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Climate Change Policies and Older Adults: An Analysis of States' Climate Adaptation Plans

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Abstract

Background and Objectives. As climate change drives more frequent and intense weather events, older adults face disproportionate impacts, including having the highest mortality rates from storms, wildfires, flooding, and heat waves. State governments are critical in deploying local resources to help address climate change impacts. This policy study analyzes states' climate adaptation plans to assess the methods through which they address the impact of climate change on older adults.

Research Design and Methods. This study uses content analysis to analyze available climate change adaptation plans for all U.S. states for strategies designed to increase resilience of older adults to impacts of climate change.

Results. Nineteen states have climate adaptation plans, of which 18 describe older adults as a population group with specific health impacts and risks factors. Four categories of adaptation strategies for older adults include communications, transportation, housing, and emergency services. State plans vary in terms of the risk factors and adaptation strategies included.

Discussion and Implications. To varying degrees, states' climate change adaptation planning address health, social and economic risks specific to older adults, as well as strategies for mitigating those risks. As global warming continues, collaborations between public and private sectors and across regions will be needed to prevent negative outcomes such as forced relocation and other social and economic disruptions as well as disparate morbidity and mortality.

Keywords

Public policy, climate resilience, aging, adaptation

Background and Objectives

In the coming decades, extreme climate change events are expected to increase in frequency, intensity, and duration across all regions of the U.S. as global warming continues (Pörtner et al., 2022). In response, governments have created climate change adaptation plans that describe the risks faced by vulnerable population groups, and how to protect them. Although older adults are disproportionately impacted by extreme weather events and other climate-related impacts (Bryant et al., 2022; Gamble et al., 2013), little is known about how climate change adaptation plans address this population. This research examines if and how states' climate change adaptation plans address older adults as a specific population group.

Climate Adaptation

Government agencies in the U.S. engage in climate change planning at the federal, state, city and other geopolitical levels (Bierbaum et al., 2013). Although many states have developed both climate action and climate adaptation plans, there remains a lack of consensus on how to define climate action and climate adaptation, and what components the plans should include. Whereas state climate action plans generally include greenhouse gas emissions reduction targets and detail actions states can take to help meet those goals (Center for Climate and Energy Solutions, 2023), state climate adaptation plans typically document the processes of adjustment to actual or expected climate change and its effects, with a specific focus on moderating harm or utilizing beneficial opportunities in human systems (Environmental Protection Agency, 2021). Accordingly, with a focus on the impact on older adults, we have chosen to analyze state climate adaptation plans. Thirty-three U.S. states have released a climate action plan or are in the process of revising or developing one, of which 19 have a climate adaptation plan (Center for Climate and Energy Solutions, 2023; Georgetown Climate Center, 2023).

U.S. governing bodies began developing climate adaptation plans relatively recently (Georgetown Climate Center, 2022), despite the U.S. being the largest emitter of greenhouse gasses since 1850, with approximately 20 percent of the global total (Evans, 2021). A 2009 Executive Order established the U.S. Climate Change Adaptation Task Force; however, it was not until 2013 that the President's Climate Action Plan and EO 13653 directed federal agencies to develop agency specific adaptation plans (Environmental Protection Agency, 2022). The content and focus of adaptation plans vary given that climate change impacts are regional (e.g., wildfires in the western U.S., hurricanes in the eastern U.S.), but typically aim to influence decision making and policy development, reduce exposure, and promote infrastructure and technology innovations to mitigate future events (Owen, 2020). Adaptation plans include resources and information to guide communities' preparation and response to severe weather events such as rising sea levels, flooding, and extreme heat (Georgetown Climate Center, 2023), and typically address populations most vulnerable to weather events and other disasters (Ray & Grannis, 2015).

Vulnerability to climate change impacts involves a combination of exposure to stressors, sensitivity to disturbances, and capacity to adapt (Pörtner et al., 2022; Gallopín, 2006). Adaptation in this context generally involves attempts to reduce vulnerability and increase resilience and the ability to cope with environmental changes (Adelman et al., 2012). Older adults are more vulnerable than younger persons due to intersecting individual- and community-level factors (Gamble et al., 2013; Rhoades et al., 2018). A growing body of research has identified social, physiological, and psychological factors that contribute to the vulnerability of older adults to climate change, including physical and cognitive impairment, reliance on

caregivers and health systems, as well as social determinants of health and social isolation (See Table 1).

