10 days on.”

“I had been at the doctor the previous week and diagnosed with the flu. I went back to work on that Monday. When I was outside walking to my car, I had a violent coughing fit that lasted two or three minutes. I had tears streaming down my cheeks, my face and eyes were red and I was struggling to take a breath. My throat felt like it was bulging and in a spasm. I was actually sitting in my car, making a mental note of what signs were around me, thinking I was going to need to call an ambulance, (what concerned me was at that stage I wouldn’t have been able to speak anyway!). It was very frightening, and I sat in the car for around 10 minutes when I finally stopped coughing, just trying to recover from it. I don’t have asthma, and have never experienced anything like this before.”
The cost of preventer medication was raised by a couple of respondents.

Those that put it down to being indoors at the time of the event, generally with windows closed and often with the air-conditioner on, said:

“Woke up in the middle of the night with closed airways and panicking, tight chest, difficulty breathing. Previously have never suffered from asthma until the first night of the thunderstorm asthma. Luckily my partner had a blue asthma puffer on hand, which immediately relieved my symptoms. I did suffer these symptoms the second night off the storm asthma.”

Some in this group ended up seeking medical treatment and a small number were diagnosed with asthma.

**THEME 2:** A small proportion of respondents were well prepared for the event in one of three ways – by regularly taking preventer medication, by choosing to remain indoors with windows closed and in many cases with the air conditioner on, and/or by having an AAP and using it – and this resulted in no exacerbation at all or minor symptoms the respondent could manage.

A small minority of respondents (7.5%) commented that they did not experience any problems during the event or only the usual symptoms they experience on any given day and most did not give a reason for this. However, those that gave a reason put it down to appropriate use of medication with most making reference to use of preventer medication (with or without other medication), being indoors at the time of the event, and/or having an AAP and using it.

Those that made reference to preventer use said:

“Due to increased allergies that week, extra vigilant to ensure preventer taken each day. No effect of the thunderstorm, no salbutamol required.”

“Wasn’t aware of major problem but I do feel if you take your preventer your well managed. I do know however I have a health care card so we can afford a preventor.”

The cost of preventer medication was raised by a couple of respondents.

Those that put it down to being indoors at the time of the event, generally with windows closed and often with the air-conditioner on, said:

“My wife was inside with the evaporative air con. on and did not feel any effects from the thunderstorm outside. No issues on the following days either.”

“I did not have any asthma during the event. I was inside in air conditioning for most of the day and at the time of the thunderstorm.”

Some who ensured they stayed indoors as much as possible to minimise exposure to pollen and high winds and humidity did experience symptoms, and in general they responded with medication as they knew they were susceptible to weather changes or windy weather or to pollen.

A small number of people referred specifically to use of their AAP:

“I was nervous but was prepared with medication at easy reach and having an action plan.”

Respondents who had experienced asthma previously or similar respiratory symptoms to those they experienced during the event/days following could handle the situation. They generally used their regular medication, followed their asthma plan or a GP plan or AAP, or practised techniques to manage their breathing and associated feelings of anxiety and panic.

22. For the purpose of this analysis panic was coded as a feeling rather than indicating the person suffered a ‘panic attack’.

23. For the purpose of this analysis anxiety was coded as a feeling rather than a symptom.
Learning of the magnitude and seriousness of the event reassured some respondents and made them feel more comfortable using their current medication more frequently than usual, or just helped them understand why their asthma had been worse than normal:

“Once the story started to get media coverage of the weather phenomenon and it’s widespread impact, this was actually a bit reassuring and actually made me a bit more comfortable using the reliever at rates above what has been normal over the past few months.”

“Once I heard the reports on the radio about the asthma epidemic, I realised that was why my asthma had been worse than usual the night before.”

Some learnt of the event from local pharmacies or through work, as illustrated in the following quotes:

“I developed sudden wheezing after returning indoors from my home letterbox at around 7 pm. The wheezing became worse with in 15 minutes. My husband then drove me to the local Chemist Warehouse to purchase a blue Ventolin inhaler. The Pharmacist told me that it was the weather conditions causing my wheezing and that a lot of people had been affected by it that day.”

“I usually experience asthma following exercise. That night I had an asthma attack out of nowhere around 6pm. I used my reliever and it became less urgent though my chest was tight that night and the next morning. Then at work I found out about the event the night before.”

Others, largely respondents unaware of TSA or individuals never having experienced severe respiratory symptoms before, when they learnt of the magnitude and seriousness of the event felt more vulnerable as they realised that they were more at risk than they had thought:

“I don’t suffer from asthma my son does so when I had the tighting of chest and hard to breathe it was all new to me. Having managed my sons asthma I was able to know the signs, and I didn’t know until the next day on the news how serious it was, very scary”

A large proportion of responders indicated they (or the person they cared for) had either experienced asthma for the first time or had experienced much more severe symptoms than usual or different symptoms to usual. In these instances their usual methods of managing were not effective and the feelings experienced more pronounced:

“Once we realised there was an asthma emergency happening with others we kept an extra close eye on her and made sure she was keeping up with her medication.”

