ACT Government Health

ACT Population Health Bulletin

Volume 2 Issue 3 August 2013

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Upcoming Events

- Healthy Canberra Grants and the Health Promotion Innovation Fund are now open for applications until 20 September 2013: www.health.act.gov.au/hpgrants
- Sportenary – 100 Sporting Events, 100 Days, 1 Centenary Year: http://canberra100.com.au/programs/sportenary-/.

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Introduction

A message from the Chief Health Officer, Dr Paul Kelly

Air quality in the Australian Capital Territory (ACT) is the topic of this issue of the Bulletin. Air quality may be affected by human activity including pollution from industry, domestic wood heaters and motor vehicles and from natural phenomena such as bushfires. Human health effects include acute respiratory syndromes such as the exacerbation of asthma and longer term issues including chronic lung and cardiovascular diseases and at high concentrations of some pollutants, lung cancer.

The ACT enjoys very high air quality most of the time because of our geography and our isolation from major centres of population and industry. However, Canberra residents are not immune to either perceived or real concerns related to ambient air quality. Whilst being the "bush capital" holds many air quality advantages, our setting is prone to bushfires in the summer, and is subjected to hazard burns in other seasons. Smoke from those fires, both within our borders and beyond, can lead to human health effects. Additionally, in the winter months, temperature inversion at night can affect some parts of Canberra which can result in higher concentrations of particulate matter, notably from domestic wood heaters, which may also lead to adverse health outcomes.

Internal air quality is also important for human health. There is an association between burning of fossil fuels in poorly ventilated dwellings and respiratory disease, particularly in children in developing countries. In recent years, the Population Health Division has been asked for advice on the testing, remediation and the human health effects of mould in public (offices and schools) as well as in private dwellings. An article on mould has therefore also been included in this issue of the Bulletin.

One of the key elements of any population health response to events such as a deterioration of air quality is communicating that risk to the public. Public health practitioners are trained to appraise the nature of the hazard, analyse the situation including public perceptions of personal and collective risk and to provide suitable messages to explain those risks. In this issue, the broad elements of a risk communication strategy are explained and a recent local example is included as an illustrative case study.

The Australian Capital Territory Government Analytical Laboratory (ACTGAL) is part of the Population Health Division of ACT Health and, amongst other vital support functions, has responsibility for air quality monitoring, analysis and reporting.

Thanks to the guest editor for this issue, Dr Ranil Appuhamy, and to all those who contributed with articles and to the editorial processes.

Dr Paul Kelly
Editor
August 2013

Acronyms

AAQ	Ambient Air Quality
ABS	Australian Bureau of Statistics
ACTGAL	ACT Government Analytic Laboratory
ACTRFS	ACT Rural Fire Service
AQI	Air Quality Index
AS	Australian Standard
CALD	Culturally and Linguistically Diverse
CO	Carbon Monoxide
COPD	Chronic obstructive pulmonary disease
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPA	Environment Protection Authority
ESA	Emergency Services Agency
ESDD	Environment and Sustainable Development Directorate
HPS	Health Protection Services
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measures
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
O_3	Ozone
PAH	Polycyclic aromatic hydrocarbons
PICC	Public Information Coordination Centre
PHD	Population Health Division
PM	Particulate Matter
PMS	Performance Monitoring Station
TAMS	Territory and Municipal Services
WHO	World Health Organization

Views from top of Monash Performance Monitoring Station.
Source: PHD file photograph.

Further information

- Health Protection Services, ACT Health: http://health.act.gov.au/hps
- Emergency Services Agency, Bushfire information: http://esa.act.gov.au/
- Environment and Sustainable Development, Wood fire heater information: http://www.environment.act.gov.au/environment/burn_right_tonight
- Territory and Municipal Services, Bushfire management information: http://www.tams.act.gov.au/

A new air quality station for the ACT

Ian Fox, Swarup Chatterjee, Simon Rockliff, ACTGAL, Population Health Division

- The ACT's population has grown beyond the point where the Ambient Air Quality National Environment Protection Measure requires a second Performance Monitoring Station.
- The Health Protection Service in conjunction with the Environmental Protection Agency identified which of the regions in Canberra would be the best to locate the new Performance Monitoring Station.
- Belconnen was selected as the region to receive the new Performance Monitoring Station, mainly on the basis of population.
- The search for a location in Belconnen was then undertaken, based on the Australian Standard criteria for siting of Ambient Air Monitoring Stations. Operational experience also influenced the selection of a location.
- Neumann Place in Florey was selected as the site for the new Performance Monitoring Station. The Health Protection Service is in the process of establishing the new station there.

Background

In the 1990s there was an agreement between Commonwealth, State and Territory governments to address environmental issues in a co-ordinated manner under an agreed national framework. This was achieved by forming the National Environment Protection Council (NEPC). The NEPC developed the National Environment Protection Measures (NEPMs) for protecting and managing various aspects of the environment. One of these NEPMs covers the monitoring, reporting and regulation of ambient air quality to ensure that the Australian population is equally protected from the impacts of air pollution – this is the Ambient Air Quality (AAQ) NEPM, which came into force in 1998.

The AAQ NEPM identified six pollutants that need to be considered for monitoring. These are known as the 'criteria air pollutants' - a term used for pollutants that are regulated and used as indicators of air quality. The criteria pollutants and their sources are listed in Table 1 on the following page.

Civic AAQMS Source: PHD file photograph

A new air quality station for the ACT *(continued)*

Background *(continued)*

Table 1. AAQ NEPM criteria air pollutants

Pollutant	Sources
Carbon Monoxide (CO)	Motor vehicles, some industrial activities
Nitrogen dioxide (NO_2)	Motor vehicles, burning of fossil fuels (e.g coal, oil, gas) in power generation
Ozone (O_3)	Motor vehicles, oil refining, printing, petrochemicals, aviation, bushfires and hazard burns
Particle matter less than 10 micrometers in diameter (PM_{10})	Motor vehicles, solid fuel heaters, bushfires and hazard burns
Lead	Mining operations, waste incinerators, previously from motor vehicle usage
Sulphur dioxide	Industrial activities, including burning of fossil fuels

The ACT Government reports on four of the six criteria pollutants, these being carbon monoxide, nitrogen dioxide, ozone and particulate matter less than 10 micrometres equivalent aerodynamic diameter (PM_{10}), against the standard set in the AAQ NEPM. The ACT also reports on particulate matter less than 2.5 micrometres equivalent aerodynamic diameter ($PM_{2.5}$) which is currently an AAQ NEPM advisory standard. The other two pollutants in the AAQ NEPM, lead and sulphur dioxide, are not monitored as previous monitoring has shown that the concentrations of these pollutants are below the limits of detection in the ACT.

Why is another station needed?

The AAQ NEPM mandates that each state and territory maintain a minimum number of Performance Monitoring Stations (PMSs) in their airsheds and report back to NEPC on the air quality data from the PMSs. An airshed is broadly defined as an atmosphere that behaves in a coherent way, and predominantly affects a particular catchment/population area in a coherent way. While most jurisdictions (e.g. New South Wales) have a number of airsheds within their borders that need monitoring, in Canberra the whole city itself is regarded as one single airshed.

The minimum number of PMSs required in an airshed is calculated from a population based formula:

$$\text{Number of stations} = 1.5P+0.5$$

where P is the population of the region (in millions) and the number is taken to the next whole number.

According to the formula, one PMS is required if the population is above 25,000, and a second PMS when the population is over 340,000. The ACT population as reported by the Australian Bureau of Statistics passed 340,000 in 2007. The August 2008 National Ambient Air NEPM Peer Review Committee report to NEPC noted the ACT's population was nearing the threshold for an additional air monitoring station in the airshed. In the 2009-2010 budget planning process, the Health Protection Service sought the resources to establish an additional Air NEPM PMS. These resources were included in the 2012-2013 budget.

National Arboretum Canberra

Source: Australian Capital Tourism Image Library

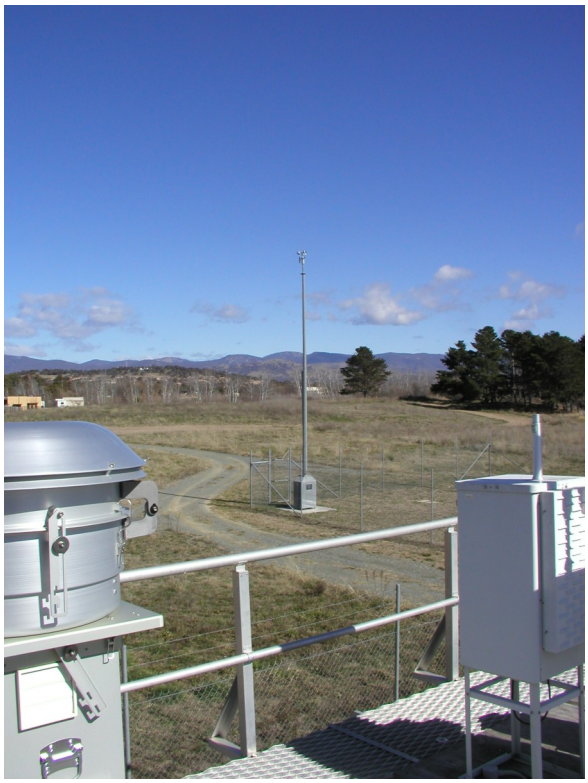
A new air quality station for the ACT *(continued)*

Air quality monitoring in the ACT

The Environmental Chemistry unit of Health Protection Service (HPS) carries out air quality monitoring at a PMS at Monash, to meet the ACT's NEPM obligations. The unit is accredited by the National Association of Testing Authorities (NATA) (March 2002) to the international standard "General requirements for the competence of testing and calibration laboratories" (ISO17025) for Air Quality Monitoring as required by the NEPM.

The air quality data is supplied to the Environment and Sustainable Development Directorate's (ESDD) Environment Protection Authority (EPA), which prepare the NEPM reports for the ACT. Environment Protection, in consultation with the HPS, is responsible for most of the policy issues relating to air quality. The data is also supplied to Territory and Municipal Services (TAMS) for calibration of their planning models which are used to predict the impacts of development on air quality.