Climate Impacts: Individual-Level Factors

As climate change events cause older adults to experience extreme temperatures and stress, and interruptions in medical treatments and access to food, water, and durable medical equipment for those with limited mobility, chronic illnesses worsen (Balbus et al., 2016). Older adults do not adjust as effectively to sudden changes in temperature as younger people, are more likely to have a chronic medical condition that modifies normal body responses to heat, vulnerability to dehydration, diminished sensory awareness, and to take medications that affect the body's ability to regulate temperature or sweat (CDC, 2022). Socioeconomic status and race contribute to the vulnerability of older adults to climate change events. Socioeconomic status impacts pre-event factors related to individuals' risk perception and disaster preparedness, in addition to the physical and financial effects of the event itself and post-event factors related to receiving aid, housing access, and mental and physical health outcomes (SAMSHA, 2017). Racial and ethnic disparities related to higher risks of living in or near poverty, having poor housing conditions, experiencing compromised health status, and having limited healthcare access (Thomas et al., 2019) also exacerbates older adults' vulnerability to climate change impacts.

Climate Impacts: Community-Level Factors

Community-level factors that affect older adults during extreme weather events include inadequate transportation for people with mobility impairments, inadequate public warning systems, shelters that overlook the needs of older adults and people living with disabilities or

chronic illness, and social isolation (Bryant et al., 2022; Rhoades et al., 2018). Almost one-quarter of community-dwelling older adults in the U.S. are socially isolated (The National Academies of Sciences, Engineering, and Medicine, 2020), and these individuals are particularly vulnerable to extreme weather events (Kafeety et al., 2020).

Despite the existence of state-level climate change adaptation plans (Lawson et al., 2017), and the evidence that older adults with compound risk factors face disproportionate morbidity and mortality associated with extreme weather events, little is known about the ways that states address older adult populations in their climate adaptation efforts. To fill this gap, this study describes how state climate change adaptation plans address potential impacts and adaptation strategies focused on older adults, and how state plans on aging address weather-related disaster and emergency preparedness. Our underlying goal is to inform future state climate adaptation plans about the needs of older adults. State level planning is particularly critical for older adults, as states can direct the assets and agencies over which they have control toward climate risks and preparedness, and promote collaboration between public and private sectors and across regions.

Research Design and Methods

This study uses content analysis methods, a systematic classification process for coding and interpreting textual data (Hsieh & Shannon, 2005), and builds on policy surveillance methods (Burriss & Anderson, 2011; Burriss et al., 2016), an approach that integrates legal, social science, and epidemiological methods to interpret how state policies impact public health.

Procedures

Our first step involved identifying state-level climate policy documents and state plans on aging. We considered the CDC's Building Resilience Against Climate Effects (BRACE) Framework, state websites (e.g., environmental health, climate adaptation), state executive orders and the Georgetown Climate Center's State Adaptation Progress Tracker (2023). We selected the latter because it was a comprehensive, current, and reliable source of state climate adaptation plans. We ruled out using state climate action plans, as those tend to focus more on efforts to reduce greenhouse gas emissions (i.e., mitigation), while climate adaptation plans focus on reducing the impacts of climate change on society and building resilience, particularly among vulnerable populations (i.e., adaptation). We downloaded climate adaptation plans for all states with a published policy from the Georgetown Climate Center's State Adaptation Progress Tracker (2023) website, then checked each states' websites to ensure they were current. The plan for the District of Columbia (D.C.) was excluded because its municipal plan format made it an outlier in this sample of state plans. State plans on aging for each state with a climate adaptation plan were accessed from the AdvancingStates website (2023).

