

# Intro to the Zoom Platform

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**NOTE:** Speakers will be speaking slowly because of concurrent interpretation. Please be patient.

# Outdoor Heat Exposure Virtual Stakeholder Meeting

March 17, 2022

Bradley Farrar, Technical Specialist

Drew Kertzman, Technical Specialist

Carmyn Shute, Administrative Regulations Analyst/Project Manager



Washington State Department of  
**Labor & Industries**

# Today's Meeting Agenda

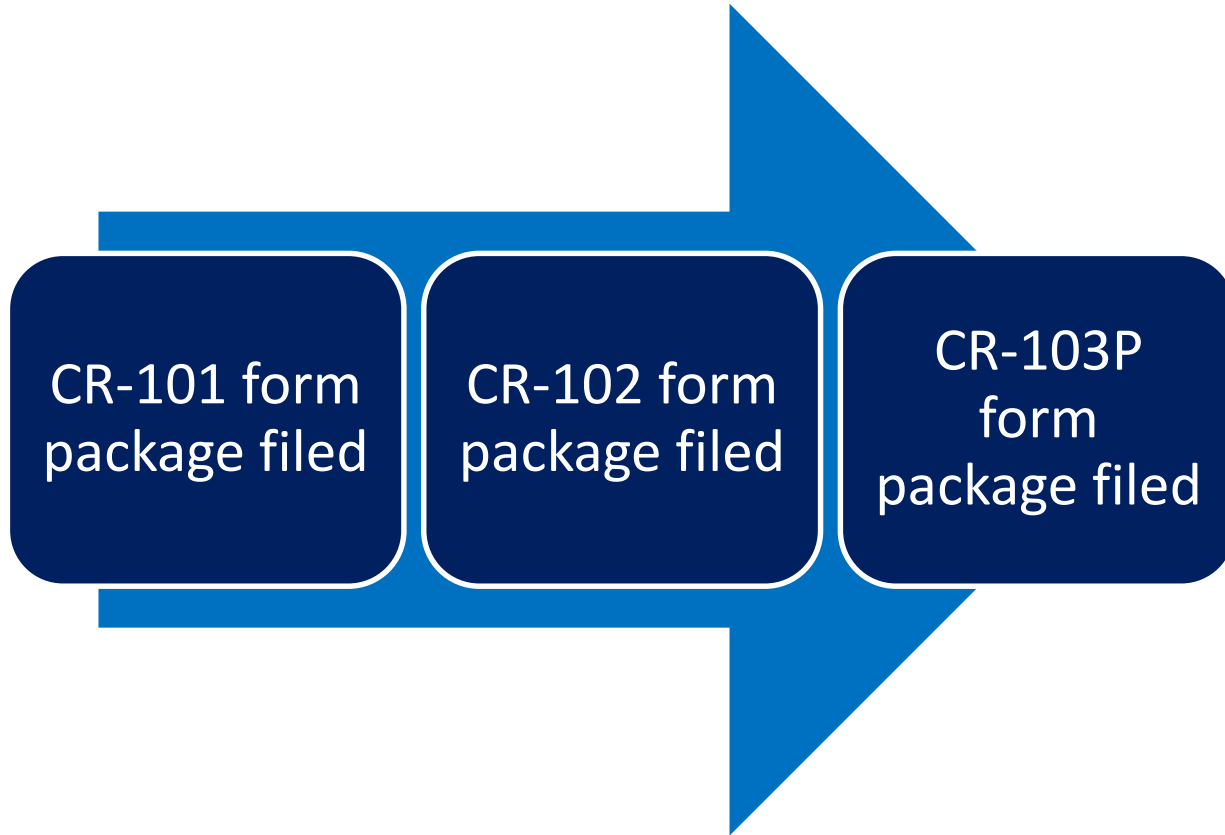
- Rulemaking Process
- Q&A Session
- Presentation by Dr. Dave Bonauto and Dr. June Spector
- Q&A Session
- Current Status and Next Steps
- Q&A Session and Closing

# Agency Rulemaking

***Revised Code of Washington (RCW) regulations that affect and guide rulemaking.***

- The Washington State Administrative Procedures Act (APA), chapter 34.05 RCW.
- The Regulatory Fairness Act, chapter 19.85 RCW.