The ACT's ambient air monitoring network also consists of two partial stations located in the City and Belconnen. Neither of the partial stations meet the siting requirements for an AAQ NEPM PMS, as they are too close to roads and trees (a more detailed explanation of siting requirements will be given in a later section). Neither is suitable for an upgrade to meet the requirements. This meant a new location needed to be found for the additional PMS. NEPM PMS.



Views from front and top of Monash Performance Monitoring Station.
Source: PHD file photograph.

A summary of current and historical air quality monitoring in the ACT is given in Table 2.

Table 2: Summary of air quality monitoring in the ACT

Region	Pollutants Monitored	Comments
Tuggeranong Valley	CO, NO_x, O_3, PM_{10}, $PM_{2.5}$, and PM_1	NEPM Station
Woden Valley	None	Used to have PM_{10} High Volume (Hivol) but was heavily impacted on by motor vehicles and trees within 10 metres.
Weston Creek	None	Some limited particulate monitoring has occurred in the past.
South Canberra	None	
North Canberra	CO, NO_x, O_3, PM_{10}, $PM_{2.5}$, and PM_1	Heavily impacted by the Central Business District (CBD) traffic. Trees within 10 metres and site is within 50 metres of a road.
Belconnen	PM_{10}, $PM_{2.5}$, and PM_1.	Trees within 10 metres and road within 50 metres.
Gungahlin	None	Some background monitoring carried out at the CSIRO station near Gungahlin in the 80's and 90's.
Molonglo	None	

A new air quality station for the ACT *(continued)*

In which region of Canberra should the new station be located?

2009 Site and Population breakdown

The current PMS is in the Tuggeranong valley. Tuggeranong has a population of 89,480 (26% of ACT population), and there is no justification for a second station in Tuggeranong as its population does not contain over 75% of the ACT population. This leaves the following valleys/districts that could be monitored (population, % total population):

- Woden Valley (33,426, 10%)
- Weston Creek (23,005, 7%)
- South Canberra (25,617, 7%)
- North Canberra (45,991, 13%)
- Belconnen (89,769, 26%)
- Gungahlin (37,969, 11%)

Data, ABS publication 3218.0 Regional Population Growth, Australia, April 2009.

The HPS, in conjunction with the EPA, reviewed the merits of locating the additional PMS in these districts.

North & South Canberra

The combined population of North and South Canberra is around 20% of the ACT population. North Canberra is monitored by the Civic station. The station also gives an indication of conditions in South Canberra to a limited extent. Previous monitoring (see Table 2) indicates no major ambient air quality problems in this region. The station is, however, non-compliant with the siting requirements for a PMS. If a suitable representative location could be found this region is an acceptable option.

Weston Creek

A site at the lower end of the Weston Creek airshed would cover approximately 7% of the ACT population. In mid 2009 a GRIMM particle counter which monitors PM_{10}, and $PM_{2.5}$ was installed at a site in the suburb of Holder for a short time, however the dataset collected is minimal.

Map showing Canberra's regions.
Source: ACT Planning and Land Authority 2003

Woden Valley

Placing a station along the line of Yarralumla Creek near Curtin would give coverage of the Woden Valley region (approximately 10% of the ACT population). Woden has some usage of wood heaters, although previous monitoring (see Table 2) did not indicate any concern with air quality in this region.

Molonglo

As Molonglo is a new area, it could be beneficial to monitor the effect of development on local air quality. However, as it currently has minimal population it should be ruled out.

Belconnen

Belconnen is the second most populous region of Canberra at around 26% of the ACT population, and has some usage of wood heaters. A GRIMM particle monitor is in operation in the area but is located on high ground in the light industrial area of the town centre. Much of the area of Belconnen is in a shallow valley winding along the line of the Ginninderra creek. This means Belconnen is less likely to be effected to the same extent as the much deeper Tuggeranong Valley. Ideally the site would be placed somewhere along the line of the Ginninderra Creek.

Gungahlin

Gungahlin is an expanding region to the north of Belconnen. Like Belconnen it is located in a shallow valley which bottlenecks just before it continues into the Belconnen region. Because Gungahlin is a new district, the prevalence of wood heaters is low resulting in less wood smoke pollution.

The HPS reviewed the above information about the various districts in the ACT. A decision was made that Belconnen is the preferred region for the siting of the additional PMS based mainly on the population coverage. The existing Monash station and an additional station in Belconnen would result in air quality monitoring covering over 50% of the ACT's population. It could also provide information on the effect of wood heater use in the north of Canberra. These conclusions were supported by the EPA.

A new air quality station for the ACT *(continued)*

Where in Belconnen to site the station?

Having reached a consensus that the additional AAQ PMS would be located in Belconnen, consideration then turned to where in Belconnen would be the best place to locate the station. In 2009, in consultation with the EPA, the HPS undertook a review to recommend the location of the additional PMS. In siting the new PMS, the review looked at the following:

1. Performance Monitoring Stations must be sited to ensure the data is representative of the popula tion being monitored and comply as much as pos sible with the Australian Standard AS3580.1.1:2007 for the siting of ambient air quality monitoring stations.

2. The Australian Standard requires a range of is sues to be considered when siting an air monitor ing station. These include the objective of the monitoring program, anthropogenic (man-made) f actors of pollution, topography, meteorology and climatology, and distance from sources of pollut ants and/or interferences.

Monitoring objective

In keeping with the aims of the AAQ NEPM, the most appropriate monitoring objective in Canberra would be to measure in an area which is likely to experience pollution at the upper bound of levels experienced in the region. By locating the station in such an area it can be reasonably assumed that, if the NEPM Standards are met at those sites, then the population of the larger region will be exposed to air at or below these pollution levels. In this way the desired environmental outcome of the NEPM of adequate protection of human health and well-being should be assured.

Belconnen site for the new Performance Monitoring Station
Source: PHD file photograph

Anthropogenic factors of air pollution

The ACT generally experiences good air quality. However, concentrations of PM_{10} and $PM_{2.5}$ have occasionally exceeded the NEPM standards in the past. While levels of these pollutants have reduced in recent years, they remain the pollutants of most concern in the ACT. The largest man-made sources of PM_{10} and $PM_{2.5}$ are from solid fuel heaters (e.g. wood heaters) used in the colder months, or from hazard reduction burns in and around the ACT. The new PMS, therefore, should be located at a site likely to capture higher levels of particulate matter found in the region.

Topography

The ACT is considered one air shed for AAQ NEPM purposes. However the ACT is a series of valleys which can be considered as sub-airsheds. Based on previous monitoring across Canberra over the period of a year the variation across the airshed is not significantly different, however local variations in air quality do occur over short time frames.

Most of the population resides on lower slopes and floors of valleys with very little development having occurred on the upper slopes and ridgelines. Therefore the monitoring station should be located in the lower sections of a valley.

Meteorology and Climatology

The major cause of higher levels of particulate pollution in Canberra is the temperature inversion that occurs during the cold months of the year. In colder weather people light their wood fires and when a temperature inversion forms a phenomenon called katabatic flow occurs. Katabatic flow is when the air on the ridge line cools and begins to flow downhill, behaving very much like water. This draining air carries with it the smoke particles from wood fires. When this colder air reaches the valley floor it can become 'trapped' below a layer of warmer air. This may result in high levels of particulate matter being concentrated in the valley floor.

Therefore, in keeping with the monitoring objective, it is preferable to monitor in the lower sections of a valley and obtain data on the 'worst case' air pollution. If the monitored concentration in the lower sections of a valley is below the standard then the whole area being monitored can be assumed to be satisfactory.

A new air quality station for the ACT *(continued)*

Where in Belconnen to site the station? *(continued)*

Distance from sources and/or interferences

The Australian Standard has requirements for the siting of the AAQ PMS to ensure that data is not unduly affected by atypical factors. The closest road is to be no closer than 50m from the AAQ PMS. This is based on the requirement for particle monitoring not having a road with traffic volumes of greater than 10,000 vehicles per day within 50m. If the traffic volume is greater the distance needs to be increased.

The monitoring station must be no closer than 10m to the nearest tree(s). The station should be no closer than 50m to the nearest house, and avoid being close to incinerator stacks and other pollution sources as they may result in readings that are unrepresentative of the general air quality.

Other considerations

Other considerations in establishing a PMS include the following:

- Accommodation - Equipment has to be protected from the weather and is usually located in some type of demountable building.
- Access to power - Equipment generally runs on 240V mains power, so the site needs to be connected to the local electricity grid.
- Vehicle access - As goods such as gas cylinders and monitoring equipment need to be loaded into and out of the PMS there needs to access to the shed door for a vehicle.
- Communication access - The AAQ PMS require access to the 3G network so that a 3G wireless modem can transmit air quality data back to the HPS.
- Future Land Development Considerations - The AAQ PMS should be on a site where the surrounding area (100m radius) will not be developed for the next 5 to 20 years. AAQ NEPM requires that a station be in place for at least 5 years. To gather long term trends a station should ideally be in place for at least 10 years or longer.

Keeping these considerations in mind, a series of sites were scoped by HPS. Sites in the suburbs of Evatt, Melba, and Florey were investigated. These suburbs are in the lower areas of Belconnen, not far from the line of Ginninderra Creek. They are relatively central in the Belconnen region and are likely to capture any high levels of particulate pollution arising from wood heater usage from neighbouring suburbs higher up the valley. The HPS assessment of the locations identified issues with many of them, such as the cutting of trees, or difficulties in supplying power or providing vehicular access.

A consultation process was then undertaken with other areas of the ACT Public Service to decide on the a suitable location for the AAQ PMS. In this consultation the findings of the HPS assessment of the shortlisted locations, including the decision that the additional AAQ PMS be located in the Belconnen region, were discussed. It was agreed the most suitable location was at Neumann Place in Florey. The site is located centrally enough to capture pollution events in Belconnen, and requires little modification of the existing area to comply with the requirements of the Standard for siting air monitoring stations.

With the provision of funding for establishing the PMS in the 2012-13 Budget, work is underway to establish the PMS at Neumann Place Florey. Approval to use the land at this site has been obtained. The existing station at Belconnen Town Centre, which was used to measure particulate matter, has been closed down in preparation for the move. The shed will be relocated to Neumann Place Florey and be set up as a full PMS.

References

Australian Bureau of Statistics. 3218.0 - Regional Population Growth, Australia, 2011-12 http://www.abs.gov.au/ausstats/abs@.nsf/mf/3218.0 accessed June 2013.

