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Assessing the Vulnerability of Older Americans to Climate Change

Janet L. Gamble, Ph.D.

Office of Research and Development, National Center for Environmental Assessment, Global Change Research Program




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The Big Picture

Older adults are identified as a population that will be especially vulnerable to the impacts of climate change. During the coming decades, a rapidly growing population of older Americans and accelerating changes in global climate converge to make both issues, and their interactions, increasingly significant and timely.

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Project Overview

- **Objectives:**
  - (1) Assess the vulnerability of older adults
  - (2) Explore opportunities for adaptation, and
  - (3) Define a research agenda.

- **Approach:**
  - (1) Listening session with aging-focused NGOs
  - (2) Literature review on the state of the science
  - (3) Experts workshop to identify current research gaps and opportunities for action







Key Findings from Listening Session

Aging-focused NGOs are interested in understanding the potential impacts of climate change for their constituents.

- They find that older adults are **less concerned about the long-term** consequences of climate change and **more so about near-term** extreme weather events,
- They note that most **policy responses have focused on near-term threats** from extreme weather rather than on longer-range impacts of climate change,
- They recognize a number of **"non-climate" risk factors** that create greater vulnerability to climate change, and
- They **desire input from government** about the **state of the science** and about **best practices for adaptation**.

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Literature Review on the State of the Science

Defining population vulnerability to climate change

- **Vulnerability** is the degree to which human and natural systems are susceptible to and unable to cope with adverse effects of climate change.

- **Vulnerability** is a function of the character, magnitude, and rate of climate change and variation to which a population is **exposed**, its **sensitivity** to those changes, and its **adaptive capacity** or resilience.

Source: IPCC Fourth Assessment Report, 2007




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The exposure of older adults to climate-related weather extremes

Older adults are at relatively greater risk for exposure to adverse impacts from a variety of climate-related weather extremes and their associated sequelae, including:

- Extreme heat, drought, and wildfires
- Other extreme weather events (e.g. hurricanes and tropical storms, high winds, and torrential rains with flooding)
- Storm surge and sea level rise
- Elevated ground level ozone and fine particulate matter (which are aggravated by extreme heat)

Source: IPCC Fourth Assessment Report, 2007

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A Snapshot of U.S. Annual Weather Extremes