# Standard Rulemaking



# Standard Rulemaking

## *The start of rulemaking*



CR-101

- Public notified of intent of possible rulemaking via WA Register
- Development of proposed rule language with input from stakeholders
- Agency conducts any required analysis, including the Cost Benefit Analysis and the Small Business Economic Impact Statement

# Standard Rulemaking

## *Public notice of proposed rule & public hearing*



CR-102

- Proposed rule filed
- Public hearings held and written comment period
- Public comments collected and reviewed
- Response to public comments prepared
- Decisions made on final rule language

# Standard Rulemaking

## ***Filing CR-103 - rule now adopted***



CR-103P

- Adoption of final rule that incorporates agency consideration of public comments upon filing CR 103 with Code Reviser
- Public comments and agency responses compiled into Concise Explanatory Statement provided to all commenters and the public
- Public notified of rule adoption via *WA Register*
- Rule becomes effective on its effective date, minimum 31 days after adoption



# Emergency Rulemaking

## *The Emergency Process*



CR-103E

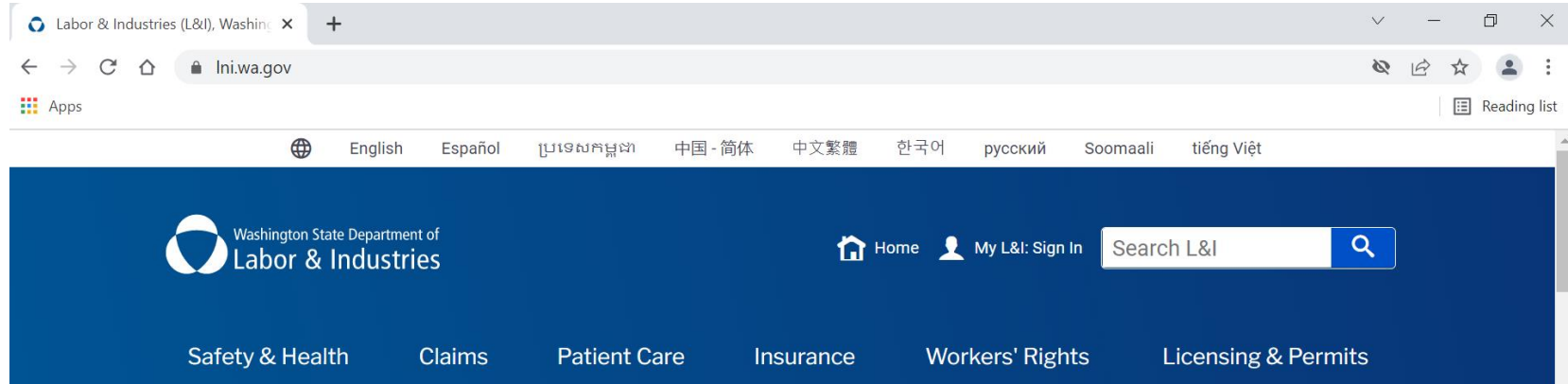
- May be used when a rule is needed before the standard rulemaking process can be completed
- Requires the agency find the immediate adoption of a rule is necessary, including due to public health, safety, or general welfare concerns
- Does not require public notice or hearing
- Public notified of intent of rulemaking via WA Register
- Emergency rule is for 120 days, a new filing needed to extend

# Sign Up for Updates

- You can sign up for updates on all rulemaking being done by L&I.
- You can sign up for updates on DOSH rulemaking only.
- You can also email the contact listed on any Code Reviser form and ask to be put on an interested party list for that topic only.

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Go to L&I website



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Scroll to the bottom of the page and select the envelope

## CONTACT

7273 Linderson Way SW  
Tumwater, WA 98501-5414

## Office Locations

Switchboard: [360-902-5800](tel:360-902-5800)  
Fax: [360-902-5798](tel:360-902-5798)  
TTY\*: [1-800-833-6388](tel:1-800-833-6388)

\*Washington State Relay Service for the hearing  
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**Safety & Health**

Agriculture Safety & Health Forum



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Next scroll down and select:

Worker Protection Rulemaking

Workplace Violence in Healthcare

Explosives Rulemaking

WISHA Safety Standards (rules) updates

# Why we are conducting this rulemaking.

- L&I adopted a rule for Outdoor Heat Exposure (OHE) in 2008.
- L&I was petitioned June 28, 2021 to modify the Outdoor Heat Exposure rule.
- The petition for rulemaking was accepted.
- DOSH Emergency Rule – Outdoor Heat Exposure (Adopted July 9, 2021)
  - <https://www.lni.wa.gov/rulemaking-activity/AO21-25/2125CR103EAdoption.pdf>

# Outdoor Heat Exposure: Existing Rule

## In effect annually May 1 - September 30

- **In 2008 L&I adopted a rule for control of Outdoor Heat Exposure that requires employers to:**
  - ✓ Address outdoor heat exposure in a written accident prevention plan.
  - ✓ Ensure drinking water is accessible for workers to drink at least one quart of water per hour.
  - ✓ Respond to signs and symptoms of heat-related illness.
  - ✓ Provide training to employees and supervisors.
  - ✓ In effect annually, May 1 – September 30.
  - ✓ Applies at temperatures of 89 degrees Fahrenheit with lower temperature thresholds for work in double-layer woven clothes or non-breathing clothes.