“Haven’t had Asthma for years normally just get seasonal Asthma but last week it hit me hard and a week on I’m still battling with it strangest and scariest experience.”

“‘I was nervous but was prepared with medication at easy reach and having an action plan.’”

“‘We were in total shock that she had asthma. She had never had it before so had no idea what we were dealing with.’”

“‘I felt scared. My ventolin didn’t ease my symptoms and I ended up having a week off work.’”

“‘I was unaware of thunderstorm asthma and as I have never been diagnosed with asthma, I was unaware of what action to take. It wasn’t until I saw the news the next day that I realised the severity.’”

“‘I was nervous but was prepared with medication at easy reach and having an action plan.’”

“‘We were in total shock that she had asthma. She had never had it before so had no idea what we were dealing with.’”

“‘I felt scared. My ventolin didn’t ease my symptoms and I ended up having a week off work.’”

“‘I was unaware of thunderstorm asthma and as I have never been diagnosed with asthma, I was unaware of what action to take. It wasn’t until I saw the news the next day that I realised the severity.’”

Access to information during the TSA event and days following

THEME 4: Those who described their feelings responded to these feelings (and associated symptoms) by using available medication, looking for information on what was happening, and trying to stay calm.

THEME 5: Most respondents learnt about the event and the resulting asthma epidemic through the news media – radio, TV, or online - the following day.

Approximately 1 in 20 respondents gave detail relating to information flow before, during and after the event, including how respondents tried to find out what was going on, and the majority of them said they learnt about the event through the news media the following day – over the radio, on TV or online.

Others, when they learnt of the magnitude of the event, were prompted to seek medical treatment as they understood why they or their child were reacting:

“‘We weren’t aware of thunderstorm asthma until we heard the news on the radio the next morning. We took him [4 year old child suffering respiratory symptoms the night of the event] straight to Dr who diagnosed asthma attack.’”

Others, largely respondents unaware of TSA or individuals never having experienced severe respiratory symptoms before, when they learnt of the magnitude and seriousness of the event felt more vulnerable as they realised that they were more at risk than they had thought:
THEME 7: Social Media was a source of information for some people on the unfolding event.

Some people learnt what was going on via social media feeds as illustrated in this quote:

“I wasn’t aware there had been an asthma event until friends shared articles on social media. No one in our household experienced any asthma or hay fever symptoms that night.”

THEME 8: A number of respondents noted the lack of warning before the event and a number noted the lack of an alert system operating during the event.

A small number of people noted they had no warning of the event:

“Would have been good to have some kind of warning to increase preventative dose from once a day to twice a day to better cope.”

“Not enough warning as to the possible affects it would have.”

There was no warning. I wondered Monday night what was going on as both of my girls developed asthma at the same time.”

And a number of respondents discussed the need for an alert system in such an event – one that operated during the event rather than people having to rely on news or other sources after the event to learn of the magnitude or significance of what was occurring. And there was a sense that an alert system – operating during the event - would have helped people both cope with and manage the situation unfolding:

“It would have been helpful to have alerts sent out via phone or social media about what was going on with the thunderstorm asthma as when my partner could not breathe I encouraged him to go outside and get some fresh air not realising this is potentially the worst thing we could have done. He had never experienced asthma before in his life.”

References to an AAP or a GP plan by survey respondents

THEME 9: Use of an AAP or a GP Plan helped respondents manage their symptoms during the event and in the days after the event and the event itself prompted some to get an AAP.

In the open text response section of the survey there were a small number of references to some sort of plan to manage asthma including references to asthma reviews with GPs (n=30).

A number of respondents noted that they kept their asthma under control in general, but also during the event, through use of some sort of asthma plan or through reviews of their asthma with their usual health care provider. This plan was variously referred to as an AAP, asthma plan or an asthma management plan.

Some respondents specifically referred to using a plan they got when they were a child, such as this person:

“My preventers, my nebuliser and the doctors plan have been my life savers over the years.”

“I was having a reasonably normal spring day with mild hay fever when I experienced a sudden increase in symptoms - shortness of breath, wheezing, sneezing, runny nose and swollen eyes. I followed my asthma plan - going inside, using reliever medication, and showering.”

