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## Contents

Authors .................................................................................................................................................. 2
Acknowledgements ................................................................................................................................. 2
List of Figures ......................................................................................................................................... 4
List of Tables .......................................................................................................................................... 5
Abbreviations ......................................................................................................................................... 6
Executive Summary ............................................................................................................................... 7

1. Introduction ....................................................................................................................................... 9
2. Research Question ............................................................................................................................ 10
3. Human Research Ethics Committee approval ................................................................................ 10
4. Methods ........................................................................................................................................... 10
  4.1. Study Design ................................................................................................................................. 10
  4.2. Eligible subjects ............................................................................................................................. 10
  4.3. Final sample size ........................................................................................................................... 10
  4.4. Contact and recruitment methods ............................................................................................... 10
  4.5. Direct contact methods ............................................................................................................... 11
  4.6. Indirect contact methods ............................................................................................................. 11
  4.7. Recruitment time line .................................................................................................................. 12
  4.8. Data collection instrumentation and measures ............................................................................. 20
  4.9. Data quality .................................................................................................................................. 25
  4.10. Statistical analyses ..................................................................................................................... 27

5. Results ............................................................................................................................................ 29
  5.1. Recruitment results ...................................................................................................................... 29
  5.2. Assessment of sampling bias ....................................................................................................... 32
  5.3. Health-related risk factors ........................................................................................................... 37
  5.4. Self-perceived general health ....................................................................................................... 40
  5.5. Self-reported doctor-diagnosed medical conditions ..................................................................... 41
  5.6. Self-reported respiratory health symptoms and conditions ...................................................... 43
  5.7. Psychological wellbeing .............................................................................................................. 44

6. Discussion ....................................................................................................................................... 46

7. References ....................................................................................................................................... 50

8. Document History ............................................................................................................................. 52

Appendix A  Adult Survey questionnaire for Morwell participants ....................................................... 53
List of Figures

Figure 1 Adjusted Rate ratios and 95% Confidence Intervals for self-reported asthma and current respiratory symptoms ................................................................. 7

Figure 2 Images of promotional fridge magnets which were delivered to letter boxes across Morwell (left) and Sale (right) ................................................................................................................................. 13

Figure 3 Example of news article arising from an Adult Survey media release ......................................................... 14

Figure 4 Tri-fold flyer promoting catered events in public venues for Adult Survey participants ......................... 15

Figure 5 Recruitment Coordinator, Susan Denny, at the Morwell 50 mile Farmers Market, June 2016 .................. 16

Figure 6 HHS promotional stand at Morwell Pop-Up Park in April 2016 ................................................................. 16

Figure 7 Proof of an ad intended for publication in the Latrobe valley Express ..................................................... 17

Figure 8 Roadside banner promoting the Hazelwood Health Study ........................................................................ 17

Figure 9 Examples of posters promoting Adult Survey questionnaire packs available in Morwell and Sale ........ 18

Figure 10 Map of Morwell demonstrating the Areas that were approached sequentially over a six month recruitment period from May to October 2016 ................................................................................................. 19

Figure 11 Map of Sale demonstrating the Areas that were approached sequentially over a five month recruitment period from June to October 2016 ......................................................................................... 19

Figure 12 Adult Survey recruitment rate by mail-out Area for Morwell ................................................................. 30

Figure 13 Adult Survey recruitment rate by mail-out Area for Sale ......................................................................... 31

Figure 14 Adult Survey participation rate by CSIRO modelled cumulative 12 hourly PM$_{2.5}$ exposure .................. 34

Figure 15 Self-perceived health status reported by Morwell and Sale participants ..................................................... 41
List of Tables

Table 1 Recruitment outcomes for the Morwell and Sale residents on the VEC list .................................................................29
Table 2 Percentage of participants completing the Adult Survey by telephone, online or on paper ..........................32
Table 3 ABS 2011 Census estimated adult resident population by age and gender for Morwell and Sale compared with Adult Survey participants ..............................................................................................33
Table 4 Self-reported smoking status in Latrobe City and Shire of Wellington compared with Adult Survey participants ........................................................................................................................................33
Table 5 Comparison of participants with non-participants who completed a Refuser Questionnaire ..................35
Table 6 Demographic characteristics for participants from Morwell and Sale .................................................................37
Table 7 Tobacco and passive smoke exposure in Morwell and Sale participants .................................................................38
Table 8 Frequency of alcohol use and proportion of participants classified as low risk and high risk drinkers ......39
Table 9 Number of stressful life events reported by Morwell and Sale participants .................................................................40
Table 10 Self perceived health status in Morwell and Sale participants .........................................................................................40
Table 11 Self-reported doctor-diagnosed medical conditions first diagnosed prior to the mine fire (2013 or earlier) or post mine fire (2014 or later) .........................................................................................42
Table 12 Self-reported respiratory symptoms and conditions in Morwell and Sale participants ..........................43
Table 13 Self-reported doctor-diagnosed psychological conditions first diagnosed prior to the mine fire (2013 or earlier) or post mine fire (2014 or later) .........................................................................................44
Table 14 IES-R and K10 scores for Morwell and Sale participants .................................................................................................45
Table 15 Prevalence of respiratory symptoms in other Australian research .........................................................................................47
Abbreviations

A5  Metric paper size 148x210 mm
A6  Metric paper size 105x148 mm
ABS  Australia Bureau of Statistics
AUDIT-C  Alcohol Use Disorders Identification Test
BHR  Bronchial Hyper-reactivity (usually demonstrated by Methacholine challenge test)
BOLD  Burden of Obstructive Lung Disease study
CIDI  Composite International Diagnostic Interview
COPD  Chronic Obstructive Pulmonary Disease
CSIRO  Commonwealth Scientific and Industrial Research Organisation
DOB  Date of birth
DSM-IV  Diagnostic and Statistical Manual of Mental Disorders, fourth edition
GOLD  Global Initiative for Obstructive Lung Disease
HRF  Hunter Research Foundation
IES-R  Impact of Events Scale – Revised
K10  Kessler 10 item Psychological Distress Scale
MICE  Multiple imputation by chained equations
MUHREC  Monash University Human Research Ethics Committee
PM$_{2.5}$  Particulate Matter less than 2.5 thousandths of a millimetre in diameter
PTSD  Post-traumatic Stress Disorder
SA1  Statistical Area Level 1
SF12  Short Form 12 item Health Survey
SPHPM  Monash University School of Public Health and Preventive Medicine
VEC  Victorian Electoral Commission
WHO  World Health Organization
Executive Summary

This report comprises Volume 1 of the Hazelwood Health Study Adult Survey findings, which aims to assess whether Morwell adults, who were heavily exposed to smoke from the Hazelwood mine fire, have adverse cardiovascular, respiratory or psychological symptoms compared to Sale adults, who were minimally exposed.

Eligible participants were people aged 18 or older, at the time of the mine fire, who lived in Morwell or in one of 16 selected areas in Sale. Contact details for eligible subjects were drawn from the electoral roll maintained by the Victorian Electoral Commission (VEC). The VEC identified 9,448 registered Morwell residents and 4,444 registered Sale residents. For their convenience, participants were offered the option of completing the Adult Survey in one of three ways: by telephone interview, online or by paper questionnaire. Diverse strategies were utilised in the effort to contact and maximise recruitment of eligible adults from Morwell and Sale. These included personalised mail, $20 gift vouchers as reimbursement, free public events, radio and print media, posters and flyers. Feedback was monitored in order to identify and address barriers to participation.

Recruitment commenced in May 2016 and concluded in February 2017. In total 3,096 (33%) Morwell residents and 960 (23%) Sale residents participated in the Adult Survey. These recruitment rates were similar to, if not higher than, comparable studies. However sampling (selection) bias was a concern, where the health of participants might differ from the health of non-participants. A comparison of participants with community data, collected by the Australian Bureau of Statistics (ABS), indicated that women, and people aged over 50, were slightly overrepresented amongst participants. Importantly this occurred in both the Morwell and Sale groups which makes bias, that might be caused by gender or age differences, unlikely. To reduce the possibility of participation bias, the results were weighted by gender and age group. Furthermore, to minimise the effects of important health risk factors, multivariable methods were used to adjust for differences between the participating groups in education, employment, smoking, and alcohol use, as well as gender and age.

Prior to the mine fire, the prevalences of most self-reported, doctor diagnosed medical conditions were similar in the two groups. Exceptions were high cholesterol and angina, which were slightly higher in Morwell, and arrhythmia (irregular heart rhythm) which was slightly lower. However, since the time of the mine fire, Morwell participants have been at 1.5-fold higher risk than Sale participants of having high blood pressure diagnosed, and nearly seven-fold risk of heart attack. While this finding for heart attack was striking, the numbers of people affected were small.

![Figure 1 Adjusted Rate ratios and 95% Confidence Intervals for self-reported asthma and current respiratory symptoms](image-url)
The differences between Morwell and Sale, in self-reported pre- and post-mine fire asthma and respiratory symptoms in the past 12 months, are summarised in Figure 1. Self-reported doctor diagnosed asthma, since the mine fire, and current respiratory symptoms were all significantly more common among Morwell compared with Sale participants. Amongst asthmatics, symptoms were also more severe in Morwell compared to Sale. The risks of irritant symptoms from the chest and nose, consistent with chronic bronchitis and rhinitis, were also significantly higher among Morwell participants compared with Sale.

The Adult Survey included a number of measures of psychological wellbeing, including distress specifically linked to the mine fire event (IES-R) as well as a non-specific measure of current distress (K10). Morwell participants reported higher levels of distress on both measures, including all three subscales of the IES-R representing intrusive thoughts, avoidance behaviours and hyperarousal. In addition, Morwell participants were over three times more likely than Sale participants to report a diagnosis of posttraumatic stress disorder (PTSD) since the mine fire event, although the numbers of people affected were very small. There appeared to be no significant differences between Morwell and Sale in regard to diagnoses of mental health conditions prior to the mine fire, nor any difference in number of lifetime stressful life events.

An important strength of the Adult Survey was the inclusion of a comparison group of adults, from selected areas of Sale, who were similar to the Morwell adults in terms of their regional location and socio-economic indices. The findings were further strengthened by the availability of gender and age information, allowing for appropriate weighting of results. Additional statistical adjustments for gender, age, education, employment, smoking and alcohol also reduced the potential confounding effects of these important health risk factors.

A methodological limitation, of the Adult Survey, was the reliance on self-reported health measures. Such measures could render the results vulnerable to differential recall/reporting bias. For example, this might occur if exposed participants had a heightened awareness of symptoms and therefore, reported them more frequently relative to unexposed comparison participants whose health was otherwise the same. The Adult Survey design aimed to minimise the risk of differential recall bias by utilising validated questionnaires where possible.

Future analyses will include linked administrative health datasets, such as ambulance and emergency presentations and hospital admissions, which should be less prone to recall bias. Finally, future analyses will also compare similarly exposed Morwell adults. That analysis should be less prone to recall bias and could investigate whether some sub-groups, of similarly exposed participants, are more vulnerable than others to health impacts.

This analysis of the Adult Survey provides the first available evidence of current adverse cardiovascular, respiratory and psychological effects of the Hazelwood mine fire on the adults in Morwell. Increased risks have been observed for high blood pressure, heart attacks, respiratory symptoms, asthma and psychological distress. This report presents just broad differences between Morwell and Sale based on self-reported data. Future linkages to administrative health datasets will complement the self-reported data. The Adult Survey findings will be further strengthened by analyses which blend CSIRO modelled air pollution data with participants’ location information, to measure any association between estimated mine fire smoke exposure and health outcomes.

The Adult Survey sub-studies, commencing data collection in the 2nd half of 2017, will further complement the current work. The self-report data will be supplemented with clinical data on blood pressure, vascular function, inflammatory markers, respiratory function, and interview-based information on current perceptions of the mine fire events and the role of other social factors.
1. Introduction

During February and March 2014 a brown coal fire burned in the Hazelwood power station open-cut pit causing a period of smoky conditions in the Latrobe Valley, Victoria. The fire was unusual in that it burned and emitted smoke at the same location, adjacent to the town of Morwell, for over a month and was larger than previous coal fires in Australia and overseas. There were few precedents upon which to base public health protection messages or to assess adverse health effects. The Victorian State Department of Health (DOH) determined that it was important to learn from the fire, particularly for:

- the benefit of the local community who [were] exposed to this smoke by monitoring any potential long term health effects; and
- assisting health authorities, environment protection agencies and emergency services to inform and improve future policy and planning in the event of future similar events.

In order to achieve these objectives, the DOH released a Request for Tender for *A long term study into the potential health effects from the Hazelwood coal mine fire*. On 30th October 2014, the DHHS let the Tender to a Monash University-led research team with collaborators at Federation University, the University of Tasmania, the University of Adelaide and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

The Hazelwood Health Study (HHS), as it has been renamed by the researchers, is a program of research that comprises several research streams, each with their own aims and objectives. They include the:

- Adult Survey stream (upon which this report is based) which focuses on the health of adults who lived in Morwell at the time of the fire, relative to a comparison group of adults who lived in Sale.
- Latrobe Early Life Followup (ELF) stream which focuses on the health and development of infants born in the Latrobe Valley close to the time of the mine fire;
- Child component of the Psychological Impacts stream (also termed the Schools Study) which focuses on the psychological health of school aged children in the Latrobe Valley;
- Impact on Older People stream which focuses on policy decisions made in regard to older people during the event;
- Community Wellbeing stream which describes the perceived impact of the event on community wellbeing as well as effectiveness of community rebuilding activities and of communications during and after the event;
- Hazelinks stream which investigates short, medium and long term health effects across the Latrobe Valley by using routinely collected health databases such as ambulance, hospital, cancer and death data.

This Report comprises Volume 1 of the findings from the Hazelwood Health Study Adult Survey. Specifically, this Volume presents the Adult Survey aims, methods and results specific to the cross-sectional comparison of the self-reported health of adults in Morwell with that in Sale.

It is anticipated that subsequent Hazelwood Health Study Adult Survey volumes will include aims, methods and results investigating the incidence rates of long term health outcomes based on linkage to administrative health datasets, and the association between estimated levels of exposure to the mine fire smoke and the health of adults in Morwell.
2. Research Question

The Adult Survey research question, which is addressed in this Volume, is as follows:

Is there evidence that people in general, and susceptible sub-populations in particular, who were heavily exposed to emissions from the Hazelwood mine fire, compared with otherwise similar people who were minimally exposed to emissions from the fire, currently have clinical or sub-clinical cardiovascular, respiratory or psychological conditions that could be associated with clinically important adverse health consequences in the future?

3. Human Research Ethics Committee approval

The protocol for the Adult Survey (Project number CF15/872) was considered by the Monash University Human Research Ethics Committee (MUHREC). The Committee was satisfied that the proposal met the requirements of the National Statement on Ethical Conduct in Human Research and granted approval for the period 21 May 2015 to 21 May 2020.

4. Methods

4.1. Study Design

This part of the Adult Survey comprises a cross-sectional study of self-reported health.

4.2. Eligible subjects

The Adult Survey exposed (study) group is defined as people who lived in Morwell, and were 18 years or older, on the 31st of March 2014. For the purpose of the study, Morwell is defined as the area within the township boundary.

The eligible comparison group are people aged 18 years or older on the 31st of March 2014, who live within one of 16 selected statistical areas Level 1 (SA1s) within Sale which have comparable median age, household size, Socio-Economic Indexes for Areas (SEIFA) and population stability as Morwell. Sale was determined, via CSIRO modelling, to have had little exposure to smoke during the Mine Fire event.

The electoral roll maintained by the Victorian Electoral Commission (VEC) was determined to be the preferred sampling frame from which to identify eligible subjects, and their contact details, for the Adult Survey.

