

Should electric fans be used in a heatwave?

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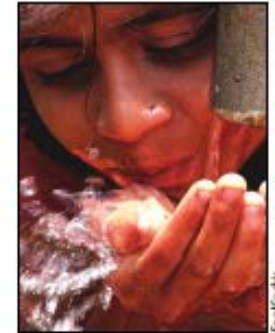
Health professionals: be prepared for heatwaves

Heatwaves, periods of abnormally and uncomfortably hot and usually humid weather, are among the most dangerous natural hazards. Because of climate change, heatwaves are becoming increasingly frequent and intense, with 14 of the 15 warmest years on record all occurring in the 21st century. In 2003, the European heatwave resulted in deaths of more than 70 000 people.

This year, the trend is even more worrying. During May and June, heatwaves have already killed more

conditions such as heart diseases, diabetes, respiratory or renal insufficiency, Parkinson's disease or severe mental illness; and behavioural patterns such as overexertion during work or leisure, inadequate fluid intake, and neglect of protective measures against heat.

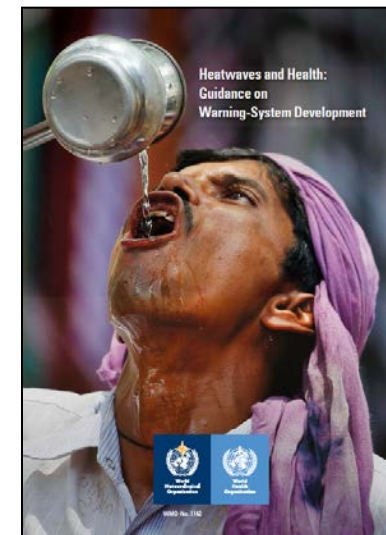
Medication is frequently associated with the high morbidity and mortality recorded during heatwaves, and some drugs can provoke or increase the risks in heat-susceptible individuals through mechanisms such



NHS, UK



CDC, USA



WHO

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Use of physiological evidence for heatwave public policy

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 PlumX Metrics

References

Article Info

Very high temperatures across Europe last summer served as a reminder of the harmful health effects of heatwaves, which are expected to increase in frequency, intensity, and duration in the future because of climate change.¹ A coherent public health plan for hot weather and heatwaves is essential to protect the health of everyone. Yet, there is a pressing need to ensure that a key component of such plans—the recommendation of personal cooling

Keeping cool in heat waves

Using Air Conditioning...

- **0%** of heat wave deaths in NYC (2001-12) had an operating air conditioner – *JAMA, 2012*
- AC use is strongest protective predictor against heat-related hospitalization: **35x less likely** — *Kaiser, Am J Forensic Med Pathol, 2001*
- Cost of AC use is enormous
 - Economically
 - “Time of use pricing”: most expensive during hottest part of day
 - Environmentally
 - AC use in the US alone creates half a billion tonnes of CO₂ per year

Heat wave simulation in the laboratory



Heat wave simulation in the laboratory

- Physiological measures:
 - **Core temperature**
 - Skin temperature
 - **Heart rate**
 - **Blood pressure**
 - Cardiac output
 - Local sweating
 - Skin blood flow
 - Limb blood flow
 - Metabolic rate
 - **Total sweat losses**



Interventions: What should we do?

Using Electric fans...

- *Accessible*
- *Sustainable*
- *Affordable*

Electric Fan:

55-100 W

\$64/year

Window Air Conditioner:

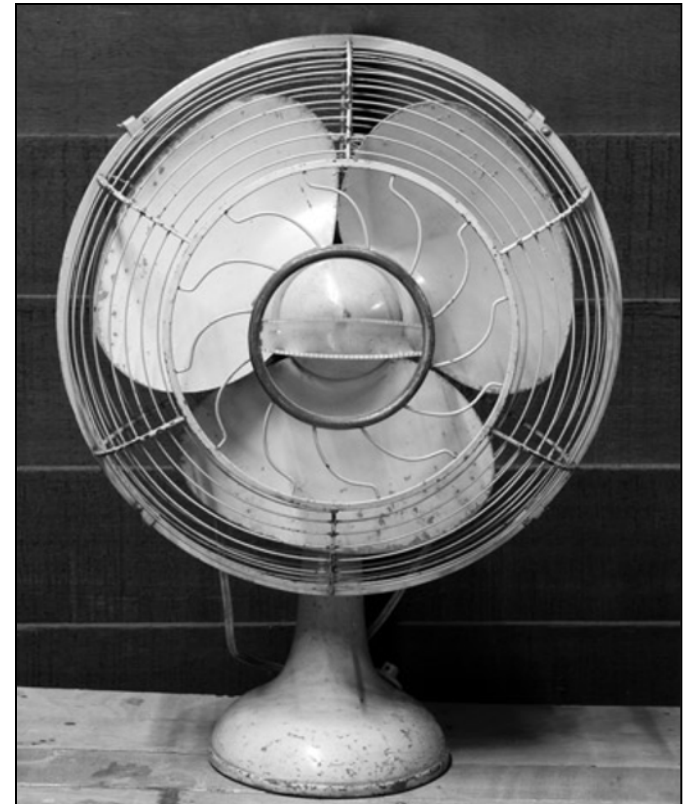
500-1500 W

\$850/year

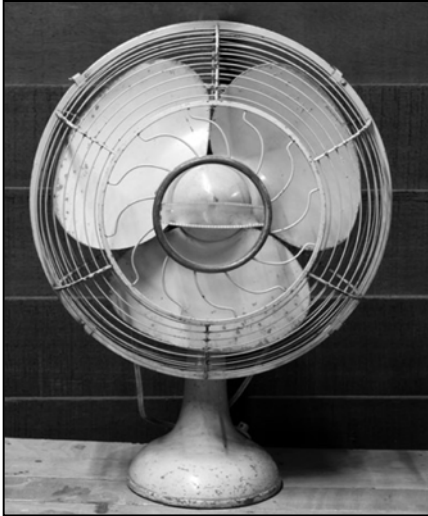
Central Air Conditioning:

3000-5000 W

\$2950/year



Sustainable alternative to AC: Fans?