# Outdoor Heat Exposure Emergency Rule

- Adopted July 9, 2021.
- Addressed extreme high heat procedures.
- Requirements for preventative cool-down rest periods.
- Specific amounts of shade.
- Mandatory cool-down rest periods at 100° F.

# Outdoor Heat Exposure Permanent Rulemaking

- Chapter 296-62 WAC General Occupational Health Standards
- Chapter 296-307 WAC, Part G-1 Agriculture Safety Standards
- We are reviewing:
  - ✓ Trigger temperatures
  - ✓ Other measures of environmental conditions
  - ✓ Time frame for when the rule is in effect
  - ✓ Preventative measures – water, shade or other cooling means, rest/time breaks
  - ✓ Emergency response measures
  - ✓ Training and planning
  - ✓ Acclimatization
  - ✓ Outdoor and indoor heat exposure

Questions?

# Health Effects, Risk Factors, and Trends for Outdoor Workers Exposed to Heat

**June Spector, MD MPH**

Safety & Health Assessment & Research for Prevention (SHARP)  
Program

Associate Professor, University of Washington

**David Bonauto, MD MPH**

Safety & Health Assessment & Research for Prevention (SHARP)  
Program

# L&I SHARP Program

- L&I's workplace safety and health research program.
- Research and prevention programs rely on analyses of data, worksite visits, interviews with workers, employers and safety professionals, and understanding the scientific literature.
- Separate from L&I's DOSH, workers' compensation, and labor standards divisions.



# Outline

1. Health effects of heat exposure
2. Heat exposure metrics
3. How the body responds to heat
4. Risk factors for health effects from heat
5. Trends in heat health effects

# What is heat-related illness (HRI)?

Prolonged and/or intense exposure to hot environments and physical work, even in cooler conditions, can lead to HRIs, including:

- ✧ *Heat stroke*
- ✧ *Heat exhaustion*
- ✧ *Heat syncope (fainting)*
- ✧ *Heat cramps*
- ✧ *Rhabdomyolysis*

even in young healthy people.



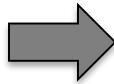
*Image c/o Stacey Holland*



Environmental exposure



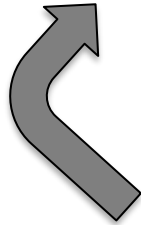
Heat Stress



Heat Strain



Heat-Related Illness (HRI)



Metabolic heat exposure (e.g., from physical work) & clothing

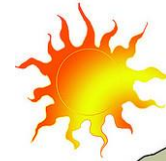


Image c/o Stacey Holland

# Heat stress *versus* heat strain *versus* HRI

In other words, **environment + work activity + clothing** → **heat strain** → **HRI**

# How is heat exposure measured?

- (Dry air) temperature 🌡️
- ‘Real feel’ – temperature & humidity 🌡️ 💧
  - Heat Index (HI): temperature & relative humidity
  - Humidex: temperature & dew point
- Wet Bulb Globe Temperature (WBGT)
  - Takes into account dry air temperature, humidity, wind, and solar radiation (sun)



# Heat Index

Humidity can make the air temperature feel higher to the human body



Air Temperature	Relative Humidity	Heat Index
80-89°F	40%	80-89°F
90-97°F	40%	91-103°F
98-103°F	40%	105-116°F

Higher Heat Index at higher temperatures with constant humidity



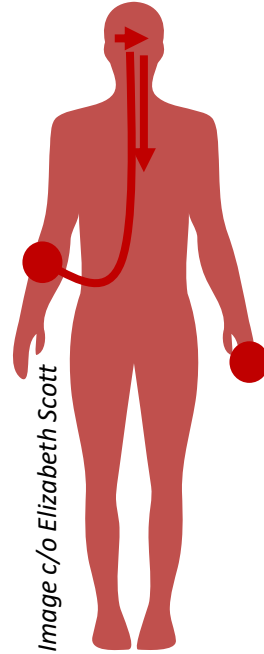
Air Temperature	Relative Humidity	Heat Index
90°F	40%	91°F
90°F	45%	92°F
90°F	50%	95°F