4.3. Final sample size

The VEC identified 9,448 adults registered on the electoral roll as residents of Morwell at the time of the Hazelwood mine fire in February 2014.

The VEC identified 4,444 adults registered on the electoral roll as residents of the targeted areas of Sale in February 2014.

These numbers, provided by the VEC, excluded an unknown number of silent electors for whom the VEC could not disclose contact details.

4.4. Contact and recruitment methods

Numerous methods were employed in the attempt to contact and maximise recruitment of eligible adults from Morwell and Sale. As recruitment progressed, the researchers monitored feedback from residents via public events, calls and emails to the Recruitment Coordinator, also feedback from the interviewers who were
administering the Survey over the phone, the members of the Community Advisory Committee and Wordwise Communications. These various sources of feedback were used to identify barriers to participation and common areas of misunderstanding about the Adult Survey. Based on this feedback, the direct and indirect recruitment strategies, described below, were regularly updated and refined.

4.5. Direct contact methods

Using the name and address details provided by the VEC, all eligible adults were initially invited to participate via mailed invitation.

The first Invitation Pack contained:

- a personally addressed letter of invitation (one of two versions; those being one for Morwell and one for Sale) from the Principal Investigators, Professors Michael Abramson and Judi Walker;
- the Adult Survey and Health Record Linkage Information Sheet;
- an A5 insert showing “How to Participate” on one side and answers to “Frequently Asked Questions” on the other;
- an A6 insert showing that participants would be eligible to receive either a $20 Shop Latrobe City gift card (for Morwell residents) or a $20 Shop in Sale eVoucher (for Sale residents) as reimbursement for their participation.

If no response had been received within two weeks of the mailed Invitation Pack, attempts were made to contact the residents by phone in cases where publicly listed phone numbers could be found. These phone contact attempts were undertaken by a trained team of interviewers at the Hunter Research Foundation (HRF). This team was regularly updated about feedback being received from potential participants including barriers to participation.

If no response had been received within three weeks of the mailed Invitation Pack, a Reminder Postcard was mailed.

If no response was received within three weeks of the mailed Reminder Postcard, a Final Reminder Pack was mailed. The Final Reminder Pack contained:

- personally addressed cover letter (one of two versions; those being one for Morwell and one for Sale) from the Principal Investigators, Professors Michael Abramson and Judi Walker;
- a copy of the Adult Survey and Health Record Linkage Information Sheet;
- one of two versions of the Adult Survey and Health Record Linkage paper questionnaire; those being one for Morwell (Appendix A) and one for Sale, with accompanying Reply Paid envelope;
- an A5 insert showing “How to Participate” on one side and answers to “Frequently Asked Questions” on the other;
- an A6 insert showing either the Shop Latrobe City gift card or the Shop in Sale eVoucher.

4.6. Indirect contact methods

In addition to the direct mail and phone contact attempts, numerous promotional activities were carried out in order to generate interest in the Adult Survey across the two towns and to address possible barriers to participation. Those promotional activities included:

- letter box delivery of fridge magnets (Figure 2) promoting the launch of the study in Morwell and Sale and featuring local study supporters;
- monthly media releases tailored to promote the Adult Survey activities and to address community concerns or misconceptions (for example, Figure 3);
• regular updates to the FAQs on the Hazelwood Health Study website;
• radio advertising;
• attendance at numerous public events such as the Morwell 50 Mile Farmers Market and the Morwell Pop-up Park (Figure 5 and Figure 6);
• newspaper advertisements (Figure 7);
• a dedicated 1300 number, manned by the Adult Survey Recruitment Coordinator and additional trained Monash University researchers, to respond to incoming enquiries;
• advertised attendance of Monash University researchers at the local libraries to provide assistance or answer enquiries;
• attendance at existing community groups such as sports clubs;
• roadside banners (Figure 8);
• posters (Figure 9)
• questionnaire packs made available in public venues such as doctor’s rooms, sports clubs, laundromats and libraries

4.7. Recruitment time line

Recruitment into the Adult Survey launched in May 2016 in Morwell, and June 2016 in Sale.

For the purpose of the mail-out of personalised invitation packs, Morwell was divided in to six areas (shown in Figure 10) which were targeted sequentially over a six month recruitment period; with Area 1 mailed invitation packs in May 2016, Area 2 in June 2016, Area 3 in July 2016 and so on until Area 6 was mailed invitation packs in October 2016. The VEC data included current address for residents who were registered at a Morwell address in early 2014 but had since moved out of the town. They were included in the July 2016 mail-out.

Sale was divided in to five areas (shown in ) which were targeted sequentially over a five month recruitment period; with Area 1 mailed invitation packs in June 2016, Area 2 in July 2016 and so on until Area 5 was mailed invitation packs in October 2016. Residents who had moved out of Sale, since the time of the mine fire, were included in the August 2016 mail-out.

The Hazelwood Health Study is a large, independent study which is underway in Gippsland.

A major survey of adults has commenced and we are asking for your help.

Study supporters in Morwell

To learn why we are surveying Morwell adults, see overleaf.

In response to community concerns, the Hazelwood Health Study is investigating the long-term health effects of smoke from the Hazelwood mine fire in February and March 2014.

The Adult Survey component of the study is being led by Monash University and targets health concerns identified as important to the community.

Over the next few weeks, eligible adults in this area of Morwell will be mailed an invitation package asking them to participate in the Adult Survey.

In order to understand the severity and spread of any health impacts of the smoke it is essential that as many adults as possible complete the survey, whether they are young or old, well or unwell.

For further information go to www.hazelwoodhealthstudy.org.au
or free call 1800 985 899
or email recruitment@hazelwoodhealthstudy.org.au

The Hazelwood Health Study is investigating the long-term health effects of smoke from the Hazelwood mine fire in February and March 2014.

The Adult Survey component of the study is being led by Monash University and targets health concerns identified as important to the community.

In order to understand the severity and spread of any health impacts of the smoke, it is important to compare Morwell to another less exposed local community - with Sale being selected as the comparison community.

In addition to understanding the impacts of the fire, having two communities in Gippsland will provide valuable information on the health and health service usage of adults in both regions. This will inform future health planning in Gippsland.

Over the next few weeks, eligible adults in this area of Sale will be mailed an invitation package asking them to participate in the Adult Survey. It is essential that as many adults as possible complete the survey, whether they are young or old, well or unwell.

For further information go to www.hazelwoodhealthstudy.org.au
or free call 1800 985 899
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Figure 2 Images of promotional fridge magnets which were delivered to letter boxes across Morwell (left) and Sale (right)
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Figure 9 Examples of posters promoting Adult Survey questionnaire packs available in Morwell and Sale
Figure 10 Map of Morwell demonstrating the Areas that were approached sequentially over a six month recruitment period from May to October 2016

Figure 11 Map of Sale demonstrating the Areas that were approached sequentially over a five month recruitment period from June to October 2016
4.8. Data collection instrumentation and measures

4.8.1. Self-report health survey

The data that have been analysed and reported upon in this volume of results, were drawn from answers to the following sections of a self-report health survey/questionnaire (see Appendix A for the complete questionnaire for Morwell participants).

Section A - Details about you (questions A1-A14)

Participants were asked to provide demographic information including their age, gender, marital status, country of birth, language/s spoken at home, any Aboriginal or Torres Strait Island origin, highest level of education completed, employment status, current address, home ownership status and number of years lived in Gippsland.

Section B – General Health

Self-perceived general health status (question B1)

The first question from the Short Form 12 Health Survey (SF-12) was used as a broad measure of self-perceived general health status. The SF12 has become one of the most widely used instruments for measuring the health of populations. The first question has been used as a brief stand-alone measure of health status in the Australian Health Surveys.

Doctor-diagnosed medical conditions (questions B2 – B5)

Participants were asked to report whether or not a medical doctor had ever told them that they had high blood pressure, high cholesterol, angina, heart attack, heart failure, irregular heart rhythm, other heart disease, stroke, cancer, diabetes, anxiety, depression, post-traumatic stress disorder, other mental health conditions or other medical conditions not previously listed. If Yes, the year of first diagnosis or episode was requested. If Yes to diabetes, the type of treatment received was also requested.

Where participants reported a medical condition with year of first diagnosis or episode in 2013 or earlier, these were coded as prior to the mine fire. Where participants reported a medical condition with year of first diagnosis or episode in 2014 or later, these were coded as post mine fire.

Section C - Respiratory Health (questions C1-C14)

A modified version of the European Community Respiratory Health Survey (ECHRS) was included to identify respiratory symptoms such as wheeze, chest tightness, shortness of breath, allergies, cough and sputum and respiratory medical conditions including asthma, emphysema or chronic obstructive pulmonary disease (COPD) and associated medications. Pekkanen et al. developed an asthma severity score based on eight symptoms from the ECRHS questionnaire. Seven of these questions were included in the Adult Survey and formed the basis of a modified asthma severity score.

Section D - Smoking history (questions D1-D3)

Cigarette smoking has been associated with numerous diseases including cardiovascular diseases, cancers, emphysema, stroke and thrombosis. Therefore it was essential to measure participants’ exposure to tobacco and other smoke. In the Adult Survey, respondents indicated whether they had ever smoked at least 100 cigarettes, or a similar amount of tobacco, in their life-times.
Participants who answered “No” were defined as never smokers as per the World Health Organization (WHO) definition. Participants who answered “Yes”, then reported whether they were current daily, weekly or less than weekly smokers, or former or occasional smokers.

Smokers were also asked to estimate their total number of years of smoking, and the average number of cigarettes smoked per day, week or month. That information was used to calculate the total number of cigarettes smoked, which was expressed in pack-years. It was assumed that one pack contained 20 cigarettes. Pack-years were calculated as total number of cigarettes per year, divided by 20 (cigarettes per pack), divided by 365 (days per year). One pack year is equivalent to smoking one pack of 20 cigarettes per day for a year. For example, a person who smoked an average of 10 cigarettes per day for a duration of 10 years (the equivalent of 36,500 cigarettes) received a pack-years score of 5 (36,500 ÷ 20 ÷ 365 = 5).

Amongst never smokers, passive tobacco smoke exposure in the past 12 months was measured by asking about other people in the household who smoked regularly inside the house.

Further, amongst never smokers, passive exposure to wood or briquette smoke was measured by asking the number of years in total a participant had lived in any home with a wood or briquette heater.

Section D - Current wellbeing in regard to the Hazelwood event (questions E1-22)

The Impact of Events Scale – Revised (IES-R) was utilised here as the primary psychological outcome measure. The IES-R measured the current subjective level of distress associated with exposure to the Hazelwood smoke event. The scale involved 22 items which respondents scored on a 0-4 scale (0 = Not at all; 1 = A little bit; 2 = Moderately; 3 = Quite a bit; 4 = Extremely). The items tapped into symptoms associated with Post-Traumatic Stress Disorder. The items were grouped into the three sub-scales which aligned with the diagnostic criteria for PTSD in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). These three groupings were: Intrusion (such as intrusive thoughts of the event), Avoidance (such as trying not to think about the event) and Hyperarousal (such as being jumpy and easily startled). Scoring the IES-R involved calculating the sum of the response items for each of the sub-scales and for the total score (so the total could range from 0 to 88).

According to the original publication, the IES-R subscales have high internal consistency with coefficient alpha scores ranging from 0.79 to 0.90 with acceptable six-month test-retest reliability correlations ranging from 0.57 to 0.92. More recently, Beck et al. assessed the psychometric properties of the scale and confirmed alpha coefficients between 0.85 and 0.90 for the subscales and 0.95 for the total scale.

The IES-R was not designed as a diagnostic tool, so there were no standardised cut-offs for PTSD. However a number of researchers have assessed the sensitivity and efficiency of the IES-R by comparing it with results from a diagnostic interview. These suggested cut-offs scores for likely diagnosis of PTSD range between 22 and 44 with scores above 33 being considered as the most appropriate cut-off for probable diagnosis of PTSD.
Section I - Recent wellbeing (questions I 1–10)

The Kessler Psychological Distress Scale (K10)\textsuperscript{13} is a brief 10-item scale which was developed as a population screen for psychological distress. Kessler \textit{et al.}\textsuperscript{14} assessed the suitability of the K10 as a screen for serious mental illness and found that it performed as well as more lengthy clinical measures and had a high Cronbach alpha internal consistency score of 0.93.

The K10 has been commonly used in Australian population health surveys such as the ABS Australian Health Survey,\textsuperscript{15} the Victorian Population Health Survey\textsuperscript{16} and in longitudinal studies such as the 45 and Up Study.\textsuperscript{17} The K10 was included in the Adult Survey to allow comparison with these existing datasets. Unlike the IES-R, the K10 is not specific to an event and is about the level of anxiety and depression experienced in the past four weeks.

Each item is scored on a 1-5 scale (1=none of the time; 2=a little of the time; 3=some of the time; 4=most of the time; 5=all of the time), resulting in a total score ranging from 10 to 50. There are no set cut-offs for the K10, with multiple approaches used in Australia. For example, the ABS used the following groupings: 10-15=Low, 16-21=Moderate, 22-29=High, 30-50=Very high.\textsuperscript{18}

Section J - Stressful life events

Prior stressful life events have been shown to impact on traumatic outcomes for some individuals in relation to new critical events. It was therefore considered important to measure participant exposure to stressful events other than the mine fire.

The survey utilised a list of 11 stressful life events extracted from the PTSD module of the Composite International Diagnostic Interview (CIDI) Version 2.1\textsuperscript{19} which was developed by the World Health Organization. The list included exposure to combat, life-threatening accident, rape, and physical attack or any other extremely stressful or upsetting event including having suffered a great shock because of one of these events happening to a close associate.

Because the events list was extracted from the much longer CIDI, and was not designed as a standalone measure, there are no published indications of reliability or validity. The list or a variant of it, has commonly been used in research including two other Australian studies\textsuperscript{20,21} so it may be possible to compare the current population with those from earlier studies. There are no set rules for scoring the responses, so for the purpose of the Adult Survey, we report the number of participants with none, one or two, or three or more exposures to a stressful life event.

Section K - Alcohol use (questions K1-K3)

High alcohol consumption is a major contributor to the burden of disease in Australia. Excessive drinking is associated with numerous diseases, including cardiovascular disease, also social problems, hospitalisations and death.\textsuperscript{2} The Alcohol Use Disorders Identification Test (AUDIT-C) is a brief three-item measure of alcohol consumption, based on the earlier 10-item scale first developed by the WHO in 1989.\textsuperscript{22} The psychometric properties of the AUDIT-C, as well as its utility across diverse health settings, cultures and languages, have been extensively assessed. In 2009 a systematic review of 47 articles confirmed the psychometric properties of the measure and showed that the abbreviated AUDIT-C was in some instances more sensitive than the longer 10-item version.\textsuperscript{23}
The three items relate to the frequency of drinking alcohol in the past year, the number of drinks on a typical day, and the frequency of drinking more than six standard drinks on the one occasion. Each item is scored on a zero (never) to 4 scale. The total score is the sum of the 3 items, thus ranges from zero to 12. Amongst drinkers, a threshold score of 3 or more for women, and 4 or more for men, has been used to identify high risk drinkers.\textsuperscript{24}

Modes of health survey completion

Participants were offered the option of completing the self-report health survey in one of three ways.

1. \textit{Computer assisted telephone interview (CATI)}

Using this method, trained interviewer from the HRF accessed an online version of the health survey and asked participants the questions over the phone. This mode of administration was the researchers’ preferred option. Considerable resources were invested in the programming of the CATI and associated training and supervision of the interview team. The CATI was the preferred option for several reasons, including:

- the HRF interviewers were able to assist respondents to understand the intent of each question which enhanced the accuracy of responses and responder satisfaction;
- the computer programming included various logic checks to ensure that responses were within a reasonable range (eg. age at least 18 at the time of the mine fire), relevant/applicable (eg. if a participant had never been a smoker, then subsequent smoking questions were skipped), and complete (eg. program would not continue if a question was missed).