For the climate plans only, we identified all text that specifically referred to older adults (elder/elderly, older adult or person, aging, retiree, senior and senior citizen, as well as nursing home, assisted living and senior center) and copied it into a spreadsheet for coding and content analysis. To develop the coding strategy for climate topics, each of the first four co-authors reviewed and wrote a brief analytic memo describing three climate adaptation plans, and one of those plans was assigned to another co-author for review and discussion. This process informed us about the depth and breadth of topics specific to older adults in climate plans and the climate-specific topics to use as inductive codes applied to both plan types (e.g., climate, aging). We

used existing literature on older adults and climate change (Bryant et al., 2022; EPA, 2014; Gamble et al., 2013; Rhoades et al., 2018) to identify deductive codes. The initial list of climate-specific codes included: climate, weather, extreme heat, flood, wildfire, and other extreme weather. Four additional codes were identified as the first four authors read and discussed all climate plan text that referred to older adults. This process resulted in a final list of 10 climate codes that the first four authors applied to the climate adaptation and state aging plan text for this content analysis (see Table 2). The group later discussed the creation of four new topics, three of which were originally coded as “other extreme weather” (e.g., drought, late freeze, erosion).

Data Analysis

Using a directed approach to content analysis (Hseih & Shannon, 2005), each full sentence that included the climate topic received a dichotomous code (yes/no) for the purpose of counting the presence of these topics. Within each climate adaptation plan, each segment of text that included a mention of both older adults (and related keywords) and a climate-related topic were counted as one mention for the purpose of tabulating the results. We applied the 10 climate-related topics to the state plans on aging.

The next stage of analysis included identifying the meaning underlying the text, or latent content analysis (Hseih & Shannon, 2005), an approach similar to other qualitative approaches that begin with descriptive or open coding (e.g., thematic, grounded theory), followed by the identification of themes or conceptual categories. The co-authors met weekly for three months to discuss ongoing analysis, and to develop categories that captured the meaning of how plans referred to older adults in the context of climate-related topics. Through this process, we identified four categories: Health impacts of climate-related events on older adults, risk factors

specific to older adults, services needed by older adults during climate emergencies or disasters, and factors related to environmental justice, social determinants of health, and health equity.

Results

According to the Georgetown Climate Center’s State Adaptation Progress Tracker, 19 states have climate adaptation plans. These plans describe specific climate events that affect older adults (Table 2), potential health impacts (Table 3), risk factors (Table 4), and services that older adults might need following a climate-related event (Table 5). While the climate adaptation plans discuss these four categories of topics related to older adults, it is important to remember that these are planning documents that do not necessarily materialize into concrete actions. These adaptation planning documents convey states’ priorities and policy positions as they relate to expected climate impacts, building on the emergency and disaster response infrastructure of the National Response Framework (Federal Emergency Management Agency, 2023). In some cases, states outline action steps, while others provide recommendations to their governor’s office to then decide on further action.

Each of the 19 state climate adaptation plans specifically addresses older adults as a unique population group in the context of climate change, and specified weather events and other conditions. Many states discussed older adults alongside other populations considered vulnerable to extreme weather events. “Elderly” was the most commonly used term (see Online Supplementary Material, Section A). For example, Pennsylvania’s plan indicates:

As with other extreme weather events, groups vulnerable to flooding include the elderly, the poor, infants and children, those with underlying chronic diseases and those with disabilities (Georgetown Climate Center, 2023).

Hereafter, we use the term “older adult” inclusive of all terms used in the plans and use the state-specific terms only in direct quotations.

Florida’s climate plan indicates that the state has “the highest population of senior citizens as a percentage of total population,” explaining that this group has “greater vulnerability to impacts of climate change than the population at large, although children under five, those living in poverty, and those living in coastal areas can also be vulnerable” (Georgetown Climate Center, 2023). Of the 10 climate topics linked to older adults specifically, three (extreme heat, flooding, and wildfire smoke and air-quality) were included in eight or more state climate plans. The remaining six topics were included in four or fewer state climate plans (Table 2).

In addition to describing the number of states that address how specific climate topics impact older adults, Table 2 presents the number of topics per state climate plan. Massachusetts’ climate adaptation plan addresses six of the 10 topics when describing risks to older adults. Two other states, Oregon and Montana, each address five topics. Massachusetts was one of four states to address water scarcity or drought in the context of older adults:

EOEEA’s drought website provides resources for residents whose wells have gone dry during a drought, including...costly solutions...may most heavily impact people with little means (e.g., rural, elderly, and disabled individuals) who have no means of paying for a drilled well to reach remaining water supplies when their shallower wells have failed. (Georgetown Climate Center, 2023)

Why Older Adults Are at Risk

Some state climate plans explain why older adults might be at increased risk of climate impacts (see Table 3). Virginia's plan is one of 14 that refers to pre-existing health conditions and one of 13 that refers to the socioeconomic status of older adults:

Certain groups of people are recognized as being more vulnerable to the health impacts of climate change. These vulnerable populations include the following: children and the elderly, people of low socioeconomic status, members of racial and ethnic minorities, people living in coastal areas and floodplains, and people with pre-existing health conditions and disabilities (Georgetown Climate Center, 2023).