Higher Heat Index at higher humidity with constant temperature

<https://www.wpc.ncep.noaa.gov/html/heatindex.shtml>

# How does the body respond to heat?

1. Sense heat & send signals to the brain



2. Brain receives signal

3. Increased heart rate, blood flow to skin, & sweating to maintain a normal core/deep body temperature (~37°C, 98.6°F)

**Adequate hydration and the ability to lose heat via the skin is necessary for an effective cooling response (*Sawka et al 2011*)**

# How does clothing affect heat stress?

- The amount of evaporative cooling depends on the humidity, air motion, and breathability of clothing
- **Less breathable clothing raises the effective heat exposure**

Type of Clothing	Amount <u>added</u> to environmental (wet-bulb globe temperature [WBGT]) measurement when determining heat stress
Normal work clothes	0
Double layer clothing	5.4°F (3°C)
Vapor-barrier coveralls	19.8°F (11°C)

*Table adapted by OSHA from TLVs® and BEIs®. Thermal stress: heat stress and heat strain. (ACGIH, 2017)*

# How does workload affect heat stress?

- Muscles are only ~20% efficient, with ~80% of expended energy released as heat (*Sawka et al 2011*)
- **The duration & intensity of work determine the amount of metabolic heat generated from work**

Level of Workload	Examples, from <a href="https://www.osha.gov/heat-exposure/hazards">https://www.osha.gov/heat-exposure/hazards</a> <i>Note: Different ways of doing the same task may lead to different wattages</i>	Metabolic Rate (Watts)
Rest	Sitting	115
Light	Sitting with minimal arm/hand work, stooping, standing watch	180
Moderate	Pushing/pulling light carts, picking fruit/vegetables	300
Heavy	Carrying loads, stacking lumber, landscaping, mixing cement	415
Very heavy	Sledgehammer use, stacking concrete, intense shoveling or digging	520



# How can acclimatization help prevent HRI?

- Acclimatization consists of changes in the body (adaptations) that occur with exposure to heat that allow the body to better withstand working in hot conditions.
  - Can take 4-14 days to develop, with a substantial amount of adaptation occurring in the first 4-5 days.
  - Can be lost after a week away from working in the heat.
- **Acclimatization is particularly important for new workers, workers returning from a prolonged absence, and sudden hotter exposures.**

*Periard et al 2015; <https://www.cdc.gov/niosh/topics/heatstress/acclima.html>; Bernard et al 2021.*

# What can happen when the body's ability to cool down is overwhelmed?

Heat stroke:

- Very high body temperature (>40°C, 104°F)
- Confusion, irritability, seizure, collapses, nausea, vomiting, death
- **The effects of heat stroke on the brain can prevent a worker from recognizing they are unwell**

# Rapid recognition & cooling has been shown to prevent death from heat stroke

- **Medical Emergency -- Call 911!**
- **Research suggests best chance for survival is with rapid recognition** and cold-water immersion (*Casa et al 2007; Douma et al 2020*), though practicality may be challenging.
- Move to cool place, remove heavy/outer clothing, wet and fan, & ice packs, if available.
- **Heat stroke is preventable!**