The limitations of participation by CATI included:

- participants needed to make, and keep, an appointment to do the health survey with an interviewer;
- appointments could not always be offered at any time a participant wished;
- participation over the phone was not suited to people with hearing difficulties.

2. \textit{Computer assisted web-based interview (CAWI)}

This method involved the participants accessing the online version of the health survey themselves.

The advantages of this method included:

- the computer programming advantages as described above, which maximised the logic, relevance and completeness of the participant responses;
- the convenience, for respondents, of answering the questions at whatever time suited them, and to do this in several sessions if needed;
- suitability for participants with hearing difficulties.

The limitations of participation by CAWI included:

- no direct contact with the HRF interviewers or the Monash researchers, however respondents were encouraged to call the HHS 1800 number if they had any questions or difficulties with the Survey;
- the requirement for participants to have a high literacy level in order to read, understand and respond to the questions;
- the need for participants to have internet access and be sufficiently technology-savvy to access the online survey, navigate through the questions and key the responses.

3. Paper questionnaire

The third way of participating in the health survey was to complete the questions on a paper version of the questionnaire (see Appendix A).

The advantages of this method included:
- the convenience, for respondents, of answering the questions at whatever time suited them, and to do this in several sessions if needed;
- that many people were familiar with pen-and-paper type questionnaires;
- no need for participants to have internet access not associated technological skills;
- suitability for participants with hearing impairment.

The limitations of participation by paper questionnaire included:
- the requirement for participants to have a high literacy level in order to read, understand and respond to the questions;
- the need for participants to be able follow the “if... then...” skips in the questionnaire so that they did not answer irrelevant questions;
- the need for participants to take extra care to accurately answer each question without any computer-programmed prompts or checks;
- the inconvenience of needing to return the paper questionnaire to the researchers via Reply Paid mail.

4.8.2. Refuser Questionnaire

Residents wishing to decline participation in the study were offered the option of completing five brief questions in relation to their current health, smoking status, reasons for not participating, sex and age.

Specifically, the Refuser Questionnaire comprised:

1. Question 1 from the SF12\textsuperscript{1} which was also included in the health survey. This allowed a comparison between the participants and those non-participants who completed the Refuser Questionnaire, on self-perceived health status.
2. A question about smoking status (never; never regularly; former; current but less than weekly; current weekly but not daily; current daily). This was designed to match as closely as possible to the smoking status questions in the health survey, so that a comparison could be made between participants and non-participants who completed the Refuser Questionnaire.
3. A question about reasons for non-participation including being too busy, not well enough, health not affected by the mine fire, not exposed to the mine fire, not interested in participating in a health study or ‘another reason’ that respondents could specify.
4. A question about sex (male, female, other).
4.9. Data quality

There were a number of strategies used to optimise the quality of the data collected from Adult Survey participants.

4.9.1. Instrument selection

As described in section 4.8, the Adult Survey used previously validated data collection instruments, and published scoring procedures, where possible.

4.9.2. Pilot studies

The Adult Survey Information Sheet, Consent Form and questionnaire were piloted in two phases. Phase 1 involved 17 adults from the Moe/Newborough area who were asked to complete a paper copy of the Adult Survey questionnaire and to review the Adult Survey Information Sheet and Consent Form. The aims were to identify inconsistencies or errors with the paper-based questionnaire, difficulties with the wording or comprehensiveness of the information sheet and consent form, and to assess the length of the Morwell questionnaire.

Phase 2 involved 20 adults from Morwell or Sale and aimed to assess any difficulties, inconsistencies or errors with the computer-assisted telephone or online versions of the questionnaire.

Feedback, from pilot study participants, was used to:

- identify misconceptions about, or barriers to, participation;
- polish the wording of invitation materials so as to maximise readability and comprehension and to minimise misconceptions and barriers to participation;
- to provide clarification, for the participant, as to why certain types of questions were included (eg. why smoking was included, or why we were asking about well-being in the last 7 days); and
- to augment instructions around ‘if... then go to...’ statements in the questionnaire in order to improve participant experience and data quality.

4.9.3. Training

All Monash University staff, involved in Adult Survey recruitment, data collection or data entry, completed a course on Ethics and Good Research Practice run by the Monash University School of Public Health and Preventive Medicine (SPHPM).

A Database Procedures Manual was developed and maintained by the Hazelwood Health Study Data Manager. This reference document was reviewed by all staff involved in data entry to ensure consistency in data entry across the project. The Adult Survey database was regularly reviewed by the Data Manager and Senior Project Manager, with daily feedback to staff in relation to quality and consistency.

All HRF staff, who were involved in interviewing Adult Survey participants by CATI, received training in regard to the background to the Adult Survey and the purpose of the questions in the questionnaire.

4.9.4. Data entry, cleaning and missing data

The method of data entry was determined by the mode of participation. CATI data were entered, by the HRF interviewers, in to an online database. CAWI data were entered, by the respondents, in to a
modified version of that same online database. There were a number of checks programmed into
the online database in order to detect missing, invalid, inconsistent or outlying results. For example,
the program would provide a prompt if a question was missed, or an error message if a response
was outside of a feasible range.

Paper questionnaires were forwarded to Datatime Pty Ltd where the questionnaire responses were
double keyed. That meant two Datatime operators separately keyed each questionnaire. If there
was any disparity, between the two datasets created for each questionnaire, a supervisor viewed the
disparity and made a judgement as to which was the correct entry. If the Datatime operators were
not able to decipher a respondent’s answer or, if the respondent put answers which were
inconsistent with the questionnaire instructions (eg. the respondent selected two answers when
they were instructed to choose one), these were referred to the Monash researchers for further
review.

Data from the CATI, CAWI and paper questionnaires were then merged in to a single database,
where they were then run through a series of additional statistical checks for missing, invalid,
inconsistent or outlying results. Where such problems were found in the data, decision rules were
made which allowed most records to be ‘cleaned’ in preference to treating the responses as missing.
All such decision rules were incorporated in to the *Database Procedures Manual*.

Examples of the checks, and associated decision rules, include:

- **CHECK:** Was year of self-reported diagnosis before year of birth, and therefore invalid? This
  occurred, for example, when respondents misunderstood the question and answered with
  the number of years they had experienced a condition, and not the calendar year of
  diagnosis.
  **DECISION RULE:** If the answer was judged to be number of years, replace that answer with
  an estimate of which calendar year it would have been. For example, if a respondent
  who participated in 2016 answered ‘5’ for year of angina diagnosis, replace the 5 with 2011.

- **CHECK:** Was a Yes or No response provided for each medical condition listed in Section B2 of
  the questionnaire? Some respondents looked down the list of medical co-
  nditions and only
ticked Yes to the conditions that they had, and skipped (left as missing) those medical
  conditions which they didn’t have.
  **DECISION RULE:** Where the above pattern of responses occurred, replace the missing
  answers with No.

- **CHECK:** Did respondents choose one answer to each of the **Wellbeing** questions in Section E?
  Some participants found it difficult to choose a response category that fitted them and,
  instead, they chose two adjacent categories; eg. they might have ticked “quite a bit” and
  also “extremely” in response to one question.
  **DECISION RULE:** Use a random left-right list to select either the lower (left) or higher (right)
  response category. That ensured that the researchers didn’t systematically over estimate or
  under estimate respondents’ symptoms/health score.

Where data remained missing, after the above cleaning and decision rules were applied, methods of
imputation were employed as part of the statistical analysis (see 4.10 for further detail).
4.10. Statistical analyses

Statistical analysis and data transformations were predominantly performed using Stata version 14 (Stata Corporation, College Station, Texas 2015).

4.10.1. Data transformations and preparation

Participant characteristics, symptoms and other adverse health outcomes were most typically measured on dichotomous (e.g. ‘no’, ‘yes’), categorical (e.g. married; divorced; single, never married), ordinal (e.g. not at all; moderately; extremely) or continuous (e.g. score ranging from 1-100) scales.

Some categorical variables were combined for reporting purpose (e.g. divorced and separated were combined to one category). Where participants reported year of diagnosis for medical conditions, separate variables were created to represent diagnoses of a condition prior to the mine fire (2013 or early) or post mine fire (2014 or later).

4.10.2. Imputation for missing values

In population surveys it is common to have missing data, which can sometimes lead to biased estimations if the reasons for the data to be missing are related to variables of interest. For most of variables in the Adult Survey data, the missing proportion was generally less than 1%, however the missing proportion for some multi-scaled instruments were as high as 5%. To obtain more accurate estimations and control for nonresponse bias, imputation procedures were incorporated in the analysis. A widely accepted approach to dealing with missing data is multiple imputation (MI). In many situations, MI produces more statistically valid results compared with other approaches that might be considered, such as mean imputation or complete-case analysis. MI is a technique that replaces each missing values with multiple sets of plausible values that are consistent with the observed data. Then each set of imputations is used to create multiple complete data sets and each of these is analysed separately. The results from each imputed data set are collected together and subsequently combined (averaged) to obtain valid statistical inference.

Multiple imputation by chained equations (MICE) was the method adopted. For health and respiratory outcomes, imputation and regression were carried out using Stata MI procedures. The imputation procedure operated by first fitting a set of imputation models, one regression model for each variable with any missing values (linear, logistic or multinomial logistic regression depending on the measurement scale of the variable being continuous, binary or multi-category respectively). The procedure was then repeated ten times to yield ten imputed datasets. Considering the small proportion of missing data and computational cost, only 10 imputed datasets were used.

Sensitivity analysis, for selected variables, identified that using 20 imputed datasets would not make any substantial difference in the eventual results. In the second stage, regression models were fitted with imputed datasets and results were combined and presented. For psychological outcomes with multiple sub-scales, MICE was carried out using a user-written package, which provided the ability to define use-specified chained equations. For each item, the imputation equation was reduced from including all other items to only include those items within the sub-scale and only the sum scores for other sub-scales. The estimation process is carried out the same as the MI procedure.
4.10.3. Assessment of sampling bias and weighting of participant results

*Sampling (participation or selection) bias* can occur if participants differ from non-participants (i.e. refusers and non-responders) on characteristics which are associated with the study outcomes, such as health status. A complete examination of sampling bias would require the collection of comprehensive and current health, demographics and mine-fire smoke exposure information for all of the non-participating study and comparison group subjects. Such comprehensive data were not available for non-participants. However, there are some data sources available which could be used to assess the extent to which the study participants were representative of the populations from which they were drawn.

These data sources included the Refuser Questionnaire data on gender, age, self-perceived health status and smoking status; the Australian Bureau of Statistics (ABS) 2011 Census data\(^{15}\) on age and gender in Morwell and Sale; the Victorian Population Health Survey 2011-12 data\(^ {16}\) on smoking status in Latrobe City and the Shire of Wellington; and the CSIRO modelled data on air pollution for each SA1 in Morwell for the period of the mine fire.

Based on the findings of the assessment for sampling bias, post-stratification weights will be developed and all further analyses will be conducted using weighted methods of estimation.

4.10.4. Comparison between Morwell and Sale participants

The first stage of analysis involved a cross-sectional comparison of the Morwell and Sale participants.

Differences in participant characteristics between Morwell and Sale are assessed for statistical significance using Pearson chi-squared tests for categorical measures and t-tests for continuous measures, with post-stratification weighting being applied. Where the distribution of a continuous variable was extremely skewed, the nonparametric Somers’ D statistic was used to compare groups\(^ {27}\). On a technical note, the Somers’ D was used because the equivalent but more widely used Wilcoxon rank-sum test is not available to be used with weighting in Stata.

Differences in the prevalence of pre-fire medical conditions in Morwell participants, relative to the Sale comparison group, were initially quantified as crude prevalence ratios (PR). Adjusted prevalence ratios (Adj PR) were then calculated using multivariable log binomial regression to control for known confounders such as age, gender, education, employment status, smoking and where appropriate, alcohol use. A technical issue encountered was that high prevalence of some health outcomes caused convergence issues with the log binomial regression model. In those cases the usual workaround was employed, that was to use Poisson regression model with robust error variance estimation.\(^ {28}\)

The difference between Morwell and Sale participants in incidence of health outcomes diagnosed after the fire (in 2014 or later) were quantified as crude rate ratios (RR) and adjusted rate ratios (Adj RR). Similar to the adjusted prevalence ratios, the adjusted rate ratios were obtained by fitting the log binomial regression and controlling for key confounders.

Continuous outcomes and sums of dichotomous or scaled items (e.g. Impact of Event Scale-Revised scores) were compared between Morwell and Sale participants using mean differences (mean diff) and adjusted mean differences (Adj mean diff) using multiple linear regression to control for key confounders.
Differences between groups in outcomes measured as categorical variables, were presented as crude and adjusted relative risk ratios (RRR) using multinomial logistic regression to control for key confounders.

4.10.5. Guide to interpreting the PR and RR

In these analyses the PR is a measure of the percentage of participants, with a self-reported medical condition which pre-dates the mine fire, in Morwell compared to Sale. In contrast the RR is a measure of the risk of a health outcome happening in the post-fire period, in Morwell participants compared to Sale participants.

A PR or a RR with a CI that includes the value one (e.g. a 95% CI of 0.80 to 1.2) means there is a 95% chance that no real difference exists between the two groups in terms of their risk of the measured health outcome. A PR or a RR with a CI lower limit that is greater than one (e.g. a 95% CI of 1.2 to 3.0) means there is at least a 95% chance that Morwell participants are at greater risk of the health outcome than the Sale comparison group. In contrast, a PR or RR with a CI upper limit that is less than one (e.g. a 95% CI of 0.25 to 0.90) means there is at least a 95% chance that Morwell participants are at lower risk of the health outcome than the Sale comparison group.

5. Results

5.1. Recruitment results

5.1.1. Recruitment from the VEC list

As described above, the VEC identified a study group of 9,448 adults residing in Morwell at the time of the mine fire. Of those, 435 were removed from the recruitment denominator because they were identified as being deceased (n=326) or as ineligible. Consequently the recruitment denominator for study group residents on the VEC list was 9,013.

The VEC identified a study group of 4,444 adults residing in the targeted areas of Sale at the time of the mine fire. Of those 238 were removed from the recruitment denominator because they were identified as being deceased (n=174) or as ineligible. Consequently the recruitment denominator for comparison group residents on the VEC list was 4,206.

<table>
<thead>
<tr>
<th>VEC list recruitment rate denominator</th>
<th>Morwell</th>
<th>Sale</th>
<th>Study total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=9013</td>
<td>N=4206</td>
<td>N=13219</td>
</tr>
<tr>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Participants</td>
<td>3096 (34%)</td>
<td>960 (23%)</td>
<td>4056 (31%)</td>
</tr>
<tr>
<td>Refusers</td>
<td>1170 (13%)</td>
<td>829 (20%)</td>
<td>1999 (15%)</td>
</tr>
<tr>
<td>Non-responders</td>
<td>4806 (53%)</td>
<td>2420 (58%)</td>
<td>7226 (55%)</td>
</tr>
</tbody>
</table>
Table 1 shows that a third (34%) of eligible Morwell residents on the VEC list, and almost a quarter (23%) of eligible Sale residents on the VEC list, participated in the Adult Survey. Overall one seventh (15%) declined participation, whilst the majority (55%) simply did not respond with a decision about participation during the study recruitment period.