How State Plans Address Climate Impacts on Health

We identified six health-related topics specific to older adults in state climate adaptation plans (see Table 4). Of these, two were addressed by six states: heat-related illness, and respiratory and air quality-related illness. For example, New Hampshire's plan includes the following:

The Concord/Manchester area is projected to experience nearly 65 days per year when the heat index is above 90F. The elderly, young children, pregnant women, the chronically ill, and essential service workers are particularly vulnerable to heat stress of this nature. (Georgetown Climate Center, 2023)

Washington's climate plan addressed the increasing frequency of extreme heat events:

Since extreme heat days are uncommon in the Puget Sound region, most homes lack cooling systems. Most people are not well prepared and do not take the necessary

precautions. In the Seattle area, the number of heat-related deaths for people age 65 and older is projected to increase. (Georgetown Climate Center, 2023)

North Carolina's climate plan included the following information about heat:

Improving substandard housing and providing the ability to cool off for several hours daily during high temperatures protects health in the face of increasing temperatures. Older adults are at increased risk for heat-related illness due to social isolation, decreased ability of the body to cool itself, and potentially fixed or limited income. (Georgetown Climate Center, 2023)

Pennsylvania included additional details about the impact of heat stress on older adults, such as heat stroke and exacerbation of pre-existing chronic health conditions, and North Carolina highlighted the differential impacts of poor air quality from wildfire smoke, including “greater mortality among senior citizens” (Georgetown Climate Center, 2023).

Services Needed for Older Adults

Some state climate adaptation plans addressed services that older adults might need in response to climate emergencies. We identified four broad categories of services: communications, transportation, housing, and emergency services (Table 5).

Eight states addressed communication topics such as advertising cooling centers, hazard mapping, factsheets, alert systems, telephone/addresses/internet connections, and telehealth and data related solutions. An example of the latter topic comes from Massachusetts' plan:

Strengthen the Environmental Public Health Tracking network and the Climate and Health Program in the DPH. Using DPH's current cross-state databases, perform data

collection and needs assessment for particularly vulnerable populations (such as the homeless, the elderly, and people with mental illness or substance use disorders) and develop and implement adaptation and resiliency plans for these vulnerable populations. (Georgetown Climate Center, 2023)

Within the transportation category, addressed by six states, Maine's plan described transit-oriented development as a way to support "aging in place" (p. 45). Delaware's action plan included:

Supporting access to zero emission vehicle mobility for populations with limited access to personal vehicles (including low-income households, students and seniors), through local car-sharing programs and strategic deployment of charging stations. (Georgetown Climate Center, 2023).

Housing-related services were addressed in four states' plans, including weatherizing senior housing; addressing hazards at state-funded sites that house vulnerable populations including older adults; prioritizing resilient energy grids for critical facilities (including senior centers and nursing homes); planning to keep vulnerable populations cool with air conditioning and passive cooling; and discounting air conditioners for older adults to purchase. New York's plan identifies nursing home residents as among the most vulnerable populations that need heightened emergency management support.

Emergency services were addressed by four state climate plans. These included access to warming and cooling facilities and emergency shelters (utilizing schools and senior centers); fuel delivery to primary end users including nursing homes; and, in California, access to the Senior Farmers Market Nutrition Program. Of the 12 states that addressed one of the four broad service

categories, Rhode Island addressed all four, and California and Pennsylvania each addressed three.

Environmental Justice, Social Determinants of Health, and Health Equity

Some state climate plans discuss social and environmental justice issues in the context of older adults, as well as other population groups. For example, Massachusetts' plan directs the state agency to:

Provide data with a social determinants framework to inform the Municipal Vulnerability Preparedness (MVP) Program and DPH preparedness plans. Identify adaptation and resiliency strategies that address health and racial equity. (Georgetown Climate Center, 2023).

