

Projections of Extreme Heat: Health Impacts from a US Military Perspective

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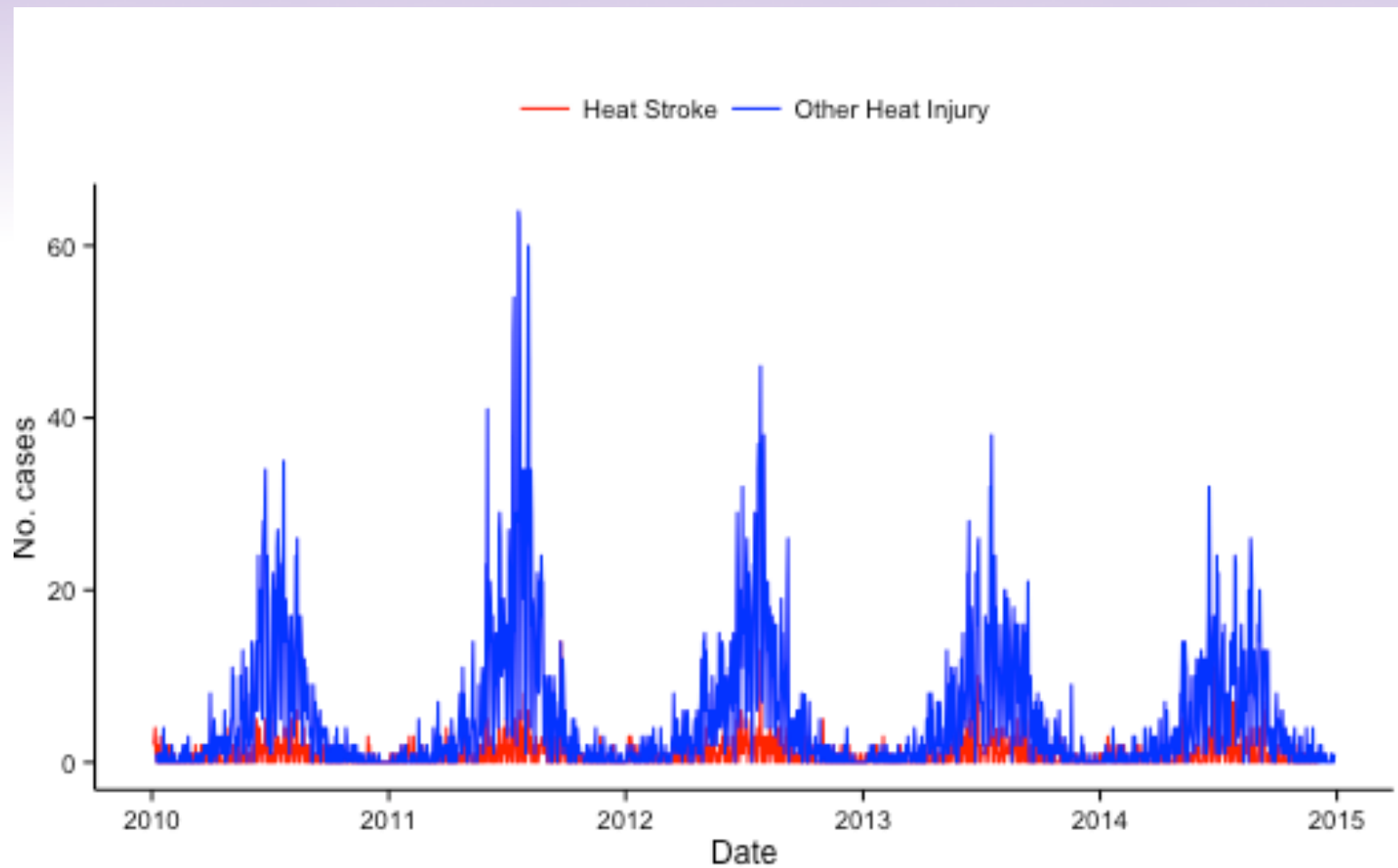