Figure 12 shows the recruitment rates in Morwell for each of the mail out Areas 1 to 6 (as previously described in Figure 10) and also for those former Morwell residents who had moved out of the town. Residents who received their mailed invitations in the earlier mail outs had more time to participate than those who received their invitations later. The highest participation rate (40%) was in Area 3 which also happened to be the residential neighbourhood closest to the location of the mine fire. The lowest participation rate (20%) was for those residents who had moved out of Morwell, which likely reflected the more mobile nature of this group.

![Morwell recruitment rates](image-url)

**Figure 12 Adult Survey recruitment rate by mail-out Area for Morwell**
Figure 13 shows the recruitment rates in Sale for each of the mail-out Areas 1 to 5 (as described in Figure 11) and also for those former Sale residents who had moved out of the town. There was a gradual, though consistent, increase in participation rates over time, with the highest participation rate (27%) in mail-out Area 5 which received invitation packs last. In the lead up to the Adult Survey launch the Hazelwood Health Study, as a whole, had relatively less publicity in Sale than in Morwell. The pattern in recruitment across mail out Areas may reflect the fact that the Areas approached last had been exposed to several months of additional publicity by the time their invitation packs arrived; whereas Area 1 had been exposed to proportionately less publicity. However, the Areas targeted early also had the greatest amount of time to participate before recruitment closed. Consistent with the finding for the Morwell group, the lowest participation rate (12%) was for those residents who had moved out of Sale.

5.1.2. Recruitment of Morwell and Sale residents not listed in the VEC data

Whilst registration on the Electoral Roll is compulsory in Australia, there would have been a number of Morwell and Sale residents who were not listed in the VEC data for various reasons. Silent electors, whilst listed on the Electoral Roll, were also not included with the VEC data. However, these residents remained eligible to participate in the Adult Survey. Such residents did not receive personalised, mailed invitations to participate. Instead, it was hoped that some might respond to the additional recruitment strategies shown at section 4.6.
Termed “opt-ins”, 59 Morwell residents and three Sale residents, who were not included on the VEC list, participated in the Adult Survey.

5.1.3. Final number of participants and mode of participation

The final number of participants in the Adult Survey, adding those from the VEC list and the opt-ins, was 3,096 in Morwell and 960 in Sale.

Table 2 shows the proportions of Morwell and Sale participants by mode of Survey completion. The pattern of participation was very similar in the two study groups, with greater proportions of participants in both groups completing the Adult Survey by telephone (38%) or online (38%) and slightly smaller proportions participating on paper (24%).

Table 2 Percentage of participants completing the Adult Survey by telephone, online or on paper.

<table>
<thead>
<tr>
<th>Mode of participation</th>
<th>Morwell</th>
<th>Sale</th>
<th>Study total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of participants</td>
<td>N=3096</td>
<td>N=960</td>
<td>N=4027</td>
</tr>
<tr>
<td>n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone interview</td>
<td>1171 (38%)</td>
<td>377 (39%)</td>
<td>1548 (38%)</td>
</tr>
<tr>
<td>Online questionnaire</td>
<td>1181 (38%)</td>
<td>371 (39%)</td>
<td>1552 (38%)</td>
</tr>
<tr>
<td>Paper questionnaire</td>
<td>744 (24%)</td>
<td>212 (22%)</td>
<td>956 (24%)</td>
</tr>
</tbody>
</table>

5.2. Assessment of sampling bias

As described in 4.10.3, there were some data sources available which could be used to assess the extent to which the study participants were representative of the populations from which they were drawn.

5.2.1. Australian Bureau of Statistics data

Australian Bureau of Statistics (ABS) 2011 Census data provided population estimates by age and gender for the Morwell and Sale areas. The breakdown is shown in Table 3 alongside the Adult Survey participant proportions. Adult Survey participants in both the Morwell and Sale groups were more likely to be female and aged 50 or above, compared with the 2011 ABS estimates for the two towns respectively. That is, there was over-representation of women and older people participating in the Adult Survey, in both Morwell and Sale.

It is on the basis of these ABS data, that post-stratification weighting of Adult Survey participant results, by gender and 5-year age band, were applied. This weighting aimed to minimise any bias in health outcomes, which may have been caused by the over-representation of women and older people.
Table 3 ABS*2011 Census estimated adult resident population by age and gender for Morwell and Sale compared with Adult Survey participants

<table>
<thead>
<tr>
<th>Gender</th>
<th>Morwell</th>
<th>Census</th>
<th>Sale</th>
<th>Census</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>45%</td>
<td>48%</td>
<td>43%</td>
<td>45%</td>
</tr>
<tr>
<td>Female</td>
<td>55%</td>
<td>52%</td>
<td>57%</td>
<td>55%</td>
</tr>
</tbody>
</table>

Age Category

<table>
<thead>
<tr>
<th></th>
<th>Morwell</th>
<th>Census</th>
<th>Sale</th>
<th>Census</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>8%</td>
<td>25%</td>
<td>9%</td>
<td>28%</td>
</tr>
<tr>
<td>30-39</td>
<td>9%</td>
<td>16%</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>40-49</td>
<td>14%</td>
<td>17%</td>
<td>13%</td>
<td>17%</td>
</tr>
<tr>
<td>50-59</td>
<td>20%</td>
<td>16%</td>
<td>20%</td>
<td>16%</td>
</tr>
<tr>
<td>60-69</td>
<td>24%</td>
<td>13%</td>
<td>22%</td>
<td>11%</td>
</tr>
<tr>
<td>70+</td>
<td>25%</td>
<td>13%</td>
<td>27%</td>
<td>14%</td>
</tr>
</tbody>
</table>


As tobacco smoking is a major risk factor for cardiovascular and respiratory diseases, among others, it was important to know whether smokers were fairly represented amongst the participants. The breakdown of Adult Survey participants, by smoking status, are shown in Table 4 alongside Victorian Population Health Survey 2011-12 data for Latrobe City (which includes Morwell and several surrounding towns) and the Shire of Wellington (which includes Sale and several surrounding towns).

Compared with the pattern of smoking recorded in Latrobe City, Morwell participants were equally likely to be current smokers, more likely to be former smokers and less likely to be never smokers. Compared with the pattern of smoking recorded in Wellington Shire, Sale participants were less likely to be current smokers, slightly more likely to be former smokers and equally likely to be never smokers. The slight over-representation of former smokers amongst the Morwell participants, and under representation of current smokers amongst Sale participants, highlighted the importance of statistically adjusting for this health risk factor.

However an important limitation, to the use of the Latrobe City and Shire of Wellington data to assess sampling bias, is that the people across the wider municipality regions may not be completely representative of the non-participants in Morwell and Sale.

Table 4 Self-reported smoking status in Latrobe City and Shire of Wellington compared with Adult Survey participants

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Morwell participants N=3096</th>
<th>Latrobe City* N=42068</th>
<th>Sale participants N=960</th>
<th>Shire of Wellington* N=73788</th>
<th>χ² p-value</th>
<th>χ² p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smoker</td>
<td>19%</td>
<td>20%</td>
<td>14%</td>
<td>19%</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Former smoker</td>
<td>32%</td>
<td>26%</td>
<td>33%</td>
<td>28%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>49%</td>
<td>54%</td>
<td>52%</td>
<td>53%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2.2. Exposure to the mine fire smoke

As part of the Hazelwood Health Study, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Oceans & Atmosphere Flagship have modelled hourly and 12-hourly cumulative exposure to air pollution particles smaller than 2.5 micrometres (μm; PM$_{2.5}$) for all SA1s in Morwell for the period of the mine fire. A report describing this air quality modelling is available at http://hazelwoodhealthstudy.org.au/study-findings/study-reports/.

By mapping each Adult Survey participant’s residential address (at the time of the mine fire) to the SA1s, the CSIRO modelled data could be used to assess whether participants were representative of the wider Morwell population in regard to their likely mine fire exposure.

Figure 14 shows the Adult Survey participation rates in the various SA1s across Morwell and also the cumulative 12 hourly PM$_{2.5}$ exposure level modelled for those SA1s. In general, participation rates were slightly higher among residents in the areas to the south of Morwell which were most highly exposed to the mine fire smoke. That may mean that more highly exposed residents were over represented amongst the Morwell-based Adult Survey participants, which may result in the study slightly over-estimating the average difference in health between the Morwell and Sale groups.

Whilst this slight over-representation of highly exposed residents cannot be adjusted for in these analyses, future analyses will aim to evaluate any association between modelled level of air pollution exposure with health impacts within the Morwell study group.

Figure 14 Adult Survey participation rate by CSIRO modelled cumulative 12 hourly PM$_{2.5}$ exposure
5.2.3. Refuser Questionnaire data

The Refuser Questionnaire was completed by 358 refusers; 235 from Morwell and 123 from Sale. This provided a further source of information from which to assess the representativeness of participants.

As shown in Table 5 participants in Morwell were very similar to those non-participants in Morwell who completed the Refuser Questionnaire, in regard to gender and self-perceived health. However, Morwell participants were more likely to be aged in their 20s to 50s, less likely to be aged over 70, and more likely to be current smokers than these non-participants.

Participants in Sale were more likely to be male, more likely to be aged 20 to 59, less likely to be aged over 70, more likely to rate their health as good and less likely to rate it as fair or poor, and more likely to be current smokers than non-participants in Sale who completed the Refuser Questionnaire.

Because the most elderly residents and current smokers were underrepresented in both groups of participants these factors were unlikely to notably effect the magnitude or direction of any observed differences in health outcomes between study groups.

It was encouraging to observe that Morwell participants reported a similar pattern, of self-perceived health, as Morwell non-participants. If people with poor health were over-represented in the Morwell participants, that would artificially inflate the observed differences between the two groups. In contrast, the slight over-representation of Sale participants in good health may reduce the observed differences between the two groups. The underrepresentation of women among Sale participants, which was not reflected in the Morwell participants, could also possibly effect the magnitude or direction of differences in health outcomes between study groups. For this reason it was important to adjust for gender as a potential confounder in the statistical analyses.

An important limitation, in regard to the use of Refuser Questionnaire data to assess sampling bias, is that the people who complete the Refuser Questionnaire may not themselves be representative of the remaining non-participant group. For example, people who completed the Refuser Questionnaire were often those with publically listed landline phone numbers and therefore, they may have been older residents at long-term addresses.

<p>| Table 5 Comparison of participants with non-participants who completed a Refuser Questionnaire |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Question                                    | Participant N=3096 | Morwell Refuser N=235 | Participants N=960 | Sale Refuser N=123 |                      |
|                                              | n (%)            | n (%)            | χ² p-value       | n (%)           | χ² p-value       |
| Gender                                      |                  |                  |                  |                  |                  |
| Male                                        | 1389 (45%)       | 105 (45%)        | 0.914            | 410 (43%)       | 0.085            |
| Female                                      | 1705 (55%)       | 127 (55%)        |                  | 550 (57%)       |                  |
| Age Category                                |                  |                  | &lt;0.001           |                  | &lt;0.001           |
| 18-29                                       | 243 (8%)         | 13 (6%)          |                  | 85 (9%)         |                  |
| 30-39                                       | 270 (9%)         | 5 (2%)           |                  | 94 (10%)        |                  |
| 40-49                                       | 417 (13%)        | 14 (6%)          |                  | 127 (13%)       |                  |</p>
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-59</td>
<td>630 (20%)</td>
<td>28 (12%)</td>
<td>189 (20%)</td>
<td>19 (16%)</td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td>748 (24%)</td>
<td>50 (22%)</td>
<td>208 (22%)</td>
<td>24 (20%)</td>
<td></td>
</tr>
<tr>
<td>70+</td>
<td>782 (25%)</td>
<td>116 (51%)</td>
<td>257 (27%)</td>
<td>60 (50%)</td>
<td></td>
</tr>
</tbody>
</table>

**In general would you say your health is:**

<table>
<thead>
<tr>
<th>Health Status</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>263 (9%)</td>
</tr>
<tr>
<td>Very good</td>
<td>800 (26%)</td>
</tr>
<tr>
<td>Good</td>
<td>1087 (35%)</td>
</tr>
<tr>
<td>Fair</td>
<td>659 (21%)</td>
</tr>
<tr>
<td>Poor</td>
<td>266 (9%)</td>
</tr>
</tbody>
</table>

**Smoking status**

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>Current Smoker</th>
<th>Former Smoker</th>
<th>Occasional</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smoker</td>
<td>516 (17%)</td>
<td>992 (32%)</td>
<td>60 (2%)</td>
<td>1495 (49%)</td>
</tr>
<tr>
<td>Former smoker</td>
<td>24 (11%)</td>
<td>79 (36%)</td>
<td>25 (11%)</td>
<td>90 (41%)</td>
</tr>
<tr>
<td>Occasional</td>
<td>126 (13%)</td>
<td>315 (33%)</td>
<td>10 (1%)</td>
<td>498 (52%)</td>
</tr>
<tr>
<td>Never</td>
<td>11 (9%)</td>
<td>44 (38%)</td>
<td>4 (3%)</td>
<td>58 (50%)</td>
</tr>
</tbody>
</table>
5.3. Health-related risk factors

5.3.1. Demographic measures

<table>
<thead>
<tr>
<th>Participant characteristics</th>
<th>Morwell N=3096</th>
<th>Sale N=960</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>Weighted %</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1389</td>
<td>45%</td>
<td>48%</td>
</tr>
<tr>
<td>Female</td>
<td>1705</td>
<td>55%</td>
<td>52%</td>
</tr>
<tr>
<td>Age Category</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>243</td>
<td>8%</td>
<td>17%</td>
</tr>
<tr>
<td>30-39</td>
<td>270</td>
<td>9%</td>
<td>15%</td>
</tr>
<tr>
<td>40-49</td>
<td>417</td>
<td>13%</td>
<td>18%</td>
</tr>
<tr>
<td>50-59</td>
<td>630</td>
<td>20%</td>
<td>17%</td>
</tr>
<tr>
<td>60-69</td>
<td>748</td>
<td>24%</td>
<td>16%</td>
</tr>
<tr>
<td>70+</td>
<td>782</td>
<td>25%</td>
<td>19%</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td>1852</td>
<td>60%</td>
<td>57%</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>398</td>
<td>13%</td>
<td>11%</td>
</tr>
<tr>
<td>Widowed</td>
<td>309</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>Single/never married</td>
<td>508</td>
<td>17%</td>
<td>24%</td>
</tr>
<tr>
<td>Country at birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>2460</td>
<td>80%</td>
<td>85%</td>
</tr>
<tr>
<td>Other</td>
<td>632</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>Language usually spoken in household</td>
<td>2815</td>
<td>91%</td>
<td>93%</td>
</tr>
<tr>
<td>English</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>276</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Aboriginal or Torres Strait Islander</td>
<td>30</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Yes</td>
<td>30</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>No</td>
<td>3025</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>Highest educational qualification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to year 10</td>
<td>1006</td>
<td>33%</td>
<td>27%</td>
</tr>
<tr>
<td>Year 11-12</td>
<td>668</td>
<td>22%</td>
<td>24%</td>
</tr>
<tr>
<td>Certificate/Diploma</td>
<td>996</td>
<td>33%</td>
<td>34%</td>
</tr>
<tr>
<td>Tertiary degree</td>
<td>385</td>
<td>13%</td>
<td>15%</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid employment</td>
<td>1311</td>
<td>43%</td>
<td>51%</td>
</tr>
<tr>
<td>Student/volunteer/home-duties/retired</td>
<td>1368</td>
<td>45%</td>
<td>35%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>139</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Unable to work</td>
<td>239</td>
<td>8%</td>
<td>7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean</th>
<th>Weighted mean</th>
<th>Weighted SD</th>
<th>Mean</th>
<th>Weighted mean</th>
<th>Weighted SD</th>
<th>p-value</th>
</tr>
</thead>
</table>

Hazelwood Health Study Adult Survey, Volume 1 Comparison of Morwell and Sale. v1.1 30 August 2017
Hazelwood Health Study Senior Project Manager Page 37
The demographic characteristics of Morwell and Sale participants are shown in Table 6. Although females were over-represented in both samples, after weighting there was no significant difference in the gender balance between Morwell and Sale. Younger participants were under-represented, but after weighting, there was no significant difference in age distribution between Morwell and Sale either. Morwell participants were significantly less likely than Sale participants to be married or in de facto relationships and more likely to be single or never married. Morwell participants were significantly more likely than Sale participants to have been born outside of Australia. Only very small numbers of Aboriginals or Torres Strait Islanders participated in the Adult Survey. Morwell participants were also significantly less educated than Sale participants, also significantly less likely to be in paid employment and more likely to be unemployed or unable to work. On average, Morwell participants had lived in Gippsland for three years longer than Sale participants.

