

# Considerations for physicians: Mitigating the adverse health effects of heat in older Colorado adults

Brittany Denzer, MS4, Janet Meredith, MBA

## Disclosures

Brittany Denzer and Janet Meredith have no conflicts of interest to disclose

## Background

- Hotter temperature due to climate change is one of the greatest emerging threats to human health, especially in Colorado<sup>1</sup>
- Significant morbidity and mortality is associated with extreme heat events<sup>2</sup>
- Older adults (65 and older) are at increased risk for adverse health effects due to heat due to impaired compensatory physiology<sup>3</sup>
- Physicians are poorly equipped to address heat-related risks in their patients, which requires an individualized approach<sup>4</sup>

## Research Questions

1. What vulnerabilities predominate in adults 65 and older in Colorado?
2. What other risk considerations related to heat are important for Colorado's local climate and population?
3. What medication classes may compound the risk of heat-related illnesses?

## Methods

- 2019 US Census Bureau data for Colorado was filtered by age, disability, housing tenure, and family types
- Literature review using keywords "medications," "heat," "risk," and "elderly"
- Internet search using keywords "climate," "health," "Colorado," "heat," "vulnerability," and "older adults, elderly" to identify local organization reports and media releases on heat and health in Colorado
- Literature review using "medications," "heat," "risk," "elderly" to develop medication resource

## Results

Vulnerability	Supporting data	Implication
Colorado has a large farmworker population	<p>Colorado has a population of about 40,000 farm workers, about three-quarters of whom are from Mexico and Central America on seasonal or temporary visas <sup>12</sup></p> <p>Colorado has 37,000 farms and ranches.<sup>7</sup></p> <p>2013 study in one health facility in Colorado found the likelihood of migrant farmworkers seeking health care increased 88% on hot days<sup>8</sup></p>	Colorado farmworkers have high heat vulnerability due to multiple risk factors of poverty and strenuous working conditions.
Colorado has a dry climate	<p>Colorado rates 46th out of 50 states for humidity and dew point.<sup>5</sup></p> <p>Dry heat has a similar effect as humid heat on mortality in older adults<sup>3</sup></p>	Excess fluid loss from sweat evaporation may make Coloradans, especially older adults, more susceptible to dehydration and hypovolemia <sup>3</sup>
Coloradans are more active than the national average	61% of residents engage in 150 minutes of moderate aerobic activity/week (compared with under 51% nationally) <sup>8</sup>	Activity during heat is a risk factor for heat-related illness. This risk is increased with age <sup>18</sup>
A large number of older Coloradans have some type of disability, comparable to the national average	<p>30.1% of Colorado adults 65 and older have a disability, with 11% having an independent living disability, 6% having a self-care disability, 17% having an ambulatory difficulty, and 7% having a cognitive disability.<sup>27</sup></p> <p>The prevalence of disability increases with age, with 47% of Coloradan adults &gt;75 having at least one type of disability.</p> <p>During the Chicago heat wave, being confined to bed had an odds ratio of 8.2 for risk of heat-related death compared to those not confined to bed.<sup>23</sup></p>	Individuals who are disabled are at higher risk for heat-related death.
Many older Coloradans live alone, comparable to the national average	<p>26% of Colorado adults 65 and older live alone<sup>22</sup></p> <p>During the Chicago heat wave, living alone had an odds ratio of 2.3 for risk of heat-related illness.<sup>23</sup></p>	Individuals who live alone are at higher risk for heat-related death.

Table 1: Summary of identified vulnerabilities pertinent to Colorado's older population. See handout for additional references.