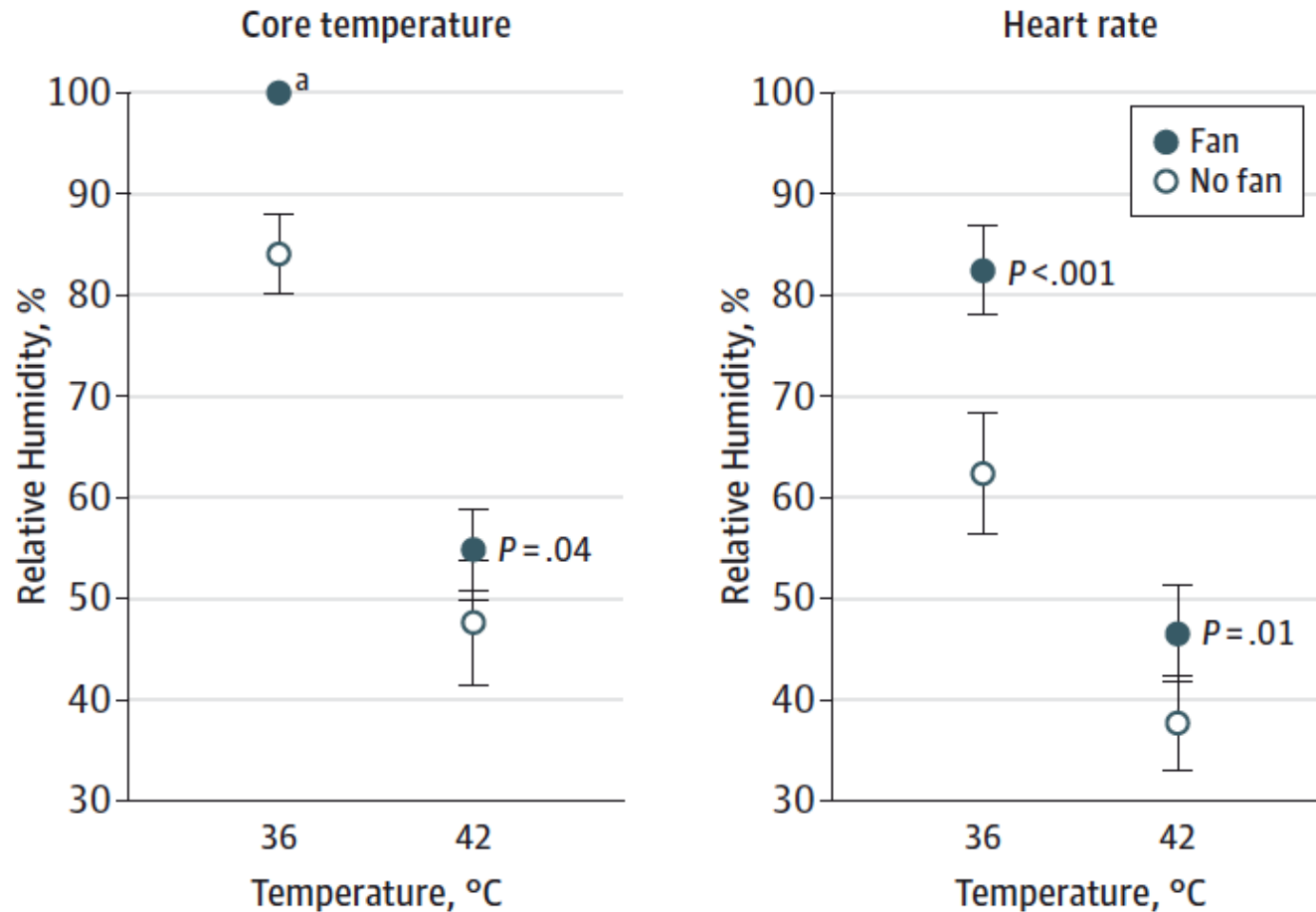
CDC: “fans are not protective at air temperatures above 32.3°C (90°F) when coupled with a relative humidity of 35%”

WHO: “electric fans should not be used when air temperature is greater than 35°C (95°F)”

USEPA: “fans use above a heat index of 37.2°C (99°F) actually increases the heat stress the body must respond to”

“Not only do (fans) not work, they actually make (the risk of overheating) worse. We compare (fans) to a convection oven. By blowing hot air on a person, it heats them up rather than cools them down.” – **Dr. Mike McGeehin, Director of the Environmental Hazards and Health Effects Program at the Centers for Disease Control and Prevention (CDC), USA (Scientific American, July 23, 2010)**

