national safe work month

25 October 2017

have the conversation today

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In case of an emergency, the fire exit is via the foyer at the front entrance of the building or via the fire exit at the southern end of the building.

If there is a need to evacuate the building, wardens will direct you out of the building to the assembly area, which is the car park of the public libraries building at the corner of Orsmond and Milner Streets.

Toilets can be found at the southern end of the ground and first floors, near the fire exits, as well as on each floor behind the lifts in the centre of the building.

Please turn off your mobile phones.
Dino Pisaniello, Alana Hansen and Blesson Varghese

Heat and Work Injury

adelaide.edu.au

seek LIGHT
Overview

- Introductory remarks (DP)
  - How/why do injuries occur in the heat?
  - Headline injury prevention messages from the latest research

- Findings from the analysis of workers comp data (BV)
  - Epidemiology of injury

- Findings from complementary data sources (AH)
  - Online surveys, interviews, complaints database – perspectives, practices and experiences from stakeholders

- Implications for risk assessment/management? (DP)

- Question and Answer
Work
- e.g. task, physical work rate, time of day, clothing and PPE

Work environment
- e.g. temperature, humidity, supervision, water availability, confined space

Internal heat
(Metabolic heat production)

External heat
(Weather-related or man made)

Heat Stress
Heat Stress

Worker
  e.g. medications, hydration, experience acclimatization

Physiological response
  e.g. Reduced concentration, productivity, psycho-motor performance, sweating

Psycho-behavioural response
  e.g. Discomfort, altered behaviour, reduced use of PPE

Diminished capacity and increased susceptibility
The ARC Heat and Work Injury Research Project

Part 1
Analysis of compensation claims data

Part 2
Survey of industry stakeholders and experts

Part 3
Case studies: Work-associated heat illness/injury

Part 4
Development of resources and guidance for heat injury prevention
Evidence base

- Workers compensation claims data
- Ambulance call outs (+ Hospital data)

- Questionnaire survey data
- Interview data
- Complaints data
Key messages from the research

• Injury rates do increase with ambient temperature
  (as measured by high air temperature and heatwave severity)
• The injury burden for the workforce is greatest for moderately hot, rather than extremely hot, conditions
• Indoor workers as well as outdoor workers
• Heat adversely affects task performance and behaviour, which occurs before illness
• Most workers associate heat stress with illness, but there is less awareness that heat can contribute to injury
• Need to think more broadly about heat as a factor in injury prevention, and use more information in judging risk
Effects of daily maximum temperature and heat waves on worker injury risks?

Blesson Mathew Varghese
PhD Candidate, School of Public Health
What we aimed to address (1)

• Examine the relationship between ambient temperatures and work-related injuries

• Identify vulnerable sub-populations, industries and types of injuries
What we did

- Study site: Adelaide metropolitan area
- Study design: Case-crossover

Data sources:
- Return to Work SA workers’ compensation claims data (2003-2013)
- Bureau of Meteorology weather data

Modelling:
- % increase of injury risks as compared to optimal temperature (OT= 25)
Risk assessment and characterisation

1. Worker characteristics
   - Occupation
   - Industry

2. Work characteristics
   - Physical demands of work
   - Hazards present
   - Work performed

3. Work environment characteristics
   - Worksite location
   - Size of business

Injury occurrence

- Gender
- Age group
- Experience
Descriptive analysis

- 224,631 claims
- 90% due to injuries
- 66% Males
- 47% Labourers, Technicians and trades workers
- 55% Community services, Manufacturing
- 52% Large business (201+)
- 20% Non-powered hand tools, equipment
- 36.6% Upper limbs
- 38.6% Body stressing
- 43% Traumatic joint/ligament, muscle/tendon
What we aimed to address (1)

- Examine the relationship between ambient temperatures and work-related injuries
- Identify vulnerable sub-populations, industries and types of injuries
What we found

[Graph showing the relationship between maximum temperature (°C) and risk of injury.]
What we aimed to address (1)