Belconnen site for new PMS view from North
Source: PHD file photograph

What is an AQI?

Ben Lodder, ACTGAL, Population Health Division

The Ambient Air National Environmental Protection Measures (NEPM) for Australia set national standards for six key air pollutants: carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide, lead, particulate matter less than 10 microns (PM_{10}), and particulate matter less than 2.5 microns ($PM_{2.5}$). The standard for each pollutant sets out an ambient concentration benchmark with the aim of keeping concentration levels below this value. Because the pollutants occur in differing concentrations, it becomes difficult to interpret the pollutant concentrations as a measure of air quality. An Air Quality Index (AQI) is a more succinct way of reporting air quality by taking into account the NEPM standard for each pollutant.

An AQI is calculated for each pollutant based on the relevant NEPM standard. An AQI is the ratio between actual concentration and NEPM standard concentration, expressed as a percentage.

The following formula used is:

$$AQI_{(pollutant)} = \frac{\text{Pollutant concentration}}{\text{Pollutant standard}} \times 100.$$

Thus, an AQI value of 50 means a pollutant is at half the concentration of the standard while a value of 100 means a pollutant has a concentration equal to the standard. If an air quality monitoring site is measuring multiple pollutants, the AQI of the site will be the same as the pollutant with the highest individual AQI.

To provide meaning to reported AQI values, many organisations such as the NSW Office of Environment and Heritage, and the Environment Protection Authority of Victoria give an indication of air quality if it falls within a predefined range. Each level of air pollution is given a description as well as a colour to allow easy interpretation.

An example of the chart used by NSW is shown below:

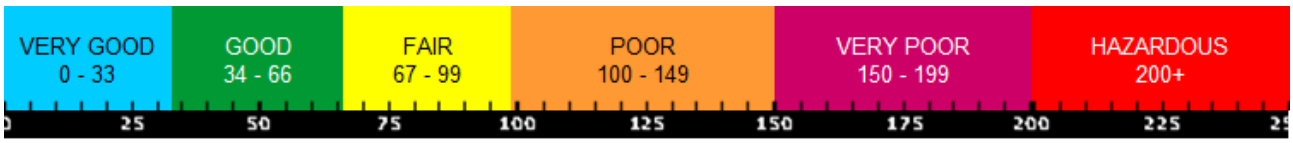


Figure 1 – The AQI chart used by NSW to determine air quality.
Source: NSW Office of Environment and Heritage

Each level of air quality (good, fair, poor, etc.) is accompanied with recommended measures to protect the health of people in the area. As an example, a less severe pollution event might be accompanied by a health update advising people who are at a greater risk (the elderly, those with lung disease including asthma) to stay indoors. The health warning for a more serious pollution event such as thick bushfire smoke would be for all people to refrain from exercise or physical exertion, and to remain indoors wherever possible.

An AQI gives an indication of air quality but is not designed as a model to predict future air pollution or be used to infer the exact concentration of air pollution. These services are offered in addition to AQI values and are used by both the NSW Office of Environment and Heritage, and the Environment Protection Authority of Victoria. They include real-time data concentrations of each pollutant and forecasting services which take into account weather conditions and expected pollution events such as back-burning. One limitation of real time data is that it cannot be continuously checked for quality control and may require subsequent correction due to instrument calibration, power failure, etc.

Reporting measurements as an AQI allows for simple interpretation of pollutant concentration. Grouping ranges of AQI values allows a quick evaluation of air quality. By combining real-time AQI values with geographical maps, air quality monitoring provides a convenient way to check air quality and take steps to reduce the impact of pollution events on the health of the population. There is currently no AQI scheme for the ACT, however ACT Health is developing an AQI reporting system which will be available online in the future.

Digital Datalogging System for the Air Quality Monitoring Network

Swarup Chatterjee, ACTGAL, Population Health Division

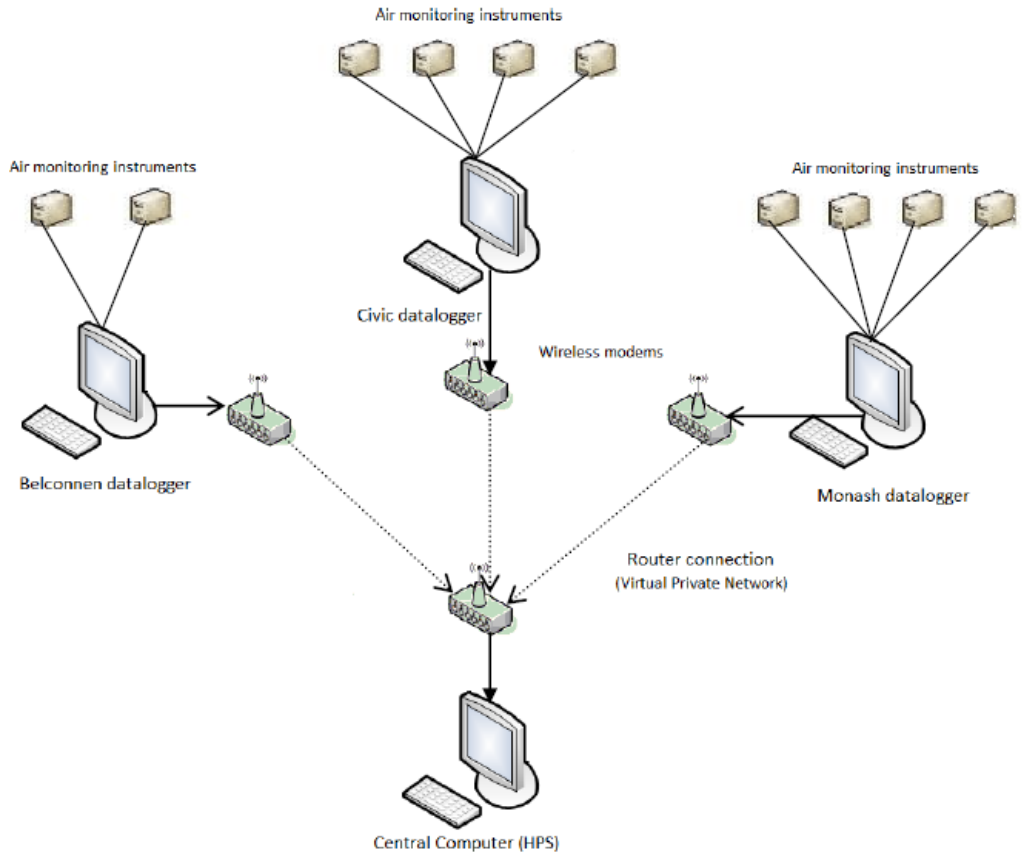
The ACT Government's air quality monitoring stations at Monash, Civic and Belconnen, consist of a series of air quality monitoring instruments and associated support equipment housed in an enclosure. A key consideration in operating an air quality monitoring station is collecting the readings from the instruments so that they can be analysed and reported in a meaningful way. A reliable data acquisition system is required for this purpose.

For many years the Health Protection Service (HPS) used an analogue datalogging system. This system consisted of an electronic data logger unit to which the air quality instruments were connected. The instruments would send an output voltage to the data loggers, which converted the voltage, using a mathematical equation, into an approximate measured pollutant concentration. The data stored in the data loggers was then manually downloaded on to the ACT Health network every morning by an HPS officer. While this system worked, it had become disjointed and outdated. It required the use of a series of on-site computers using the Linux operating system, with extra data being transferred from the site back to the office via a USB drive. The system also required different connections for different models of instruments, which added a layer of difficulty when replacing them, and was not compatible with all the air monitoring instruments in use.

In addition to these operational considerations, the data loggers only worked with dial-up modems. Using dial-up modems was not technically feasible for providing real-time data on the internet. This factor became more important in recent times as demand increased from some sections of the community and members of the Legislative Assembly for real-time air quality data to be published on the internet. Unlike other Australian jurisdictions which have air quality websites, the ACT could not provide this using an analogue datalogging system.

To address these concerns, HPS upgraded to a digital datalogging system in 2010. The system used is the Envista Air Resources Manager software, running on computers with the Windows operating system. The system is set up in the following way: at the monitoring stations, an Envista computer is connected to the air quality instruments and collects and stores measurements from the instruments. The computers at the monitoring stations are connected via a wireless modem to a central Envista computer at HPS, and the air quality data is transferred to the computer at HPS every five minutes and stored on a database. The process is depicted in the following diagram:

Figure 1: Process for digital datalogging system

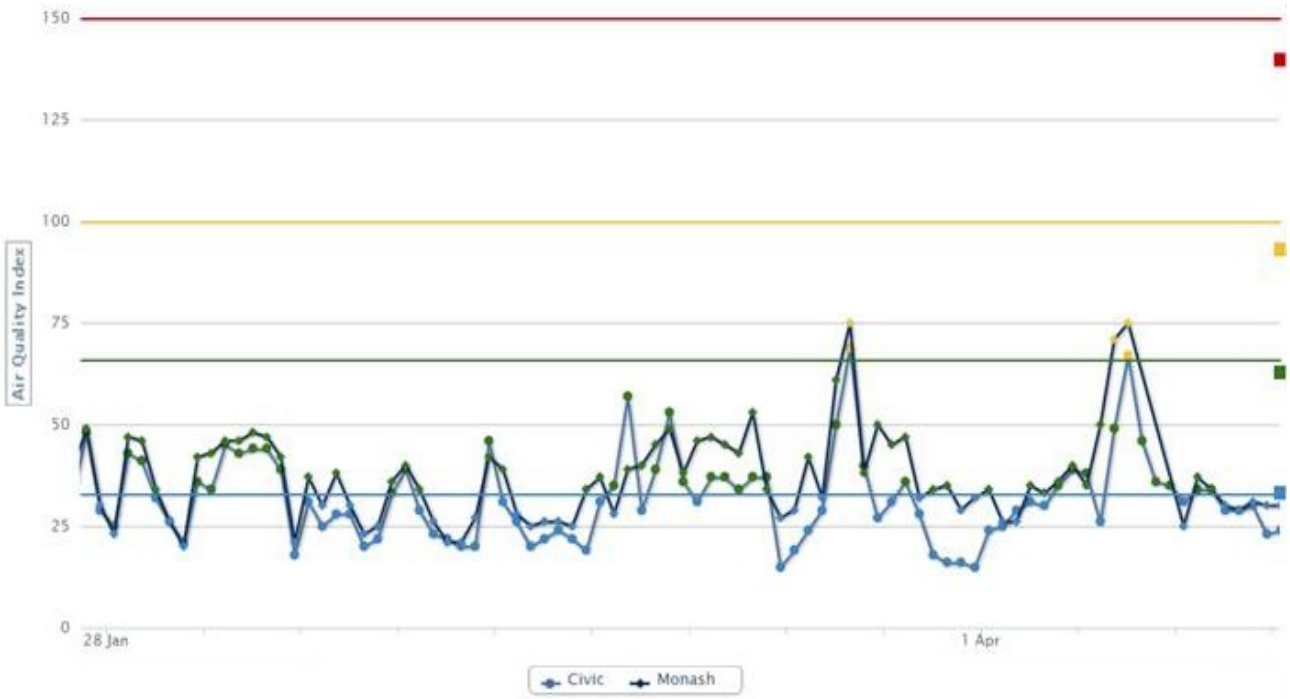


Digital Datalogging System for the Air Quality Monitoring Network *(continued)*

With the HPS computer collecting data from the stations every five minutes, air quality data can be effectively viewed and analysed at HPS in real-time. One major advantage of this is that HPS is now far more responsive in providing up-to-date air quality reports and advice to the Chief Health Officer during high pollution episodes. This occurred, for example, during several hazard reduction burn events and bushfires in and around the ACT in recent years.