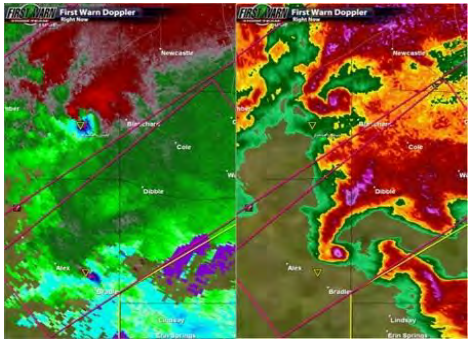
6 Atlantic Hurricanes

1,270 Tornadoes

5,000 Floods

10,000 Violent Thunderstorms

Extreme Heat with 115 deaths annually

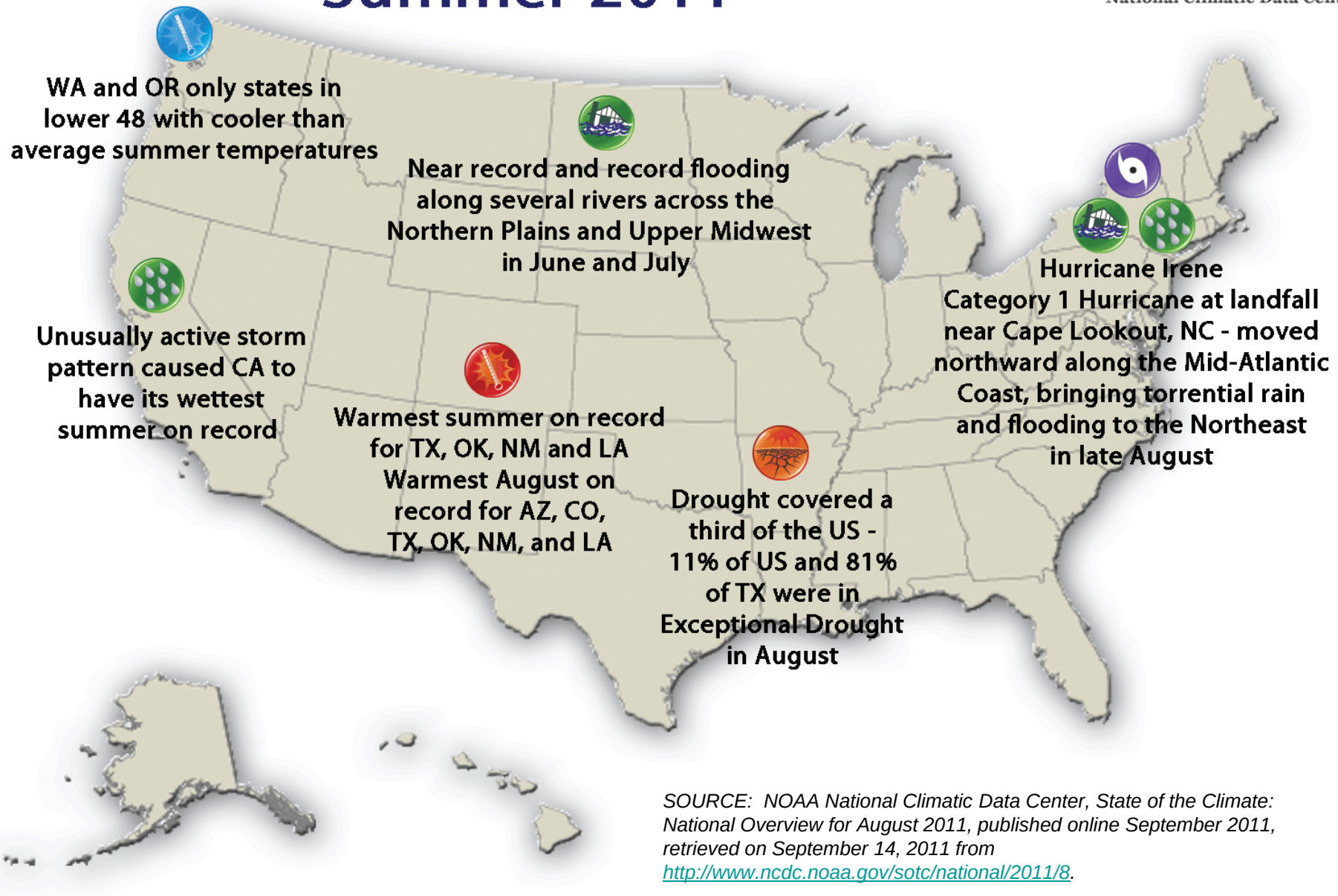


In 2010:
490 Deaths
2,369 Injuries
$9.9 Billion in Damages

National Weather Service, Summary of Natural Hazard Statistics in the United States, 2010.