• Examine the relationship between ambient temperatures and work-related injuries

• Identify vulnerable sub-populations, industries and types of injuries
Risk assessment and characterisation

1. Worker characteristics

Injury occurrence
# Worker characteristics

## Moderate heat

<table>
<thead>
<tr>
<th>Category</th>
<th>Increase</th>
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<tbody>
<tr>
<td>Males</td>
<td>9%</td>
</tr>
<tr>
<td>Females</td>
<td>7%</td>
</tr>
<tr>
<td>Young workers (15–24 years)</td>
<td>16%</td>
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<tr>
<td>Experienced workers</td>
<td>9%</td>
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</tbody>
</table>

## Extreme heat

<table>
<thead>
<tr>
<th>Category</th>
<th>Increase</th>
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</thead>
<tbody>
<tr>
<td>Males</td>
<td>28%</td>
</tr>
<tr>
<td>Females</td>
<td>36%</td>
</tr>
<tr>
<td>Young workers (15–24 years)</td>
<td>51%</td>
</tr>
<tr>
<td>Experienced workers</td>
<td>32%</td>
</tr>
</tbody>
</table>

*% increase risk in injury*
Risk assessment and characterisation

2. Work characteristics

Injury occurrence
Work characteristics

Moderate heat

- 79% increase in electricity, gas, and water
- 20% increase in transport and storage

Occupations:
- Electrical, warehousing

Physical demands:
- Medium and heavy

Work performed:
- Regulated inside and multiple locations

Extreme heat

- 810% increase in electricity, gas, and water
- 300% increase in agriculture, forestry, fishing
- 280% increase in mining
- 72% increase in construction
- 50% increase in transport and storage
- 28% increase in manufacturing
- 20% increase in community services

Occupations:
- Food service, cleaners

Physical demands:
- Medium
Risk assessment and characterisation

1. Worker characteristics
2. Work characteristics
3. Work environment characteristics

Injury occurrence

3. Work environment characteristics
Work environment characteristics

• Work site location:
  – Adelaide CBD (5000-5005) and Inner suburbs (5006-5100)

• Business size:
  – Medium (20-199 employees) and Large (>199 employees)
Injury characteristics

Areas of the body most affected

- Upper limbs: Moderate heat 11%, Extreme heat 33%
- Lower limbs: Moderate heat 11%, Extreme heat 60%
- Systemic locations: Moderate heat 57%, Extreme heat 168%

Objects involved in injuries

- Moderate heat: Non-powered hand tools 11%
- Extreme heat: Powered tools and appliances 66%, Machinery 63%
## Cause of injury

### % increase risk in injury

<table>
<thead>
<tr>
<th></th>
<th>Moderate heat</th>
<th>Extreme heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat &amp; electricity</td>
<td>39%</td>
<td>140%</td>
</tr>
<tr>
<td>Chemicals &amp; other substances</td>
<td>24%</td>
<td>120%</td>
</tr>
<tr>
<td>Hitting objects with a part of the body</td>
<td>14%</td>
<td>49%</td>
</tr>
<tr>
<td>Being hit by moving objects</td>
<td>13%</td>
<td>27%</td>
</tr>
<tr>
<td>Body stressing</td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>
Injury characteristics

Nature of injury

<table>
<thead>
<tr>
<th>Nature of injury</th>
<th>Moderate heat</th>
<th>Extreme heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns</td>
<td>32%</td>
<td>130%</td>
</tr>
<tr>
<td>Fractures</td>
<td>21%</td>
<td>30%</td>
</tr>
<tr>
<td>Wounds, lacerations, amputations &amp; internal organ damage</td>
<td>10%</td>
<td>24%</td>
</tr>
</tbody>
</table>

% increase risk in injury
Summary

• There is a relationship between daily temperature on the day of injury and injury risk

• Key vulnerable subpopulations include;
  – Both males and females
  – Young workers
  – Experienced workers
  – Both outdoor and indoor industries
    • ‘Electricity, gas and water’, ‘Transport and Storage’
  – Medium and heavy physical demanding occupations
  – Workers in regulated inside climates
  – Occupations: electrical, warehouse, food service and cleaners

So what about heatwaves?
What is a heat wave?