A digital system can also allow for real-time reporting of air quality data on the internet. The software has also been configured to generate an Air Quality Index (known as an AQI), such that it can calculate the pollutant and site AQI and send that data to the dataACT and ACT Health websites. ACT Health is currently developing a website for air quality data reporting, which is expected to be online in the near future.

Figure 2: Example of Air Quality Trend graph



Air quality index

Very good 0-33	Good 34-66	Fair 67-99	Poor 100-149	Very poor 150+

Description	Air Quality Index	Potential Health Risks
Very Good	0-33	Air quality is considered good, and air pollution poses little or no risk.
Good	34-66	Air quality is considered good, and air pollution poses little or no risk.
Fair	67-100	Air quality is acceptable. However, there may be a health concern for very sensitive people.
Poor	100-149	The air quality is unhealthy for sensitive groups, such as people with lung disease or heart disease. The general population is not likely to be affected.
Very Poor	Greater than 150	Everyone may begin to experience health effects, especially those from sensitive groups.

Health Effects of Airborne Particles

Ben Lodder, ACTGAL, Population Health Division

- Particulate pollution is produced from natural sources (bushfires, dust storms, volcanic eruptions) and human activities (vehicle exhaust, fireplaces, power plants using fossil fuels).
- Airborne particulates can have varying health effects depending on the concentration and composition of the particles. Less severe effects include shortness of breath or coughing while more serious effects are increased risk of respiratory disease, cardiovascular disease and lung cancer.
- Air quality in the ACT is usually very good. The main sources of particulate pollution in the ACT are wood-burning heaters and bushfires (including hazard reduction burns). ACT Health has several initiatives aimed at reducing particulate pollution. These include the Wood Heater Replacement Program and the Don't Burn Tonight campaign.
- ACT Health is currently developing a public, online reporting system to monitor air quality. This system, along with ACT Health issued alerts for significant events, will allow people to avoid hazardous levels of airborne particulates and protect their health.

Airborne particulate matter (PM) is made up of small liquid or solid particles dispersed in the air. Because of their small size, they can remain airborne for long periods of time and may be carried over long distances by the wind. Particulate matter is classified according to its size. PM_{10} refers to particles less than 10 microns in diameter while $PM_{2.5}$ refers to particles less than 2.5 microns in diameter. Classifying particles based on size is important because smaller particles can enter the lungs more easily and cause more severe health effects.[1] Particulate matter can be emitted from a variety of natural sources or caused by human activity. Natural sources include sea spray, dust storms and volcanic eruptions while man-made sources comprise vehicle exhaust, power generation, mining, wood heaters and bushfire smoke. Airborne particulates can also be formed directly in the atmosphere from reactions between gaseous precursors such as ammonia, sulphur dioxide, or volatile organic compounds.[2] Known as secondary particles, these can form aerosols and are included in the $PM_{2.5}$ category. Particulate matter composition can vary considerably depending on the environment and where it originated. Common PM compounds include inorganic carbon, ammonium sulphate, ammonium nitrate, and volatile organic compounds such as polycyclic aromatic hydrocarbons. Larger particles may be made up of dust or pollen.

Particulate matter is a health concern because it can easily disperse through the air and be inadvertently inhaled. Because these particles are so small, they are not effectively filtered out by the body's natural mechanisms such as mucus membranes and have been shown to disrupt lung endothelial cell barrier integrity.[3] Once inhaled into the lungs, these small particles may provoke alveolar inflammation, leading to detrimental health effects.[4] Exposure to PM can result in short term disruption of lung function (e.g. shortness of breath), a higher risk of longer term respiratory and cardiovascular disease, aggravation of pre-existing respiratory conditions (such as asthma), and even lung cancer at high concentrations due to adsorbed compounds.[5]

Asthma medication
Source: D. Van de Zandt

The concentration of airborne particles is measured in micrograms (µg) of particulate matter per cubic metre (m^3) of air. It is estimated that the daily mortality of a population increases 0.2 – 0.6% for every 10µg/m^3 of PM_{10} and 6 – 13% for every 10µg/m^3 of $PM_{2.5}$.[2] The health impacts of PM are due to the small size and chemical properties of the particles. Exposure to PM may occur over a short or long term period. Short term exposure generally causes temporary effects which may resolve after the source of pollution subsides. Continuous, long term exposure to PM has the potential to cause chronic health effects which may persist for months or years. Vulnerable groups include children, the elderly and those with already impaired lung function. Those with impaired lung function are at risk of worsening their condition and children are at risk because their lungs are still developing and any exposure to particulate pollution impedes this development.[6]

Health Effects of Airborne Particles *(Continued)*

In high concentrations, vehicle exhaust can be carcinogenic due to the presence of compounds such as polycyclic aromatic hydrocarbons (PAHs).[7] $PM_{2.5}$ particles such as those produced in combustion are more hazardous than larger particles because they pass into the lungs more easily and may be bound to acidic compounds such as sulphates, nitrates and metals which can damage the lining of the lungs.[1] Smaller particles also persist in the air for longer and can therefore spread more easily.

Traffic in Canberra City
Source: PHD file photograph

In the ACT, smoke from bushfires and domestic wood heaters is the main source of particulate pollution.[8] Pollution from bushfires and hazard reduction burn events occurs around summer time and is usually a short-lived event lasting a few days at a time. It has been shown that air pollution events caused by bushfires are associated with increased hospital admissions for respiratory conditions.[9] Healthy adults generally find that any symptoms they develop because of bushfire smoke resolve after the smoke clears.[10]

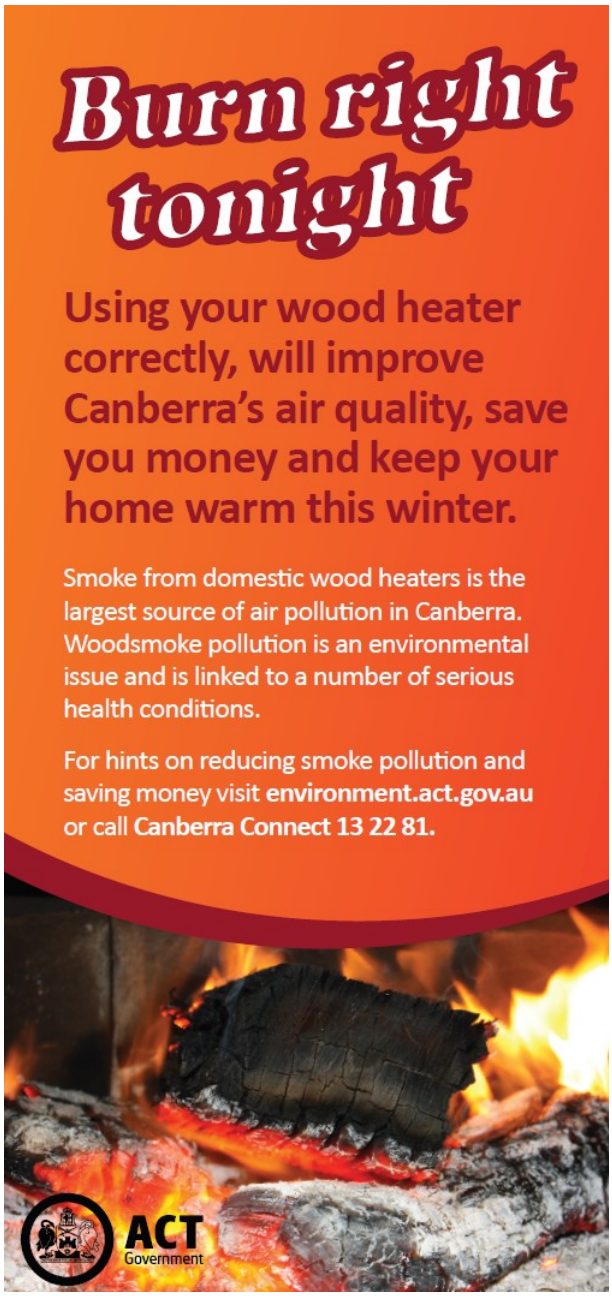
Many people in the ACT use a wood heater during winter but an incorrectly adjusted heater can generate excessive particulate pollution. This is especially evident during the cold winter months where temperature inversions can trap smoke close to the ground. The ACT Government is committed to reducing pollution from wood heaters evidenced by several initiatives. The Wood Heater Replacement Program offers a rebate of up to $800 to eligible participants who replace their wood heater with a cleaner gas heater.[11] The Burn Right Tonight campaign encourages Canberrans to use alternative forms of heating on still, cold nights when smoke is less likely to dissipate.[8]

Exposure to airborne particles has been shown to cause health problems but there are ways to limit exposure and reduce local sources of emissions. In cities with high levels of PM pollution such as Beijing, a face mask has been found to help protect against PM exposure.[12] Exercising in high pollution areas compounds any effects of exposure so avoiding local sources of pollution may be beneficial to your health.