Significant Events for August and Summer 2011

NOAA's
National Climatic Data Center

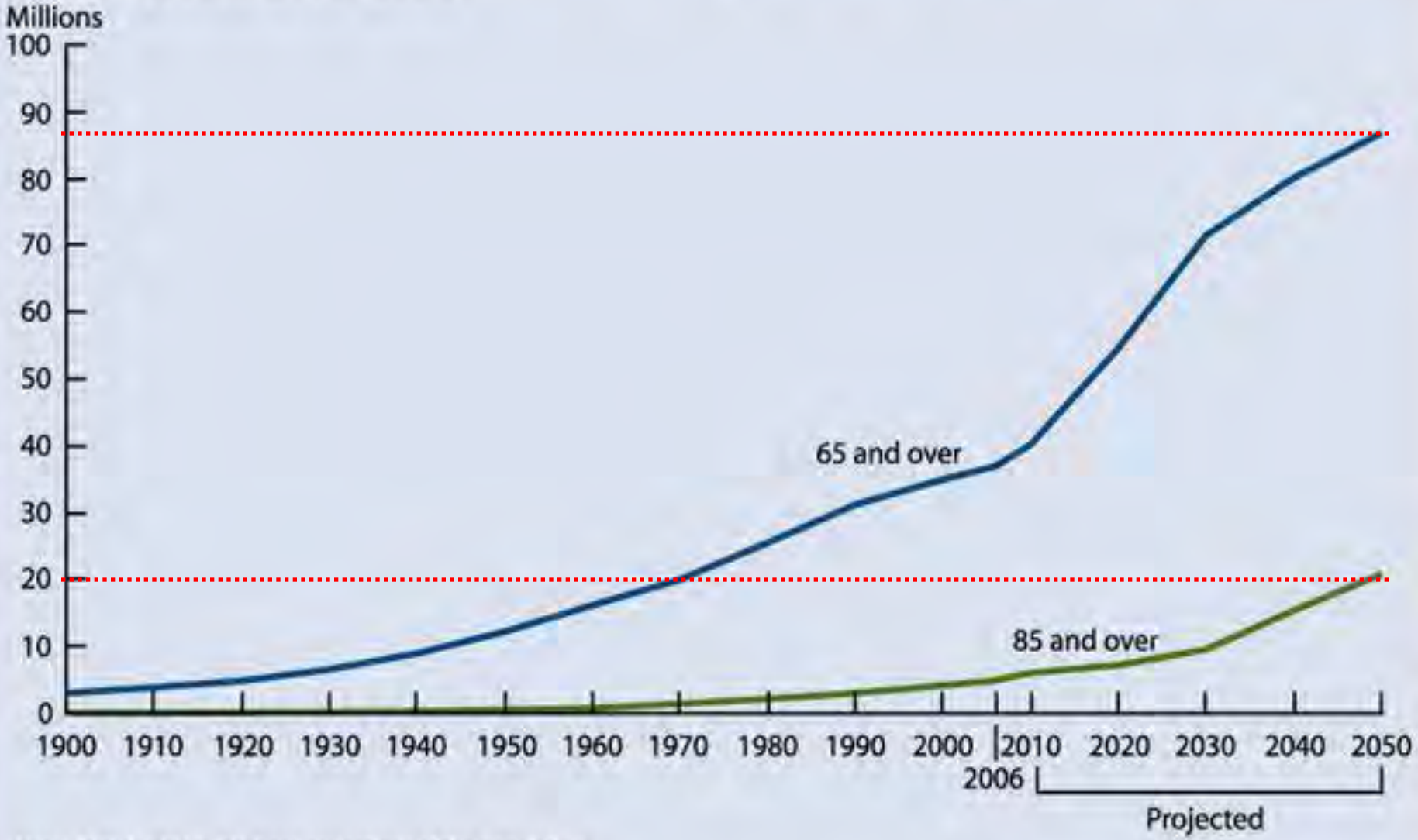


SOURCE: NOAA National Climatic Data Center, State of the Climate: National Overview for August 2011, published online September 2011, retrieved on September 14, 2011 from http://www.ncdc.noaa.gov/sotc/national/2011/8.

Vulnerability to climate change will be exacerbated by the presence of other stresses.

Certain trends in non-climate stresses, such as **demographic and settlement patterns,** will contribute to the vulnerability of older adults. These factors interact with climate change to determine the extent of a population's exposure to climate impacts, especially to extreme weather events.

Number of people age 65 and over, by age group, selected years 1900–2006 and projected 2010–2050



Note: Data for 2010–2050 are projections of the population.