“A period of prolonged unusual or exceptionally hot weather”

- What defines prolonged?
- What defines excessive?
- Why should it matter?
- What else should we consider?

No gold standard definition
EHF (Excess heat factor)

- Developed by the Bureau of Meteorology

- At a particular location, EHF is calculated from a 3-day average of daily mean temperature & how this relates to:

  \[(i) \text{EHIsig} = \left(\frac{T_i + T_i+1 + T_i+2}{3}\right) - \text{the very hottest days on record}\]

  \[(ii) \text{EHlaccl} = \left(\frac{T_i + T_i+1 + T_i+2}{3}\right) - \text{the last 30 days}\]

  \[\text{EHF} = \text{EHIsig} \times \text{Max}(1, \text{EHlaccl})\]

  Long term temperature anomaly × (+ve Short term temperature anomaly)

- EHF is a measure of heatwave severity that is relative to location

- More unusual heat \(\rightarrow\) higher EHF severity value

National Heatwave Forecast Product-EHFseverity

Three-day Heatwave Forecast for Wednesday, Thursday and Friday starting Wednesday 11/01/2017 Product of the Bureau of Meteorology

http://www.bom.gov.au
Heatwave Situation for Tuesday, Wednesday, & Thursday (3 days starting 17/10/2017)

The heatwave expands through inland areas of the Kimberley and eases across the Arnhem and Carpentaria NT districts. Low intensity heatwave conditions contract towards the southern coast in Tasmania.

Heatwave Situation for Wednesday, Thursday, & Friday (3 days starting 18/10/2017)

Heatwave conditions are forecast to continue for the western Top End and Kimberley and expand into the...
What we aimed to address (2)

• To assess to what extent heatwaves of varying severity affect workers’ health and safety;

• To identify workers vulnerable to heatwaves;
Methods

OCCUPATIONAL MORBDITY DATA

Workers’ compensation claims
Work-related ambulance call-outs

Return to Work SA
SA HEALTH

DATA ANALYSIS
Heatwaves and occupational morbidity

Bureau of Meteorology
METEREOLOGICAL DATA

High intensity heatwave: daily $\text{EHF}_{\text{sev}} \geq 2$

Moderate intensity heatwave: daily $\text{EHF}_{\text{sev}} \geq 1 \& < 2$

Low intensity heatwave: daily $\text{EHF}_{\text{sev}} > 0 \& < 1$

No heatwave: daily $\text{EHF}_{\text{sev}} \leq 0$

Excess Heat Factor severity categories
Results (1) : Descriptive analysis

Number of heatwave days in warm-season (October-March, 2003-2013)

- **High intensity heatwave**
  - 7 days
  - 3-day daily Tmax: 41.1°C
  - 3-day daily Tmin: 25.6°C

- **Moderate intensity heatwave**
  - 19 days
  - 3-day daily Tmax: 38.2°C
  - 3-day daily Tmin: 22.7°C

- **Low intensity heatwave**
  - 118 days
  - 3-day daily Tmax: 35.2°C
  - 3-day daily Tmin: 20.4°C

- **No heatwave**
  - 1679 days
  - 3-day daily Tmax: 25.1°C
  - 3-day daily Tmin: 13.4°C
What we aimed to address (2)

• To assess to what extent heatwaves of varying severity affect workers’ health and safety;

• To identify workers vulnerable to heatwaves;
What we found

- Workers compensation claims
- Work-related ambulance callouts

Heatwave Severity-EHF
- Low intensity
- Moderate intensity
- High intensity
What we aimed to address (2)

• To assess to what extent heatwaves of varying severity affect workers’ health and safety;

• To identify workers vulnerable to heatwaves;
Findings from moderate-intensity heatwaves