Compared to other regions, the ACT has minimal levels of air pollution. If the ambient air in the ACT does reach unsafe levels, a health alert is issued detailing any vulnerable groups and precautions to limit exposure. If the source of pollution is from an external event such as a bushfire, remaining indoors and refraining from physical exercise is a good way to avoid adverse health effects. If an air-conditioner is installed, setting it to recirculate helps to reduce the amount of smoke entering a building.[10] Reducing local sources of particulate emissions also helps to keep the ambient air free of pollution. Wood-burning fireplaces produce more particulate pollution than other forms of heating.[13] Studies have shown that reducing ambient sources of biomass (combustion of organic matter) smoke is associated with a decrease in annual mortality and a reduction in cardiovascular and respiratory mortality during winter months.[14] Using alternative forms of transport such as buses, car pooling or riding a bike to work are other ways to reduce particulate emissions.

Person placing bicycle on bus bike rack
Source: PHD file photograph

Airborne particulate matter is produced from a wide variety of sources and its potential to cause adverse health effects is well known. Although there is no evidence of a safe level of exposure to $PM_{,}^{2}$ by taking precautions and reducing emissions, airborne particulate pollution and its negative health effects can be avoided.



Source: ACT Government Environment and Sustainable Development Directorate

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Articles

Bushfire Smoke and Air Quality

Chris Kelly, Manager, Preparedness and Response Section, Population Health Division

- Bushfire smoke can lead to deterioration in air quality, impacting on individuals and communities
- Bushfire smoke in the ACT can be present from either a bushfire or a large hazard reduction burn
- ACT Health monitors air quality in the ACT and if the air quality in Canberra is a hazard, a health warning will be issued

Smoke from bushfires can rapidly lead to a significant deterioration in air quality, with high concentrations of fine particles, gases and water vapour released into the atmosphere. Bushfire and hazard reduction burn smoke can impact on individuals and communities at any time of year, depending on the size and intensity of the fire and the prevailing weather conditions. Routinely the gases in bushfire smoke may include combinations of carbon monoxide, carbon dioxide, nitrogen oxides and volatile organic compounds.[1]

Usually individuals perceive bushfire smoke as a visible haze and smoke can be detected by its distinctive smell. As a general rule the more visible the smoke haze is, and the stronger the odour, the more likely it is that the smoke contains concentrations of gases and particles that will be hazardous to health.

Whilst a visible haze will indicate the presence of bushfire smoke, the concentration of hazardous particles and gases will be dependent on a number of factors including: the size of the bushfire and the amount of smoke produced; the distance the smoke has travelled from the source of the bushfire; and, the prevailing weather conditions including wind directions and speed.

Fine particles in bushfire smoke can get into the eyes and the respiratory system, causing watering and irritation. In healthy individuals the effects from bushfire smoke disappear quickly once the smoke has cleared. However, those with respiratory or heart conditions (such as congestive heart failure, angina, chronic obstructive pulmonary disease (COPD), emphysema or asthma) are more sensitive to the effects of smoke. Exposure to particles can aggravate their condition and sufferers may experience symptoms at lower smoke levels than healthy people. Children, the elderly and pregnant women are also generally more sensitive to the effects of bushfire smoke. A recent study demonstrated an association between high bush-fire related air pollution levels and increased admission for respiratory conditions in Sydney hospitals.[2]

Sources of bushfire smoke in the ACT

Smoke may be present in the atmosphere from either a bushfire or large hazard reduction burn. In the ACT the bushfire season runs from 1 October until 31 March annually, unless extended by the ACT Emergency Services Agency (ESA) for operational or climatic reasons.

The process of hazard reduction burning involves removing vegetation (fuel) to reduce the intensity of bush or grass fires in future. To reduce the fuel hazard, authorities and land managers either physically remove the vegetation, or minimise it as much as possible. This can be achieved by burning, slashing, grazing or vegetation removal.

Planned burning uses fire to burn away a fuel hazard, such as long grass or thick bush. Dependent on the type of land involved, planned burning in the ACT can be undertaken by the ACT Rural Fire Service (ACTRFS), the Territory and Municipal Services (TAMS), or by rural lease holders.

During the bush fire season a rural land holder must seek a permit from the ACTRFS before lighting a planned burn. Rural land holders are encouraged to seek advice from the ACTRFS all year around before lighting planned burns.

Usually March until June sees extensive hazard reduction burns undertaken in the ACT and interstate as the culmination of summer fuel growth requires reduction in a relatively short period of time.

Controlled burn
Source: ACT Emergency Services Agency

Bushfire Smoke and Air Quality (Continued)

Air Quality during Bushfire and Reduction Burns

Bushfire smoke can travel large distances dependent on the prevailing weather conditions. The ACT can be impacted by bushfire smoke originating in other states including Victoria and New South Wales.

When conducting hazard reduction burns fire services and land managers take due care to ensure that the burn is conducted in weather conditions that will minimise the impact of the smoke produced in the area and on the surrounding community, taking into consideration conditions such as predicted wind strengths and directions.

ACT Health provides a standard health warning to the ESA. The ESA issues a community alert for all planned burns at its website http://esa.act.gov.au/ and via ESA social media feeds.

ACT Health monitors air quality in the ACT continuously for pollutants. If monitoring determines that air quality in Canberra is a hazard, a health warning will be issued as a media release.

More information on Bushfires is available from esa.act.gov.au/actrfs/ and further information on air quality from bushfire smoke is available at health.act.gov.au/publications-reports/fact-sheets/bushfire-smoke.

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ACT Rural Fire Service
Source: ACT Emergency Services Agency

Protecting yourself against bushfire smoke

Bushfire smoke exposure and health effects

Smoke from bushfires (and hazard reduction burns) is made up of small particles, gases and water vapour.

Fine smoke particles affect the human breathing system. If present in high enough concentrations, these particles and gases can cause a variety of health problems, such as itchy or burning eyes, throat irritation, runny nose and illnesses such as bronchitis.

Smoke particles can also aggravate existing lung conditions, such as chronic bronchitis, emphysema, asthma as well as some cardiac conditions. Symptoms can occur for several days after exposure, so people with the above conditions need to be vigilant with their treatment plans.

If you have asthma or a lung conditions and you develop symptoms such as shortness of breath, coughing or wheezing, follow your personal Asthma or COPD Plan.

Health precautions

The following precautions can help you minimise adverse effects for exposure to bushfire smoke:

- Stay indoors, with windows and doors closed; or
- If possible, stay in air-conditioned premises, switch your air-conditioner to 'recycle' or 'recirculate' to reduce the amount of smoke coming inside your house;
- Avoid vigorous exercise, especially if you have asthma or other chronic respiratory and/ or chronic cardiac diseases;
- It is especially important for people with asthma to continue their medication and consult their general practitioner if they have any difficulties breathing.

If you must be outdoors when bushfire smoke is present consider using a mask designed to filter fine particles.

If you are particularly susceptible to bushfire smoke, and if safe to do so during a bushfire event, consider:

- Staying with a friend or relative whose house has clean indoor air; or
- Leaving the area for a cleaner environment.

If you or anyone in your family is experiencing symptoms that may be due to bushfire smoke exposure, seek medical advice from your local doctor.

Anyone experiencing difficulty in breathing or chest pain should seek urgent medical assistance.

For more information visit the ACT Health website: www.health.act.gov.au

Mould—an overview

Dr Alexandra Greig, Public Health Registrar, Population Health Division

- Mould is a generic term which encapsulates many types of fungi. Mould is found everywhere, both in the indoor and outdoor environment.
- Indoor mould has been associated with a variety of human health effects.
- There is an association between indoor mould and asthma, and the symptoms of asthma such as cough, wheeze, and shortness of breath.
- Visible mould in the indoor environment should be removed. Testing for mould is generally not helpful.

Mould, in the vernacular, is a generic term which encapsulates many types of fungi. Fungi are a diverse class of microorganisms which reproduce from spores and include, amongst others, yeasts, moulds, and mushrooms.[1] Fungal spores require organic matter as a nutrient base and moist, humid conditions to reproduce.[2] Throughout this article the generic term “mould” will be used to describe indoor fungi as a whole.

Moulds are ubiquitous and found in the outdoor air and in the house dust or surfaces of every home.[2] Mould spores may be present on materials, clothing or footwear brought in from the outdoor environment. They may be brought in by pets, blown in through open windows or doors and dormant spores are usually present on many of the building materials themselves.[3]

Moulds require moisture and organic matter to grow and in these conditions dormant spores may proliferate.[2] Moulds may find an organic nutrient base in household dust, wallpaper or textiles which contain the appropriate mix of carbohydrates, protein and lipids for growth, as well as multiple other sources including depositions of paint, glues, cooking oils and paper products.[2] In general, nutrients for growth are plentiful in the environment and indoor temperature is not a limiting factor. Thus the most important factor in the proliferation of moulds is the moisture level or “dampness” of the indoor environment and elevated numbers of fungi and fungal spores have been demonstrated in “damp” homes on field studies.[2] Dampness inside a home is more likely to occur in environments where there is overcrowding, lack of insulation, ventilation and proper heating[4] and thus it may disproportionately affect lower income communities.

Biological substances associated with mould include fungal spores, fungal allergens, irritant organic compounds, fungal (1-3)-β-D-glucans (a component of the fungal spores cell wall) and mycotoxins which may be found in components of fungi such as spores and hyphae.[2]

Health effects associated with mould

Exposure to moulds has an established association with various adverse health effects, including fungal infections, hypersensitivity pneumonitis, respiratory effects from moulds irritant by-products and mycotoxicosis.[1,5] Mycotoxicosis usually results from ingestion of fungally contaminated foods that release mycotoxins. Poorly defined syndromes such as "toxic mould syndrome" and hypothesised health effects such as immune dysregulation have been attributed to mould despite there being no reliable evidence.[1,5]

One of the most well-established associations is between indoor mould and asthma. Asthma is a common condition in the ACT. Data for the period 2009-10 indicates that 9.6% of ACT residents had asthma.[6] This is consistent with national data which indicates approximately 9.9% of the Australian population had a current diagnosis of asthma in the period 2007-2008.[7] Triggers for asthma include exercise, cold air, viral infections, environmental irritants or pollutants, and a variety of inhaled allergens including dust mites, domestic pet dander, cockroaches, pollen and fungal spores.[8]

The relationship between exposure to microbes, including bacterial endotoxins and fungal agents, and atopy and allergic disease, including allergic asthma is complex. The “hygiene hypothesis” suggests that children growing up in a microbiologically hygienic environment might have an increased risk of developing allergies, and some studies have indicated that exposure to microbes in early life may have a protective effect.[2] However, other studies have found either no protective effect or an increased risk of an adverse health outcome. One hypothesis is that the time at which you are exposed is important, with exposure in early life being protective, whilst exposure in later life may place persons at risk.[2]

Mould
Source: PHD file photograph

Health effects associated with mould *(continued)*

The World Health Organization (WHO) in 2009[2] assessed the health effects of indoor-dampness related agents (including mould) and found sufficient evidence that they were associated with various respiratory effects. These include exacerbations of asthma, the development of asthma, an individual currently having asthma as well as symptoms of asthma such as cough, wheeze, shortness of breath and other upper respiratory tract symptoms.