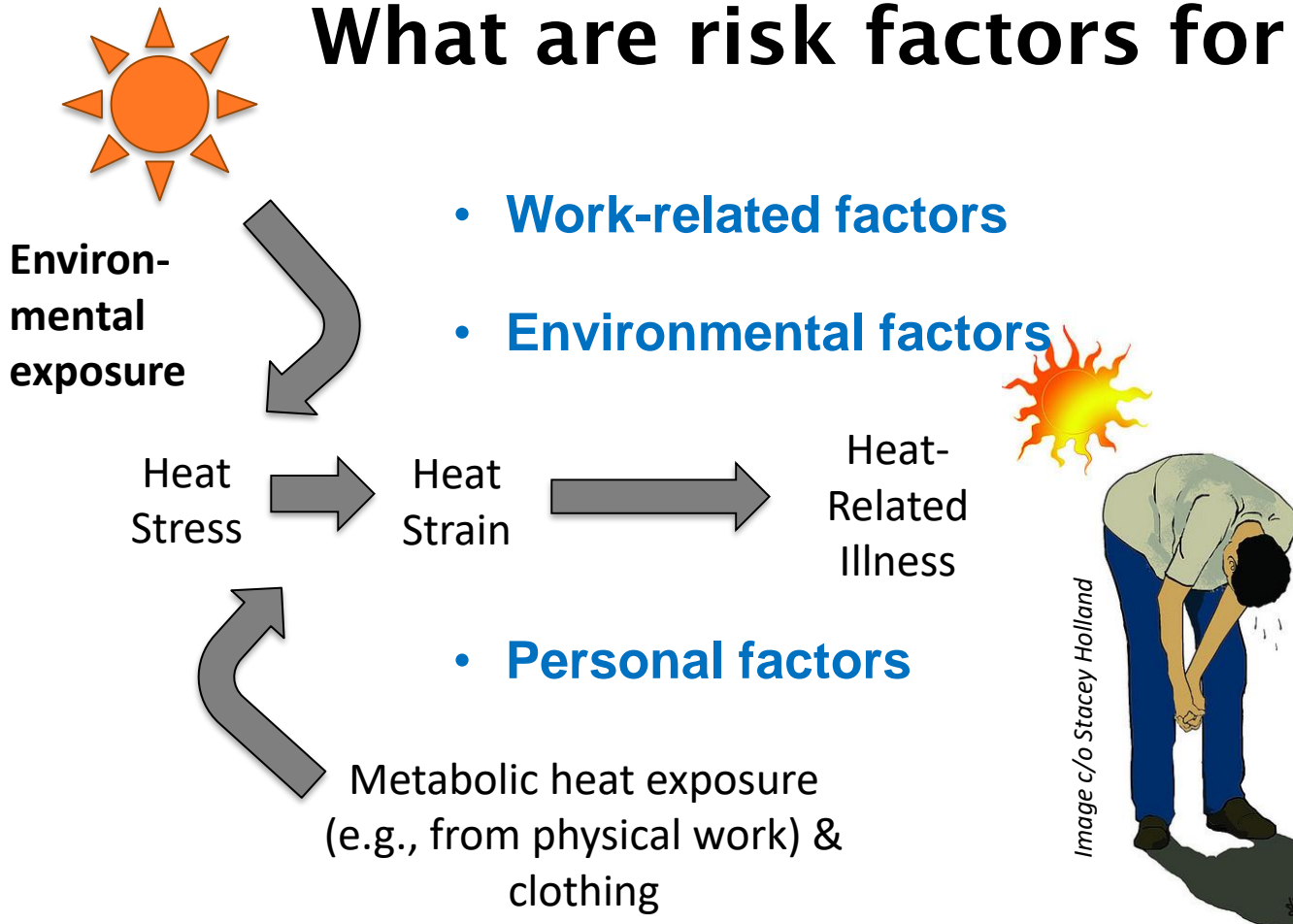
# In addition to HRIs, how else can heat affect outdoor worker health?

Additional research has evaluated the relationship between occupational heat exposure and:

- Traumatic injuries (example: fall from ladder)
- Acute kidney injury
- Absorption of chemicals
- Pregnancy/birth outcomes
- Mental health outcomes

*Calkins et al 2019; Spector et al 2016; Binazzi et al 2019; Spector et al 2019; Moyce et al 2017; Shi et al 2022; Bourbonnais et al 2013; Kuehn et al 2017; Yazd et al 2019.*

# What are risk factors for HRI?



# Work-related risk factors for HRI



**Heavy workloads**



**Working near hot machines**



**Indoors with no cooling or ventilation**



**Wearing personal protective equipment**



**Wearing dark clothes and lots of layers**



**Too much sugar**



**Not being used to hot weather**



**Not drinking enough water**



**Not enough breaks**

*Images c/o Stacey Holland*

# Environmental risk factors for HRI



**Direct sun**



**High temperature**



**No wind or hot wind**



**High humidity**

*Images c/o Stacey Holland*

# Personal risk factors for HRI



**Hungover**



**Heart disease**



**Diabetes**



**High blood pressure**



**Not enough sleep**



**Cold, flu, fever**



**Certain medications**



**Previous heat illness**



**Overweight**



**Older age**



**Pregnancy**

*Images c/o Stacey Holland*



# Washington (WA) workers' compensation claims for HRI

Workers' compensation State Fund data only – not self-insured

Case identification and description of cases:

- Cases identified from Report of Accident form and claim medical diagnosis codes
- Onset of illness near to exposure
- Key data elements
  - Industry of employment
  - Location data to link to temperature

*Hesketh M et al. Heat related illness among workers in Washington State: A descriptive study using workers' compensation claims, 2006-2017. Am J Ind Med 2020 Apr;63(4):300-311.*

*Spector J et al. Heat-related illness in Washington State agriculture and forestry sectors. Am J Ind Med. 2014 Aug;57(8):881-95.*

*Bonauto D et al. Occupational heat illness in Washington State, 1995-2005. Am J Ind Med. 2007 Dec;50(12):940-50.*