One respondent who ignored the asthma plan their doctor gave them suffered an asthma attack during the event and ended up in hospital. This respondent, who had not suffered an asthma attack for 40 years, said:

“Amazingly, my doctor did warn me about thunderstorms a couple of years ago and I’ve always remembered it - her prediction came to pass in a truly spectacular way on Monday night. She even provided me with an asthma plan which I promptly ignored because I thought I’d “grown out of” being an asthmatic plus I had no idea where it was - so I had no option but to go to hospital… We [the man and his partner] went to Maroondah Hospital - 36 puffs of ventolin, monitoring and steroids for 5 days and I’m feeling OK.”
And while these plans were useful for many, it was clear that the event of November 2016 pushed some people who had an asthma plan to the limit and in instances the plan did not work. One respondent was distressed that the plan they had did not work in the event and noted the following symptoms and feelings during the event and in the days following:

“Prolonged tightness, heaviness & pain in the chest, breathlessness, tired, lethargic & exhausted. Upset and somewhat distressed that my asthma action plan wasn’t helping relieve my symptoms. I’m now on a high dose of steroids and antibiotics (in addition to my Seretide, Ventolin, antihistamines, nasal sprays & eye drops). I’m still not 100%, not close either. It’s 8 days since the event.”

A number of respondents said they would go to their GP to discuss what happened during the event and/ or for advice on ongoing symptoms (for asthma, hay fever, allergies) – some of whom indicated that their regular medications were not helping or acting as they usually did.

Within this group was a subset that experienced severe respiratory symptoms and had never had an asthma attack before this event. This group discussed going to their general practitioner to get an asthma plan or to determine if they or the person they cared for has asthma, or to get medication in case a similar event occurred in future:

“I will be getting a Lung Function Test next week to learn whether I have actual asthma or not.”

**THEME 11: In the longer term most respondents indicated their intention to be more vigilant with medication.**

Of the responders who made comments relating to future actions they intended to take in the longer term, the large majority stated their intention to be more vigilant with medication – either a reliever or a preventer. They noted they intended to carry an ‘in date’ reliever (such as a Ventolin puffer) or to ensure they took their preventer medication regularly:

“Just a reminder to be vigilant with preventers”

“Making extra sure to have Ventolin and spacer with me at all times.”

Access to healthcare during the TSA event and the emergency response system

**THEME 12: Pharmacies played an important role during the event in providing people with medication and helping people understand and manage their symptoms.**

“Couldn’t believe the line up in the Terry White Pharmacy to buy Ventolin on the day - they almost ran out. Staff were great keep me calm - they were trained by Asthma Australia I later found out.”

“I couldn’t breathe. Been several years since I have felt this way so went to the Chemist for a puffer. She told me I was the 8th in an hour to get a puffer. The man after me was the 9th”

“ Asthma symptoms started 8pm, worsening through the night. Went to several pharmacies from 10.30pm for reliever (first was sold out). Currently still suffering mild symptoms.”

“Went to a pharmacy at about 11.30pm to buy more Ventolin with my Mum. There were 6 others at the Pharmacy while we were there who were also buying Ventolin for similar symptoms. We all thought it was very strange.”

**THEME 13: Some respondents had difficulty getting into local doctor surgeries or after hours clinics the night of the event as demand for medical care was so high.**

A number of respondents explicitly stated they tried to get into a doctor’s surgery or after hours clinics or tried to access a home visit doctor but due to the high demand were unable to:

“I was home alone and was having great difficulty breathing. I tried to get a doctor’s appointment but they were booked out. I contemplated going to the ER but felt silly. When my partner got home I was in tears and they tried to get onto a home visit doctor - no luck. He then spoke to our neighbour who was a nurse and they came down and with my Ventolin got me settled.”

**Intended actions specified by respondents (short term and long term)**

**THEME 10: In the short term most respondents indicated they would go to their general practitioner to discuss the event and ongoing symptoms if they had any, or just as they thought they would benefit from a review.**

In the open text response section of the survey there were few responses with detail on actions respondents intended to take in either the short term or the longer term in response to the event (n=43).
“Took my 12 year old to an after hours clinic but they were too busy and gave me 2 phone numbers for another 2 clinics. One the number was busy and the other said they were not accepting any more patients. My daughter was coughing and wheezing and because she had thunderstorm asthma in November 2010 I knew she needed ventolin so I went to the chemist and bought her some which helped her.”

“I’d never had ‘asthma’ before but have had hay fever my whole life. So when I became short of breath around 6:30 that night when on my way to a friends, I was a tad concerned. The shortness of breath continued and worsened, prompting me to try to go to an after hours clinic but I was rejected as they were full. My symptoms continued until the next morning when I saw my GP ....”

THEME 14: There was evidence the emergency response system was overloaded and in instances people could not get through to ‘000’ and decided to drive to the nearest Emergency Department themselves.