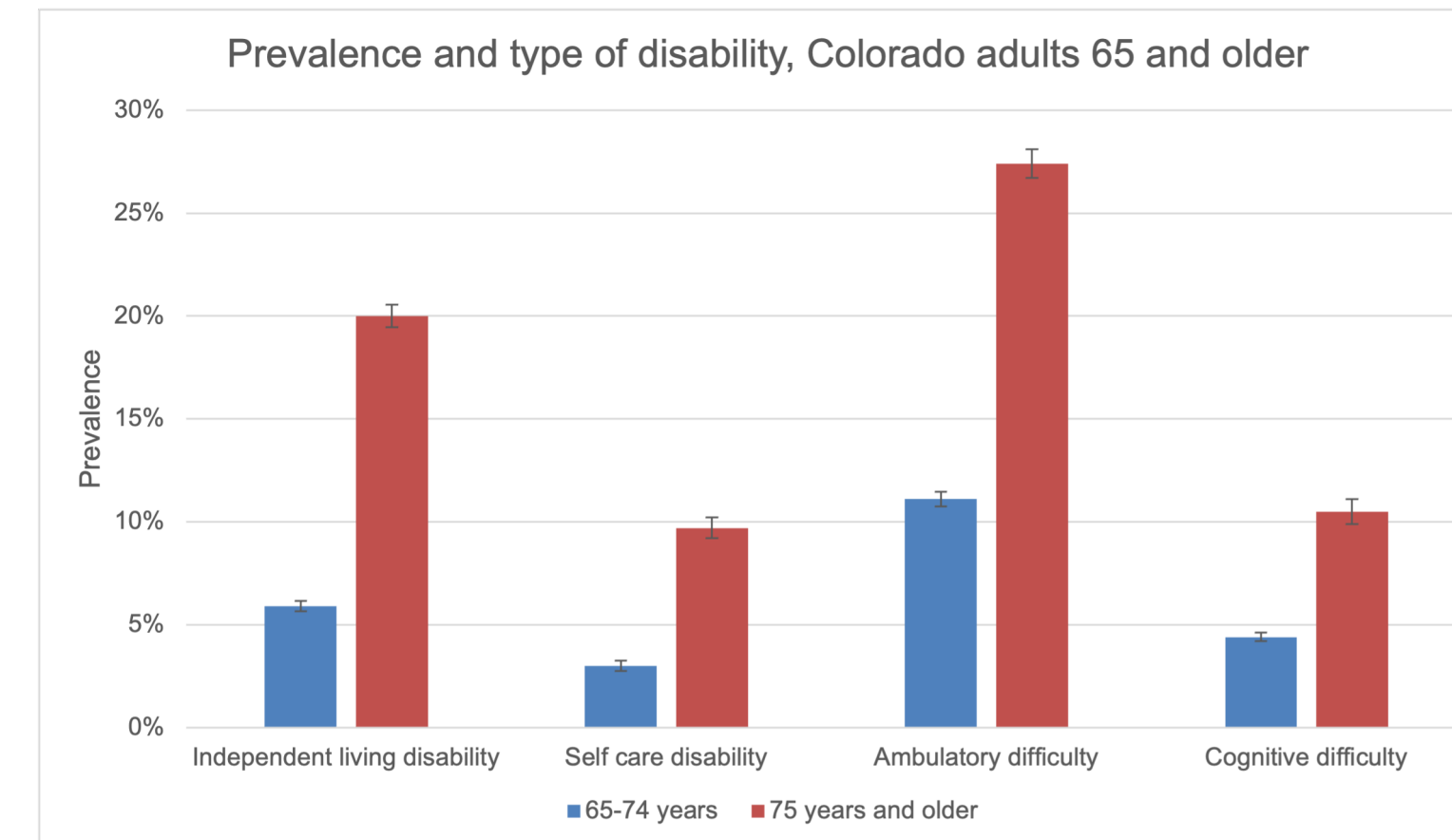


Figure 1: Prevalence and type of disability of Colorado adults 65 and older. Error bars indicate the Census Bureau's margin of error at a 90% confidence level.

	Kidney Injury, electrolyte imbalances	Hypovolemia	Hyperthermia / increased risk for heat stroke	Impaired sweating	Impaired cardiac reserve	Blunted thirst sensation	Cognitive impairment
ACE inhibitors and ARBs	•	•				•	
Anti-adrenergics and beta blockers		•	•	•	•		
Antiarrhythmics		•		• <sup>a</sup>			
Calcium channel blockers		• <sup>b</sup>	•		• <sup>c</sup>		
Diuretics	•	•			•		
NSAIDs	•						
Anticholinergics		•	•	•	•		•
Antidepressants	•	•	•	•			
Antipsychotics			•	•			
Benzodiazepines							•
Anticonvulsants							•

Table 2: Theoretical and measured effects of common medications on physiologic responses to heat. Table adapted from Meade et al. 2020 and Westaway et al. 2015 a: disopyramide, b: amlodipine, c: diltiazem and verapamil.

## Conclusions

- Colorado's population and climate have several distinct considerations that may influence climate change-informed patient care.
- A physician education resource summarizing the effects of common medications on physiologic responses to heat was created to help inform medication management strategies.
- Principles of risk mitigation align with current patient-centered care including education on risks and preventative measures, assessing functional status, and medication review and reconciliation

## Limitations and Implications

- Limitations: Lack of information on baseline perceptions of physicians and older adults about heat risk. The vulnerabilities addressed are not comprehensive. Several significant vulnerabilities were not able to be assessed such as lack of air conditioning.
- Adaptation to more frequent and severe heat requires physician knowledge of region specific and individual risks of heat-vulnerable populations as well as relevant medication profiles.

## References

1. Allan RP. Climate Change 2021: Sixth Assessment Report of the Intergovernmental Panel on Climate Change. WMO, IPCC Secretariat; 2021.
2. Romanello M., et al. The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future. Lancet.
3. Meade RD, et al. Physiological factors characterizing heat-vulnerable older adults: A narrative review. Environ Int.
4. Valois P, et al. The Health Impacts of Climate Change: A Continuing Medical Education Needs Assessment Framework. J Contin Educ Health Prof.

## Acknowledgements

Thank you to Janet Meredith, Maya Katz, MS3, and the Colorado Health Institute for their support and contributions to this project.