Oregon's plan calls out "the elderly" and defines environmental justice (EJ) as:

Equal protection from environmental and health hazards, and meaningful participation in decisions that affect the environment in which people live, work, learn, practice spirituality, and play. EJ communities include minority and low-income communities, tribal communities, and other communities traditionally underrepresented in public processes. (Georgetown Climate Center, 2023).

Connecticut's plan devotes two pages to the public health needs of "environmental justice communities," including "children, the disabled, the elderly and outdoor workers." The plan directs local health departments to be made aware of the state's "Department of Public Health Database of Vulnerable Population Locations, and how to use it for adaptation planning purposes" (Georgetown Climate Center, 2023).

State Plans on Aging

Of the 19 state plans on aging reviewed, 18 referred to emergencies or disasters. Five states described weather-related “disasters” such as extreme heat or cold, flooding, and hurricanes, and four described weather-related “emergencies.” While no plan addressed “climate change” specifically, 10 described how extreme weather events affect older adults (Table 2), and 12 described services needed by older adults (Table 5). The Administration on Community Living (ACL) directs states to include emergency preparedness in their plans (ACL, 2021).

Discussion and Implications

Building on previous research that analyzed a sample of state plans on aging to determine how they addressed disaster preparedness for older adults (Peterson et al., 2022), this paper, to our knowledge, is the first to describe how U.S. states’ climate adaptation plans address older adults as a specific population group, and how state plans on aging address climate-related topics. As climate change increasingly disrupts and threatens the health and wellbeing of individuals across the U.S., these plans provide a framework for government and non-government agencies and others to prepare for and respond to threats as varied as rising sea levels, extreme temperatures, and emerging disease vectors, among others. In the following, we provide examples from states’ climate adaptation plans and state plans on aging that policy planners and others may use as they engage in anticipatory policy making in response to climate change and population aging.

Older adults represent a distinct subset of populations that planners define as vulnerable given their preexisting health conditions, physiological susceptibility, and social vulnerability, especially those who live alone or are socially isolated (Pörtner et al., 2022). These vulnerability

challenges are compounded by evidence indicating that most older adults are minimally prepared for disasters, are unaware of relevant resources, and do not participate in disaster preparedness programs (Bryant et al., 2022; Wang, 2018).

The 19 state climate adaptation plans we reviewed indicate that the complex and evolving factors associated with climate change impacts on older adults necessitates intersectoral responses and adaptation planning, and cooperation among local, regional, and national partners. Several state plans address social factors that place older adults at particular risk, describe the need and strategies for reducing health effects and enhancing critical services needed for older adult resilience, and the importance of adopting collaborative processes informed by what we have learned about environmental justice, the social determinants of health, and health equity (see Online Supplementary Material, Section B). The following section will discuss these adaptation methods in further detail.

Why Older Adults Are at Risk

A majority of states identified enhancing social resources for older adults as crucial for adaptation planning. Given high levels of social isolation among older adults (Cudjoe et al., 2020), adaptation plans can provide processes that facilitate the coordination of nonprofit and community-based organizations who can identify and reach out to older adults, enroll care recipients in GPS location-tracking programs linked to emergency personnel (Bryant et al., 2022), and promote volunteer ride sharing and transportation assistance (Rhoades et al., 2021). One way to coordinate this kind of support is by encouraging aging service providers and organizations to participate in programs such as community organizations active in disasters. Given the role of state plans on aging in informing state and local responses to service needs of older adults, and with ongoing climate change impacts predicted to worsen, we anticipate that the

aging network will also be an important partner in future state climate adaptation planning. For example, Connecticut’s plan describes how “lessons learned” from the Covid-19 pandemic lead to new emergency preparedness plans, including coordination between Area Agencies on Aging and local health departments, state and local emergency response agencies, a statewide call center, relief organizations, and senior centers (Georgetown Climate Center, 2023).

How State Plans Address Climate Impacts on Health

We identified six health-related topics specific to older adults in state climate adaptation plans (see Table 3), with heat-related illness and respiratory and air quality-related illness the two most commonly identified topics. Six state plans on aging addressed these health topics. Future plans may build on these existing efforts by providing processes and resources that address these older adult health vulnerabilities, and communicating best practices related to factors such as monitoring air quality (Miller, 2019), increasing fluid intake, and limiting physical activity during heat waves (Worfolk, 2000). While the health impacts of climate change on older adults was addressed by numerous state climate adaptation plans, only one plan addressed a health service. Some state aging plans address health-related supports needed by some adults, such as Rhode Island which has a Special Needs Emergency Registry to help people who use ventilators or other life support systems, and people with mobility or other disabilities (AdvancingStates, 2023).