This woman, who went outside for a few minutes to check on a fence after the storm, became very ill minutes after coming back inside, and the usual medication she used to manage breathing difficulties – her blue puffer – did not provide relief:

“I normally get relief straight after the first two puffs but this was different. Instead of relief, I felt my chest was getting tighter and I was struggling to breath in. I was grasping for air yet I thought few more puffs is going to make it better ... [They decided to drive to ED] At that point I thought I was going to die and asked them to call emergency. Nobody answered triple zero, it kept ringing and ringing, I knew by then that something bad has happened. [They got into the car to drive to ED] While on our way my daughter tried triple zero few more times and 5 minutes since leaving home they answered. They said if we want an ambulance we have to pull over otherwise they can’t arrange for one. My daughter asked about the time frame for the earliest ambulance and was told they don’t know so my hubby said that he will drive me to the emergency himself and will not pull over. I am so glad that we didn’t wait for the ambulance .... [This person waited for 2 hours in ED to see a doctor and in this time their asthma settled down] I am one of the lucky person. Who knows if I would be telling my story today had I waited for the ambulance. Rest in peace to all those who have lost their lives due to thunderstorm asthma.”

THEME 15: Some hospital emergency departments in Melbourne were overloaded with patients but respondents were appreciative of the professionalism of the staff and the care and management they received under these conditions.

This woman, who had been driven to the emergency department by her husband as they had difficulty getting through to the ‘000’ operators, said she just:

(QUOTE CONTINUED FROM ABOVE)
“walked straight up to the admin window and said ‘Excuse me..I can’t breath’ with all the energy I had left in me. What came out sounded like a whisper. She looked up and referred me to the next window over to the triage nurse telling her ‘another one’. I thought oh there is someone else suffering from asthma. I was breathless and couldn’t answer any of the nurses questions and was feeling like I will drop dead any second. She checked my oxygen and was happy with it. She got me to calm down a little. Then she said all these people in here have the same problem. I looked around and could see them grasping for air; they had blue puffer in their hand. It seemed like a scene from a movie....just then a man came in, his eyes were buldging out as he was struggling to breathe ....”

“The nurses at Footscray hospital were incredible at dealing with the influx of people there that night.”

Suggestions/ Recommendations made by survey respondents

Only a small number of responses were coded to the Recommendations node (n=28), and the suggestions/recommendations made by consumers fell into 2 broad categories:

- Education
- Warning and notification systems

Education needed for the Community

A number of respondents – people with asthma – described the need for more education (or improved education) related to asthma itself and some thought it would be appropriate to include education on hay fever and pollen allergies too, with specific calls for:

- Increased education on correct Ventolin puffer use and on how to check if there is sufficient medication remaining in the device and if the medication is still in date
- The importance of people knowing their signs and symptoms

A small number of respondents highlighted the importance of family or friends understanding the significance of symptoms and acting when a person is suffering shortness of breath and therefore may be somewhat cognitively impaired:

“The roll of family and friends to pick up on changes to the asthmatic to advise a doctor visit and take them if SOB etc. ‘It’ll be right in a few hours’ doesn’t cut it as in a few hours the ability to breath can be severely compromised and window of opportunity lost to reverse a potentially dangerous / life threatening incident. People who are struggling have a foggy head and are potentially not good at making decisions as they are just too tired and dont want to make the next step esp on their own. ? whos driving.”

Some respondents thought there needed to be broader community education on TSA:

“It will be important to educate the community about what to do in future.”
A small number of respondents called for increased education of specific groups – schools and teachers, family members and general practitioners specifically.

“In the past few weeks leading up to the Melb experience, it has my worst period of asthma that I have experienced for many many years. I am a nurse and have a plan, however the weather tested my plan. I went to 2 doctors before I eventually got a doctor who really took me serious my asthma. I present a little differently from the usual asthma. By the third GP I was so tight and ended up on cortisone for ten days and a week off work. It wasn’t my fault. I had been struggling with the changes in weather for weeks. The GPs need to respond better. More education is required for GPS and families of asthma people."

And this respondent thought that schools need additional training on recognising asthma in a child that had never previously been diagnosed with asthma:

“As a teacher and first aider, this event has been an eye-opener. As teachers we all know which kids in our school have asthma BUT we don’t know about the kids who may have asthma for the first time during such an event. If this storm had occurred during the school day (or for example during a school camp), it could have had serious consequences for any child experiencing it for the first time. I think there needs to be education and first aid training around the issues of undiagnosed asthmatics experiencing asthma symptoms for the first time.”

Warning and notification systems

Respondents thought there needed to be improved notiﬁcation of high pollen count days – that pollen counts should be more widely publicised and/ or that asthmatics and hay fever sufferers should be made aware of pollen count apps:

“A pollen count on BOM as there is on Weather Underground site would be very helpful.”

“The prevalence of the pollen in the days after the storm needs to be better publicised.”