5.3.2. Tobacco and passive smoke exposure

Table 7 Tobacco and passive smoke exposure in Morwell and Sale participants

<table>
<thead>
<tr>
<th>Cigarette smoke exposure</th>
<th>Morwell</th>
<th>Sale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking status</td>
<td>N=3096</td>
<td>N=960</td>
</tr>
<tr>
<td>Current smoker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>516</td>
<td>126</td>
</tr>
<tr>
<td>%</td>
<td>17%</td>
<td>13%</td>
</tr>
<tr>
<td>Weighted %</td>
<td>18%</td>
<td>13%</td>
</tr>
<tr>
<td>P-value</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Former smoker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>992</td>
<td>315</td>
</tr>
<tr>
<td>%</td>
<td>32%</td>
<td>33%</td>
</tr>
<tr>
<td>Weighted %</td>
<td>28%</td>
<td>28%</td>
</tr>
<tr>
<td>Occasional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1495</td>
<td>498</td>
</tr>
<tr>
<td>%</td>
<td>49%</td>
<td>52%</td>
</tr>
<tr>
<td>Weighted %</td>
<td>51%</td>
<td>58%</td>
</tr>
<tr>
<td>Passive smoke exposure among never smokers</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>No exposure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>990</td>
<td>302</td>
</tr>
<tr>
<td>%</td>
<td>66%</td>
<td>61%</td>
</tr>
<tr>
<td>Weighted %</td>
<td>71%</td>
<td>65%</td>
</tr>
<tr>
<td>Tobacco smoke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>93</td>
<td>20</td>
</tr>
<tr>
<td>%</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Weighted %</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Wood or briquette heater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>408</td>
<td>176</td>
</tr>
<tr>
<td>%</td>
<td>27%</td>
<td>35%</td>
</tr>
<tr>
<td>Weighted %</td>
<td>23%</td>
<td>30%</td>
</tr>
</tbody>
</table>

*Estimated using nonparametric statistics Somers’ D corresponding to rank-sum tests

After weighting for age and gender, Morwell participants were significantly more likely than Sale participants to be current smokers and less likely to have never smoked (Table 7). These findings highlighted the importance of statistically adjusting for smoking status when measuring differences.
in respiratory health between the two groups. Amongst never-smokers, Morwell participants were slightly more likely to have been exposed to passive smoke from other smokers in the household, but less likely to be exposed to passive smoke from wood or briquette heaters. Amongst smokers, there was no difference of note between groups in regard to median pack years of smoking.

5.3.3. Alcohol use

After weighting for age and gender, Table 8 shows that Morwell participants reported drinking alcohol significantly less frequently than Sale participants. Morwell participants were also significantly less likely to be categorised as risky drinkers on the AUDIT-C. These findings highlighted the importance of statistically adjusting for alcohol use, which is an important risk factor for cardiovascular health and psychological health. There were no differences between the groups in regard to the number of alcoholic drinks on a standard day or the frequency of having six drinks or more on one occasion.

<table>
<thead>
<tr>
<th>AUDIT-C alcohol use</th>
<th>Morwell N=3096</th>
<th>%</th>
<th>Weighted %</th>
<th>Sale N=960</th>
<th>%</th>
<th>Weighted %</th>
<th>Weighted p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency of having a drink</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Never</td>
<td>830</td>
<td>27%</td>
<td>25%</td>
<td>219</td>
<td>23%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Monthly or less</td>
<td>868</td>
<td>29%</td>
<td>32%</td>
<td>221</td>
<td>23%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>2 to 4 times per month</td>
<td>484</td>
<td>16%</td>
<td>17%</td>
<td>153</td>
<td>16%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>2 to 4 times per week</td>
<td>486</td>
<td>16%</td>
<td>16%</td>
<td>190</td>
<td>20%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>4 or more times per week</td>
<td>361</td>
<td>12%</td>
<td>9%</td>
<td>159</td>
<td>17%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td><strong>Amongst drinkers: number of drinks on a standard day</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.634</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 or 2</td>
<td>1449</td>
<td>67%</td>
<td>62%</td>
<td>462</td>
<td>64%</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>3 or 4</td>
<td>418</td>
<td>19%</td>
<td>22%</td>
<td>149</td>
<td>21%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>5 or 6</td>
<td>193</td>
<td>9%</td>
<td>10%</td>
<td>75</td>
<td>10%</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>7 to 9</td>
<td>57</td>
<td>3%</td>
<td>3%</td>
<td>19</td>
<td>3%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>10 or more</td>
<td>40</td>
<td>2%</td>
<td>2%</td>
<td>15</td>
<td>2%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td><strong>Amongst drinkers: frequency of having six drinks or more on one occasion</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.666</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1254</td>
<td>57%</td>
<td>49%</td>
<td>389</td>
<td>54%</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>Less than monthly</td>
<td>545</td>
<td>25%</td>
<td>30%</td>
<td>186</td>
<td>26%</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Monthly</td>
<td>206</td>
<td>9%</td>
<td>12%</td>
<td>76</td>
<td>11%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Weekly</td>
<td>154</td>
<td>7%</td>
<td>8%</td>
<td>58</td>
<td>8%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Daily or almost daily</td>
<td>42</td>
<td>2%</td>
<td>2%</td>
<td>13</td>
<td>2%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td><strong>Amongst drinkers: proportion scoring above and below threshold</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low risk drinker</td>
<td>1087</td>
<td>50%</td>
<td>50%</td>
<td>302</td>
<td>42%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>High risk drinker</td>
<td>1067</td>
<td>50%</td>
<td>50%</td>
<td>418</td>
<td>58%</td>
<td>59%</td>
<td></td>
</tr>
</tbody>
</table>
5.3.4. Stressful life events

As shown in Table 9, more than 60% of Morwell and Sale participants reported that they had experienced at least one of the 11 stressful life events included in the CIDI v2.1 PTSD module. Further, approximately one quarter of Morwell and Sale participants reported that they had experienced three or more of the 11 stressful life events. The two groups did not differ on these measures.

Table 9 Number of stressful life events reported by Morwell and Sale participants

<table>
<thead>
<tr>
<th>Stressful life events</th>
<th>Morwell</th>
<th>Sale</th>
<th>RRR</th>
<th>Adj RRR* 95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>34%</td>
<td>36%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>One or two</td>
<td>38%</td>
<td>40%</td>
<td>1.11</td>
<td>0.99 (0.81,1.23)</td>
<td>0.957</td>
</tr>
<tr>
<td>Three or more</td>
<td>28%</td>
<td>24%</td>
<td>0.81</td>
<td>1.12 (0.89,1.41)</td>
<td>0.319</td>
</tr>
</tbody>
</table>

*Adjusted for age, gender, education, employment, drinking and smoking

5.4. Self-perceived general health

As shown in Table 10, and graphically presented in Figure 15, there was a statistically significant difference between Morwell and Sale participants on self-perceived general health status. Morwell participants were more likely to report their health to be poor or fair, and less likely to report their health to be excellent or very good.

Table 10 Self perceived health status in Morwell and Sale participants

<table>
<thead>
<tr>
<th>Self-perceived general health</th>
<th>Morwell N=3096</th>
<th>Sale N=4229</th>
<th>Weighted p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In general would you say your health is:</td>
<td>n</td>
<td>%</td>
<td>Weighted %</td>
</tr>
<tr>
<td>Excellent</td>
<td>263</td>
<td>9%</td>
<td>12%</td>
</tr>
<tr>
<td>Very good</td>
<td>800</td>
<td>26%</td>
<td>28%</td>
</tr>
<tr>
<td>Good</td>
<td>1087</td>
<td>35%</td>
<td>34%</td>
</tr>
<tr>
<td>Fair</td>
<td>659</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>Poor</td>
<td>266</td>
<td>9%</td>
<td>7%</td>
</tr>
</tbody>
</table>
5.5. Self-reported doctor-diagnosed medical conditions

Data on self-reported, doctor-diagnosed medical conditions are summarised in Table 11. In the pre-mine fire period, an increased prevalence of high cholesterol and angina, and a decreased prevalence of arrhythmia, was reported by Morwell participants relative to Sale participants. Other pre-mine fire prevalences of medical conditions were similar between the two towns, after statistical adjustment for age, gender, education, employment, drinking and smoking.

In contrast there were statistically significant increases, in post-mine fire diagnoses of high blood pressure and heart attack, in Morwell relative to Sale. Morwell participants reported a 40% greater likelihood of having high blood pressure diagnosed, and a nearly seven-fold increase in likelihood of heart attack. However, for the latter estimate, absolute numbers were very small, meaning that this heart attack finding should be interpreted with caution.

Most of the other medical conditions, included in Table 10, were also in the direction of increased risk for Morwell participants in the post-mine fire period, except for angina. Those findings, however, did not reach statistical significance.
### Table 11 Self-reported doctor-diagnosed medical conditions first diagnosed prior to the mine fire (2013 or earlier) or post mine fire (2014 or later)

<table>
<thead>
<tr>
<th>Medical Condition</th>
<th>First diagnosed in 2013 or early</th>
<th>First diagnosed in 2014 or later</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Morwell participants</td>
<td>Sale participants</td>
</tr>
<tr>
<td></td>
<td>Weighted %</td>
<td>Weighted %</td>
</tr>
<tr>
<td>High blood pressure / hypertension</td>
<td>30.7</td>
<td>28.6</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>24.9</td>
<td>19.8</td>
</tr>
<tr>
<td>Angina</td>
<td>3.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Heart attack</td>
<td>4.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Irregular heart rhythm / arrhythmia</td>
<td>8.1</td>
<td>10.2</td>
</tr>
<tr>
<td>Other heart diseases</td>
<td>1.2</td>
<td>1.8</td>
</tr>
<tr>
<td>Stroke</td>
<td>2.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Any cardiovascular diseases</td>
<td>15.1</td>
<td>15.3</td>
</tr>
<tr>
<td>Cancer</td>
<td>6.5</td>
<td>7.0</td>
</tr>
<tr>
<td>Diabetes</td>
<td>9.2</td>
<td>7.5</td>
</tr>
</tbody>
</table>

* Estimation based on log Poisson model; ^ Adjusted for age, gender, education, employment, drinking and smoking.
5.6. Self-reported respiratory health symptoms and conditions

Self-reported respiratory symptoms and conditions are presented in Table 12.

Table 12 Self-reported respiratory symptoms and conditions in Morwell and Sale participants

<table>
<thead>
<tr>
<th>Respiratory symptom or condition</th>
<th>Morwell participants</th>
<th>Sale participants</th>
<th>RR</th>
<th>Adj RR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weighted %</td>
<td>Weighted %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current wheeze</td>
<td>42.4%</td>
<td>25.8%</td>
<td>1.64</td>
<td>1.52 (1.33, 1.73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Chest tightness</td>
<td>26.8%</td>
<td>16.4%</td>
<td>1.63</td>
<td>1.48 (1.23, 1.79)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nocturnal shortness of breath</td>
<td>20.0%</td>
<td>11.4%</td>
<td>1.75</td>
<td>1.55 (1.26, 1.92)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Resting shortness of breath</td>
<td>20.3%</td>
<td>8.9%</td>
<td>2.27</td>
<td>1.94 (1.50, 2.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asthma diagnosed 2013 or prior</td>
<td>25.7%</td>
<td>23.2%</td>
<td>1.11</td>
<td>1.13* (0.96, 1.34)</td>
<td>0.140</td>
</tr>
<tr>
<td>Asthma diagnosed 2014 or later</td>
<td>1.9%</td>
<td>0.6%</td>
<td>3.49</td>
<td>3.71 (1.53, 8.98)</td>
<td>0.004</td>
</tr>
<tr>
<td>Current Asthma</td>
<td>11.5%</td>
<td>7.4%</td>
<td>1.56</td>
<td>1.46 (1.10, 1.94)</td>
<td>0.009</td>
</tr>
<tr>
<td>Chronic cough</td>
<td>30.9%</td>
<td>17.4%</td>
<td>1.78</td>
<td>1.60 (1.37, 1.86)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Chronic phlegm</td>
<td>25.3%</td>
<td>15.1%</td>
<td>1.67</td>
<td>1.41 (1.18, 1.69)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nasal &amp; eye symptoms</td>
<td>31.5%</td>
<td>22.7%</td>
<td>1.39</td>
<td>1.35 (1.16, 1.57)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nasal symptoms</td>
<td>49.6%</td>
<td>41.5%</td>
<td>1.19</td>
<td>1.18 (1.07, 1.30)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Current nasal symptoms</td>
<td>44.3%</td>
<td>35.4%</td>
<td>1.25</td>
<td>1.23 (1.10, 1.37)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Amongst asthmatics: symptom severity score

<table>
<thead>
<tr>
<th></th>
<th>Weighted mean (SD)</th>
<th>Weighted mean (SD)</th>
<th>Mean diff</th>
<th>Adj mean diff (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.64 (2.06)</td>
<td>2.85 (1.84)</td>
<td>0.79</td>
<td>0.58 (0.25, 0.90)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* This pre-mine difference is measured as a PR

After adjustment for age, gender, employment, education and smoking, participants from Morwell were significantly more likely than those from Sale to report current wheeze, chest tightness, nocturnal and resting shortness of breath and current asthma. Whilst there was little difference in asthma diagnosed 2013 or prior, the risk was increased almost fourfold among Morwell participants from 2014. The modified mean symptom severity score was significantly higher among Morwell participants with asthma compared to those from Sale. Chronic cough and phlegm, nasal and eye symptoms were also significantly more likely to be reported by Morwell participants.
5.7. Psychological wellbeing

Data on self-reported, doctor-diagnosed psychological conditions are summarised in Table 13. Prior to the mine fire event, there were no statistically significant differences between Morwell and Sale in terms of self-reported diagnoses of anxiety, depression, PTSD, other mental health conditions or any mental health condition. However following the mine fire, Morwell residents were more than three times more likely to be diagnosed with PTSD, although this did not quite reach statistical significance and was reported by a very small proportion of participants.

<table>
<thead>
<tr>
<th>Psychological Condition</th>
<th>First diagnosed in 2013 or earlier</th>
<th>First diagnosed in 2014 or later</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Morwell</td>
<td>Sale</td>
</tr>
<tr>
<td>Anxiety</td>
<td>19.9</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Depression</td>
<td>22.4</td>
<td>21.3</td>
</tr>
<tr>
<td></td>
<td>4.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Posttraumatic stress disorder</td>
<td>4.5</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Other mental health conditions</td>
<td>3.2</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Any mental health conditions</td>
<td>28.9</td>
<td>26.4</td>
</tr>
<tr>
<td></td>
<td>7.5</td>
<td>5.6</td>
</tr>
</tbody>
</table>

*Estimation based on log Poisson model; ^Adjusted for age, gender, education, employment, drinking and smoking
Results for the IES-R and K10 are shown in Table 14. Morwell participants scored significantly higher than Sale participants on all three subscales of the IES-R, as well as on the total score, indicating increased mine-fire-related stress in the previous week. Morwell participants also reported significantly higher K10 scores, indicating greater levels of psychological distress, compared to Sale participants.