- **8%** increase in overall claims
- **10%** increase in injury claims

% increase risk in injury

- **9%** indoor industries
- **13%** male workers
- **15%** medium-size business (20-199 employees)
- **21%** laborers
- **31%** new workers
- **35%** electrical hazards
- **39%** between 12 and 2pm
Summary

- Increased risk of injuries during moderate-intensity heatwaves

- Vulnerable groups at risk of injury
  - Males, new workers (moderate-intensity heatwaves)
  - Indoor industries (moderate-intensity heatwaves)
    - Manufacturing industry (low-intensity heatwaves)
  - Medium-size business (moderate-intensity heatwaves)
  - Hazards present: electrical (moderate-intensity heatwaves)
What does it all mean

• Both single hot days and consecutive hot days are predictors of work-related injuries

• Workplaces need to consider the health and safety of workers during heatwaves
  – Need to keep an eye on BOM heatwave service maps to understand how heatwave conditions are contracting
Heat and Work Injury Research

Status & early findings

Dr Alana Hansen

national safe work month

Heat and Work Injury Research Status & early findings

adelaide.edu.au
Introduction

• The Heat and Work Injury project aims to address, and reduce the risk of, heat-induced injuries for workers

• In order to grasp the “whole picture” of heat as a workplace hazard, there are other aspects to our research:
  – Surveys
  – Interviews
  – Analysis of telephone calls to SafeWork SA ‘Help Centre’ that relate to hot working conditions
Surveys

www.adelaide.edu.au/oeh/heat

QUESTIONNAIRE SURVEYS

Please read the information sheet before proceeding.

If health and safety is your full time responsibility (e.g. Consultant, Inspector, Safety Manager, Trainer) please click here.

Survey A: H&S Professionals

15-20 minutes to complete. Questions are centred on heat-associated risks, experiences of injuries, and implications for productivity loss in workplaces you currently visit.

If health and safety is a part time responsibility (e.g. Health and Safety representative, union official, site supervisor) please click here.

Survey B: H&S Reps

10-15 minutes to complete. Questions are about heat-associated risks, experiences of injuries, and implications for productivity loss in your organisation

If you have worked in hot conditions and would like to share your views on preventing injuries in the heat, you can complete a brief (5 minute) survey. This survey can be accessed here.

Survey C: Workers’ portal
Briefly.....

• Survey A & B (15-20 minutes)
  – Section 1 - Demographics
  – Section 2 - Heat-related injuries/incidents
  – Section 3 – Preventive measures
  – Section 4 – Training
  – Section 5 – Policies & guidelines
  – Section 6 – Barriers
  – Section 7 - Productivity & potential solutions (Survey B only)

• Survey C (5 minutes)
  – Questions:
    • 4 on demographics
    • 1 on experience with injuries in hot conditions
    • 1 on suggested strategies for prevention
To date

- Survey A (H & S professionals)
  - 177 responses
- Survey B (H & S representatives)
  - 147 responses
- Survey C (Workers’ portal)
  - 72 responses

Interesting early findings regarding prevention:
- Outdoor workers
  - HSR professionals (A) thought there should be more heat stress training
  - HSR reps (B) thought outdoor work should cease if temps are extreme
- Barriers
  - Lack of awareness by workers that heat can be associated with ill health and injury (A & B)
  - Lack of awareness by supervisors of heat hazards (A)
  - Management concerns about productivity loss (A)
  - Lack of management commitment to protect health and safety (B)
  - Lack of training of workers (B)
INTERVIEWS

If you have had an injury in the heat your experience would be valuable to the research. We invite you to participate in a face-to-face or telephone interview lasting 30-60 minutes, for which you receive a $50 gift voucher. To read necessary information about confidentiality, the risks and benefits associated with being involved, and what to do if you have any concerns about the project, click here.

