Too hot to handle -
Working safely in hot conditions

Dr Alana Hansen
Background

- The body gains heat from the environment, and internally generates heat from metabolic activity.
- Body temperature remains stable if we lose heat accordingly.
- This is due to *physiological* thermoregulation.
  - Radiation, convection, conduction, evaporation of sweat.
- Also *behavioural* thermoregulation.
  - Protective mechanisms.
  - E.g. seeking shade, reducing physical activities.
- Failure to adequately thermoregulate when temperatures are high can lead to the onset of heat-related conditions.
Heat kills more people than any other weather-related hazard

Office of Climate Water and Weather Services: http://www.nws.noaa.gov/om/hazstats.shtml
(1) Our research on heatwaves in SA

“Heatwaves” = 35°c for ≥ 3 consecutive days

Metro Adelaide
- Increase in ambulance call-outs 4% (6 extra cases daily)
- Increase in daily hospital admissions 7% (86)
  - Mental disorders 7%
  - Renal disorders 13%
  - Ischemic heart disease 8% (65-74 years old)
- Increase in emergency admissions 4% (38)
  - Mental disorders 6%
- No overall increase in mortality
  - But increase in mental disorder related mortality 2.6 times

Published SA evidence


Source: Dr. Monika Nitschke, SA Health
(2) Ambulance callouts during heatwaves 1993-2005

Ambulance callouts vs temperature during the warm season

<table>
<thead>
<tr>
<th>Suburb</th>
<th>IRR*</th>
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<tbody>
<tr>
<td>Adelaide CBD</td>
<td>1.00</td>
</tr>
<tr>
<td>Mansfield Park</td>
<td>1.23</td>
</tr>
<tr>
<td>Port Adelaide</td>
<td>1.21</td>
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<tr>
<td>Panorama</td>
<td>1.20</td>
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<tr>
<td>Glenelg</td>
<td>1.10</td>
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<tr>
<td>Gawler</td>
<td>1.14</td>
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</tbody>
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Work-related ↑ >3x;

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(3) 2008/2009 heatwaves in SA

- We found direct heat-related hospital admissions increased:
  - 3-fold in 2008
  - 14-fold in 2009
- There was increased mortality in 15-64 year age group in 2009
- Ambulance callouts increased by:
  - 10% in 2008 heatwave
  - 16% in 2009 heatwave
  - 37% in 15-64 year age group
Workplace heat exposure

Can affect:

• Indoor workers
  o Foundries, furnaces, factories, welding, confined spaces etc.
• Outdoor workers
  o Agriculture, construction, road workers, emergency services etc.

Due to:

• High heat exposure
• Personal protective equipment
• Physical work
Potential health impacts of heat exposure on workers

• Heat-related illnesses can occur when over exposed to heat, or due to overexertion in hot conditions
  o Dehydration
  o Heat cramps
  o Heat oedema
  o Heat exhaustion
  o Heat stroke (can be fatal)
  o Exacerbation of existing chronic conditions

• Heat-related injuries
Why can injuries occur in hot conditions?

- A loss of concentration and decreased perceptual motor skills may be associated with increased incidence of workplace injuries in the heat:
  - Loss of grip due to sweating
  - Slips
  - Contact with hot surfaces
  - Impaired judgement due to heat fatigue
- Injuries can be in addition (or secondary) to heat induced illness
- The effects can be more prevalent amongst young workers, possibly due to:
  - Physically strenuous tasks
  - Lack of skill and experience
(4) Effects of heat on occupational injuries

Aims:
• To investigate the association between ambient temperature and work-related injuries
• To identify groups of workers at high risk

Methods:
• SafeWork SA worker’s compensation claim data 2001-10 and weather data from Bureau of Meteorology
• Time series analysis

Dr Jianjun Xiang
Results

The association between maximum temperature and total work-related injuries in Adelaide, SA, 2001-2010

- A reversed U-shaped exposure-response relationship
- 1 degree increase in temperature was associated with 0.2% increase work-related injuries
- Decline when temperature above 37.7°C
  - Due to prevention measures in place

