

# Cold weather injury among people experiencing homelessness

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# Background

- In 2022 Denver's homeless population reached an all-time high
- At least 5,000 individuals experienced homelessness
- Over 1,000 individuals unsheltered on a single night in January
- Average temperature in the 2022-2023 Denver winter was 32.9°F
- People experiencing homelessness are at high risk for hypothermia and frostbite

# Background: hypothermia

- **Hypothermia: abnormally low body temperature**
  - affects heart and brain function
  - occurs from extended exposure to cold temperatures, potentially around or slightly above 40°F,
  - when individuals are damp from rain or sweat

Swiss Staging System for Hypothermia

TABLE 2

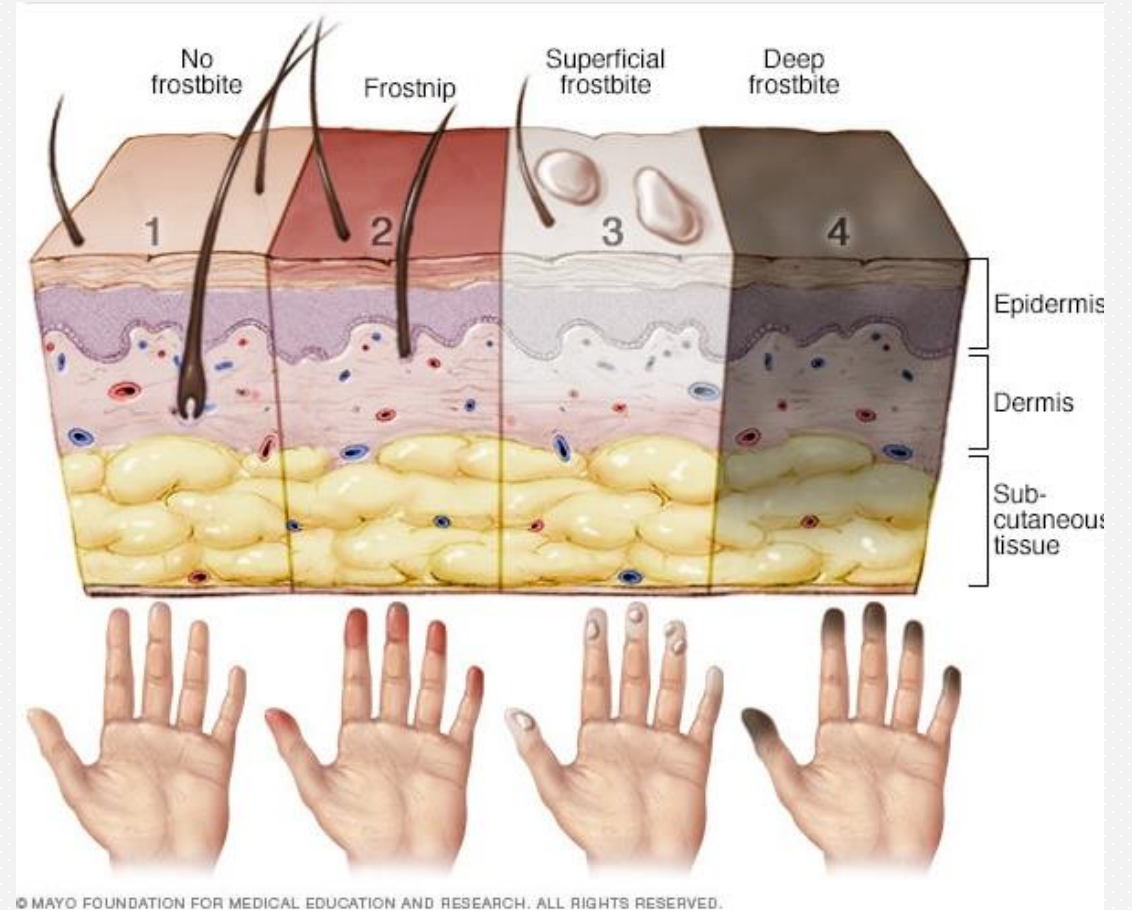
## Swiss Staging System for Hypothermia

Stage	Symptoms	Suspected core temperature
I	Conscious and shivering	89.6 to 95°F (32 to 35°C)
II	Altered mental status, not shivering	82.4 to 89.6°F (28 to 32°C)
III	Unconscious, not shivering, vital signs present	75.2 to 82.4°F (24 to 28°C)
IV	No vital signs	< 75.2°F (< 24°C)

*Information from references 13 and 14.*

# Background: frostbite

- **Frostbite: the freezing of a body part**
  - typically occurs in freezing conditions, or below 5°F,
  - higher temperatures when wet,
  - wind chill increases risk,
  - can require hospital admission, a burn unit treatment, and/or amputation



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# Nonfreezing cold injuries

- Immersion foot (i.e., trench foot) occurs with prolonged exposure (typically two to three days) to wet conditions above 32°F (0°C)
- Pernio (i.e., chilblains) is localized inflammatory lesions that most commonly affect the hands or feet within 24 hours of exposure to damp environments

# Frostbite and hypothermia

- People experiencing homelessness have a higher risk of amputation from frostbite injury than housed individuals
- They are less likely to discharge with supportive medical care
- They are more likely to have unplanned readmission

Endorf and Nygaard. *J Burn Care Res.* 2021; 42(6):1261-1265.  
Endorf and Nygaard. *J Burn Care Res.* 2021; 42(5): 857-864.