1st evaluation of fan use in heat waves

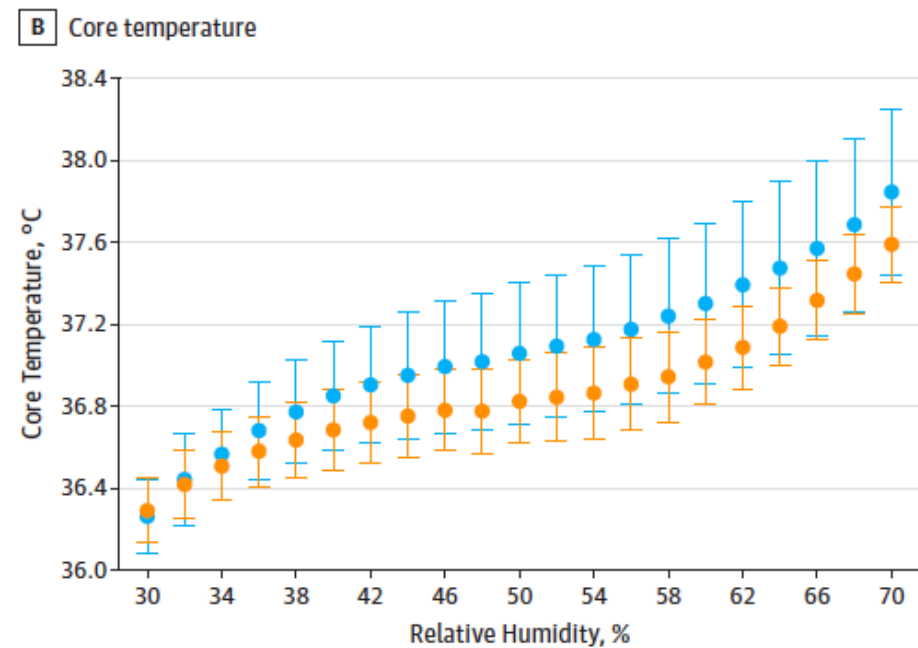
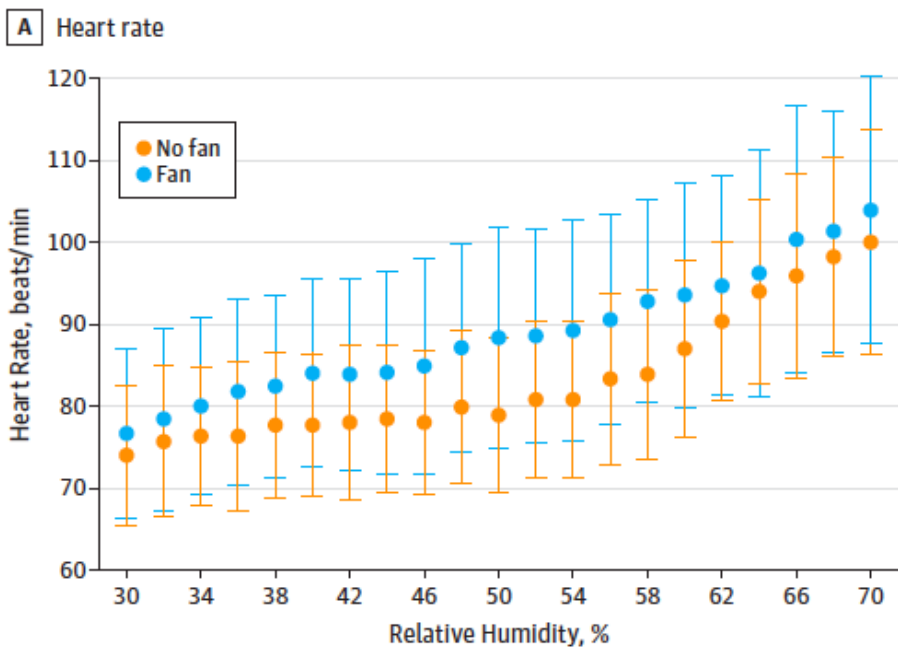


WHO/CDC Fan Limit: ~32 to 35°C

Ravanelli, Hodder, Havenith & Jay, 2015, JAMA

Fan use by the elderly

Older individuals: 68 ± 4 y
Air temperature 42°C



WHO/CDC Fan Limit: ~ 32 to 35°C

Gagnon, Jay & Crandall, 2016, JAMA

Ahmedabad May 21, 2018
(46°C, 10%RH; HI: 43°C)