Table 14 IES-R and K10 scores for Morwell and Sale participants

<table>
<thead>
<tr>
<th>Psychological Wellbeing measure</th>
<th>Morwell</th>
<th>Sale</th>
<th>Mean diff</th>
<th>Adj mean* diff (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrusion (range 0-32)</td>
<td>3.88 (6.23)</td>
<td>0.64 (2.43)</td>
<td>3.25</td>
<td>2.94 (2.65, 3.24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoidance (range 0-32)</td>
<td>3.43 (5.77)</td>
<td>0.72 (2.55)</td>
<td>2.71</td>
<td>2.44 (2.15, 2.73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hyperarousal (range 0-24)</td>
<td>2.47 (4.69)</td>
<td>0.30 (1.58)</td>
<td>2.16</td>
<td>1.91 (1.70, 2.12)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total score (range 0-88)</td>
<td>9.84 (15.70)</td>
<td>1.78 (6.18)</td>
<td>8.06</td>
<td>7.28 (6.53, 8.02)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>K10 score</td>
<td>16.62 (8.09)</td>
<td>14.06 (6.35)</td>
<td>2.56</td>
<td>2.08 (1.51, 2.64)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* Adjusted for age, gender, education, employment, drinking and smoking
6. Discussion

This volume of Hazelwood Health Study Adult Survey findings sought to determine whether Morwell adults, who were heavily exposed to smoke from the Hazelwood mine fire, have adverse cardiovascular, respiratory or psychological conditions or symptoms compared to Sale adults, who were minimally exposed.

Recruitment and sampling bias

Substantial resources were invested in multiple strategies aimed at optimising contact and recruitment of eligible participants. Consequently, recruitment rates of 33% for Morwell, and 23% for Sale, were achieved. Whilst the researchers had hoped for a greater response from the two communities, these rates would be considered satisfactory relative to other population health surveys. For example, Sinclair et al. 29 tested a number of different recruitment methods for a community-based survey. They achieved response rates which ranged from as low as 2% to 30%. Tran et al. 30 only achieved a 10% recruitment rate for their Australian community trial of vitamin D supplementation.

The high rate of non-participation in the Adult Survey rendered the results vulnerable to sampling (participation or selection) bias. This occurs when participants differ in important ways, such as health status, from the larger population they represent. Comparisons with local community data, showed that both the Morwell and Sale samples appeared to exhibit biases towards women and older people having higher response rates. These are commonly encountered trends for population-based surveys in general. Importantly the direction and strength of the bias appeared very similar for the two communities, which meant that gender and age were unlikely to affect the strength or direction of the results observed in this study. Weighting of results to account for differences between participants and non-participants in gender and age, further minimised the possible bias conferred by these factors and promoted confidence in the findings.

Recent international research indicates that participation bias is unlikely to significantly affect the results of associations or multivariate analyses. 31 For example, the next phase of Adult Survey analyses, which involves examining any associations between estimated exposure to the mine fire smoke, and subsequent health outcomes within Morwell participants, should not be affected.

Another comparison, between participants and non-participants, indicated that smokers were somewhat fairly represented amongst participants in both groups, with slight over-representation of former smokers from Morwell, and under representation of current smokers from Sale. As cigarette smoking is a major contributor to both respiratory and cardiovascular disease, smoking status and estimated pack years of smoking were included in the Adult Survey questionnaire as were other health-related risk factors.

Determinants of health other than the mine fire

In Australia, almost one third of ill health, disability and premature deaths can be attributed to lifestyle health risk factors. 32 Therefore, it was important that the Adult Survey assessed likely determinants of health other than the Hazelwood mine fire. The health risk factors that were measured included socioeconomic indices (eg. employment status, marital status and education), tobacco and passive smoke exposure, alcohol use, exposure to traumatic life events and previous medical history.

Compared with Sale, it was observed that the Morwell participants were slightly more likely to be unemployed or unable to work, less highly educated, more likely to be current smokers, but less likely to be risky drinkers. It was important to be confident that differences in cardiovascular, respiratory and psychological health outcomes, observed between Morwell and Sale, were not related to these health risk factors. Therefore statistical adjustments for these core confounders, along with gender and age, were applied throughout the analyses.
Morwell and Sale participants were equally likely to report traumatic life events, so that risk factor was unlikely to be contributing to the differences in psychological health outcomes, observed between the two groups. Where applicable previous medical history was also assessed, with those findings discussed below.

Self-perceived general health status

Morwell participants were more likely, than Sale participants, to report their health to be poor or fair, and less likely to report their health to be excellent or very good. In an additional comparison of Morwell responses with AIHW population data for Australia’s most disadvantaged citizens,\(^2\) Morwell participants were also less likely to report their health status as excellent or very good (40% Morwell, 46% AIHW), and more likely to report their health status as fair or poor (26% Morwell, 23.5% AIHW). Self-assessed health status is not only a consequence of previous adverse health but also a good predictor of subsequent illness, future health care and premature mortality.\(^3\)

Cardiovascular health

The findings based on self-reported, doctor-diagnosed medical conditions indicated that, prior to the mine fire, there was already an increased prevalence of high cholesterol and angina in Morwell relative to Sale, but a decreased prevalence of angina. Prevalences, of other pre-existing cardiovascular conditions, were similar in the two towns. However since the mine fire, Morwell participants were at higher risk of having high blood pressure and heart attack diagnosed, by 1.5-fold and nearly seven-fold, respectively. While the finding for heart attack appeared striking, it should be noted that the numbers of people affected were very small: 1% versus 0.1%. More definitive information about the risk of cardiovascular disease conferred by the mine fire will be provided by the cardiovascular sub-study of the HHS Adult Survey which will be collecting data in the 2\(^{nd}\) half of 2017.

Respiratory health

All respiratory symptoms in the last 12 months were significantly more common among Morwell than Sale participants, after adjusting for age, gender, employment, education and smoking. The risk of post-mine fire self-reported doctor-diagnosed asthma appeared to be significantly increased. Furthermore, symptoms were more severe among asthmatics from Morwell compared with those from Sale. The risks of irritant symptoms from the chest and nose consistent with chronic bronchitis and rhinitis were also significantly higher among Morwell than Sale participants.

### Table 15 Prevalence of respiratory symptoms in other Australian research

<table>
<thead>
<tr>
<th>Symptom / Condition</th>
<th>Young adults (20-44yo)(^{24})</th>
<th>Middle aged and older adults (45-70yo)(^{25})</th>
<th>Adults &gt; 40yo(^{36})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeze</td>
<td>28.1%</td>
<td>20.5%</td>
<td>30%</td>
</tr>
<tr>
<td>Nocturnal chest tightness</td>
<td>20.5%</td>
<td>14.2%</td>
<td>-</td>
</tr>
<tr>
<td>Asthma</td>
<td>17.4%*</td>
<td>12.5% †</td>
<td>18.0%‡</td>
</tr>
<tr>
<td>Current asthma</td>
<td>9.7%</td>
<td>6.7%</td>
<td>-</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>-</td>
<td>12.0%</td>
<td>7.4%</td>
</tr>
<tr>
<td>COPD GOLD Stage II+</td>
<td>-</td>
<td>6.8%</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

* ECRHS definition † Wheeze + BHR ‡ Asthma ever

However, the prevalence of respiratory symptoms such as wheeze and nocturnal chest tightness, and current asthma in Sale was similar to our previous research in Melbourne and elsewhere in Australia, summarised in Table 15. The prevalence of chronic bronchitis (chronic cough and phlegm) appeared a little higher in Sale than Melbourne. It will not be possible to comment on objective evidence of chronic obstructive pulmonary disease (COPD) until lung function testing has been completed as part of the HHS Adult Survey respiratory sub-study. That research stream will be collecting data in the 2\(^{nd}\) half of 2017.
Psychological health

The Adult Survey included a number of measures of psychological wellbeing, including a measure of distress specifically linked to the mine fire event (IES-R) as well as a general measure of current distress (K10). Morwell residents reported higher levels of distress for the total IES-R score as well as all three subscales relating to the occurrence of intrusive thoughts, avoidance behaviours and hyperarousal. The average IES-R score, for Morwell participants, was 9.84 which is below any of the proposed thresholds for PTSD,\(^{10-12}\) suggesting that the impact on psychological wellbeing was moderate. However the increase in this measure is not surprising given the feedback we have had from community members via the qualitative components of the Older People, Community Wellbeing and Schools Study research programs regarding how concerned residents continue to be about the smoke event. While average IES-R scores in Morwell were below clinical levels, further analysis within the Morwell group is necessary to identify the most vulnerable sub-groups. That further analysis will address the core HHS research questions regarding the development and persistence of psychological distress, including the role of exposure to the mine fire smoke, sociodemographic, and other factors.

Morwell participants also reported significantly higher general distress levels in the past month on the K10, that being more than two years after the smoke event and on a measure not specifically linked to the smoke event. While the adjusted mean difference between Morwell and Sale participants was only two points, at 16.62 the average for Morwell was just over the published ABS cut-off of 16 for moderate distress.\(^{18}\) Like the IES-R results, further analysis is necessary to identify the high scorers on the K10 and examine the relationship with other factors.

Furthermore, Morwell participants were over three times more likely to report a diagnosis of PTSD following the mine fire event than were Sale participants. There was also a non-significant trend towards higher levels of anxiety and depression. Prior to the mine fire event, there were no significant differences between Morwell and Sale participants in terms of self-reported diagnosis of mental health conditions, nor was there a difference in the lifetime number of stressful life events. This suggests that the two groups were comparable in terms of their mental health history prior to the mine fire and this lends weight to the argument that there has been an impact on psychological health since the event.

As with the cardiovascular and respiratory findings, the psychological health findings will be complemented by interviews to be conducted as part of the HHS Adult Survey Psychological sub study which is planned for the 2\(^{nd}\) half of 2017.

Strengths and limitations

The Adult Survey had various strengths which gave confidence to the observed findings, but also some limitations which affected interpretation. An important strength was the inclusion of a comparison group of adults, from selected areas of Sale, who were similar to the Morwell adults in terms of their regional location and socio-economic indices, but differed in regard to the primary exposure of interest, that being exposure to the mine fire smoke. The Sale participants provided an important bench-mark against which the health of the Morwell participants could be usefully compared.

The Adult Survey findings were further strengthened by the availability of gender and age information, at the community level, allowing for appropriate weighting of results so that the impact of those important confounders could be minimised. Additional statistical adjustments for gender, age, education, employment, smoking and alcohol, also mitigated the potential confounding effects of important health risk factors and increased confidence that the findings were associated with smoke exposure.
A methodological limitation, of the Adult Survey, was the reliance on self-reported health measures. Such measures could render the results vulnerable to differential recall/reporting bias.\textsuperscript{37} For example, this might occur if \textit{exposed} participants had a heightened awareness of symptoms and therefore, reported them more frequently relative to \textit{unexposed} comparison participants whose health was otherwise the same. The Adult Survey design aimed to minimise the risk of differential recall bias in several ways: Firstly, validated health questionnaires were utilised where possible. Secondly, consent was obtained from participants to link to administrative health datasets, such as ambulance and emergency presentations and hospital admissions. Analyses of these more objectively collected measures of health, which should be less prone to recall bias, are still to be conducted. Finally, future analyses will also compare similarly exposed Morwell adults with each other, to eliminate differential recall bias which might be influenced by exposure level. That analysis should be less prone to differential recall bias and will aim to investigate whether sub-groups of similarly exposed participants are more vulnerable than others to health impacts.

\textbf{Conclusion}

This analysis of the HHS Adult Survey provides the first available evidence of current adverse cardiovascular, respiratory and psychological health effects of the Hazelwood mine fire on the adults in Morwell. Increased risks have been observed for hypertension and heart attacks, numerous respiratory symptoms and asthma, and psychological distress.

This volume of findings represents just the first step in the interrogation of the Adult Survey data, providing only broad group differences between Morwell and Sale based on self-reported data. Future linkage to administrative health datasets will complement the self-reported data. That linkage will provide more objective measures of health upon which to address research questions about long term health outcomes in the Latrobe Valley. Following that, the Adult Survey findings will be further strengthened by analyses which will blend CSIRO modelled air pollution data with participants’ location information, to measure any association between estimated mine fire smoke exposure and health outcomes. At that stage, examination of any additional predictors of poor health in the community may provide valuable information about the most vulnerable sub-groups.

The HHS Adult Survey sub-studies, commencing data collection in the 2\textsuperscript{nd} half of 2017, will further complement the current work. The self-report data will be supplemented with clinical data on, for example, blood pressure, endothelial (vascular) function and inflammatory markers, spirometry, gas transfer and small airway function, and interview-based information on current perceptions of the mine fire events, and the role of social factors other than the smoke.
7. References


## 8. Document History

<table>
<thead>
<tr>
<th>Version number</th>
<th>Date approved</th>
<th>Approved by</th>
<th>Brief description</th>
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</thead>
<tbody>
<tr>
<td>1.0</td>
<td>4 July 2017</td>
<td>DHHS</td>
<td>Hazelwood Health Study Adult Survey Volume 1 Report</td>
</tr>
<tr>
<td>1.1</td>
<td>30 August 2017</td>
<td>Senior Project Manager</td>
<td>Minor reformatting</td>
</tr>
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</table>
Appendix A  Adult Survey questionnaire for Morwell participants
ADULT SURVEY AND HEALTH RECORD LINKAGE STUDY

QUESTIONNAIRE FOR ADULTS WHO LIVED IN MORWELL DURING THE HAZELWOOD MINE FIRE
THANK YOU

For participating in the Hazelwood Adult Survey and Health Record Linkage Study

Please read the following instructions for completing the questionnaire

1. It is important that you have read and signed the Informed Consent Statement on the next page of this questionnaire.

2. Please be sure to read each question and its instructions very carefully.

3. Unless directed otherwise, EVERY question should be answered if possible. Please choose the best available response to each question, even if there is not one that suits perfectly.

4. To answer a question please place crosses \( \times \) in the boxes next to your answers. Please do NOT circle the boxes \( \square \).

   Alternatively, when required, please write clear numbers in the number boxes provided.

   For example, \( 15 \) years

5. Please follow the blue arrows \( \rightarrow \) and the ‘go to’ instructions carefully, so you don’t answer more questions than you need to.

6. Please phone the Recruitment Coordinator on 1800 985 899 if you are unsure about how to complete any section of this questionnaire. Please call during business hours, Eastern Standard Time, Monday to Friday, or leave a clear message outside of these hours.
Informed Consent Statement
Hazelwood Adult Survey & Health Record Linkage Study

IMPORTANT INFORMATION
Complete this form to consent to participate in all, or part, of the Hazelwood Adult Survey & Health Record Linkage Study. Incomplete forms may result in the study not being provided with your decision and information.

BY SIGNING THIS FORM, YOU ACKNOWLEDGE THAT:

1. You have received, read and understood the Information Sheet provided that explains this study to you and what is required of you if you choose to participate in the Hazelwood Adult Survey & Health Record Linkage Study.

2. You understand that participation in the study is voluntary, that you can choose not to participate in part or all of the study and that you may withdraw your information prior to the publication of any reports by contacting the study team on 1800 985 899.