Photo: Cpl Caitlin Brink



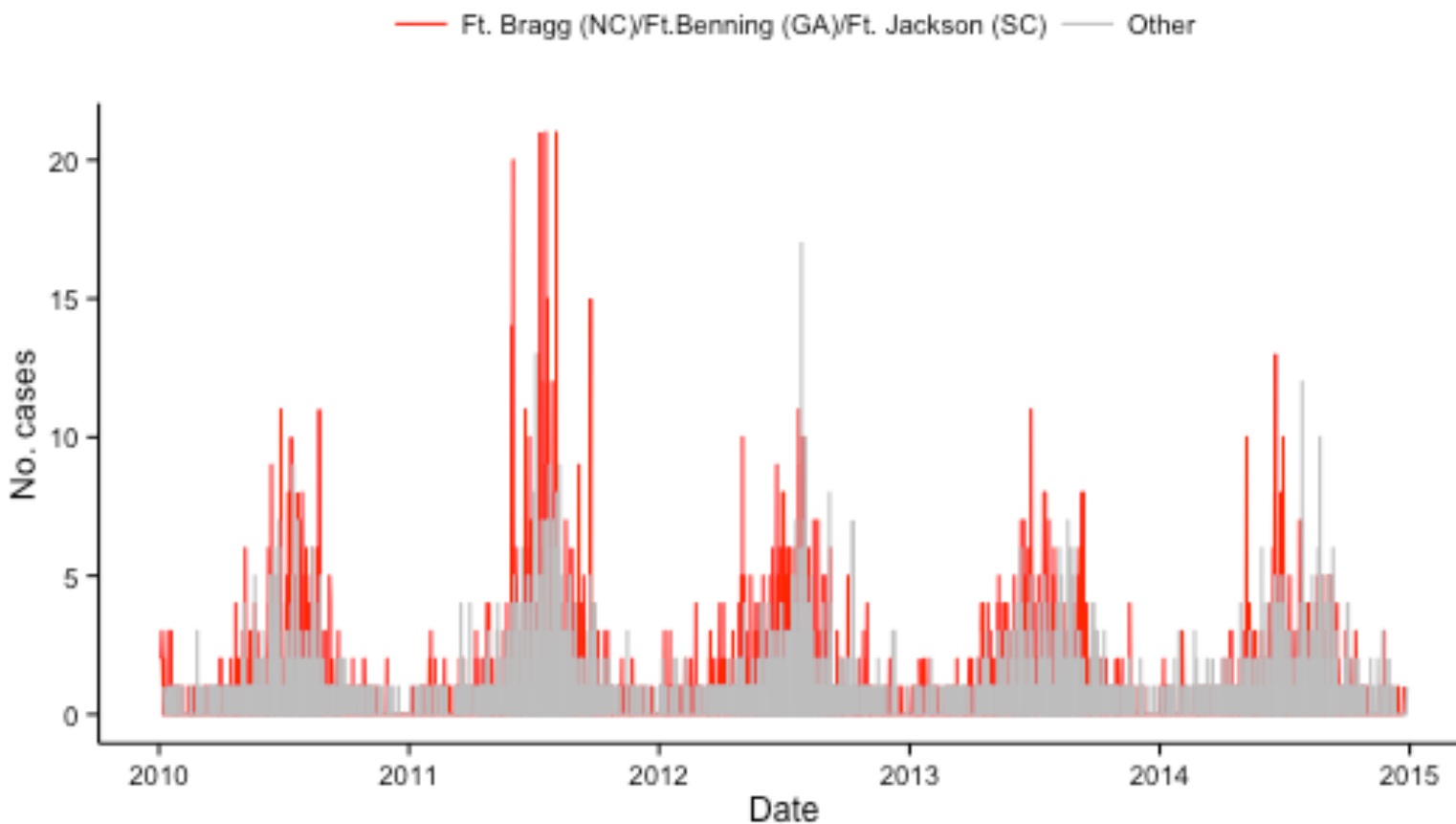
Heat injuries among Active Duty, 2010-2014 (US locations)