Climate adaptation planning may be strengthened by including older adults in workshops to develop informational materials that enhance resilience and empower local communities (Rhoades et al., 2021; Kusmaul et al., 2018). Oregon’s plan requires meaningful participation in decisions that affect the environments in which people live, particularly for underrepresented communities like older adults (Georgetown Climate Center, 2023). Local governments,

universities, and other research and planning organizations can provide opportunities for participatory planning with groups who are vulnerable to climate change; this can be done through partnerships with an organization such as a senior center (Rhoades et al., 2021). Maine's plan calls for the establishment of a service-learning Climate Corps to engage younger and older adults in climate action and engagement (Georgetown Climate Center, 2023). Intergenerational collaboration on climate change issues and planning promotes knowledge transmission and solidarity (Ayalon et al., 2022). Erikson's concept of generativity (1959) and the related concept of legacy indicate that older adults want to protect the environment as a way of caring for future generations by actions taken today (Wickersham et al., 2020). Additionally, research indicates that older adults benefit from participating in environmental volunteerism (Pillemer et al., 2017).

Services Needed for Older Adults

Enhancing infrastructure and planning related to emergency preparation, communication, housing, and transportation were prioritized by both state plan types as services needed for older adults. Future plans can focus on processes designed to facilitate better coordination between disaster-related preparedness programs, government and non-government agencies, and providers of aging services (Pierce et al., 2017). Plans should consider mapping at risk groups and individuals (McDermott-Levy et al., 2019), and provide a range of communication strategies, such as developing early warning systems and using multiple types of media (Rhoades et al., 2021).

Adaptation plans should focus on designing shelters to meet older adults' needs, including developing programs designed to retrofit homes, reduce energy insecurity, and increase personal safety (Molinsky & Forsyth, 2022), and increase the resilience of neighborhood physical infrastructure, particularly related to utilities and transportation (Gamble

et al., 2013). Some states' plans referred to these topics, such as Maine's plan to support aging in place by locating transit and services near housing. Connecticut's Department of Public Health provides extreme heat resources that local public health authorities can share with community partners (Georgetown Climate Center, 2023). Similarly, several state plans on aging identify senior centers as sources of support.

In addition to neighborhood-based housing, some climate adaptation plans addressed institutional settings such as hospitals and nursing homes. Residents of nursing homes in Florida (Dosa et al., 2020), New York (Powell & Fink, 2012) and Louisiana (Dosa et al., 2010; Gullette, 2006) experienced increased morbidity and mortality following hurricanes in those states. A summary prepared by Kaiser Health News (KHN) described examples from which climate action planners may draw lessons from events associated with Hurricane Sandy, including lack of access to caregivers who could not travel following the storm, closed pharmacies, and flooded back-up generators (Kaiser Health News, 2012).

Environmental Justice, Social Determinants of Health, and Health Equity

Climate change impacts are inextricably linked to social determinants of health, and with intersectional social factors. As we have seen from devastating disasters such as Hurricane Katrina, Superstorm Sandy, and countless other climate emergencies in our recent history, failure to adequately plan for the varying needs of vulnerable and marginalized populations has resulted in mass casualties and displacement (Hartman & Squires, 2006; Powell et al., 2012), with older adults faring the worst in many of these climate emergencies (Bryant et al., 2022). Low-income older adult people of color with functional limitations who live alone tend to be the most vulnerable and marginalized population when it comes to climate emergency outcomes (Klinenberg, 2002), reflecting large-scale environmental health inequities. Connecticut's climate

adaptation plan seeks to improve awareness of these inequities by mandating that local health departments familiarize themselves with the state's Department of Public Health Database of Vulnerable Population Locations. In addition to addressing environmental justice and health equity, some state climate adaptation plans recognized intersectionalities within population groups. Oregon's plan describes climate change as a "stress multiplier because it heightens already existing local, regional, political, and social tensions" (Georgetown Climate Center, 2023). Similarly, "threat multipliers" explain how understanding potential risks must account not only for climatic events, but for how climate change exacerbates other environmental, economic, social and political factors that underlie resources like water, food and energy insecurity (Werrell & Femia, 2015). These insecurities are differentially experienced by what some states refer to as "communities of color" and "environmental justice communities."