# WA State Fund (SF) workers' compensation HRI claims by industry sector (2006-2017)

- 918 confirmed HRI claims: 654 accepted and 264 rejected

Industry sector name	# accepted HRI claims (%)	# accepted July-Sept HRI claims (%)	July-Sept accepted HRI claim rate (# claims per 100,000 full-time employees)*
Construction	170 (26.0%)	124 (25.1%)	70.0
Agriculture, Forestry, Fishing & Hunting	111 (17.0%)	81 (16.4%)	102.6
Public Administration	94 (14.4%)	73 (14.2%)	131.3
Administration & Support & Waste Management & Remediation Services	58 (8.9%)	48 (9.7%)	61.5
Manufacturing	55 (8.4%)	44 (9.0%)	35.3
Wholesale Trade	33 (5.1%)	31 (6.3%)	44.9
Accommodation & Food Services	30 (4.6%)	18 (3.6%)	16.3
Retail Trade	23 (3.5%)	15 (3.0%)	13.6
Transportation & Warehousing	22 (3.4%)	14 (2.8%)	27.1
Other Service - Except Public Admin	12 (1.8%)	11 (2.2%)	22.5
All Other Sector Categories	46 (7.0%)	36 (7.2%)	--

\*Claim rate values are adjusted for the number of full-time employees; higher rates indicate higher HRI claim burden

# Challenges in assessing the burden of work-related HRI

- Less severe cases not receiving medical attention
- Poor awareness of workers' compensation and likely underreporting of eligible cases
  - Estimated only 60% of work-related injuries or doctor diagnosed occupational diseases were paid by WA workers' compensation (40% not in claims data)
  - Federal and state Bureau of Labor Statistics data undercount work injuries and illnesses
  - Adding rejected SF workers' compensation claims – 40% increase in the number of SF HRI claims

*Marcum et al 2017; Wuellner et al 2014,2017; Hesketh et al 2020*

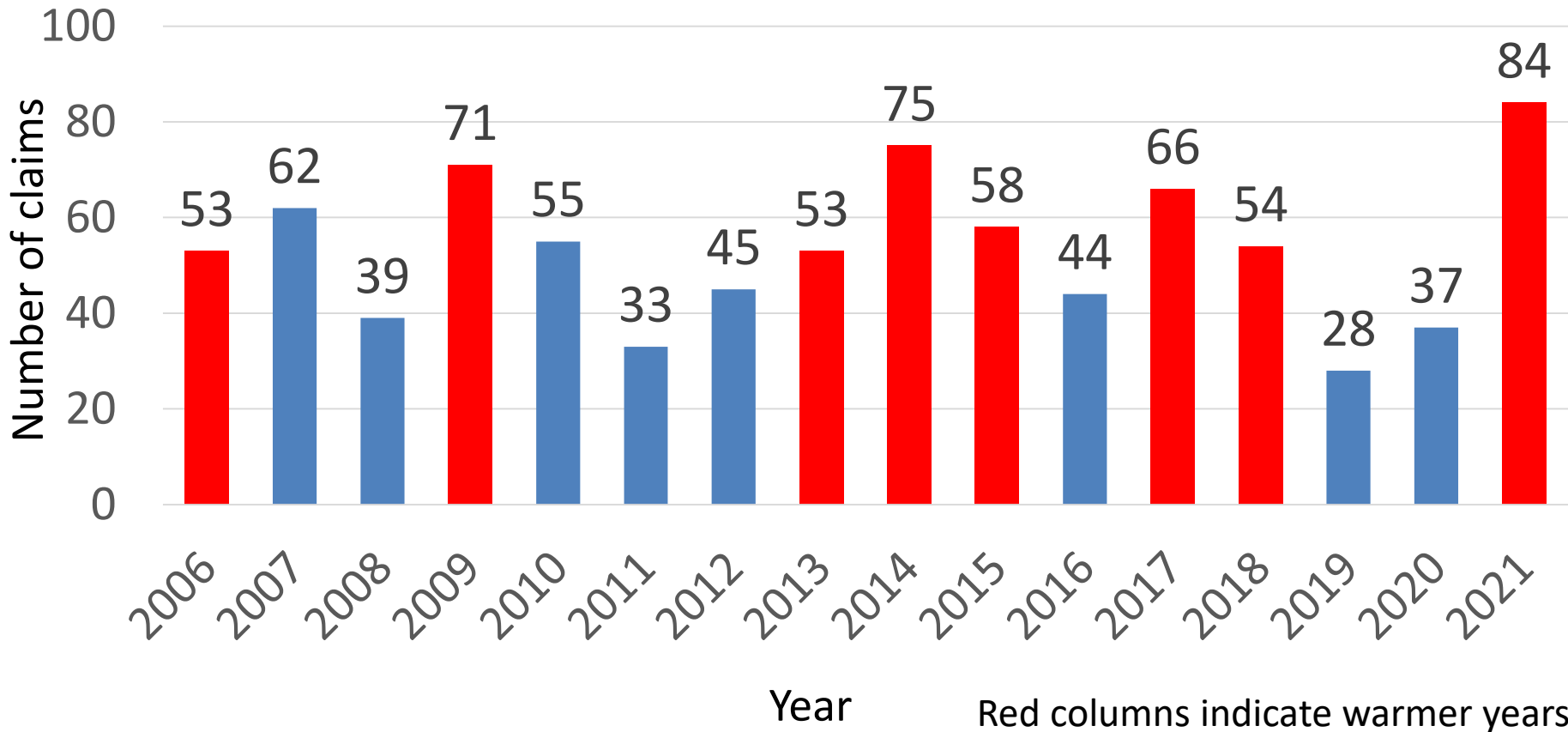
# WA workers' compensation HRI claims & environmental conditions