# Context with burns

- Compared to burns, patients (nationally) with frostbite have:
  - longer lengths of stay (8.1 v 4.0 days)
  - higher hospital charges (\$43,400 vs \$15,600)
  - non-commercial insurance (i.e., public insurance) (25.3% vs 41.7%)

Endorf and Nygaard. *J Burn Care Res.* 2018; 39(5): 676-679.

# The role of warming centers

- Warming (and cooling) centers offer refuge and help prevent cold weather injuries (temporary relief)
- Warming centers allow couples, pet owners, friends, and families to stay together
- Evaluation for cold weather injuries but no other wrap around services



# Denver's Policy

- Denver interim thresholds for cold weather sheltering that began in Winter 2022-2023:
  - Capacity is exceeded in the existing shelter system AND one of the following criteria is met:
    - 1) overnight low temperature of 20 degrees or below;
    - 2) windchill advisory, watch or warning; OR
    - 3) two inches or more of snow forecast.

There is no scientifically valid evidence supporting this temperature threshold

# What does the evidence say?

- Study of 615 people experiencing homelessness in Poland
  - Retrospective analysis from 2010-2016
  - Moderate cold ( $t_{\max} < 0.0^{\circ}\text{C}$ ), very cold ( $t_{\min} \leq -10.0^{\circ}\text{C}$ ) and extremely cold ( $t_{\max} \leq -10.0^{\circ}\text{C}$ )
  - 176 people died in the time period
  - **Most deaths occurred in conditions of cold stress**
  - 40% (n = 70), occurred during moderate cold stress, 9% (n = 17) of deaths occurred in strong cold stress conditions
  - Risk of death during moderate cold stress was 84% more likely than in thermoneutral conditions

Romaszko J, Cymes I, Dragańska E, Kuchta R, Glińska-Lewczuk K (2017) Mortality among the homeless: Causes and meteorological relationships. PLoS ONE 12(12): e0189938. <https://doi.org/10.1371/journal.pone.0189938>

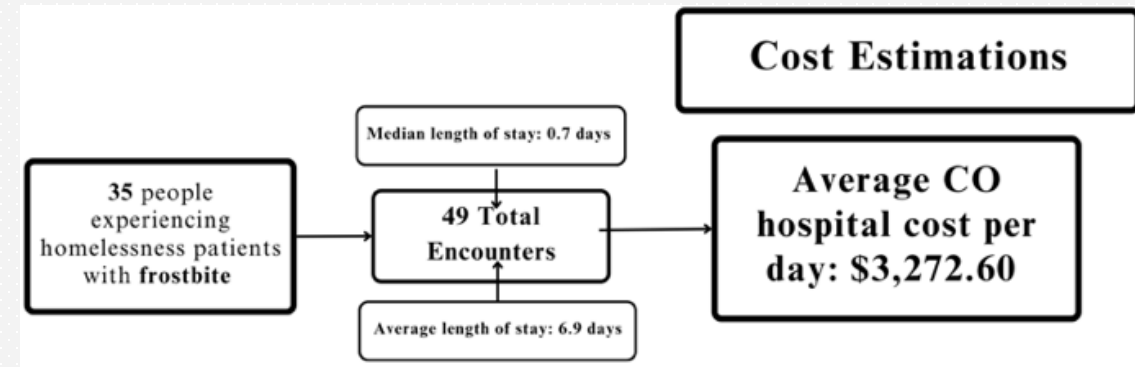
# What does the evidence say?