A related social justice issue concerns the loss of traditions and culturally-valued places that can occur due to climate impacts. American Indian, Alaskan Native and Native Hawaiian elders face the disruption of traditional ways of foraging and subsistence living (Lacounte, 2022). Alaska's climate adaptation plan was unique for identifying how climate change disrupts the key cultural role "elders" play, including how a shorter ice-fishing season threatens their ability to share traditional knowledge with youth, and the importance of working with elders in decisions about relocating gravesites and archeological sites necessitated by shifting land conditions.

Limitations

This descriptive study has some limitations. Some states and other municipalities have produced other climate planning documents, including websites, supplemental materials and progress reports that were beyond the scope of the current study, as we chose to focus on state-

level planning for the sake of comparability. The lack of a climate adaptation plan does not mean that a state lacks climate change policies. For example, Nevada has a climate action website with centralized resources, as well as an official statewide heat plan, but does not have a published climate adaptation plan. In addition to an adaptation plan, Florida has several city, county and regional plans that address area-specific climate topics. Additionally, while many tribal nations and inter-tribal organizations within the U.S. have formal climate adaptation plans, we did not include these plans in our analysis. Future research could examine these as well as emergency and disaster preparedness plans.

Implications

This study has important implications for understanding whether and how states' climate adaptation plans address older adults as a population group, including climate risks and how to mitigate these risks. State and regional planners, public health professionals and climate activists may draw important lessons from this study by assessing whether and how the categories summarized here may be relevant to their climate adaptation planning efforts. Researchers may now examine the relative robustness and specificity of climate adaptation plans, and whether these plans are associated with fewer negative outcomes (e.g., morbidity, mortality, relocation) for older adult populations.

Conclusions

Future research can follow the trajectory of state climate planning to understand how much and through which mechanisms planning translates to improved outcomes for older adults. Understanding which policies reduce vulnerability of older adults to climate stressors has significant implications for reducing morbidity and mortality. Furthermore, there is considerable variation concerning the processes by which states initiate, develop, adopt, and implement adaptation plans. Not surprisingly, adaptation plans differ significantly according to the local character of each state's perceived needs, resources, and political dynamics (Ray & Grannis, 2015). Despite these variations, there appears to be a consensus among these states that planning to promote resilience among vulnerable populations, including older adults, will mitigate risk factors and negative health and social impacts. Yet more needs to be known about how best to spend limited resources, direct state and local agencies, and partner with community organizations to lessen the impact of climate change. Future research can describe how decisions about adaptation planning are made and untangle the political dynamics of these often contentious policy processes across geographic areas, including analyzing the influence of climate change acceptance and the comprehensiveness and nuance of state plans.

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Conflict of Interest

None.

Data Availability

Data from this study is available to the public. State climate adaptation plans are available at the Georgetown Climate Center website, and state plans on aging are available at the Advancing States website. This study is not pre-registered.

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Tables

Table 1. Climate Impacts on Older Adults

Climate-Related Issue	Impacts on Older Adults	Examples
Extreme Heat	Increased risk of heat exhaustion, heat stroke, renal failure, respiratory disease and death	<p>Mortality rates associated with heat waves increase for adults 75 to 84 and even more for adults over the age of 84 (Berko and Ingram, 2014)</p> <p>72% of deaths associated with the 1995 heat wave in Chicago were among those over age 65 (Klinenberg, 2002)</p> <p>Higher summer temperatures were associated with increased mortality rates among older adults in the southeastern United States (Shi et al., 2016)</p>
Air Quality	Increased risk of respiratory illness and cognitive decline	<p>More susceptible to respiratory illness from rising air pollution and allergens, particulate matter from wildfires, and mold and mildew after storms and floods (Gamble et al., 2013; Bunker et al., 2016; McDermott-Levy et al., 2019)</p> <p>Associated with a higher incidence of dementia (Chen et al., 2017)</p>
Extreme Weather Events	Increased risk of mental health effects	<p>Increased risk of depression, anxiety, and PTSD during and following natural disasters (Leyva, Beaman, and Davidson, 2017)</p> <p>Higher stress levels three years following Hurricane Katrina compared to those under the age of 65 (Adeola and Picou, 2014)</p>