“if there had been a pollen warning, I would have closed my windows at home.”

This respondent thought that schools should be made aware of high pollen count days:

“My child needed an asthma plan for school following the thunderstorm asthma event. Prior to this event he had only been diagnosed with hay fever. School was unaware of the extreme pollen forecast that day and reluctant to keep children with asthma and hay fever indoors. Staying indoors needs to be part of the asthma and hay fever plans that schools should be obligated to follow. As a parent I was aware of the risks but I have not been able to convince the school to keep children with asthma and hay fever indoors during days with high and extreme pollen counts.”

And another group of respondents called for some sort of warning systems to be put in place – either to warn people of an impending TSA event or to provide real-time warnings and updates.

A number of respondents noted there was not sufﬁcient warning of the event:

“No enough warning as to the possible affects it would have.”

And a number of respondents called for some sort for warning system for the community in future:

“Would have been good to have some kind of warning to increase preventative dose from once a day to twice a day to better cope.”

“There needs to be a national approach to warning the public of potential health issues. Black Saturday was a huge learning curve and measures have been put in place since. The same needs to occur after what happened last Monday. 8 people too many have died. Too many are still in hospital or suffering the effects.”

This respondent suggests the weather bureau could play a role in forecasting TSA:

“I was not aware that something like Thunderstorm asthma exist. It would be better if the govt tries to raise awareness and also the weather bureau starts forecasting Thunderstorm asthma so people can be prepared and we will not loss 8 lives and many are still struggling.”

Some respondents suggested there be a warning system on the nightly news or that the community be somehow kept appraised of the unfolding event in real time:

“I had to use ventolin maybe a dozen times through the night, including a couple of times when I was woken up. It was the worst asthma I have ever experienced. At around the same time I started to come down with a cold/virus. I heard from my wife that lots of people were using ambulances, but it would have been instructive to be alerted about the nature of the event underway.”

Others thought social media or the Nurse on Call system could be used to provide real-time alerts or texts to people’s mobile phones.

“it would have been helpful to have alerts sent out via phone or social media about what was going on with the thunderstorm asthma as when my partner could not breathe I encouraged him to go outside and get some fresh air not realising this is potentially the worst thing we could have done. He had never experienced asthma before in his life.”

“As I don’t suffer from asthma myself I was very concerned for my child as I didn’t fully understand the situation. If a warning was issued it would have alleviated the anxiety around why it was happening at that moment and also not dismiss the symptoms as they suddenly arose seeming out of nowhere.”

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Considerations and Recommendations

This section of the report details considerations and recommendations to inform the development of targeted asthma management and TSA health promotion and the development of public health initiatives, based on key findings of the consumer survey.

Characteristics of people affected by the TSA event according to the Asthma Australia Consumer Survey

The Asthma Australia Consumer Survey identified a number of groups of people – according to self-report – who were more likely to be affected by the TSA event and experience an asthma attack. These groups had:

- History of hay fever/ allergic rhinitis
- Potentially undiagnosed or unrecognised asthma/ poor recognition
- Low rates of inhaled corticosteroid (preventer) use among people with a self-reported asthma attack
- Low written AAP ownership among people with a self-reported asthma attack

And there was low awareness of the Asthma First Aid Steps in general in survey respondents.

**KEY FINDING 1** - People reporting an asthma attack were younger on average, more likely to have recent symptoms and treatment of hay fever, and less likely to have recent symptoms, diagnosis and treatment of asthma.

**KEY FINDING 2** - Those who reported experiencing an asthma attack and a previous asthma diagnosis were: less likely to take preventer medication daily and less likely to have a written AAP.

**KEY FINDING 3** - Some respondents (via the open text section of the survey) indicated having an asthma plan and knowing what to do and how to respond was helpful. These respondents often did not have attacks or managed their symptoms well, and those who gave detail on how they were prepared for the TSA event made reference to regular use of preventer medication.

**KEY FINDING 4** - Many people who reported a previous asthma diagnosis had poor knowledge and understanding of their condition and how to manage it, including what their asthma treatments do, and how and when to use them. Many appeared not to be taking preventer treatment regularly.

**KEY FINDING 5** - Awareness of the Asthma First Aid Steps was low among survey respondents with or without a previous asthma diagnosis and probably impacted two key outcomes:

1. Ability to recognise asthma symptoms and/ or worsening asthma symptoms,
2. Knowledge of how to respond to symptoms including where and how to get further information and when to seek medical assistance.

**KEY FINDING 6** - There was low awareness amongst survey respondents of TSA and many called for community education about TSA and how to respond.