N = 10,549



A large portion occurs on a few installations in the southern US



Higher incidence in the southern US

FIGURE 1. Five-year average incidence rates per 100,000 person-years of heat stroke by unit location,^a active component, U.S. Armed Forces, 2010–2014

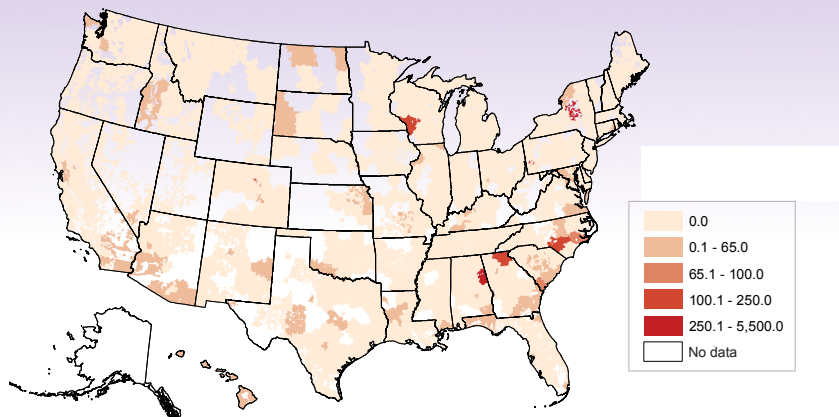
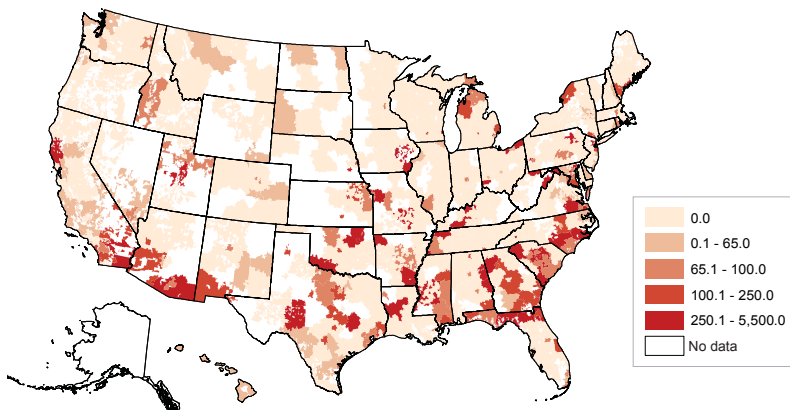
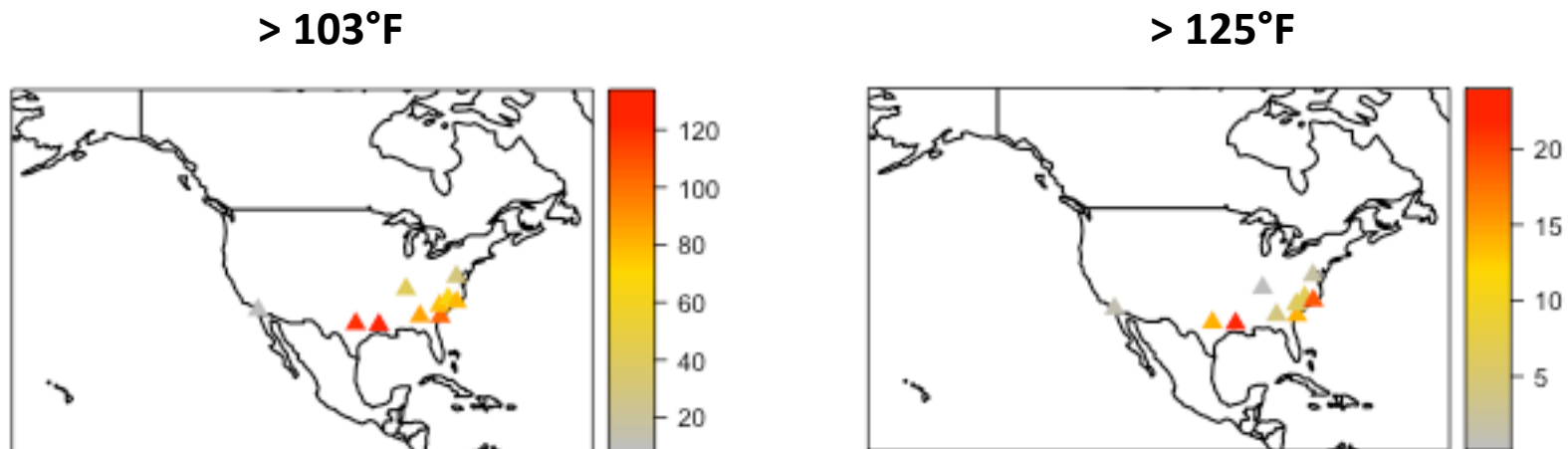