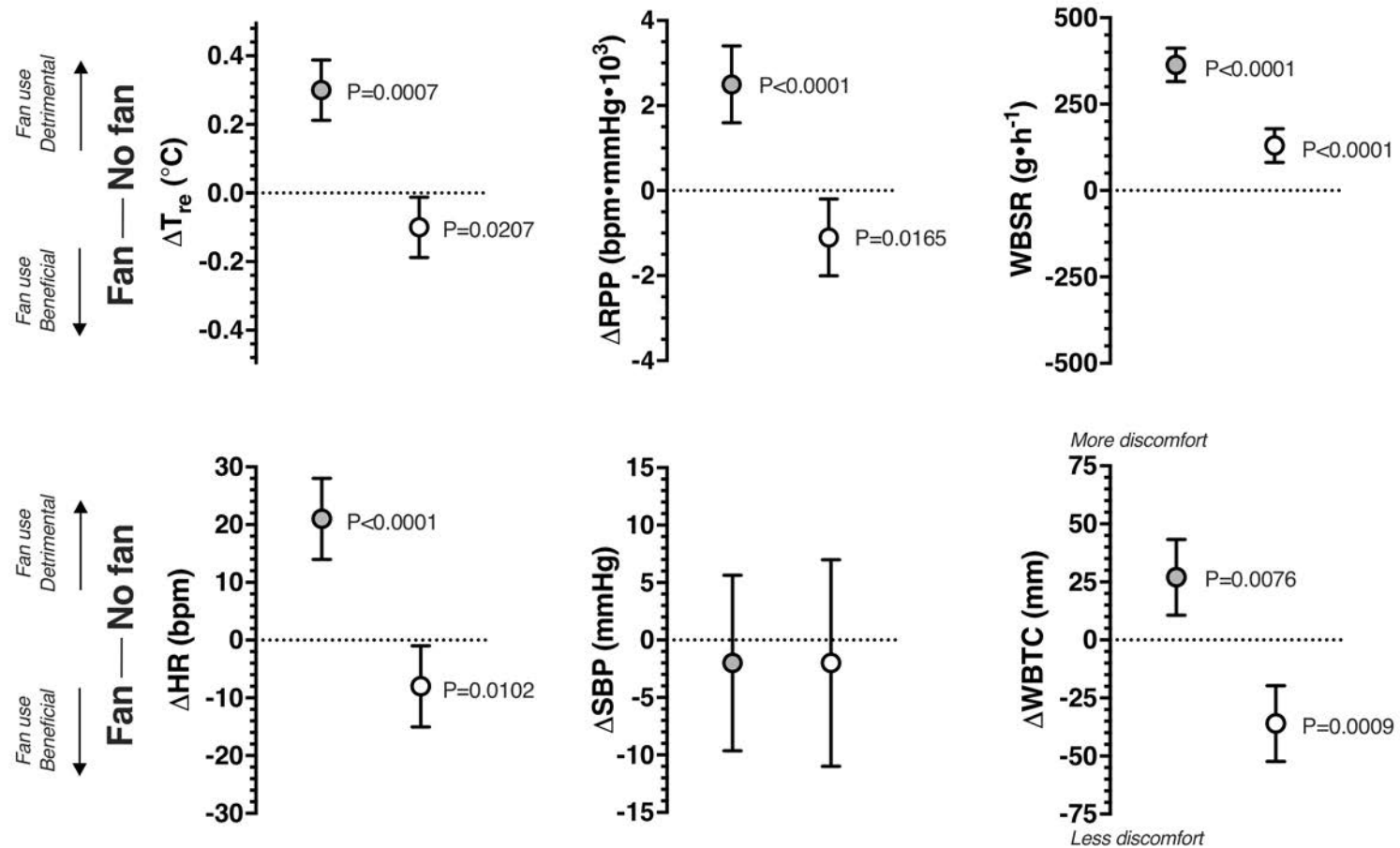
Los Angeles Jul.6, 2018
(45°C, 6%RH; HI: 41°C)