**KEY FINDING 7** - Survey respondents called for an appropriate warning system to be put in place for future TSA events and also wanted real time alerts during future events.
Recommendations

According to the Ottawa Charter for Health Promotion\(^{24}\), the following areas are essential for success in health promotion:

- Build healthy public policy
- Create supportive environments
- Strengthen community action
- Develop personal skills
- Reorient health services

*Recommendations have been outlined within these categories.*


**Recommendations for Policy Makers**

1. Develop a monitoring system, reporting and communications plan system for high pollen days and risk of TSA
2. Develop a plan for full capacity ambulance response for high risk days
3. Plan triage and emergency responses based on known high risk areas
4. Focus educational efforts on high risk geographic areas and people of non-English speaking background/ culturally and linguistically diverse backgrounds.

**Recommendations to create supportive environments**

1. Work across key stakeholder groups to achieve best outcomes, including:
   - Primary, secondary, tertiary health services,
   - Pharmaceutical companies,
   - Bureau of Meteorology,
   - Researchers,
   - Clinicians,
   - State and Federal Government Institutions (e.g. Department of Health and Human Services, Victoria, Department of Health, Australian Institute of Health and Welfare)
2. Engage the emergency services and ED physicians in developing and implementing appropriate, timely community messages and coordinated responses for TSA events.

**Recommendations to support community action**

1. The community as a whole has easy access to consumer friendly, evidence-based asthma information to support informed decision making and increase awareness of what individuals may need and how to access necessary resources and respond in a timely manner.

2. Community members have the skills, knowledge, equipment and confidence to provide Asthma First Aid and are aware of when to seek emergency medical assistance.

**What does the community need to know?**

1. **Recognise and Respond**
   - How to recognise asthma symptoms
   - How to respond to asthma symptoms
   - When to access further medical assistance

2. **Be prepared**
   - Learn Asthma First Aid – everyone needs to be aware of Asthma First Aid
   - Access to reliever medication (available over-the counter from a pharmacy and is unlikely to harm)
   - If affected by TSA speak to a doctor to develop a plan for the next pollen season
   - Institutions, such as schools with a duty of care to those in their charge, know who is affected by asthma and have a plan in place to deal with TSA – those affected may not have a history of asthma

3. **Be able to access to information**
   - Access to videos, apps and websites that can guide them through Asthma First Aid in an emergency
   - Where to find further asthma education and support
Recommendations to help people with asthma and/or hay fever and their carers develop personal skills

1. If you (or your children/family member) have a history of hay fever or asthma, past or present, you (they) are at risk of TSA.
2. Ask your doctor to assess you for asthma and/or to arrange for allergy testing, specifically for grass pollen, if appropriate.
3. Discuss with your doctor the steps to be taken if a thunderstorm is predicted, and ask your doctor to include this in your written AAP.
4. Check whether you should be taking a regular preventative medication for asthma, or if you should take it in the spring or at a particular time of the year.
5. If you have a blue reliever puffer, make sure:
   a. you know where it is
   b. it is not past its expiry date
   c. you know how to use it properly.
6. See your doctor if you had symptoms after an event that did not respond to the steps in your asthma plan.

People with asthma and/or hay fever and their carers need to be able to:

- Recognise and respond to (i.e. treat) hay fever symptoms.
- Recognise and understand the link between asthma and hay fever and ask the question ‘Could it be asthma?’ (wheeze and sneeze – think asthma).
- Recognise potential asthma symptoms and know how to respond.

If you have asthma:

- Understand your condition, and achieve good asthma control with your GP.
- Understand the link between asthma and hay fever and its potential impact on asthma control.
- Advice is also available through your pharmacist, Asthma Australia, 1800 ASTHMA, astmaaustralia.org.au
- Take your preventer regularly as prescribed. It controls your asthma and helps you stay well.
- Have a written Asthma Action Plan. Keep it safe and somewhere you and others can access it easily. Taking your asthma medication as advised helps to prevent flare-ups and attacks.

Recommendations to enable a reorientation of health services

**General Practitioners**

1. Check that your asthma and hay fever patients have a full review of their diagnosis and management.
2. Write an Action Plan for anyone who was affected by the TSA event.
3. When you prescribe inhaled medications, take time to demonstrate and check patients’ inhaler techniques.
4. Familiarise yourself with the Australian Asthma Handbook (www.nationalasthma.org) and who should receive preventative medication for asthma.

**Pharmacists**

1. Keep extra supplies of Ventolin during spring and early summer.
2. Encourage customers to see their GPs for review of their asthma.
3. Encourage customers with hay fever to see their GPs for advice on TSA and for advice on what to do if they experience TSA.