If you would like to organise an interview, please contact Alana Hansen, 08 8313 1043 or alana.hansen@adelaide.edu.au

Thank you
Interviews

• Confidential, recorded, typically take 20-60 minutes
• Face-to-face or by telephone
• Questions
  – About you, your work, your workplace
  – Details of the incident
  – Your suggestions to help prevent injuries in hot working conditions
• To date: 12 people have been interviewed
  – Variety of backgrounds
  – Nearly all from SA
  – Incidents have been mainly ‘heat stress’ rather than injury per se
**SWSA Complaints dataset**

- In 2009 SWSA establish a ‘Help Centre’
  - Details of telephone calls are compiled in a database
  - A different system was in place prior to 2008 and only certain calls were kept on file
- Using the key word “heat” the dataset from the period 2002 to 6 January 2017 was searched
- All relevant records were extracted and compiled in a separate database with identifying information (e.g. names of people or companies) removed
- Data were analysed using standard qualitative analysis techniques
Complaints dataset

• 118 heat-related calls from Nov 2002 - Nov 2016
  – Increasing trend
• Most lodged in the month of January
Complaints dataset

• Three main themes identified:
  – Work environment, health effects, organisational issues

1. **Work environment**
   > 50% related to indoor work (e.g. stores, kitchens, sheds, vehicles, restaurants, factories, workshops, glasshouses, warehouse)
     • Air conditioning (inadequate, non-existent, not working) a major subtheme

   “The thermometer in the shed was reading 55 degrees” (# 26)
   “The kitchen thermostat is reading at between 60C-70C” (# 116)

2. **Health effects**
   Ranged from:
   - Minor effects (e.g. pale, tired, distressed)
   - More serious (e.g. headaches, fainting, muscle fatigue, exhaustion, dehydration, vomiting, loss of consciousness, “heat stroke”, death)
Complaints dataset

3. **Organisational issues** (examples)
   - Workers “required to work long hours in the heat”
     - Requests for extra breaks denied
     - A bonus incentive to keep working
   - A HSR temporarily suspended for making a report
   - Management “pushing people to work past their capacity”
   - No drinking water provided by the employer
   - No PPE provided by the employer
   - No hot weather policies, or policies not adhered to

“... *The foreman's attitude was that if he stops work, don't bother coming back the next day.*” (#10)
Take home messages

• The research is ongoing (*data collection until end of Feb 2018*)
  – More analysis is being undertaken for Vic, WA, Qld
• Early findings of the qualitative and quantitative aspects of the study are indicating those most at risk in SA
  – A focus is emerging on:
    • Indoor workers
    • People working in hot environments when outdoor temperatures are not extreme, and during heatwaves
      – Bureau of Meteorology heatwave service
    • The importance of the supervisor/worker relationship
• A stakeholder workshop will be held in September 2018
• This research is **very** reliant upon input from industry

Risk Assessment Apps

Basic Thermal Risk Assessment mobile phone App


web version

which is based on


More advanced app (iphone only) Predicted Heat Strain for professional use.

http://www.thethermalenvironment.com/the-predicted-heat-strain-mobile-application/
<table>
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<tr>
<th>Time</th>
<th>Presentation Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>2.45pm to 3.45pm</td>
<td>UV radiation: a workplace hazard you don’t see coming</td>
<td>Diem Long</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cancer Council</td>
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</table>
### Thursday 26<sup>th</sup> October

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<tr>
<th>Time</th>
<th>Presentation title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.30am to 11.30am</td>
<td>Mentally healthy and safe workplaces</td>
<td>SA Mental Health Commission</td>
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<td>Working Women's Centre</td>
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<td>Beyondblue</td>
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<td>Sparke Helmore Lawyers</td>
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<td>11.45am to 12.45pm</td>
<td>Ensign’s journey to becoming a High Reliability Organisation (HRO)</td>
<td>Ensign</td>
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<td>1.30pm to 4.30pm</td>
<td>Hazardous manual tasks Workshop: WHS requirements, and practical risk management tools</td>
<td>Pinnacle</td>
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