● Very-hot-dry
(47°C, 10%RH)
HI: 43°C

○ Hot-humid
(40°C, 50%RH)
HI: 56°C

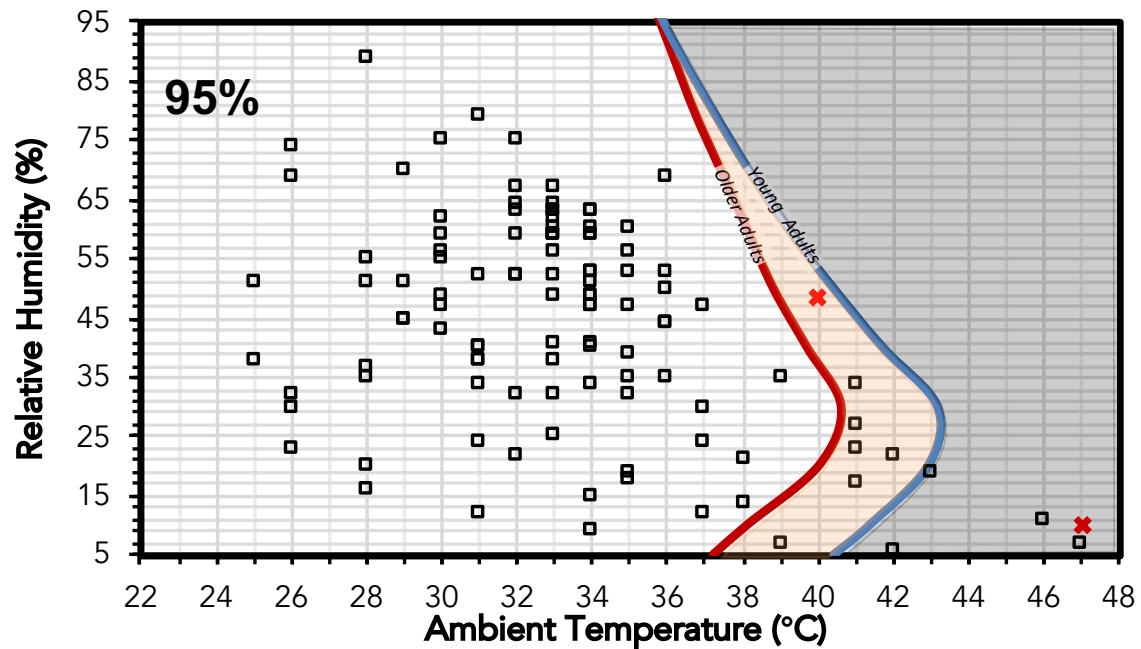
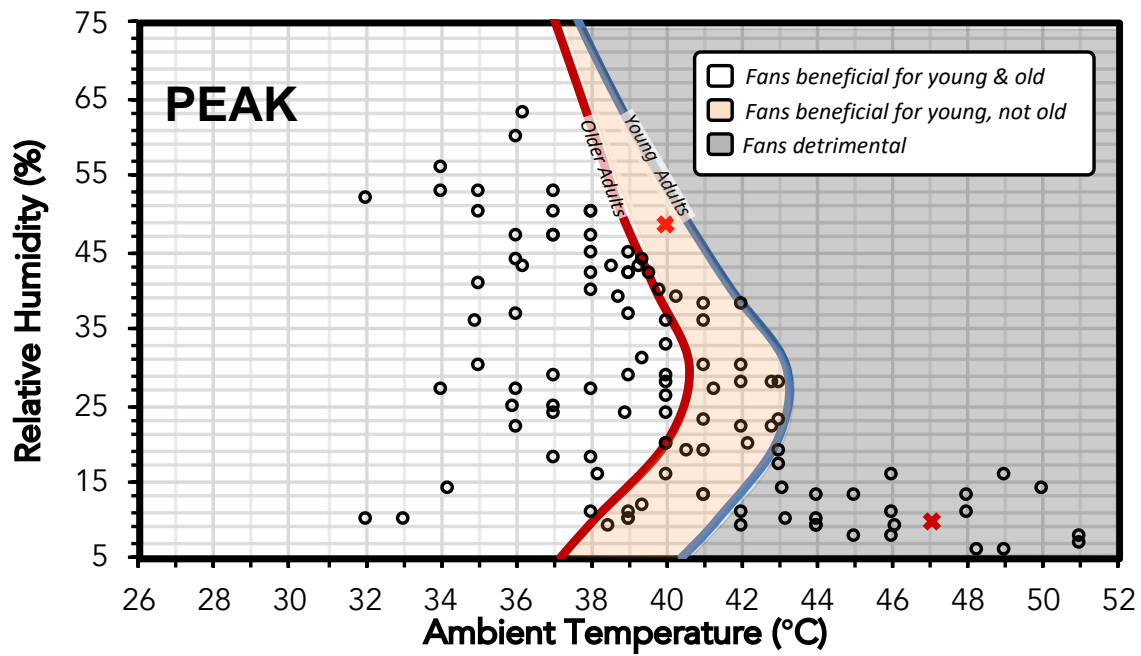
Shanghai Jul.22, 2017
(40°C, 48%RH; HI: 55°C)