	Increased risk of injury, hospitalization and death	<p>Higher rates of functional and mobility limitations make older adults more susceptible to injuries during extreme events (Gamble et al., 2013)</p> <p>Approximately 75% of deaths from Hurricane Katrina and over half of deaths from Hurricane Sandy were among older adults (Bryant et al., 2022)</p> <p>Three weeks after Hurricane Sandy there was a significant increase in emergency department visits by older adults (Malik et al., 2018)</p>
Evacuations	Increased risk of negative health effects and death	<p>Nursing home residents who relocated after Hurricane Katrina were more likely to develop pressure ulcers than non-evacuated residents, and also had a higher mortality rate (Thomas et al., 2012)</p> <p>Nursing home residents with severe cognitive impairment were at increased risk of death 30 and 90 days after being evacuated after Hurricane Gustav (Brown et al., 2012)</p>

Note: PTSD refers to Post Traumatic Stress Disorder.

Table 2. Climate Risks to Older Adults Described in State Climate Adaptation Plans and State Plans on Aging

Risk Event	AK	CA	CO	CT	DE	FL	ME	MD	MA	MT	NH	NJ	NY	NC	OR	PA	RI	VA	WA
Extreme heat		■		■	■	■	■	✓	■	■	■	■	■	■	■	■	■	■	■
Flooding		■		✓	■	■		✓	✓	■			■	✓	✓	■	■	■	■
Wildfires, air quality				■						■	■	■	■	■	✓	■			■
Drought, water scarcity & quality									■	■			■			■			
Sea-level rise									■				■		■		■		
Winter emergencies, extreme cold				✓			✓	✓	✓	■				✓	✓		■		
Storms, hurricanes				✓		■		✓	✓			✓	✓	✓	■		✓		
Landslides, erosion	■														■				
Extreme weather (general)						✓		✓	■			✓		■					
Late freeze, short ice-fishing season	■																		

Note: States' climate adaptation plans that address topics are indicated with a black box, and state plans on aging that address topics are indicated by a checkmark.

Table 3. State Climate Adaptation Plan Descriptions of Older Adults' Risk Factors

Topic	AK	CA	CO	CT	DE	FL	ME	MD	MA	MT	NH	NJ	NY	NC	OR	PA	RI	VA	WA
Pre-existing illness						✓											✓		
Economically disadvantaged				✓															
Limited mobility																	✓		
Disabilities (limited mobility)						✓											✓		
Mental/cognitive disorders						✓													
Social isolation																			
Limited access to cooling																			
Hospitalized or living in nursing homes and adult care homes																			
Displacement																			

Note: States' climate adaptation plans that address topics are indicated with a black box, and state plans on aging that address topics are indicated by a checkmark. Also discussed with only one mention: lack of access to preventive care and/or health education, emphasis on traditional practices, rising cost of living, and overexertion and/or hypothermia from attempts to clear snow and ice.

Table 4. State Climate Adaptation Plan Descriptions of Health Impacts on Older Adults

Topic	AK	CA	CO	CT	DE	FL	ME	MD	MA	MT	NH	NJ	NY	NC	OR	PA	RI	VA	WA	
Heat-related illness				■	■		■		■					■						■
Respiratory and air quality-related illness				■					■		■			■	■					■
Water, vector, food borne diseases	■	■				■														
Cancer															■					■
Cardiovascular diseases															■					■
Mental health and stress-related disorders						✓			■						■					

Note: States' climate adaptation plans that address topics are indicated with a black box, and state plans on aging that address topics are indicated by a checkmark. Also discussed with only one mention: hunger and famine, gastrointestinal illness, injuries, toxic exposures.

Table 5. State Climate Adaptation Plan Descriptions of Services Needed for Older Adults

Topic	AK	CA	CO	CT	DE	FL	ME	MD	MA	MT	NH	NJ	NY	NC	OR	PA	RI	VA	WA
Communications	✓	✓				✓					✓	✓		✓			✓	✓	
Transportation											✓			✓					
Homes/senior housing						✓			✓			✓							
Emergency services		✓		✓							✓	✓	✓	✓	✓		✓	✓	✓

Note: States' climate adaptation plans that address topics are indicated with a black box, and state plans on aging that address topics are indicated by a checkmark