- The maximum daytime temperature was **below the current WA heat rule threshold (89°F) for 45% of accepted WA HRI claims, indoor & outdoor, 2006-2017**
- **~25% of 1995-2009 outdoor WA agriculture/forestry HRI claims occurred below a maximum heat index of 90°F\***

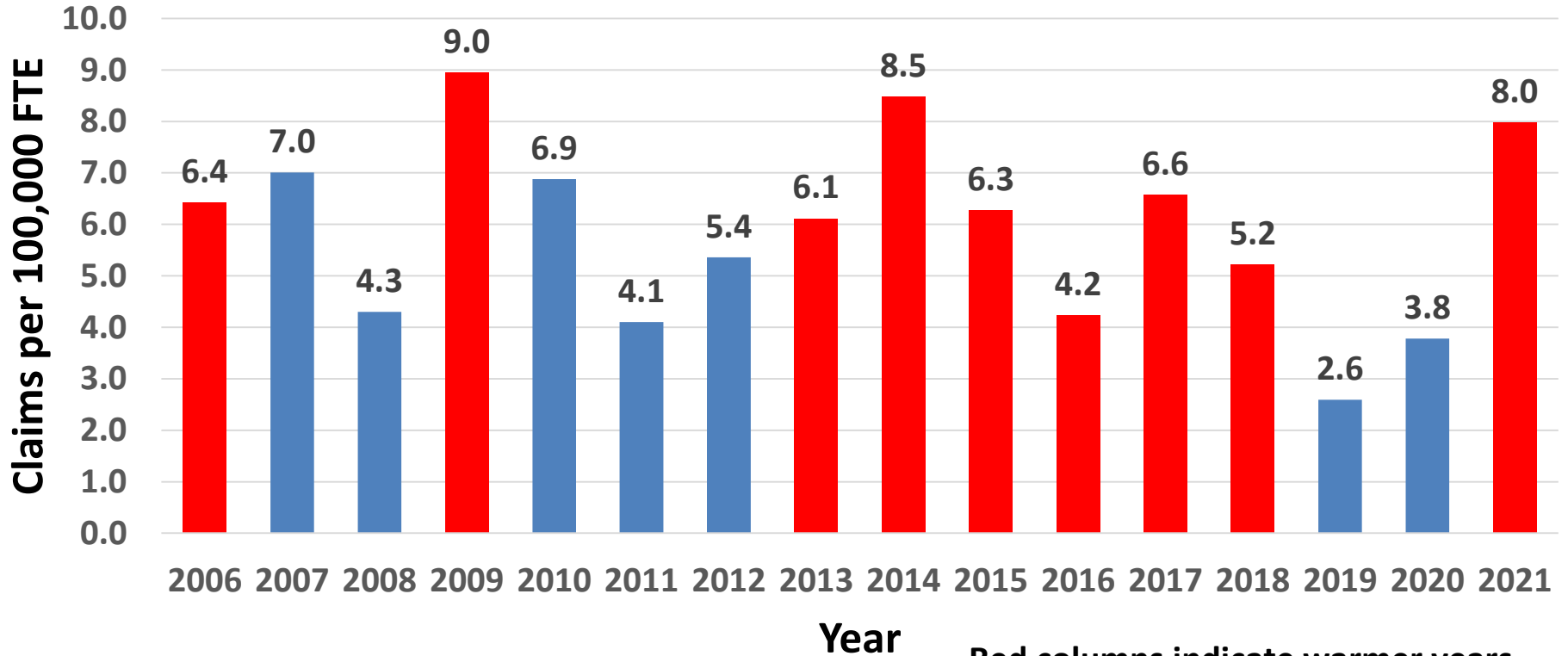
*\*Equivalent to air temperature 90°F @ 38% relative humidity*