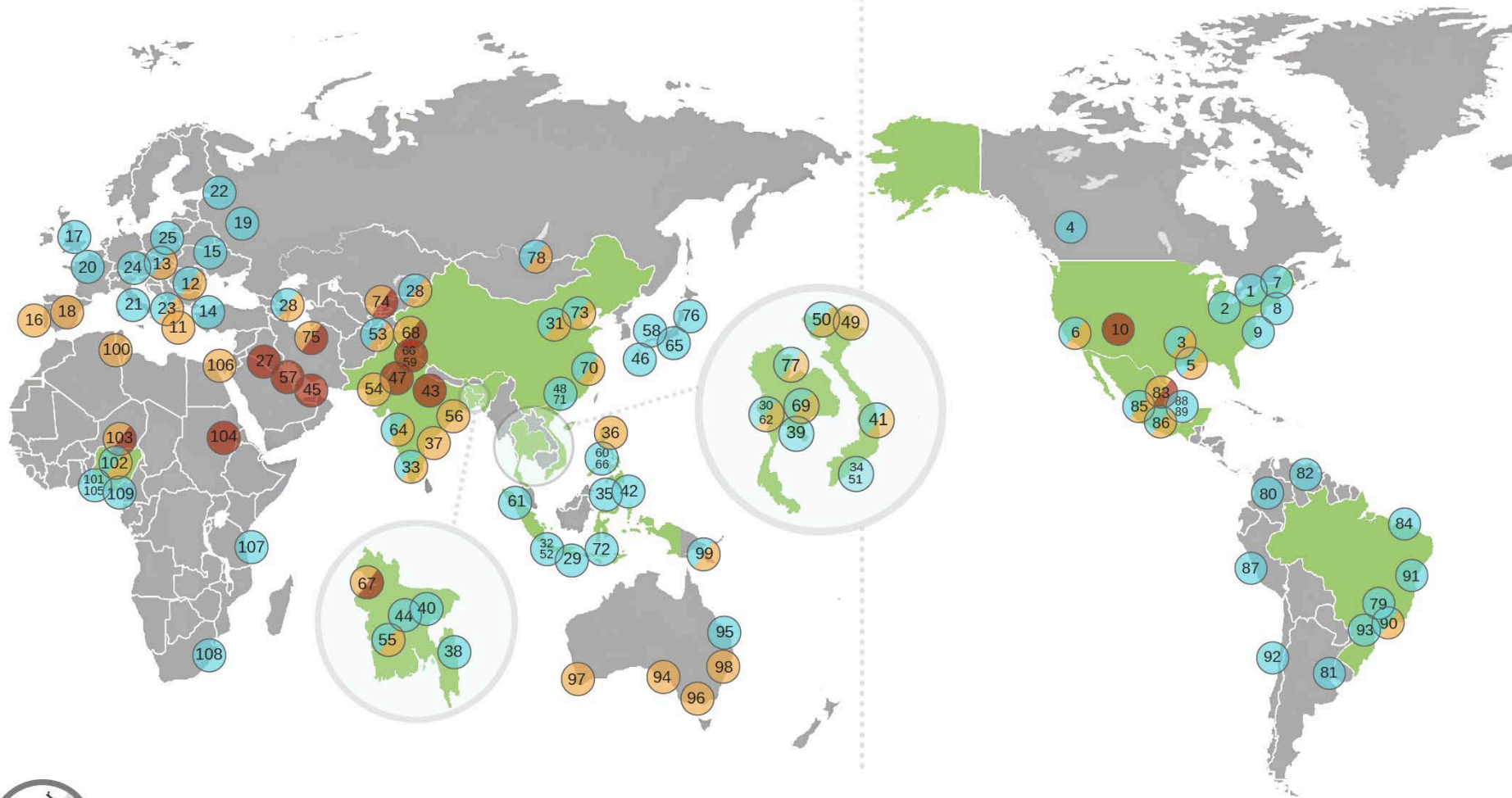
Chicago Jul.13, 1995
(39°C, 50%RH; HI: 52°C)