FIGURE 2. Five-year average incidence rates per 100,000 person-years of other heat injuries by unit location,^a active component, U.S. Armed Forces, 2010–2014



Future high Heat Index values at military installations: climate change projections (top 10 heat injury sites)





Additional average number of days/year in 2040-2049
with high Heat Index, compared to 2010-2014



Modeling by Ryan Harris et al., US Air Force 14th Weather Squadron.
The climate model is CMIP5 with the RCP 4.6 emission scenario.



Prevention: Wet bulb globe temperature

Flag Color	WGBT Index (F)	Intensity of Physical Exercise
	80 – 84.9	Discretion required in planning heavy exercise for unseasoned personnel. This is a marginal heat stress limit for all personnel.
	85 – 87.9	Strenuous exercise and activity (e.g. close order drill) should be curtailed for new and unacclimated personnel during the first 3 weeks of heat exposure.
	88 – 89.9	Strenuous exercise curtailed for all personnel with less than 12 weeks training in hot weather.
	90 and Above	Physical training and strenuous exercise suspended for all personnel (excluding operational commitment not for training purposes).



Epidemiological studies of heat injury in military trainees

Ref	Setting	Time period	Risk factors studied		Risk factors associated with heat injury
			Heat	Individual	
Gardner et al., 1996	Parris Island	1998-1992		*	BMI, fitness
Kark et al., 1996	Parris Island	1982-1991	*		WBGT
Phinney et al., 2001	Nationwide	1979-1991		*	Previous heat injury
Smalley et al., 2003	San Antonio	1956-1999			NA
Hakre et al., 2004	Parris Island	1988-1992		*	Various symptoms, labs
Wallace et al., 2005	Parris Island	1979-1997	*		WBGT (onset, previous day)
Wallace et al., 2006	Parris Island	1988-1996		*	BMI, fitness
Bedno et al., 2010	5 states	2005-2006		*	Excess body fat
Bedno et al., 2014	5 states	2005-2006		*	Excess body fat, fitness



Department of Defense climate change adaptation: health-related actions



Assessment of projected climate change on:

- Health and safety risks to DOD personnel.
- Possible increased need for health surveillance and health services.
- Distribution of disease vectors.
- Demand for DOD capabilities for emergency operations in the United States, and for overseas humanitarian assistance and disaster response.

Review and appropriate modification of health surveillance programs and personal protective equipment.

DEPARTMENT OF DEFENSE
2014 CLIMATE CHANGE
ADAPTATION ROADMAP



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The views expressed are those of the author and do not necessarily reflect the official policy or position of the Department of Defense.



Thank you!

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Some adaptation opportunities for extreme heat in the US military

- Heat stress prediction/warning systems.
- Integrated assessment of individual risk factors, heat.
- Field-appropriate measurement devices.
- Novel alternatives to the WBGT.