They also found evidence of an association between indoor-dampness related agents and respiratory infections. This means that these agents were consistently found to be associated with the health outcome, for example exacerbation of asthma, in several studies where chance or error on the part of the researchers was ruled out.[2] However, the epidemiological evidence has not demonstrated that mould is the definitive cause of any adverse human health effect.[2] The WHO found limited or no evidence of association between indoor-dampness related agents and bronchitis, allergic rhinitis, ever having asthma, changes in lung function or allergy/atopy.[2]

The WHO findings were supported by a meta-analysis of observational studies looking at the relationship between indoor dampness, mould and asthma for children. This found that the presence of visible mould in the environment was positively associated with asthma and wheeze; with children who lived in a home with visible mould having approximately 50% increase in the odds of asthma [OR 1.49 (95% CI 1.28-1.72)].[9]

In considering the epidemiologic evidence identifying associations between mould and asthma it is important to recognise that within an indoor environment an individual is exposed to multiple microorganisms. In addition we have limited methods for identifying and measuring different microbiologic exposures.[10] Consequently there is uncertainty and we are unable to definitively identify mould as a cause for asthma or identify any potential dose-response relationship. We can definitively state however, from the epidemiologic evidence, that there is a strong association between indoor dampness or mould and asthma that has been consistently demonstrated across multiple studies.[2] With the development of new methods of exposure assessment[9] and as evidence accumulates we may in the future be able to identify the exact role that mould plays in the development of asthma.

The association between asthma and indoor mould is of concern as estimates of the prevalence of indoor dampness in homes have ranged between 18 and over 50 percent[11,12] in Nordic, eastern European and north American studies.

Testing and remediation of mould

Although testing for the different species of mould, by culturing the organism in a laboratory, and other methods such as dust sampling can be performed, it is generally not helpful. Testing has not been found to be helpful in determining an individual's health risks, as in a typical environment they are exposed to multiple species of moulds and the health effects associated with these vary with the individual's susceptibility and the amount and type of mould.[13] Thus if an individual is susceptible to mould, and it is seen or smelled in the home, it should be removed.[13]

Testing for mould is generally not helpful in deciding whether or not mould should be remediated and is not routinely recommended.[13] There is no quantifiable, precise relationship between household dampness, mould exposure and health effects in humans and the mechanisms by which mould may cause ill health are not clear. Consequently the WHO guidelines[2] state "no quantitative, health-based guideline values or thresholds can be recommended for acceptable levels of contamination by microorganisms" including fungi.

Even though we cannot identify a "safe" level, in light of the strong association between indoor dampness and mould and respiratory diseases, particularly asthma, the prevention and remediation of mould are important public health activities. A recent Cochrane review[14] looked at the benefits of remediating mould in homes on reducing asthma, respiratory symptoms and respiratory infections. Overall they found evidence, of moderate quality, that remediation of mould reduced the odds of having asthma-related symptoms by approximately 35% (for wheezing OR 0.64 95% CI 0.55-0.75) as well as respiratory infections such as rhinitis, colds and flu, compared to no intervention. However their recommendation was that more and better quality studies were needed to confirm these results and to clarify other findings.

In addition to removing any mould found within buildings, an essential part of remediation is to address the conditions that encouraged mould to proliferate in the first place. As water is the most critical factor in indoor mould growth,[2] control of mould will generally entail reducing sources of moisture or dampness in the home and improving ventilation. This may include reducing humidity by ventilating moisture producing appliances such as clothes dryers, use of air conditioners and dehumidifiers, and using an exhaust fan or open window when showering. Reducing humidity, along with ventilation, increased air temperature and insulation of cold surfaces, such as water pipes, in turn helps to reduce water condensation.[15]

Mould—an overview *(Continued)*

Conclusion

Mould is an important microbial agent which has been implicated in a range of human health effects. Research is continuing to more clearly establish its exact role in different illnesses. It is important if mould is identified in a home, workplace or school that appropriate actions are undertaken to remove the mould and prevent it continuing to grow in the future. For more information please consult the ACT Health fact sheet available at: http://health.act.gov.au/publications/fact-sheets/mould.

Mould in an indoor setting.
Source: PHD file photograph

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Risk communication as a core task for public health

Dr Andrew Pengilley, Deputy Chief Health Officer, Population Health Division

Public Health as a discipline has an established role in advocating for action which improves health or avoids risks to health. In modern societies this places many demands on public health practitioners to effectively communicate about complex health risks ranging from those causing chronic disease to those in emergencies. These are population level or ongoing risks to health arising from technology, the environment and behaviour. As those with responsibility for population health, public health practitioners must master core principles of effective risk communication to reduce the harm potentially caused by these risks by changing the attitudes of the population and so their behaviour

Risk is the potential for an adverse event to occur, often as a result of an action or inaction. Risks to health, such as injury or communicable disease, cannot be entirely avoided. Western "risk societies"[1], however, place a high value on personal safety and have increasingly demanded Governments act to protect them from health risks. Public health authorities have traditionally managed the health risk from infectious diseases by recommending measures like vaccination, improved housing and clean water supplies. The modern orientation of society towards risk-aversion has placed Public Health practitioners at the intersection between the demands of Government, commercial media, the citizenry and technical expertise in a far broader range of contexts. In the past 10 years in the ACT, this has included involvement in managing technological emergencies (chemical spills), natural disasters (flood, fire), chronic behavioural risks (smoking, alcohol consumption), and environmental risks (Genetically Modified crops, cell-phone radiation, cancer clusters).

ACT Rural Fire Service
Source: ACT Emergency Services Agency

A vital part of responding to these risks is communicating their nature, and the actions which people should take to avoid harm, in a way which influences the behaviour of individuals or organisations. There is an expanding literature on how to do this precisely because there is no 'cut and dried' answer on how to communicate effectively. It is clear, however, that many incidents perceived as public health 'disasters' or 'crises' such as the flooding of New Orleans after Hurricane Katrina, the aftermath of the Fukushima reactor explosion, the impact of Severe Acute Respiratory Syndrome on health workers and the H1N1 Influenza Pandemic escalated with failed communication about risk.[2,3]

The purpose of effectively communicating about health risks is that it motivates people to take action to reduce harm and to avoid them taking actions which may increase their health risk. Effective communication about the risk posed by a bushfire can help people decide to evacuate, for example. Poor risk communication in this situation can lead to people being harmed by the fire, but can also lead to people placing themselves at risk of vehicle accidents if they decide to evacuate when it is unnecessary. Simple, transparent, communication of technical advice about how to reduce a health risk in a way that is understood and acted upon by its intended audience has been an ideal of Governments and health practitioners but unfortunately rarely occurs.[2]

People's perception of information about a health risk is often distorted by individual psychological factors. A risk which is unfamiliar is often exaggerated, one which is involuntary is perceived as more dangerous than one that a person chooses to assume, health risks arising from actions with which a person disagrees may be seen as more serious than those arising from actions they support. People do not 'sum' risks as statisticians might expect, and can focus on a remote 'dread' risk, such as developing cancer from low-frequency electromagnetic radiation, even if they have a high risk of mortality from modifiable lifestyle factors, such as smoking.[4]

The public are generally sceptical of officially communicated threats or risks and will often prefer information from trusted sources, such as family, friends, or local community leaders. This can result in people disregarding health warnings, even in an emergency, unless they are repeated in many forms, through many channels, and by trusted sources.[2-5] Governments also frequently bias technical communication out of a desire to be reassuring, wishing to avoid being alarmist, or because they fear a 'panic'. This can lead to people failing to act on risk messages. Media is often blamed for distorting risk communication and tends to 'frame' risks which fit narratives of escalation of an issue, blame for an event, or looking for lessons learned from an incident. Finally, even accurate technical risk information may be unusable by many people.

Language and educational level can be barriers to understanding, as can be presentation of 'population' data. Epidemiologists tend to measure 'averages', such as the 'mean exposure' to a toxin, when people really want to know the individual risk to their health.[2] These factors need to be considered when planning how to communicate about a particular health risk.

Risk communication as a core task for public health *(Continued)*

A process for designing risk messages has been proposed which consists of three sequential steps.[4]

'Risk appraisal' involves assessing the nature of the risk. This includes scientific information about the source, scale and severity of a health risk as well as who is at risk, whether people are at risk voluntarily or involuntarily and whether the risk is stigmatised.

'Situational analysis' involves assessing the social context of an incident or risk in the media, social and political environment. This is particularly relevant for acute health risks, such as an outbreak of gastroenteritis, where the public perception and discourse will be shaped by the memory of previous incidents. Media reporting of Salmonella outbreaks in ACT restaurants over several years has tended to be framed in terms of an ongoing risk of infectious diseases, public health actions taken or not taken since previous outbreaks and common features between incidents. Rarely does risk communication only involve those directly exposed to the risk but also their relatives and people who might be aware of a risk and concerned about it. Media coverage of some events, such as natural disasters or terrorism, can be a risk to mental health in itself and this should be considered as part of the social context in framing communication.

'Source analysis' involves asking who should communicate information about a risk, who is a highly-trusted source, who is the intended audience and what media one could use to communicate a message. Politicians and government officials may not be the most trusted communicators of information where there is suspicion of 'spin' or in communities which have a high level of distrust for authority. General practitioners, technical experts or local community leaders can be more trusted risk communicators.

Considering these three elements can assist in developing a process for communicating a health risk which has a higher chance of being effective.