USEPA Fan Limit: Heat Index (HI): ~37°C

Morris, Capon & Jay (2018) Ann Int Med (under review)





Fans beneficial all the time
 Fans beneficial $\geq 95\%$; detrimental $\leq 5\%$ of the time
 Fans beneficial $< 95\%$; detrimental $> 5\%$ of the time

Morris, Capon & Jay (2018) In Preparation

46°C, 11%RH



Control
(CON)



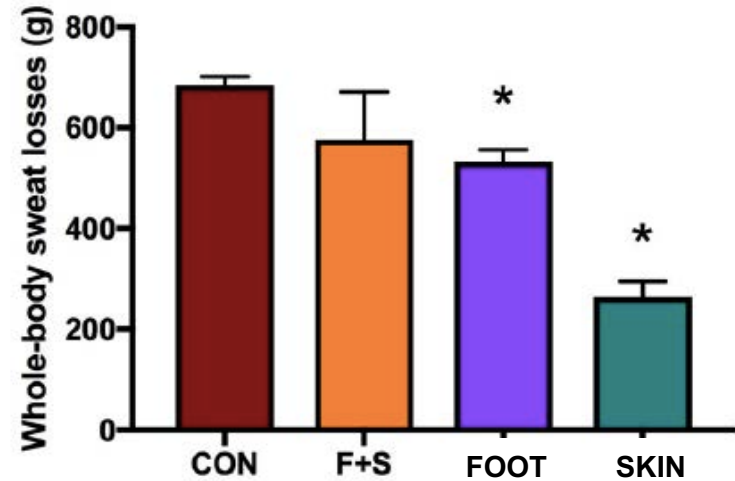
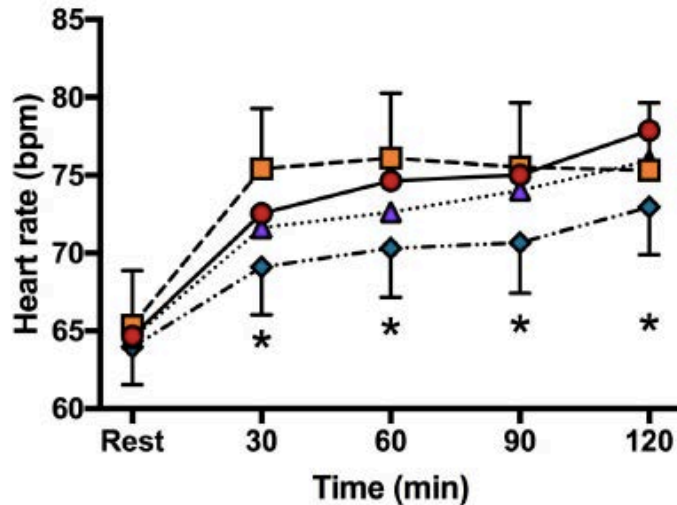
Fan + Skin Wetting
(F+S)



Foot Immersion
(FOOT)



Skin Wetting
(SKIN)



Morris, Capon & Jay (2018) In Preparation

2018-2022 (\$1.1M: 5 years)
Jay, Crandall, Capon, Bi & Gagnon

NHMR|C



Coronary Artery Disease
Hypertension
Prescription Medication

Thank you for listening

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