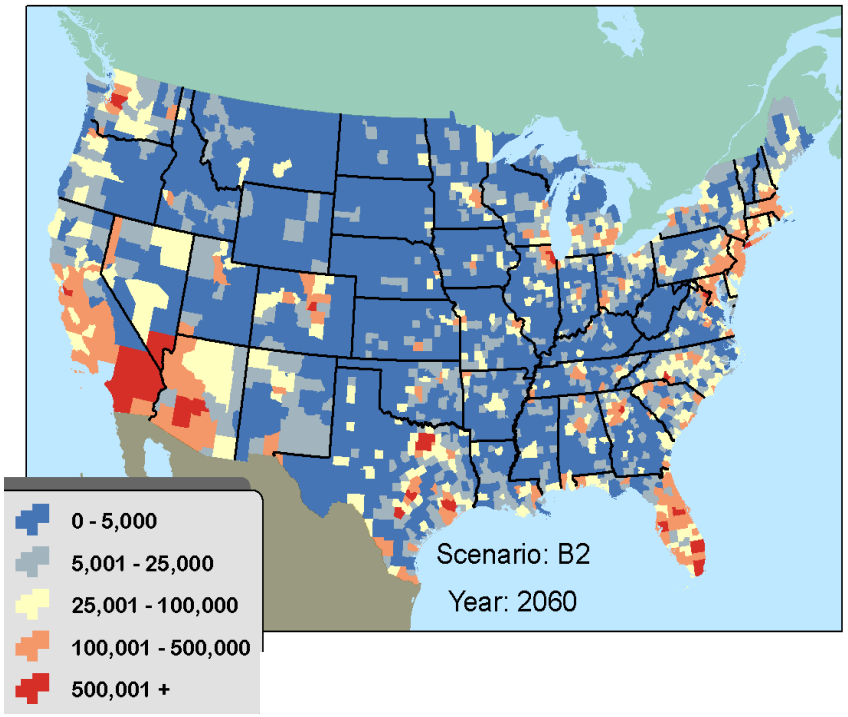
Reference population: These data refer to the resident population.

Source: U.S. Census Bureau, Decennial Census, Population Estimates and Projections.

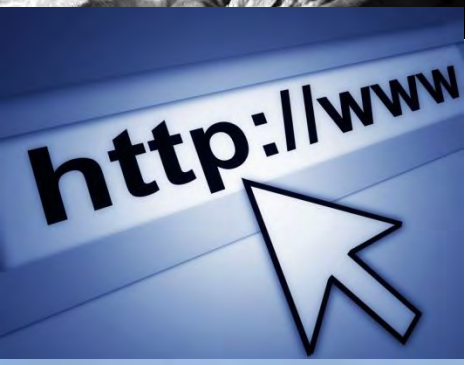
Vulnerability Conferred by Location

- An aging population, together with continued settlements in especially vulnerable areas, amplify risks associated with extreme heat, sea-level rise, storm surge, and water scarcity.

- Census data suggest that older adults are increasingly likely to live in **major urban areas** in the Northeast, the Midwest, and on the West Coast, in **"sunny" locations** in the Southwest, and in **coastal zones** along the Atlantic seaboard and the Gulf of Mexico.



Integrated Climate & Land-Use Scenarios (ICLUS): Population Age 65 and Older by County in 2060



Other non-climate stresses contribute to the sensitivity of older adults to climate change.

- In addition to demographic and settlement trends, other **non-climate individual-level factors** determine the degree of sensitivity (low, medium, and high) of older adults to climate change, including:
  - Impaired physiological status
  - Poverty and fixed incomes
  - Social isolation
  - Communication barriers
  - Behavioral issues that limit response to emergency and evacuation orders.

Determinants of Sensitivity to Climate Change: Physiological Changes with Age

Physiological Changes	Functional impacts	Related climate concerns
Skin: ↓ vasculature ↓ sweating	↓ thermoregulation	Heat waves
Cardiovascular: ↓ vascular tone ↓ adrenergic function	↓ thermoregulation ↓ tolerance of dehydration	Heat waves Waterborne disease
Immune: ↓ immune function	↑ infectious risk	Vectorborne disease Waterborne disease
Pulmonary: ↓ flow and volume ↓ oxygenation ↓ cough efficacy	↓ pulmonary reserve ↑ airway & parenchymal disease	Ozone Allergens Wildfire smoke
Muscular: ↓ muscle mass	Frailty	Disaster response
Nervous: ↓ perfusion ↑ plaques and tangles	Cognitive and memory loss	Disaster response
Skeletal: arthritic changes	↓ mobility	Disaster response
Renal: ↓ concentration ↓ GFR	Impaired fluid balance	Heat waves

Source: Frumkin, 2011

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Determinants of Sensitivity to Climate Change: Other Individual Factors