*Hesketh et al 2020; Spector et al 2014*

# WA accepted HRI WC SF claims, 2006-2021



# WA SF HRI Accepted Claims per 100,000 FTE for April - September by Year



Red columns indicate warmer years

# US heat fatality cases & environmental conditions

- US Occupational Safety & Health Administration (OSHA) outdoor HRI investigations 2011-2016: **Heat stress** exceeded NIOSH WBGT-based occupational exposure limits in all 14 fatalities and in eight of 11 nonfatal illnesses and **was below a heat index 89°F\* in 32% cases**
- OSHA systematic review of HRI fatality reports (in English):
  - 14 publications totaling 570 heat-related deaths
  - Median heat index 101, range 62-137°F
  - **Almost all outdoor deaths occurred when heat index  $\geq 80^\circ\text{F}^{**}$**

*\*Equivalent to air temperature 89°F @ 40% relative humidity*

*\*\*Equivalent to air temperature 80°F @ 40% relative humidity*

*Tustin et al 2018; Maung et al 2020*

# WA workers' compensation claims & traumatic injury risk

- WA SF outdoor HRI workers' compensation claims analyses from 2000-2012:
  - Agriculture (Central/Eastern WA): **14% increased odds (risk) of traumatic injury** at temperature 76-82°F\* (Humidex of 25-29°C), compared to temperature <76°F\* (Humidex <25°C)
  - Construction (Mar-Oct): **0.7% increase odds (risk) of traumatic injury** *for each degree Celsius increase in temperature*

\*Assuming 35% relative humidity

Spector et al 2016; Calkins et al 2019



# Questions?

# Outdoor Heat Exposure Survey

The survey was sent via GovDelivery in early February and was also posted by our Communications Team on social media.

The GovDelivery was distributed to the following lists:

- DOSH Construction Advisory Committee
- Safety News
- WISHA Safety Standards – Rules Updates

# Outdoor Heat Exposure Survey

Responses were received from employers, employees, safety professionals, employer associations, and labor advocates.

A wide range of industries responded to the survey including, but not limited to:

- Agriculture
- Construction
- Government
- Manufacturing
- Transportation
- Utilities

# Outdoor Heat Exposure Survey

Survey asked 10 scoping questions around the following topics:

- Ambient heat exposure, environmental monitoring;
- Rest breaks, work pace, and hydration;
- Acclimatization;
- Training;
- Responding to signs and symptoms of heat-related illness;
- Current standard and 2021 emergency standard; and
- Personal Protective Equipment (PPE)

# Outdoor Heat Exposure Survey

- **Shade was provided by:** trees, buildings, tarps, umbrellas, shade netting, awnings, and vehicles.
- **Challenges providing shade:** none, wind, and moving worksites.
- **Alternate cooling methods:** AC in buildings or vehicles, cooling towels/vests, fans, and misting tents.
- **Determining weather forecast:** weather phone apps, NOAA, thermometers, online, tv, notification from supervisors.
- **Challenges getting weather forecast:** None, accuracy, internet access, and distance between weather station and worksite.

# Outdoor Heat Exposure Survey

- **Rest breaks:** as needed, common practice, at a certain temperature, employers encouraging breaks, mandatory breaks and water consumption.
- **How was water provided:** jugs with ice and water, water stations, and coolers with bottled water.
- **Acclimatization:** training, alternate work schedules, buddy system, closer supervision, and employees monitored for signs of heat related illness.

# Outdoor Heat Exposure Survey

- **Training / best practices:** communication, employee engagement, repeated trainings, daily site safety meetings, and frequent reminders to take breaks and drink water.
- **Monitoring solo workers:** buddy system, radio contact, periodic check-in, and do not allow solo work.
- **Current/emergency standards – what's effective:** shade, required breaks, and general awareness provided during training.

# Outdoor Heat Exposure Survey

Survey responses will be published in English and Spanish on the public website under Rulemaking Stakeholder Information, at the link below:

<https://lni.wa.gov/safety-health/safety-rules/rulemaking-stakeholder-information/ambient-heat-exposure-rulemaking>



# Next Steps

- Next stakeholder meeting: April 28th
- Get involved in the rulemaking process:

<https://lni.wa.gov/safety-health/safety-rules/rulemaking-stakeholder-information/ambient-heat-exposure-rulemaking>

# Thank you!

Send questions or comments to:

Technical: Bradley Farrar or Drew Kertzman

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