- Association between meteorological conditions and hypothermia risk among people experiencing homelessness
  - Observed 79 injuries and 18 deaths
  - Odds of experiencing a hypothermic event increased 1.64-fold with every 5°C decrease in the minimum daily temperature
  - Most injuries and deaths occurred during periods of low and moderate cold stress: 72% occurred when the minimum daily temperatures were warmer than -15 °C (5 F)

Zhang P, et al. Cold weather conditions and risk of hypothermia among people experiencing homelessness: implications for prevention strategies. IJERPH. 2019, 16(18), 3259

# Metro Area Data

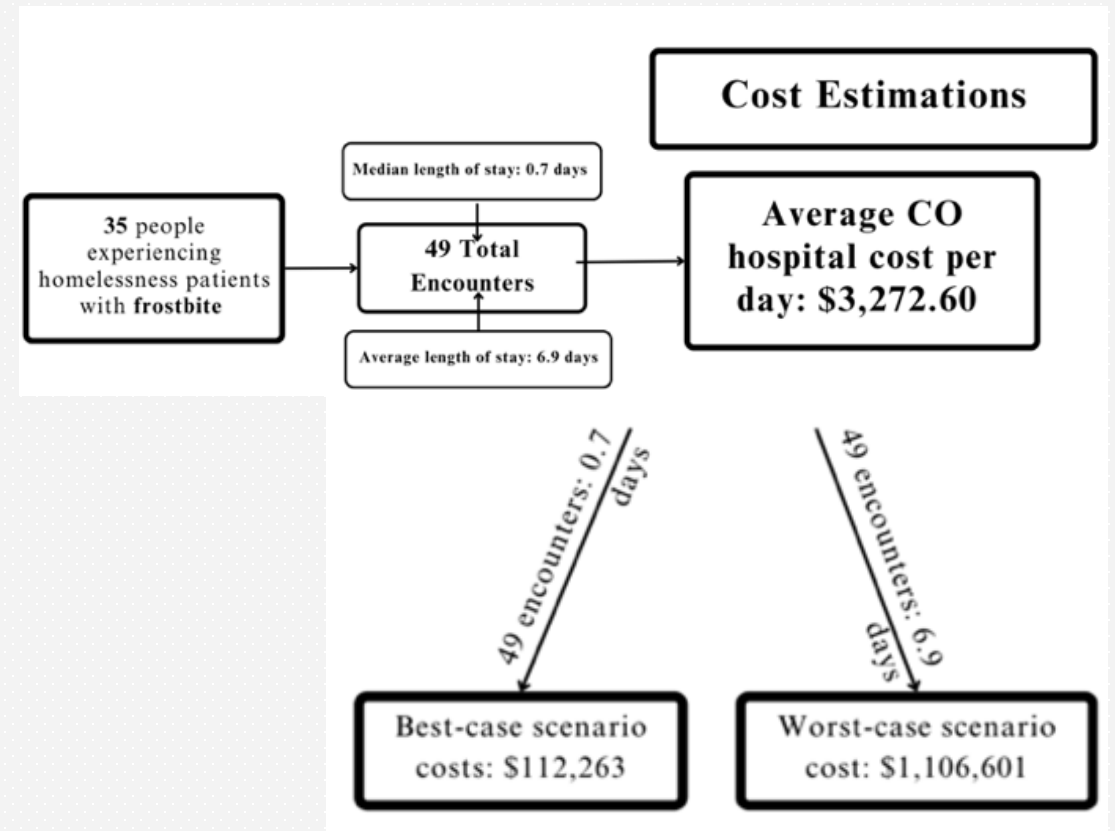
- We data from a metro area hospital
- 49 encounters for 35 patients experiencing homelessness who were discharged from a metro area hospital in 2022\* with a primary billing diagnosis of frostbite.
  - Mean length of stay was 6.9 days
- The average per day cost of hospitalization is \$3,273 in Colorado (via Kaiser Family Foundation)



\*Average temperature in the 2022-2023 Denver winter was 32.9°F

# Metro Area Data

- We estimated that costs to Colorado taxpayers for **frostbite alone** could range from \$110,000 to over \$1,100,000 in each year/per Metro area hospital
- More than \$5,000,000/year for the Metro area
- Estimate does not include for hypothermia



# What can \$5,000,000 get us?

- Colorado taxpayers may have spent up to \$5,000,000 last year on preventable hospitalizations from a single condition
- 90 days worth of warming centers assuming a \$50,000/day cost = \$4,500,000
- These are dollars being spent on care already

# Other jurisdictions

- Most Colorado cities and counties are out of step with scientific evidence, including Denver
- Vancouver engages in their extreme weather response plan when there is a forecasted temperature or wind chill of 0°C or colder, any snow accumulation, and rain at or near freezing temperatures
- New York City, institutes a “Code Blue” when the temperature drops to 32°F or below, including wind-chill, between 4 p.m. and 8 a.m.

# An approach based on *current* evidence

- Prioritize the early and extended opening of warming shelters with a temperature threshold of no less than 40°F for entire winter
- Alternative, operate at threshold of 32°F without the caveat that shelter capacity must be exceeded. Include current exceptions:
  - 1) overnight low temperature of 20 degrees or below;
  - 2) windchill advisor, watch or warning; OR
  - 3) rain, sleet, or snow forecast



**Thank you for your time**

**Questions?**