YOUR DETAILS
☐ Mr  ☐ Mrs  ☐ Miss  ☐ Ms  Other ____________
Family name (Surname): __________________________________________
First given name: __________________________ Other given (middle) name(s): __________________________
Date of birth: D D M M 1 9 Y Y Sex: ☐ Male  ☐ Female

To agree to participate in the QUESTIONNAIRE ONLY, please read the consent statement below numbered 1 and mark the box to show you agree.

1. ☐ I agree to participate in the questionnaire part of the Hazelwood Adult Survey.

OR

To agree to the QUESTIONNAIRE AND HEALTH RECORD LINKAGE, please read the consent statements below numbered 2 and 3 and mark the boxes to show you agree.

2. ☐ I agree to participate in the questionnaire part of the Hazelwood Adult Survey and the Hazelwood Health Record Linkage Study by giving Monash University permission to access my information from health databases such as ambulance, hospital, cancer and death records in future years for as long as it remains scientifically valid to do so.

3. ☐ I authorise Monash University to release my personal details to the Victorian Department of Health and Human Services to extract hospital and emergency information in future years for as long as it remains scientifically valid to do so.
   If yes, my Medicare card number is: _____ _____ _____ Ref no. _____

DECLARATION: I declare that the information on this consent form is true and correct.

____________________________________  ________________________
your signature                          date of signing

Morwell v1.0 July 2016
SECTION A - DETAILS ABOUT YOU

Please provide some information about your personal or demographic details

A2. What is your age? □ □ years old

A3. Are you □ Male □ Female □ Other

A4. What is your current marital status?
Choose one

☐ Married  ☐ Divorced
☐ De Facto  ☐ Widowed
☐ Separated  ☐ Other (please specify)
☐ Single  ___________________________________

A5. In which country were you born?

☐ Australia
☐ United Kingdom (including England, Scotland, Wales, Northern Ireland)
☐ New Zealand
☐ Italy
☐ Other (please specify) ________________________________

A6. Do you speak a language other than English at home?

☐ No, English only
☐ Yes, Other (please specify) ________________________________

A7. Are you of Aboriginal or Torres Strait Islander origin?
Choose one

☐ No, not Aboriginal or Torres Strait Islander
☐ Yes, Aboriginal
☐ Yes, Torres Strait Islander
☐ Yes, Aboriginal and Torres Strait Islander
A8. What is the highest level of education and training you have completed?

Choose one

☐ Year 10 or below
☐ Year 11
☐ Year 12
☐ TAFE or Trade Certificate or Diploma
☐ University, or other Tertiary Institute degree (i.e. postgraduate diploma, Master’s degree, PhD)
☐ Other (please specify) ___________________________________

A9. Are you currently in paid employment?

☐ No  ☐ Yes

A10. Which of these best describes your current employment status?

Select all that apply

☐ Self employed
☐ Engaged in home duties
☐ Employed full-time
☐ Retired
☐ Employed part-time or casual
☐ Unable to work
☐ Unemployed
☐ Other (please specify) ___________________________________

A11. What is your current residential address?

<table>
<thead>
<tr>
<th>Unit/Flat</th>
<th>Street number</th>
<th>Street name</th>
<th>Suburb or town</th>
<th>Post Code</th>
<th>State</th>
</tr>
</thead>
</table>

A12. For how many years have you lived at this address? ☐☐ Number of years

A13. Is this home:

☐ Owned or being purchased by you, the occupants?
☐ Rented from the housing trust or any other public agency?
☐ Rented privately?
☐ Other (please specify) ___________________________________

A14. For how many years in total did you/have you lived in Gippsland (including current residence if it is in Gippsland)

☐☐ Number of years
SECTION B – GENERAL HEALTH

B1. In general, would you say your health is (select one option):

☐ Excellent   ☐ Very good   ☐ Good   ☐ Fair   ☐ Poor

DIAGNOSED MEDICAL CONDITIONS

B2. Have you ever been told by a doctor that you have any of the following conditions?

   a) High blood pressure/hypertension   ☐ No   ☐ Yes

   b) High cholesterol                   ☐ No   ☐ Yes

   c) Angina                            ☐ No   ☐ Yes

   d) Heart attack (this includes a myocardial infarction or coronary) ☐ No   ☐ Yes

   e) Heart failure                      ☐ No   ☐ Yes

   f) Irregular heart rhythm/arrhythmia (e.g. atrial fibrillation) ☐ No   ☐ Yes

   g) Stroke (this includes a ‘mini stroke’, TIA or cerebrovascular accident) ☐ No   ☐ Yes

   h) Cancer                            ☐ No   ☐ Yes

   i) Other heart disease not listed above ☐ No   ☐ Yes

   j) Diabetes                           ☐ No   ☐ Yes

If Yes to diabetes, please estimate the year this was first diagnosed, or year of first episode

And, what treatment are you currently receiving for diabetes?

Choose one

☐ Diet only
☐ Insulin and tablets
☐ Tablets
☐ Insulin
☐ Other (please specify)

If Yes to ‘other heart disease’ please describe:

____________________________________

If No, go to B3 over the page.
B3. Have you ever been told by a doctor or psychologist that you have:

If Yes, please estimate the year this was first diagnosed

a) Anxiety
   - No
   - Yes

b) Depression
   - No
   - Yes

c) Posttraumatic stress disorder
   - No
   - Yes

d) Other mental health conditions
   - No
   - Yes

If Yes to ‘other mental health conditions’ please describe:

________________________
________________________
________________________

B5. Has a doctor ever told you that you have any other medical conditions not mentioned in this section?

- No
- Yes

If Yes, please list them here.

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Remember, to answer questions please place crosses [x] in the boxes next to your answers or write clear numbers in to the number boxes.
For assistance, please call 1800 985 899.
SECTION C - RESPIRATORY HEALTH

C1. Have you had wheezing or whistling in your chest at any time in the last 12 months?

☐ No ☐ Yes

If NO, go to C2
If Yes,

C1A. Have you been at all breathless when the wheezing noise was present?

☐ No ☐ Yes

C1B. Have you had this wheezing or whistling when you did not have a cold?

☐ No ☐ Yes

C2. Have you woken up with a feeling of tightness in your chest at any time in the last 12 months?

☐ No ☐ Yes

C3. Have you been woken by an attack of shortness of breath at any time in the last 12 months?

☐ No ☐ Yes

C4. Have you had an attack of shortness of breath that came on during the day when you were at rest at any time in the last 12 months?

☐ No ☐ Yes

C5. Have you ever had asthma?

☐ No ☐ Yes

If No, go to C8
If Yes,

C5A. How old were you when you had your first attack of asthma (if unknown please provide estimate)?

☐ ☐ years old (If started as a baby please enter ‘1’)

C6. Have you had an attack of asthma in the last 12 months?

☐ No ☐ Yes

C7. Are you currently taking any medicine (including inhalers, aerosols or tablets) for asthma?

☐ No ☐ Yes
C8. Do you have any nasal allergies including hay fever?

☐ No  ☐ Yes

If No, go to C9  If Yes,

C8A. How old were you when you first had hay fever or nasal allergy (if unknown please provide estimate)?

[ ] years old (If started as a baby please enter ‘1’)

C9. Have you ever had a problem with sneezing, or a runny or a blocked nose when you did not have a cold or the flu?

☐ No  ☐ Yes

If No, go to C11  If Yes, C10. Have you had a problem with sneezing or a runny nose when you did not have a cold or the flu in the last 12 months?

☐ No  ☐ Yes

If No, go to C11  If Yes, C10A. Has this nose problem been accompanied by itchy or watery eyes?

☐ No  ☐ Yes

C11. Do you cough on most days for as much as three months a year?

☐ No  ☐ Yes

C12. Do you bring up phlegm from your chest on most days for as much as three months a year?

☐ No  ☐ Yes

C13. Have you ever been told by a doctor that you had chronic obstructive pulmonary disease or emphysema?

☐ No  ☐ Yes

If No, go to C14  If Yes,

C13A. How old were you when a doctor told you that you had chronic obstructive pulmonary disease or emphysema (if unknown please provide estimate)?

[ ] years old

C14. In the last 12 months, have you regularly (on most days) taken Flixotide, Pulmicort, Qvar, Alvesco, Seretide, Symbicort, BreoEllipta, Flutiform or any other steroid inhaler?

☐ No  ☐ Yes
To properly evaluate your respiratory health it is important to know about your smoking history and other exposure to smoke.

**D1.** Have you smoked at least 100 cigarettes, or a similar amount of tobacco, in your entire lifetime?

- □ No
- □ Yes

**If No, go to D2**

**If Yes, D1A.** Which of the following best describes your smoking status?

- □ you currently smoke daily?
- □ you currently smoke at least weekly, but not daily?
- □ you currently smoke less often than weekly?
- □ you don’t smoke now but you used to?

**D1A.1.** At what age did you last stop smoking? □ □ years old

- □ you’ve tried it a few times but never smoked regularly?

**D1B.** For how many years in total have you smoked? (if stopped and started, add smoking periods together) □ □ years

**D1C.** Over those years, what is the average number of cigarettes that you have smoked per day or, if less than daily, per week or month?

- □ cigarettes per day
- □ Or, if less than daily cigarettes per week
- □ or cigarettes per month

**D2.** Have you been exposed to tobacco smoke on most days and nights in the last 12 months?

- □ No
- □ Yes

**If No, go to D3**

**If Yes, D2A.** Not counting yourself, how many people in your household smoke regularly? □ □ People (if none, enter ‘0’)

**If 1 or more, D2B.** Where do they usually smoke? Choose one

- □ Inside the house
- □ Outside the house
- □ Both inside & outside the house

**D3.** Have you ever used a wood or briquette heater in any residence you have lived?

- □ No
- □ Yes ➔ If Yes, D3A For how many years in total have you had a wood or briquette heater across all residences you have lived? (if not sure please estimate) □ □ number of years
SECTION E – CURRENT WELLBEING IN REGARD TO THE HAZELWOOD MINE FIRE EVENT

We ask about your current wellbeing to see if the mine fire event has had a long term impact on your health. Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you during the past seven days with respect to the Hazelwood mine fire event.

**During the past seven days**, in regard to the mine fire event, how much were you distressed or bothered by these difficulties?

<table>
<thead>
<tr>
<th></th>
<th>During the past seven days, in regard to the mine fire event, how much were you distressed or bothered by these difficulties?</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Any reminder brought back feelings about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I had trouble staying asleep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Other things kept making me think about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I felt irritable and angry.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I avoided letting myself get upset when I thought about it or was reminded of it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I thought about it when I didn’t mean to.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I felt as if it hadn’t happened or wasn’t real.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I stayed away from reminders of it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Pictures about it popped into my mind.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I was jumpy and easily startled.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I tried not to think about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I was aware that I still had a lot of feelings about it, but I didn’t deal with them.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>My feelings about it were kind of numb.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I found myself acting or feeling like I was back at that time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I had trouble falling asleep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I had waves of strong feelings about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I tried to remove it from my memory.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>I had trouble concentrating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>I had dreams about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I felt watchful and on-guard.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>I tried not to talk about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION F - YOUR RESIDENCE DURING THE HAZELWOOD MINE FIRE

The Hazelwood mine fire period is defined as the time between 9 February 2014 (the date the mine fire started) and 31 March 2014. The following questions relate to the home you lived in during the Hazelwood mine fire period, your use of air conditioning and air filters at that time and any occasions you slept away from that home.

**F1.** When the fire started in February 2014, what was the address of the home you lived in?

<table>
<thead>
<tr>
<th>Unit/Flat</th>
<th>Street number</th>
<th>Street name</th>
<th>Suburb or town</th>
<th>Post Code</th>
<th>State</th>
</tr>
</thead>
</table>

**F2.** When was that home built?

- [Y] [Y] [Y] [Y] Year

or, if you do not know the exact year, please estimate using the year ranges provided below:

- [] Prior to 1986
- [] 1986-2004
- [] After 2004

**F3.** What is the main building material of that home?

**Choose one**

- [] Concrete / Brick (veneer or double brick)
- [] Timber / weatherboard
- [] Fibro / asbestos cement sheeting
- [] Fibreglass
- [] Aluminium
- [] Other (please specify) ____________________________
- [] Don't know

**F4.** What is the main type of roofing material on that home?

**Choose one**

- [] Tiles
- [] Metal, like tin or iron
- [] Concrete
- [] Other (please specify) ____________________________
- [] Don’t know
F5. Does the home (which you listed at F1 on the previous page) have air conditioning?  

☐ No ☐ Yes  

If No, go to F6  

If Yes, F5A. What type of air conditioning is it?  

☐ Reverse cycle or split system.  
☐ Window box unit  
☐ Evaporative  
☐ Other (please specify)  

☐ Don't know  

If reverse /split system, Go to F5B

F5B. Is the Reverse cycle air conditioner  

☐ Ducted  
☐ Wall or floor mounted  
☐ Don't know

F5C. During the period of the fire, when you were living in the home listed in F1, how often did you use the air conditioning?  

Choose one  

☐ Never  
☐ Rarely (once a week or less)  
☐ Occasionally (2-3 times a week)  
☐ Regularly (most of the time)  
☐ Daily  
☐ Don’t know

F6. During the period of the fire, when you were living in the home listed in F1, how often did you use a portable air filter (e.g. an air purifier)?  

Choose one  

☐ Never  
☐ Rarely (once a week or less)  
☐ Occasionally (2-3 times a week)  
☐ Regularly (most of the time)  
☐ Daily
**F7.** During the period of the fire (from 9 February 2014 to 31 March 2014), did you sleep at a different location, other than your usual home that you listed in question F1?

☐ YES  ☐ NO, if NO, please go to Section G on the next page

**F7A** Please specify the first location that you slept at during the mine fire period, other than your usual home? Provide as much address information as possible

<table>
<thead>
<tr>
<th>Building/hotel name if applicable</th>
<th>Street number and street name</th>
<th>Suburb or town</th>
<th>Post Code</th>
<th>State</th>
</tr>
</thead>
</table>

On the calendar below, please mark with a **X** the dates for the nights you slept at this location.

<table>
<thead>
<tr>
<th>February 2014</th>
<th></th>
<th>March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>Mon</td>
<td>Tue</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

**F7B** If applicable, please specify a second location that you slept at during the mine fire period, other than your usual home? Provide as much address information as possible

<table>
<thead>
<tr>
<th>Building/hotel name if applicable</th>
<th>Street number and street name</th>
<th>Suburb or town</th>
<th>Post Code</th>
<th>State</th>
</tr>
</thead>
</table>

On the calendar below, please mark with a **X** the dates for the nights you slept at this location.

<table>
<thead>
<tr>
<th>February 2014</th>
<th></th>
<th>March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>Mon</td>
<td>Tue</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

**F7C** If applicable, please specify a third location that you slept at during the mine fire period, other than your usual home? Provide as much address information as possible

<table>
<thead>
<tr>
<th>Building/hotel name if applicable</th>
<th>Street number and street name</th>
<th>Suburb or town</th>
<th>Post Code</th>
<th>State</th>
</tr>
</thead>
</table>

On the calendar below, please mark with a **X** the dates for the nights you slept at this location.

<table>
<thead>
<tr>
<th>February 2014</th>
<th></th>
<th>March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
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<td>9</td>
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<td>11</td>
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<tr>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>
SECTION G - WORK HISTORY

The following questions are about **paid jobs** that you have had for **at least 6 months**.