![Graph showing the relationship between daily maximum temperature and total daily injury claims. The graph indicates a reversed U-shape, with an increase in injury claims up to a certain temperature, followed by a decline.]
More likely to make a claim in the heat are:
- Males
- Young workers (<=24 years)
- Medium and small businesses (<200 employees)

**Industries:**
- Agriculture, forestry and fishing
- Construction
- Electricity, gas and water

**Occupations:**
- Intermediate production and transport workers
- Labourers
- Tradespersons
(5) Heatwaves (3+ days ≥ 35°C) and WHS

- For **total** claims there was no significant difference between heatwave and non-heatwave periods.
- For **outdoor industries**, daily claims increased by 6.2% during heatwaves:
  - Male labourers, tradespersons aged ≥ 55 years
- Types of injuries that increased:
  - ‘Burns’
  - ‘Wounds, lacerations, and amputations’
  - ‘Heat stress’
- Mechanism of injury:
  - Increases in:
    - ‘Hit by moving objects’
    - ‘Chemicals and other substances’
    - ‘Heat, electricity and other environmental factors’
180 AIOH conference attendees' responses to survey questions

- **In your experience have workers ever expressed concern about heat in your workplace during very hot weather?**
  - Yes (91%)

- **Do you know of any organisations planning for increased frequency of extremely hot weather events?**
  - No (81%)

- **What do you foresee as potential barriers for the prevention of heat stress in workplaces?**
  - Lack of awareness (68%)
  - Lack of training (56%)
  - Lack of management commitment (52%)
  - Low compliance and implementation of heat stress prevention programs (40%)
  - Lack of financial resources (37%)
  - Lack of specific heat-related guidelines and regulations (37%)
(7) Workers’ perceptions of heat exposure

Methods

• 1,471 questionnaires were distributed amongst workers and trades apprentices
  o 749 were returned

Results

• 51.2% of respondents were concerned about workplace heat exposure
• 43.4% claimed they had received heat-related training
• The most common heat prevention measure was the provision of cool drinking water
• 51.4% of respondents were satisfied with the current heat prevention measures
• 63.8% said that there should be more heat-related regulations and guidelines for working during very hot weather
(8) Perceptions of Council workers - a qualitative study

Methods
- 32 workers aged 27-67 years from a suburban council participated in 5 focus groups
- Thematic analysis

Results
- Even in a well regulated and safety conscious environment, workers are impacted by the heat in various ways:
  - health, work, tools, environment, loss of productivity
- Important factors:
  - workplace management, training, acclimatisation for workers, ability to self-pace
Why is this research important?

Temperatures are projected to increase by 0.4-1.3°C by 2030; 0.8-4°C by 2070.

- Predicted that by 2070 “for un-acclimatised people, outdoor activity will not be possible on 33–45 days per year, compared to 4–6 days per year at present.”

- “For acclimatised people”… ‘manual labour will be dangerous to perform on 15–26 days per year compared to 1 day per year at present.”

Heat stress management practices

- Prevention:
  - Training and hazard awareness programs
  - Sufficient rest periods and ability to self-pace
  - Changed work schedule arrangements
  - Provision of cool micro-environments
  - Increased air movement
  - Acclimatisation
  - Adequate hydration

- Influencing factors:
  - Physical activity
  - Health & fitness, pre-existing conditions, age, medications
  - Clothing
Heat stress indices

Designed to measure the thermophysical effects of the environment

Examples include:
- Temperature
  - Maximum temperature
  - Apparent temperature/Humidex
- Wet Bulb Globe Temperature (WBGT)
- Predicted Heat Strain
- Thermal Work Limit
- Universal Thermal Climate Index
- Basic Thermal Risk Assessment (AIOH)
  - Thermal risk app
Conclusion

• Our research supports international findings that heat can be a WHS hazard
• Can create potentially serious health effects for workers:
  • Injuries, exacerbation of health conditions, heat-related illnesses
    ● Some sub-groups more at risk
• Food 4 Thought:
  o October is National Safe Work Month 2015
  o Summer is fast approaching
  o Need to strengthen awareness of heat as a WHS risk
  o Particularly with climate change predictions of warmer summers
References


