Heat and Health
Understanding risks and predicting outcomes

Dr Sari Kovats, Associate Professor,
Director, NIHR Health Protection Research Unit in Environmental Change and Health,
London School of Hygiene and Tropical Medicine, UK
Heat kills!

- Heat stroke
- Heat injury
- Heat related mortality
  - Deaths from other causes that can be attributed to heat
- Health events
  - Stroke, heart attack
  - Emergency hospital admissions
- Wellbeing
  - Cognition
  - Thermal comfort
Global review of heat impact research

- Campbell et al. 2018. Health and Place, 53:210-218
- N = 188 papers
Ambulance calls (daily), Birmingham
High risk groups

Epidemiology/Population studies
- Limited by routine data
  - Elderly [age]
- Persons with chronic disease
- Income/deprivation

Physiology
- Age
- Mostly done on healthy adults
How urban characteristics affect vulnerability to heat: a multi-country analysis

- Associations between the city-level indicators and heat AF%.
- Coefficients and 95%CI calculated from a meta-regression model adjusted by country and weather variables.
- Results are expressed as AF% change for SD increase of the indicator.
- 340 cities
- AF% is the attributable fraction of total mortality (daily deaths)
- Sera F et al. (in press). International Journal of Epidemiology.
Health and social effects of heat stress

[Diagram showing the flow of heat stress, clinical damage, and negative impact on population health status and community economy.]

Source: Tord Kjellstrom.
## US Occupational deaths by industry


<table>
<thead>
<tr>
<th>Sex</th>
<th>Race</th>
<th>Age Group</th>
<th>Industry</th>
<th>PMR</th>
<th>Deaths</th>
<th>Significanc e level</th>
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<th>Upper 95% CI</th>
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<td>MACHINERY, EXCEPT ELECTRICAL [0]307-336, [9]310-332</td>
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</table>

CKDu in Central America

- A dramatic increase of chronic kidney disease of unknown origin (CKDu)
  - Unexplained by conventional risk factors such as hypertension and diabetes
- Primarily affecting adult male agricultural workers, in particular sugarcane workers

Along the Pacific coast, in the lowlands

Source: Neil Pearce, LSHTM
Evidence for interventions

- What to do?
- When to do it?

- Acute peak in daily mortality, Greater London, 2003

Source: ONS
Climate alerts

Central England Temperature and Heat Health Watch alert levels
summer 2013

- Epidemiology of heat and cold
- Improving the use of climate data in health assessments
- Social and individual resilience to flooding
- Decision support analysis to reduce impacts of extreme events
- Evaluation of public health measures to reduce the impacts of extreme weather
- Climate change risk assessment
Burden of heat deaths

- London
- The majority of heat related deaths occur below the “heat alert” threshold.
Extreme weather and multiple risks

- 2003 Heat wave, central Europe
  - Hottest summer in at least 500 years
  - 35,000 deaths in August in Central and Western Europe
  - Damage to road and rail transport systems.
  - Risk to nuclear power generation in France.
  - Power outages
  - Grain harvest losses of 20%
  - Decline in water quality associated with low river flow
  - Air pollution episode
  - Forest fires
Health outcomes and the urban environment: connections
Built environment
Proportion of urban residents living in a slum area

WHO data, data for different (most recent years) [http://apps.who.int/gho/data/]
Low quality housing and health in urban Africa

Hallmark survey 1999 - Port Elizabeth, South Africa

- overcrowding
- lack of access to decent sanitation
- Pests
- indoor air pollution from paraffin burning
- outdoor air pollution from dust and the burning of waste.
- damp
- extremes of temperature
  - > 50% of those living in shacks reported installing insulation (e.g. paper, cardboard, or wood) to reduce temperature fluctuations and condensation.

"Temperature variations in poorly insulated and poorly ventilated shacks can be extreme, with potentially hazardous high temperatures for infants being reached on sunny days with no wind”

Thomas, E. P., et al. 1999. Household Environment and Health in Port Elizabeth, South Africa. SEI Urban Environment Series No. 6
Knowledge gaps

- What do we know?
  - Multiple outcomes/mechanisms
  - New methods
  - Scale - individual, household, community, city, country, region, global
- Regions/countries
  - Impacts in low income populations
- Determinants/risk factors
  - Social factors
  - Housing/built environment
- What do we need to know - how to provide evidence for heat planning/protection
  - Burdens - how big is the impact? What is the cost?
  - High risk groups - who is most affected, who would be benefit from intervention?
### Session tomorrow

#### part 1. Population based studies

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Benjawan Tawatsupa</td>
<td>Association between temperature and health outcomes of population in Thailand</td>
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<td>Francesco Chesini</td>
<td>Analysis of mortality during heatwaves 2013-2014 in Argentina</td>
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<tr>
<td>Joan Ballester</td>
<td>Recent trends in temperature, vulnerability and heat-attributable mortality in Europe</td>
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<tr>
<td>Peter Kim Sreatfield</td>
<td>Identifying and attributing heat effects in rural Bangladesh</td>
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#### part 2. Physiological studies/Occupational health

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<th>Name</th>
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<tr>
<td>Andreas Flouris</td>
<td>Impacts of occupational heat strain on health and productivity: systematic review</td>
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<td>Ollie Jay</td>
<td>Should electric fans be used in a heatwave?</td>
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<td>Jason Lee</td>
<td>Meta-analysis to evaluate the effectiveness of heat injury reduction measures</td>
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#### part 3. Studies on heat perceptions and behaviour

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<tr>
<td>Lam Holly</td>
<td>Personal heat protective measures during the 2017 heatwave in Hong Kong: A telephone survey study</td>
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<td>Ashley Ward</td>
<td>Identifying and engaging with groups vulnerable to heat risks.</td>
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#### part 4.

<table>
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