Planning is essential to be able to enact a considered communication of health risks, particularly in an emergency.[2,6] It is important to develop a central 'single point of truth' repository of information about an incident to avoid conflicting messages being generated. ACT Government has a Public Information Coordination Centre (PICC) to provide this in major incidents, but a 'single point of truth' should also be part of the management of 'routine' events. The Population Health Division must maintain the ability to access trusted communicators, such as the Chief Health Officer, clinicians or scientific experts. In addition to 'traditional' media outlets, the ability to provide information on the internet and social media is important. This may include the capacity to reach Culturally and Linguistically Diverse (CALD) groups through targeted media or community intermediaries as mainstream media may not reach these people effectively.[4]

The question of how to maintain this effort through what may be a prolonged incident, or merely prolonged media or public interest in an incident, is a key concern for planners. The abundant literature on risk communication is testament to the fact that communication is never executed without fault. The first step, however, is to recognise the importance of communicating well to manage health risks and to ensure this is a priority for health planners. Public Health units are ideally placed to take the lead in addressing these issues because of the breadth of their experience and exposure to communicating with the public about health risks.

Risk communication as a core task for public health *(Continued)*

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ACT Health Public Health Alerts website and ACT Health Twitter feed
Source: ACT Health website

Case Study: Deathcap Mushroom Communications Plan

Dr Andrew Pengilley, Deputy Chief Health Officer, Population Health Division

Two people died in Canberra as a result of eating wild poisonous *Amanita Phalloides* 'Deathcap' mushrooms on 31 December 2011. Following best practice the risk communication response to this incident included a risk appraisal, situational analysis and source analysis.

ACT Government Health

MEDIA RELEASE

Talk to your neighbours about the dangers of Death Cap Mushrooms

After recent summer rain, ACT Chief Health Officer Dr Paul Kelly today issued another reminder not to pick wild mushrooms, while encouraging Canberrans to talk to their families, friends and neighbours about the dangers of death cap mushrooms.

"Death Cap mushrooms often grow near established oak trees, and are found when there is warm, wet weather," Dr Kelly said.

"In Canberra this usually occurs in autumn, but as Canberra is anticipating more summer rain, it means Death Caps can be found growing now.

"Canberrans should talk to their neighbours about Death Cap mushrooms to ensure everyone is aware of the dangers.

"The fully-grown Death Cap mushroom cap is silky smooth, and its colour varies from white to greenish-brown. The gills are white – unlike the pink or brown gills of the common field mushroom. The stem is white to pale yellow-green.

"High on the stem is a skirt-like white ring, which is sometimes missing. The bottom of the stem emerges from a white cup, which is partly buried in the soil. The small button Death Cap can be very difficult to distinguish from an edible mushroom.

"All parts of this mushroom are poisonous, and eating just one mushroom can be fatal. People should not eat any mushroom unless they can be absolutely certain that it is not poisonous. It can be difficult for even experienced collectors to tell poisonous and safe species of wild mushroom apart.

ACT Health media release 10 February 2012
Source: ACT Health website

Picture of *Amanita Phalloides* (Deathcap) mushrooms
Source: Shutterstock

Risk Appraisal:

- There is a risk of death from people eating wild Deathcap mushrooms which grow wild in the ACT.
- Collecting wild mushrooms is a cultural practice particularly among some European and Asian ethnic groups.
- The Deathcap is a mushroom native to Europe but closely resembles non-toxic species collected in Asia. People from Asia who collect mushrooms may be at increased risk of collecting Deathcap mushrooms by mistake.
- Deathcap mushrooms cannot be eliminated from the environment.

Situational Analysis:

- Several years previously, a Chinese woman visiting Canberra had died from eating Deathcap mushrooms mistaken for non-toxic species.
- There was national and international news reporting of both of these cases.
- There was public concern about not knowing that these deadly mushrooms grow wild in Canberra around schools, sports grounds etc and what to do if they are found.

Case Study: Deathcap Mushroom Communications Plan *(continued)*

Source Analysis:

- Prominent members of the Chinese community noted that public information about Deathcap mushrooms, such as English language signs, did not address people who are new to Canberra and may not speak English. Local community groups were better able to access and provide information to this group.
- New simplified flyers and posters were developed in consultation with key stakeholders, including the multicultural community. Targeted media distribution took place, including interviews in Chinese television media, information in multicultural newspapers and broadcast through multicultural radio.
- Media required information about the Government response to Deathcap Mushrooms from an authoritative source. The Chief Health Officer and Clinical Director of the Emergency Department spoke to television and radio media.
- Additional concern was received from Canberra residents about where mushrooms might be found and how to deal with them. The ACT Government call centre was provided with scripting, information was mailed to households, and fact sheets were provided on the internet.
- The Health Protection Service wrote to food businesses as the Regulator to advise them not to use locally collected wild mushrooms in any dishes served to the public.
- Territory and Municipal Services changed signage around known areas with Deathcap mushrooms to include several non-English languages.
- Public Health physicians spoke to incoming international student groups about health risks in Canberra including poisonous mushrooms at the orientation sessions at tertiary institutions.

Outcome:

A formal assessment of this risk communication strategy was not been conducted and so its ultimate success cannot be judged. There have, however, been no cases of ingestion of Deathcap Mushrooms in the ACT since 2011.

Posters relating to wild mushrooms
Source: ACT Health

Area Highlight

The ACT Government Analytical Laboratory (ACTGAL)

The ACT Government Analytical Laboratory (ACTGAL) Section is part of the Health Protection Service, a branch of the Population Health Division, ACT Health and is certified to Australian Standard ISO 9000 by NCS International. ACTGAL is comprised of a number of health disciplines and employs chemists, microbiologists, technical and general service officers and administrative staff. ACTGAL is involved in collaborative research with the University of Canberra, including supervision of honours and Doctorate students and members regularly provide technical expertise to both state and national programs related to their area of expertise. ACTGAL is comprised of the following three functional units.

Toxicology and Forensic Chemistry

The Toxicology and Forensic Chemistry Unit is accredited to ISO 17025 by the National Association of Testing Authorities (NATA) in the field of Forensic Science. The unit provides analytical support for forensic investigations relating to drugs and poisons, and expert opinion to relevant ACT courts. Specifically, the service provides analytical toxicology support for coronial investigations, ACT legislation including the Road Transport (Alcohol and Drugs) Act, drug treatment programs and analytical chemistry support for controlled substances legislation and clandestine laboratory investigations.

Environmental Chemistry

The Environmental Chemistry Unit is accredited to ISO 17025 by NATA in the field of Chemical Testing and provides analytical support for the monitoring of ambient air quality in the ACT for compliance with the Ambient Air Quality National Environmental Protection Measure and Asbestos identification and counting on a fee for service basis.

Microbiology

The Microbiology Unit is accredited to ISO 17025 by NATA in the field of Biological Testing and provides microbiological analytical support related to food and water required under various ACT Acts, regulations and guidelines. In partnership with Environmental Health, the microbiology unit investigates sources of food poisoning and microbiological analysis of food and water on a fee for service basis.

Back Row: Ian Fox, Simon Rockliff, Daniel Andres, Ben Lodder

4th Row: Lynton Stewart, Tim Altamore, Radomir Krsteski, David Keith Smith

3rd Row: Ian Whittall, Swarup Chatterjee, Catherine McDonald, Deborah Denehy

2nd Row: Yamuna Karunasekara, Leanne Hillier, Priti Indapurkar, Amalie Pakchung

Front Row: Joanne Giaccio, Priya Jeevaranjan, Annie Pham, Tharka DeSilva

If you wish to contact ACTGAL you can email us on hps@act.gov.au

Quarterly Report on Notifiable Conditions

Cases of interest and diseases with higher case numbers than expected between April and June (2nd quarter) compared to previous years

Invasive meningococcal disease

There was one case of invasive meningococcal disease (IMD) notified between April and June 2013. This case was treated at hospital and recovered and the infection was caused by *N. meningitides* serotype B. In the last five years, there were nine cases of IMD, with serotype B causing infection in eight cases. On average, there are 1.8 cases of IMD notified each year in the ACT. Routine vaccination is available for children and high risk individuals against meningococcal disease caused by serotype C only.

Vaccine preventable disease

One case of mumps was notified in the 2nd quarter 2013. The case reported receiving two doses of measles-mumps-rubella (MMR) vaccine as a child. He had travelled to Europe in the incubation period, where mumps is endemic in some areas. No subsequent cases amongst his contacts were identified. Mumps is relatively unusual in the ACT -there have been only eight cases notified between 2008 and 2012 in the ACT. People born in the late 1960's – mid to 1980's are at increased risk of mumps and measles infection, because many did not acquire mumps infection naturally and missed being vaccinated when vaccination programs were introduced and through catch-up programs. Everyone should receive two doses of MMR to gain maximum protection against measles, mumps and rubella infection, unless already immune.

Influenza notifications

Between January and June 2013, there were 24 influenza B notifications compared to the five year average of 11.6 notifications. In the same period, there were 77 influenza A notifications compared to a five year average of 110.4. In the 2nd quarter, there were 38 and 19 cases of influenza A and influenza B respectively. Seasonal influenza vaccination is recommended for anyone aged six months and over, and is funded for certain at risk groups. Influenza notifications are summarised in more detail in the fortnightly influenza report during the influenza season, available at: http://www.health.act.gov.au/alerts/.

Salmonella infection

Salmonella causes gastrointestinal symptoms such as diarrhoea, abdominal cramps, vomiting, fever and lethargy. Year to date, there have been 186 notifications of salmonellosis in the ACT, with 114 notified in the 2nd quarter. Year to date, the average number of cases notified in the previous five years was 107.6. An outbreak of Salmonella typhimurium phage type 170 was investigated by the Health Protection Service in May 2013. Seventy-nine laboratory – confirmed cases and 83 linked suspected cases reported consuming food at a single restaurant prior to the onset of their illness. Control and prevention measures were instituted at the restaurant.

Gonococcal infection

Gonorrhoea is a sexually transmitted infection. There were 61 cases of gonorrhoea notified in the ACT year to date compared to an average of 36.6 notifications in the previous five years. There were 22 notifications in the 2nd quarter of 2013. The majority (89%, n=55) of notifications in 2013 have been in men. The number of notifications in the ACT increased in 2011 and 2012, with 128 and 92 notifications respectively, compared to between 22 and 56 notifications between 2008 and 2010.