**G1.** Have you ever worked in the **construction industry** for a period of at least 6 months?

- [ ] No
- [ ] Yes

**If No, go to G2**

**If Yes, G1A.** Were you a: (choose as many as apply)

- [ ] labourer, for how many years in total: [ ] years
- [ ] builder, for how many years in total: [ ] years
- [ ] carpenter (not incl. builder), for how many years in total: [ ] years
- [ ] brick layer, for how many years in total: [ ] years
- [ ] painter, for how many years in total: [ ] years
- [ ] concreter, for how many years in total: [ ] years
- [ ] driver, for how many years in total: [ ] years

**G1A_1** If driver in construction industry, what did you mostly drive? ____________________________

- [ ] Other, for how many years: [ ] years

**please specify main job**

**G2.** Have you ever worked as a **driver** (not including in the construction industry) for a period of at least 6 months?

- [ ] No
- [ ] Yes, if Yes, **G2A.** What did you mostly drive? ____________________________

**G2B.** For how many years in total were you a driver? [ ] years

**G3.** Have you ever worked in **farming** for a period of at least six months?

- [ ] No
- [ ] Yes, if Yes, **G3A.** What type of farm was it? ____________________________

**G3B.** What was your main job title? ____________________________

**G3C.** For how many years in total did you have that job (in G3B)? [ ] years

**G4.** Have you ever worked at the **coal mines**, or the **coal fired power stations** in the Latrobe Valley, such as at Yallourn, Loy Yang or Hazelwood for a period of at least six months?

- [ ] No
- [ ] Yes, if Yes, **G4A.** What was your main job title? ____________________________

**G4B.** For how many years in total did you have that job (in G4A)? [ ] years
G5. Not including the coal fired power stations in G4, have you ever worked for the SEC (State Electricity Commission, also SECV or ECV) for a period of at least six months?

☐ No  ☐ Yes, G5A. What was your main job title? __________________________

G5B. For how many years in total did you have that job (in G5A)? ☐ ☐ years

G6. For a period of at least six months, have you ever worked as a: (choose as many as apply)

☐ welder, for how many years in total? ☐ ☐ years

☐ cleaner, for how many years in total? ☐ ☐ years

☐ baker, for how many years in total? ☐ ☐ years

☐ garbage collector or at a waste/recycling depot, for how many years in total? ☐ ☐ years

☐ spray painter (motor vehicle), for how many years in total? ☐ ☐ years

☐ saw mill operator, for how many years in total? ☐ ☐ years

☐ wood worker (not carpenter), for how many years in total? ☐ ☐ years

☐ asbestos remover, for how many years in total? ☐ ☐ years

G7. Have you ever had a paid job with an emergency service for at least six months?

☐ No  ☐ Yes, if Yes, G7A. Which emergency service?

If No, go to G8

☐ Police. What was your main job title? __________________________

For how many years in total did you have that job? ☐ ☐ years

☐ Ambulance. What was your main job title? __________________________

For how many years in total did you have that job? ☐ ☐ years

☐ Fire (paid only, we ask about volunteer firefighting later)

What was your main job title? __________________________

Which fire service was that main job with:

☐ Metropolitan Fire Brigade

☐ Country Fire Authority

☐ Other, please specify __________________________

For how many years in total did you have that job? ☐ ☐ years

☐ Other emergency service. Please specify which service________________

What was your main job title? __________________________

For how many years in total did you have that job? ☐ ☐ years
G8. Have you ever worked at the Maryvale paper mill for a period of at least six months?

☐ No  ☐ Yes, if Yes, G8A. What was your main job title? __________________________

G8B. For how many years in total did you have that job (in G8A)? __________ years

G9. Not including jobs you have listed so far, have you ever worked in a job for at least 6 months where the air you breathed contained a lot of dust, fumes, smoke, gas, vapour or mist? (Please don’t include a job here if the only period of smoky air was during the mine fire).

☐ No  ☐ Yes, if Yes, G9A. What was the title of the longest held job? __________________________

G9B. For how many years in total did you have that job? __________ years

G10. During the mine fire period (9 February to 31 March 2014), were you involved in fighting the Hazelwood mine fire (paid or volunteer) or working in the Controlled Area as part of the response?

☐ No  ☐ Yes, if Yes, G10A. For how many days in total were you involved in fighting the Hazelwood mine fire or working in the Controlled Area? __________ number of days

G11. Not including the Hazelwood mine fire, have you ever been a volunteer firefighter involved in fighting fires?

☐ No  ☐ Yes, if Yes, G11A. For how many years in total? __________ years

Well done - you are well past half way.

Remember, if you need assistance please call 1800 985 899.
SECTION H - YOUR WORK LOCATION DURING THE PERIOD OF THE FIRE

The following questions are designed to measure any changes to your employment location during the time of the mine fire. We are asking about the whole period of the fire from 9 February 2014 to 31 March 2014. Please carefully follow the arrows and ‘go to’ instructions.

H1. Were you employed during the period of 9 February 2014 to 31 March 2014?

☐ YES  ☐ NO, if No, go to Section HH on page 18

If Yes, H2. What was your main job during the period of the fire? ______________________

main job title

H3. For how many hours per week, on average, was that job? __________ hours per week

H4. On which days of the week did you usually work on that job?

☐ Monday  ☐ Tuesday  ☐ Wednesday  ☐ Thursday  ☐ Friday

☐ Saturday  ☐ Sunday

H5. Was that job (listed at H2) usually located at one or more fixed locations/addresses (like an office/clinic/shop/factory job) or at multiple changing locations (like a taxi or delivery vehicle driver, emergency responder or visiting nurse). Please choose the option that best describes your work location/s.

☐ One or more usual fixed addresses. Go to H6

☐ Multiple changing locations mostly or entirely in Morwell Go to H7

☐ Multiple locations, mostly outside of Morwell but in the Latrobe Valley Go to H7

☐ Multiple locations, mostly or entirely outside of the Latrobe Valley Go to H7

H6. Please specify the usual address during the mine fire period for that main job (listed at H2). If more than one address (eg. different sites for the same business), please choose one main address where you worked.
H6A. Did the job (listed at H2) relocate from this usual address during the mine fire period for more than one day?

☐ YES  ☐ NO, If No, go to H7 down the page

If Yes, H6B. Please specify the first address this job relocated to.

On the calendar below, please mark with a x the dates your job relocated to this address.

<table>
<thead>
<tr>
<th>Building name/business</th>
<th>Street number</th>
<th>Street name</th>
<th>Town</th>
<th>Post code</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H6B_2. If this job relocated to a second address, please specify the address here, otherwise go to H7

On the calendar below, please mark with a x the dates your job relocated to this second address.

<table>
<thead>
<tr>
<th>Building name/business</th>
<th>Street number</th>
<th>Street name</th>
<th>Town</th>
<th>Post code</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

H7. During the mine fire period, and on the days that you would usually be at this main job (listed at H2), did you stay at home for more than one day for any reason (e.g. because you worked from home or took annual leave or sick leave at home)?

☐ No, go to H8 over the page

☐ Yes, I always work at home for that job, go to H8 over the page

☐ Yes, I stayed at home on the following work days, please answer H7A

H7A. On the calendar below, please mark with a x the work days that you stayed at home.

<table>
<thead>
<tr>
<th>Building name/business</th>
<th>Street number</th>
<th>Street name</th>
<th>Town</th>
<th>Post code</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Morwell v1.0 July 2016  Page 16
H8. For the main job (listed at H2), did you take any leave which you spent away from home (eg. annual leave or sick leave) during the mine fire period?

☐ YES  ☐ NO, If NO, go to H9 down the page

If YES, H8A. Please specify where you first stayed away from home when you took leave from this main job?

<table>
<thead>
<tr>
<th>Building name/hotel</th>
<th>Street number</th>
<th>Street number</th>
<th>Town</th>
<th>Postcode</th>
<th>State</th>
</tr>
</thead>
</table>

On the calendar below, please mark with a X the dates you took leave at this address.

<table>
<thead>
<tr>
<th>February 2014</th>
<th>March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>Mon</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
</tr>
</tbody>
</table>

H8B. If applicable, please specify a second place you stayed away from home when you took leave from this job?

<table>
<thead>
<tr>
<th>Building name/hotel</th>
<th>Street number</th>
<th>Street number</th>
<th>Town</th>
<th>Postcode</th>
<th>State</th>
</tr>
</thead>
</table>

On the calendar below, please mark with a X the dates you took leave at this address.

<table>
<thead>
<tr>
<th>February 2014</th>
<th>March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>Mon</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
</tr>
</tbody>
</table>

H9. In addition to the main job you listed at H2, did you have another job during the mine fire period 9 February 2014 to 31 March 2014?

☐ YES  ☐ NO, if No, go to Section HH on the next page

If Yes, H10. What was your second job during the period of the fire? __________________________

second job title

H11. For how many hours per week, on average, was that job? [ ] [ ] hours per week

H12. On which days of the week did you usually work on that second job?

☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday

☐ Saturday ☐ Sunday
H13. Was that second job (listed at H10) usually located at one or more fixed locations/addresses (like an office/clinic/shop/factory job) or at multiple changing locations (like a taxi or delivery vehicle driver, emergency responder or visiting nurse). Please choose the option that best describes your work location/s.

☐ One or more usual fixed addresses. Go to H14
☐ Multiple changing locations mostly or entirely in Morwell Go to Section HH
☐ Multiple locations, mostly outside of Morwell but in the Latrobe Valley Go to Section HH
☐ Multiple locations, mostly or entirely outside of the Latrobe Valley Go to Section HH

H14. Please specify the usual address during the mine fire period for that second job (listed at H10). If more than one address (eg. different sites for the same business), please choose one main address where you worked.

<table>
<thead>
<tr>
<th>Building name/business</th>
<th>Street number</th>
<th>Street name</th>
<th>Town</th>
<th>Post code</th>
<th>State</th>
</tr>
</thead>
</table>

SECTION HH - FIRST 20 DAYS/NIGHTS OF THE HAZELWOOD MINE FIRE

For the next two questions please think about the first 20 days and nights of the Hazelwood mine fire. That was the period 9 February to 28 February 2014.

H17A. For how many, of those 20 days from 9 February to 28 February 2014, did you spend most of the day in Morwell?

☐ all 20 days ☐ less than 20 days, please estimate the number ___ days

H17B. For how many, of those 20 nights from 9 February to 28 February 2014, did you spend most of the night in Morwell?

☐ all 20 nights ☐ less than 20 nights, please estimate the number ___ nights
## SECTION I - RECENT WELLBEING

I1. The following questions concern how you have been feeling over the past 4 weeks. This is a standard set of health questions and some may seem repetitive.

### In the past 4 weeks:

<table>
<thead>
<tr>
<th>In the past 4 weeks:</th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. About how often did you feel tired out for no good reason?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. About how often did you feel nervous?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. About how often did you feel so nervous that nothing could calm you down?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. About how often did you feel hopeless?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. About how often did you feel restless or fidgety?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. About how often did you feel so restless you could not sit still?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. About how often did you feel depressed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. About how often did you feel that everything was an effort?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. About how often did you feel so sad that nothing could cheer you up?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. About how often did you feel worthless?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## SECTION J - STRESSFUL LIFE EVENTS

J1. Because stressful life events can affect health, it is important that we ask you about very stressful events that might have happened in your life other than the Hazelwood mine fire.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did you ever have direct combat experience in a war?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Were you ever involved in a life-threatening accident?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Other than the Hazelwood mine fire, were you ever involved in a fire, flood or other natural disaster?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Did you ever witness someone being badly injured or killed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Were you ever raped, that is someone had sexual intercourse with you when you did not want to, by threatening you, or using some degree of force?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Were you ever sexually molested, that is someone touched or felt your genitals when you did not want them to?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Were you ever seriously physically attacked or assaulted?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Have you ever been threatened with a weapon, held captive or kidnapped?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Have you ever been tortured or the victim of terrorists?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Have you ever experienced any other extremely stressful or upsetting event?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Have you ever suffered a great shock because one of the events happened to someone close to you?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION K - ALCOHOL USE

Because alcohol use can affect health and interfere with certain medications and treatments, it is important that we ask you some questions about your use of alcohol. Your answers will remain confidential, so please be as accurate as possible. Try to answer the questions in terms of ‘standard drinks’.

---

<table>
<thead>
<tr>
<th>Light Beer</th>
<th>Full Strength Beer</th>
<th>Wine</th>
<th>Fortified Wine</th>
<th>Spirits</th>
<th>Full Strength Can or Stubbie</th>
</tr>
</thead>
<tbody>
<tr>
<td>425mL 2.5% Alcohol</td>
<td>330mL 4.0% Alcohol</td>
<td>100mL 12% Alcohol</td>
<td>60mL 30% Alcohol</td>
<td>25mL 40% Alcohol</td>
<td>A full strength can or stubbie contains 1 ½ standard drinks</td>
</tr>
</tbody>
</table>

The guide above contains examples of one standard drink.

---

Please mark the response that best fits your drinking.

**K1. How often did you have a drink containing alcohol in the past year?**

- □ Never  ➔ If Never, go to Section L over the page
- □ Monthly or less
- □ 2 to 4 times per month
- □ 2 to 3 times per week
- □ 4 or more times per week

**K2. How many drinks did you have on a typical day when you were drinking in the past year?**

- □ 1 or 2
- □ 3 or 4
- □ 5 or 6
- □ 7 to 9
- □ 10 or more

**K3. How often did you have 6 or more drinks on one occasion during the past year?**

- □ Never
- □ Less than monthly
- □ Monthly
- □ Weekly
- □ Daily or almost daily
SECTION L - FUTURE CONTACT

It is important that we be able to contact you in future. We may need to ask you about the information you have provided in this survey, or contact you about important study findings or follow up investigations.

For these purposes only, please provide the following contact details:

**L1. Home phone**: 0 [ ] [ ] [ ] [ ] [ ]

**L2. Mobile phone**: 0 4 [ ] [ ] [ ] [ ]

**L3. E-mail address**: ____________________________@______________________________

**L4. What is your preferred way for us to contact you?**

- [ ] Mobile phone
- [ ] Home phone
- [ ] E-mail
- [ ] Post

**L5. In case you move and we lose contact with you, please provide the contact details for up to two relatives or friends who do not live with you, but who would be likely to know your new address or contact details. We would only attempt to contact those people if we could not get in touch with you.**

<table>
<thead>
<tr>
<th>Person 1</th>
<th>Person 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td><strong>Name</strong></td>
</tr>
<tr>
<td><strong>Relationship to you</strong></td>
<td><strong>Relationship to you</strong></td>
</tr>
<tr>
<td><strong>Address</strong></td>
<td><strong>Address</strong></td>
</tr>
<tr>
<td><strong>Telephone</strong></td>
<td><strong>Telephone</strong></td>
</tr>
<tr>
<td><strong>Email</strong></td>
<td><strong>Email</strong></td>
</tr>
</tbody>
</table>
OTHER COMMENTS

If you have any further comments about your health or the Hazelwood Health Study, please add them here.

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

Congratulations on completing the questionnaire

YOUR GIFT CARD

As reimbursement for the time you have taken to complete the questionnaire, we are pleased to offer you a $20 Shop Latrobe City gift card that can be collected from Newspower Newsagent at 174/176 Commercial Rd, Morwell.

Please give us permission to pass on your name to Newspower Newsagent so that they can correctly identify you as being eligible to receive the gift card. Your details will not be used for any other purpose.

☐ Yes, I give permission for my name to be passed on to Newspower Newsagent so they can correctly identify me as eligible for the gift card.

☐ No, I want to be phoned by the researchers to make an alternative arrangement. Please phone _______________________

☐ No, I don’t want the gift card.

After the date that you mail this questionnaire back to the researchers, please allow two weeks for your card to be available at the Newspower Newsagent. Please take identification when you go to collect your card.
Thank you for participating in the Hazelwood Adult Survey and Health Record Linkage Study.

Please return your completed questionnaire using the reply-paid envelope provided.

Follow the progress of this important health study at hazelwoodhealthstudy.org.au