**Emergency Departments of Public Hospitals**

1. Develop an action plan for efficient triage for TSA events.
2. Ensure you have access to pharmacy supplies of short-acting beta agonists 24/7 during spring/summer/high risk periods.
3. Ensure hospital pharmacies keep well stocked during these periods.
The Asthma Australia TSA Consumer Survey provided community members of Melbourne and the surrounding areas affected by the TSA event of 21 and 22 November 2016 with an opportunity to have their voices heard and acknowledged. Their responses, experience and personal impact will help inform the health promotion campaign and public health initiatives designed to minimise the impact of TSA in the future. Furthermore, this survey and the results of the TSA event highlight again that the morbidity and mortality associated with asthma in Australia is not solved. A collaborative approach, building on existing platforms and avenues for public messaging and dissemination of information is needed to build community awareness of TSA and increase the knowledge and utility of best practice asthma self-management for people with asthma. Furthermore, people with hay fever need to be prepared and aware that they are at risk of an asthma attack during TSA events.

In summary:
- People with asthma need to learn effective self-management and the importance of maintaining good asthma control
- Clinicians need to provide best practice asthma management, which includes an accurate diagnosis, appropriate treatment and regular review
- The Community needs to be aware of TSA, the symptoms of an asthma attack and be able to respond promptly and appropriately
- Hay fever sufferers need to know they are at risk of asthma in TSA events and ask themselves - Could it be asthma? (Wheeze or sneeze think asthma).

The emergency services response to a TSA event will always be a key focus and the response during the November 2016 TSA event requires thorough examination and a warning system implemented if a reliable one can be developed and managed by an appropriate agency. Furthermore, real time alerts are needed during such events in future, with effective communication to the community to minimise their impact through prompt, effective responses. A system for providing real time alerts should be developed which could be used in the event of a future TSA event or another serious respiratory emergency event in any particular geographic location in Australia.

In addition to implementing the right systems and providing adequate resourcing and measures to improve preparedness for such events in future, strategies are also required for preventative action at an individual and population level. This means, identifying those most at risk and providing people with asthma and linked conditions (such as a grass allergy) and their carers with the skills and knowledge to reduce the risk and likelihood of experiencing a severe exacerbation, and the knowledge and skills at a community level to respond to an asthma emergency. As such, Asthma Australia, as the peak body supporting people with asthma and their carers in Australia, encourages the Victorian Government to invest in supporting people with asthma and linked conditions through education, prevention and Asthma First Aid awareness. This effort should extend to emergency services and health professionals and improve asthma outcomes for all Victorians with asthma in general, but also at times of increased risk such as during a TSA event.
References


Appendices
Appendix 1 Thunderstorm Asthma Consumer Survey Tool

Asthma Survey – Melbourne Thunderstorm Asthma Event

1. Please enter your postcode: _________

2. Are you completing this for yourself or someone you care for?
   o Myself
     Please enter your age: _________
   o Someone I care for
     Please enter the age of the person you care for? _________

3. Did you have an asthma attack due to the Melbourne thunderstorms (e.g. a flare up of asthma symptoms - shortness of breath, chest tightness, wheeze or cough)?
   o Yes
   o No
   o Unsure

4. Have you experienced Hay fever symptoms in the last 12 months? (e.g. itchy / eyes or nose/sneezing/runny nose)
   o Yes
   o No
   o Unsure

If yes, were you taking any hay fever treatment leading up to the thunderstorm asthma event?
   o Yes. If yes what were you taking? ______________________
   o No
   o Unsure

5. Have you previously been diagnosed with asthma by a doctor?
   o Yes
   o No
   o Unsure

6. Have you experienced any asthma symptoms in the last 12 months?
   o Yes
   o No
   o Unsure

7. Have you been prescribed a preventer medication for your asthma by your doctor?
   o Yes - If yes what were you taking
   o No (go straight to question 8)
   o Unsure

   If yes, how long were you taking preventer leading up to the thunderstorm?
   o Less than 2 weeks
   o 2-4 weeks
   o 4-8 weeks
   o More than 8 weeks

   How often do you take it?
   o Every day
   o 5-6 days per week
   o 3-4 days per week
   o 1-2 days per week
   o Less than 1 day per week
   o Less than 1 day per month
   o Only when I exercise
   o A few times a year
   o Only when I am sick (asthma is flared up)

8. Had you visited your GP for asthma in the last 6 months?
   o Yes
   o No
   o Unsure

   If yes, number of visits? _________

   Were any of these planned reviews? _________
   o Yes
   o No
   o Unsure

   Number of planned review visits? _________

9. Did you have a Written Asthma Action Plan (written instructions of what to do if asthma is worse or out of control)?
   o Yes
   o No
   o Never heard of one
   o Unsure
10. Did you have your blue reliever puffer on hand?
   - Yes
   - No
   - Unsure

11. Were you aware of the Asthma First Aid steps?
   - Yes
   - No
   - Unsure

12. Did you use either of the following medical services due to an asthma emergency?
   - GP
   - Emergency Department (via ambulance)
   - Emergency Department (via own transportation)
   - After hours doctors service
   - Other: ____________________________________________

