The Health Impacts of Bushfires

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Australia’s Biota is Shaped by Fire

Black Thursday 1851 - William Strutt
Increasing Exposure to Bushfire Smoke

› Unregulated source of air pollution.
› Generate pollution episodes across wide geographic areas
› Frequently affect major population centres.
› Increasing use of fuel-reduction burns
› Increasing development around urban / rural interface near bushland
› Bushfires likely to increase with global warming
  - Globally fires are increasing
  - Fire weather is increasing and predicted to get far worse
Immediate (Acute) Health Effects

- ~430 deaths in the last 50 years due to major Australian bushfires
- Health risks proportional to fire severity
- Highest danger when fleeing a fire front
- Radiant heat: 150°C – survivable, 300°C - survival unlikely
- Heat exhaustion: Clothing / Physical activity / Dehydration
- Trauma
- Inhalation of smoke
  - Respiratory distress leading cause of death in burns units
  - Particles and toxic gases can lead to respiratory failure
    - Chemical lung injury and inflammation
    - Impaired oxygenation
Long Term (Chronic) Health Impacts

- Ash Wednesday 1983 (Clayer 1985, McFarlane 1997)
  - Increased general illness and increased psychiatric diagnoses
- Canberra 2003, (McDermott 2005)
  - PTS in school children proportional to perception of threat
  - Increased unexplained physical and psychiatric symptoms
  - Approximately half those affected not receiving help
- Australian Centre for Post Traumatic Mental Health recommends screening for Acute Post Traumatic Stress Disorder for
  - All those affected by a major incident
  - People who repeatedly present to doctors with non specific physical symptoms (may indicate PTSD)
Public Health Impacts – Water

- Erosion - loss of storage capacity
- Chemical contamination
  Increased nutrient load - Algal blooms
- Floods - increases run-off and sediment
- Re-growing vegetation - decreases run-off over many years

Cotter Creek, ACT, 2003 (water CRC research.cmis.csiro.au)
Public Health Impacts – Air

- Smoke travels vast distances and can affect large populations: Russia → Finland, Australia → New Zealand, Indonesia → Australia
- Increased mortality: all-cause, cardiac, respiratory and neonatal
- Increased hospital admissions - especially cardiovascular and respiratory disorders
- Exacerbations of chronic diseases
- Respiratory effects worse
- Many risk groups
  - Very old and young
  - Chronic diseases
  - Socioeconomic disadvantage
Management = Learning to Live with Fire

› Disaster and emergency management
› Preventive strategies
  - Community education
  - Land management
  - Housing and land use planning
› Primary health care
  - Mental health care
  - Managing/advising air pollution
  - Advocacy
  - Individual, Community and Global issues
The Prescribed Burning Debate

› Land management solution to a public health problem
  - Highlighted in every bushfire enquiry since 1939 (Stretton)
› What is the evidence for public health benefit?
  - Effectiveness?
  - Feasibility?
› What are the public health risks?
Sydney Bushfire Study

› Health effects of bushfire PM compared with urban PM
› Morgan et al, Epidemiology 2010: 21;47-55
› “Natural” Experiments
  - major bushfires
  - smaller bushfires/ fuel reduction burns
› 3.8 million people exposed
› Mortality / Hospital Admissions
99th percentile
## Summary – Sydney Bushfire Study

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Category</th>
<th>Bushfire PM10</th>
<th>Urban PM10</th>
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<tbody>
<tr>
<td>Mortality</td>
<td>All</td>
<td>✗ (?)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Cardiac</td>
<td>✗</td>
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<tr>
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<td>Admit CVD</td>
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<td>✗</td>
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<tr>
<td></td>
<td>IHD</td>
<td>✗ (?)</td>
<td>✓</td>
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<tr>
<td>Admit Respiratory</td>
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<td>COPD</td>
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<tr>
<td></td>
<td>Asthma 15-64</td>
<td>✓</td>
<td>✗</td>
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</tbody>
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Summary

› Bushfires are an increasing public health problem
  - likely to continue worsening with climate change
› Health impacts are immediate, wide-ranging and long lasting
› Australia needs to improve all aspects of bushfire management
  - Housing / Land management
  - Management of disasters and their legacies
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Thank You
Sydney PM2.5 1996 to 2008
Sydney, Cardiac Hospital Admissions

Sydney Jan94-Jun02: % change in cardiac admissions, all ages, per 10ug/m3 change in 24hr PM10

G) bushfire-PM$_{10}$ (α=1.4) other-PM$_{10}$ (α=1)
Sydney Jan94-Jun02: % change in COPD admissions, 65+ years, per 10ug/m3 change in 24hr PM10

- bushfire-PM_{10} (\alpha=0.8)
- other-PM_{10} (\alpha=1.2)
Conclusions – Sydney Bushfire Study

- Bushfire PM10 weakly associated with all cause mortality
- Bushfire PM10 not associated with cardiovascular or respiratory mortality.
- Bushfire PM10 not associated with cardiovascular hospital admissions
- Bushfire Pm10 associated with respiratory hospital admissions
Respiratory Hospital Admissions and PM10, Sydney Bushfires, January 94 and June 02
Sydney, All Cause Mortality

Sydney Jan94-Jun02: % change in all cause mortality, all ages, per 10ug/m3 change in 24hr PM10

A) bushfire-PM$_{10}$ ($\alpha=0.8$) other-PM$_{10}$ ($\alpha=1.2$)
Sydney, Adult Asthma Hospital Admissions

Sydney Jan94-Jun02: % change in asthma admissions, 15-64 years, per 10ug/m3 change in 24hr PM10

Percent change in admissions

Sydney, Adult Asthma Hospital Admissions

Percent change in admissions
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