	Year to Date 2013	1st qtr 2013	2nd qtr 2013	2012	5 year average, year to date
VACCINE PREVENTABLE CONDITIONS					
INFLUENZA A	77	39	38	532	110.4
INFLUENZA B	24	5	19	134	11.6
MENINGOCOCCAL DISEASE (INVASIVE) *	2	1	1	1	1.2
MUMPS	1	0	1	6	0.7
GASTROINTESTINAL DISEASES					
CAMPYLOBACTERIOSIS	175	105	70	477	253.6
CRYPTOSPORIDIOSIS	31	19	12	19	27.4
GIARDIA	72	41	31	105	59.4
SALMONELLOSIS	186	72	114	241	107.6
SHIGELLOSIS	6	4	2	6	3.4
SEXUALLY TRANSMITTED INFECTIONS					
GONOCOCCAL INFECTION	61	39	22	92	36.6
VECTORBORNE & ARBOVIRUS					
BARMAH FOREST VIRUS INFECTION	4	3	1	2	3.6
DENGUE FEVER	4	3	1	22	15.2
MALARIA	10	8	2	11	11.6
RESPIRATORY CONDITIONS					
TUBERCULOSIS #	8	5	3	18	3.4

NNN - Not nationally notifiable

All Diseases except Tuberculosis are reported by onset date or closest known test date. Tuberculosis is reported by notification date.

* This condition includes cases that meet the probable and confirmed case definitions. Both probable and confirmed cases are nationally notifiable.

*YTD = Year to date total. For the relevant year, quarter 1 refers to 1 January to 31 March, quarter 2 refers to 1 April to 30 June, quarter 3 refers to 1 July to 30 September, quarter 4 refers to 1 October to 31 December.

N.B. Data reported are the number of notifications received by ACT Health. Data are provisional and subject to change.

Table 1. Number of notifications of selected notifiable conditions received in the Australian Capital Territory, 1 January to 30 June 2013.

Influenza Report

1 January 2013 to 9 August 2013

Summary: The influenza season started late in the Australian Capital Territory, with the numbers of influenza cases reported to ACT Health steadily increasing since late June. This is consistent with national influenza activity.

Influenza notifications

Between 1 January and 9 August 2013, there have been 177 notifications of influenza in the ACT (Fig 1). Of those notifications, 123 (69.5%) were influenza A. Where typing has occurred for influenza A (approximately 20% of notifications) they have been predominantly H1N1 pandemic swine influenza. Year to date in 2013, 101 (57%) notifications were in females, and 79.2% (n=80) of notified cases were aged 20-49 years (Fig 2). In 2012, the most notifications were received in the 0 – 9 years age group (n=187, 28%) (Fig 2).

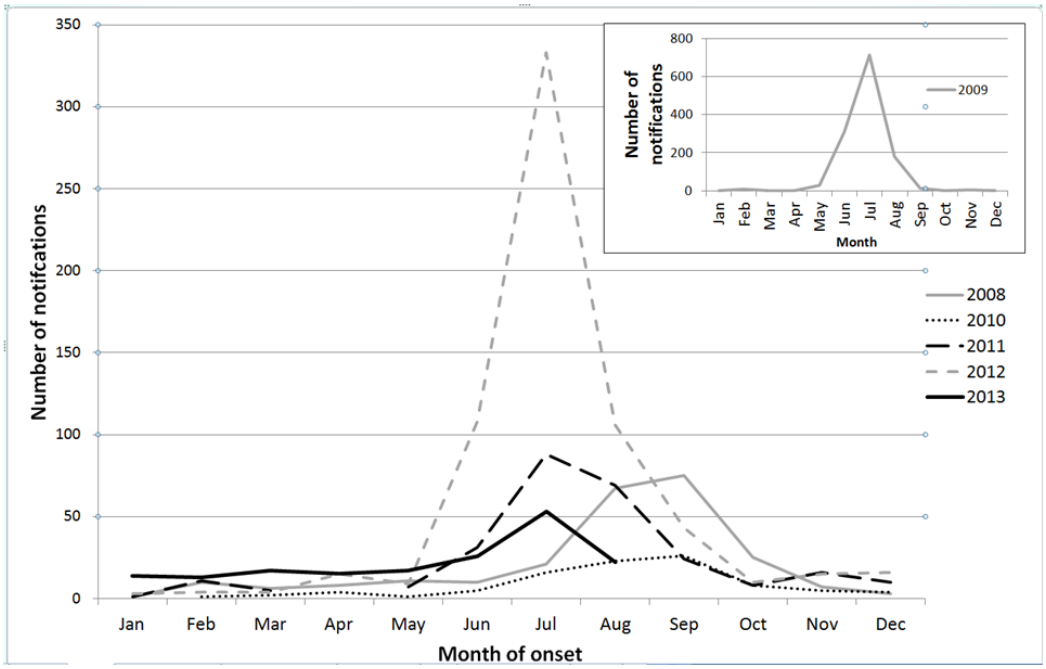

Fig 1. Number of influenza* notifications in the Australian Capital Territory, by month and year of onset, 2008 – 2013.

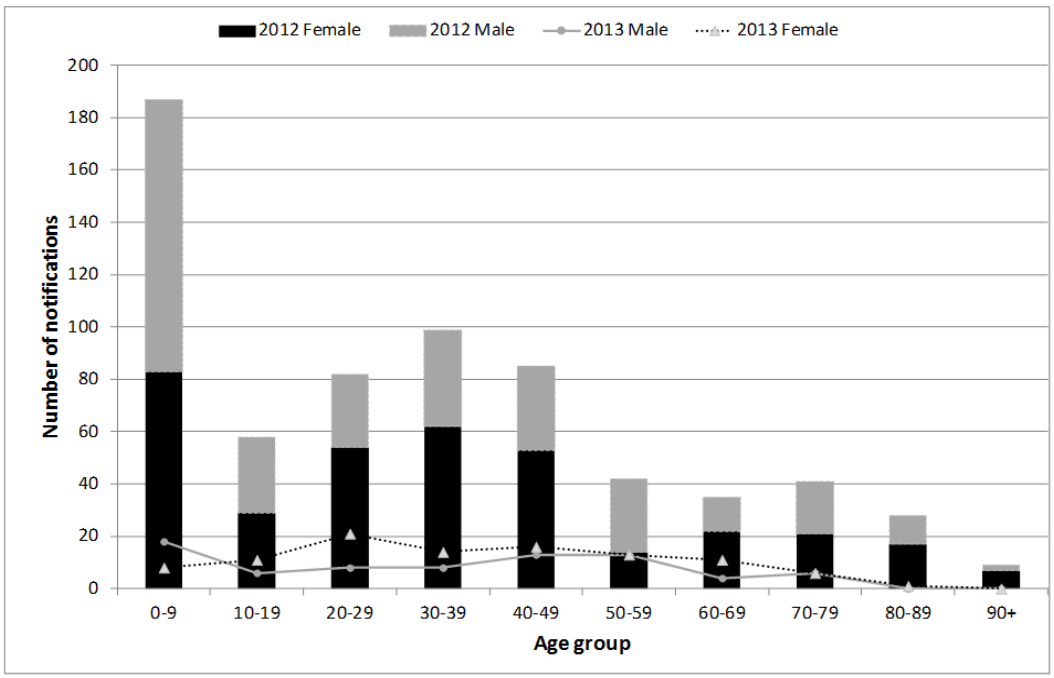

Fig 2. Age and sex# of influenza notifications* in the Australian Capital Territory, 2012 and year to date 2013.

Data provided for the current and most recent months may be incomplete. All data are preliminary and subject to change as updates are received. Notification data includes all cases diagnosed in the ACT in residents of the ACT. Generally, notified cases represent only a small proportion of cases of influenza occurring in the community. #Cases with an unknown age or sex are excluded.* **Notification data were exported on 14 August 2013 for the period 1/1/2008 to 9/8/2013. Source: Notifiable Diseases Database, ACT, Communicable Disease Control Section, ACT Health.

Reports will be updated fortnightly during the 2013 influenza season and are available on the ACT Health website at http://www.health.act.gov.au/alerts.

Hot Topics

Influenza

What is Influenza

Influenza (commonly known as 'the flu') is a highly infectious respiratory illness caused by the influenza virus. The influenza virus that circulates every winter is referred to as 'seasonal' influenza. Occasionally, when a new virus emerges and there is a lack of specific immunity in the population (also known as herd immunity), a pandemic may occur. The most recent pandemic was the H1N1 influenza (Swine flu) in 2009.

Influenza is more than a bad cold. A cold usually has different symptoms, a slower onset and is less likely to cause complications than the flu. Colds tend to cause a sore throat, blocked or runny nose, and a cough. When someone has the flu, the symptoms come on suddenly and can be severe. Symptoms usually appear within one to three days of coming into contact with the virus. Those symptoms include fever, muscle and joint aches and extreme tiredness, along with a sore throat and runny nose. Severe complications, such as pneumonia, are more common in children, pregnant women, the elderly and other vulnerable groups (e.g. people with chronic diseases).

How can I prevent influenza?

Vaccination remains the most effective way to protect yourself against becoming ill with the flu.

The influenza vaccine is free under the National Immunisation Program for people at higher risk of complications, including:

- Adults aged 65 years and over;
- Aboriginal and Torres Strait Islander people aged 15 years and over;
- Adults and children (6 months of age and over) with underlying medical conditions; and
- Pregnant women, at any stage of pregnancy.

The National Health and Medical Research Council also recommend (but do not fund) influenza vaccination for:

- People aged ≥ 6 months who live with a person who is at high risk of complications;
- Residents of aged care facilities and other long term residential facilities;
- Health-care providers, staff of aged care facilities and longer-term care facilities; and
- Travellers – especially if travelling to areas of the world where influenza is currently circulating.

The vaccine cannot cause influenza as it only contains killed virus.

In addition to vaccination, other ways to stop the spread of flu include:

- Covering your nose and mouth with disposable tissues when you cough or sneeze, throw the tissues straight into the bin and wash your hands afterwards;
- Wash your hands with soap and water frequently, or clean hands regularly with alcohol-based products that can be used without water;
- Staying away from work, school, childcare and social gatherings when unwell.