13. Asthma Control Score – only complete this if you are the person with asthma. Do not complete on behalf of someone else.
   1) In the past 4 weeks (leading up to the thunderstorm asthma event), how often did your asthma prevent you from getting as much done at work, school or home?
      - All the time (1)
      - Most of the time (2)
      - Some of the time (3)
      - A little of the time (4)
      - Not at all (5)
   2) During the past 4 weeks (leading up to the thunderstorm asthma event), how often have you had shortness of breath?
      - More than once a day (1)
      - Once a day (2)
      - 3 to 6 times a week (3)
      - 1 or 2 times a week (4)
      - Not at all (5)
   3) During the past 4 weeks (leading up to the thunderstorm asthma event), how often did your asthma symptoms wake you up at night or earlier than usual in the morning?
      - 4 or more nights a week (1)
      - 2 or 3 nights a week (2)
      - Once a week (3)
      - Less than 1 night a week (4)
      - Not at all (5)

4) During the past 4 weeks (leading up to the thunderstorm asthma event), how often have you used your Blue reliever puffer?
   - 5 or more times per day (1)
   - 1 or 2 times per day (2)
   - 2 or 3 times per week (3)
   - Once a week or less (4)
   - Not at all (5)

5) How would you rate your asthma control during the past 4 weeks (leading up to the thunderstorm asthma event)?
   - Not controlled (1)
   - Poorly controlled (2)
   - Somewhat controlled (3)
   - Well controlled (4)
   - Completely controlled (5)

14. Share your experience and how you felt during the thunderstorm asthma event and the days after it.
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

15. Could you help Asthma Australia raise awareness of asthma by sharing your story with the media? (if you tick yes, we will contact you to discuss this and will not share your story or any details without your consent)
   - Yes
   - No
   If yes:
   Name _______________________________________________
   Email address _________________________________________
   Phone number ________________________________________
   Age (in case they are under 18) __________________________
   Postcode ___________________________________________
   Tell us your asthma story:
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
# Appendix 2 Coding Frame

## Coding Frame for Qualitative Analysis

<table>
<thead>
<tr>
<th>Parent Node</th>
<th>Node Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings and response</td>
<td>Feelings during and in the days after the event (including comments indicating how the person responded to manage these feelings)</td>
</tr>
<tr>
<td>Symptoms and response</td>
<td>Symptoms during and in the days after the event (including comments indicating how the person responded to manage symptoms - eg: taking medication)</td>
</tr>
<tr>
<td>Future Actions</td>
<td>Actions the person indicated they would make in the longer term as a result of the event</td>
</tr>
<tr>
<td>Intended actions in the short term</td>
<td>Actions the person indicated they would make in the near future triggered by the event</td>
</tr>
<tr>
<td>Cost of medication</td>
<td>Comments on cost of asthma medication and implications for respondents being able to manage their asthma</td>
</tr>
<tr>
<td>Clinical context</td>
<td>Past asthma or hay fever diagnosis</td>
</tr>
<tr>
<td>Preparation</td>
<td>Comments indicating the respondent was prepared in some way for the event or not - eg knowledge of the weather event and taking preventive action</td>
</tr>
<tr>
<td>Information on the event</td>
<td>Comments on information people received about the event or comments on them trying to find out what was going on; how information flowed during the event; public health warnings</td>
</tr>
<tr>
<td>Quotable quotes</td>
<td>Great quotes that jump out at you - likely to be double coded into another of the nodes too</td>
</tr>
<tr>
<td>Impact on work or school</td>
<td>Comments indicating the responder (or the person they care for) had to take time off work or school due to symptoms triggered by the Event</td>
</tr>
<tr>
<td>Recommendations</td>
<td>Recommendations given by respondents in relation to future events</td>
</tr>
<tr>
<td>Location</td>
<td>Comments indicating where a person was located during the event and if they thought this impacted their symptoms in some way (eg: indoors v outdoors, in the countryside v in the city etc)</td>
</tr>
<tr>
<td>Asthma Action Plan or GP Asthma Plan</td>
<td>Comments on putting an AAP or a GP asthma plan of some sort into operation 9including GP asthma reviews)</td>
</tr>
<tr>
<td>Timing : onset and duration</td>
<td>Onset of symptoms prior to knowledge of thunderstorm impact or onset of an asthma attack or symptoms on learning of the severity of the event</td>
</tr>
<tr>
<td>No problem/ No difference to usual situation</td>
<td>Comments indicating that the person didn’t experience any problems during the event or only the usual symptoms they experience any other day</td>
</tr>
<tr>
<td>Other</td>
<td>A node I have for other comments that don’t fit into the above nodes but might be useful</td>
</tr>
</tbody>
</table>