Circumstances	Functional impacts	Related climate concerns
Multiple chronic diseases	Disease-related vulnerabilities (obesity, diabetes, ↓ mobility, etc.)	Heat waves Disaster response
	Need for medications	Disaster response
Social isolation	↓ adaptation, support	Disaster response
Depression	Withdrawal, apathy	Disaster preparation, response
Attachment to home and belongings	Reluctance to relocate	Need to evacuate / relocate
Poverty and limited income	Reluctance regarding voluntary adaptive measures	Disaster preparedness
	Inability to pay for higher fuel and other costs	Deprivation
Communication barriers	Unaware of emergency conditions	Disaster preparation, response

Source: Frumkin, 2011

Adaptive Capacity: Community Factors

- The 3rd aspect of vulnerability is **adaptive capacity** – the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with consequences.

- The older population's adaptive capacity is affected by several **community-level risk factors.**
  - Economic conditions
  - Technology
  - Infrastructure and the built environment
  - Human and social capital
  - Political and social institutions
  - Public health and emergency management capabilities

Source: IPCC Fourth Assessment Report, 2007

Adaptive Capacity: Community Cohesion and the Role of Caregivers

- The **social strength or cohesion of the community** also contributes to adaptive capacity**.** We need to identify mechanisms for keeping elders active in their communities and **supported by specially-targeted services.**

- In addition, we know that the less vulnerable older adult is one who has an **engaged caregiver.** People fare better if they have someone to
  - be their advocate,
  - help them access information,
  - provide transportation,
  - bring in or prepare meals, and
  - manage health care needs.

Adaptation is necessary to address climate impacts that are already occurring.

Adaptation refers to measures pursued to better respond to present or future climate conditions in order to reduce harm or take advantage of opportunities. (Source: IPCC Fourth Assessment Report, 2007)

Examples of near-term adaptation strategies:

- **"Aging-friendly" physical design changes**
- **Registries of older adults** and **"portable" electronic medical records**
- **Targeted services** that address particular needs

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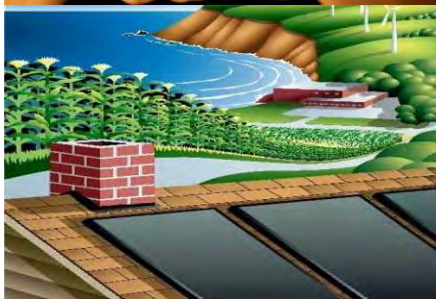
Adaptation: Realizing Co-Benefits

- Adaptation to climate change may offer **win-win solutions** that promote more **sustainable communities** and realize significant **co-benefits** for older adults.

- Adaptation strategies that **improve transit systems and pedestrian and bicycle infrastructure,** especially in neighborhoods frequented by older adults yield:
  - Better mobility
  - Better safety
  - Greater opportunities for physical activity
  - Reduced carbon emissions

- Adaptation strategies that result in **green housing alternatives designed for older adults** yield:
  - Improved living conditions, such as day lighting and improved indoor air quality
  - Lower costs
  - Reduced carbon footprint



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Adaptation: Realizing Co-Benefits

Adaptation strategies that **improve access to green space**, trees, and parkland yield:

- Improved health and reported well-being
- Venues for physical activity and relaxation
- Improved social ties and sense of community
- Improved air quality
  - Heat wave blunting
  - Stormwater management
  - Carbon sinks

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Identifying Opportunities for Research and Action

Opportunities for Research: Assessing the Vulnerability of Older Adults

- Understand the **elements of vulnerability**
- Understand underlying **non-climate risks**
- Utilize **map overlays** to spatially assess vulnerability
- Understand the potential for and/or the proximity to **tipping points** and other **non-linear** or **cascading effects**
- Determine how systems can be managed to minimize the **risk of irreversible changes**
- **Assess costs and benefits of climate change**: both those of impacts and those of responses
- Derive estimates of future impacts on older adults utilizing **climate, land use, and demographic scenarios**




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Opportunities for Action: Designing Adaptation Strategies

- Develop, implement, and evaluate **adaptations** that emphasize **co-benefits** and promote **sustainability**
- Examine current adaptation practices and the **options, barriers, and limits to adaptation**
- Develop a **ranking system to prioritize** adaptation responses
- Develop projections of **location-specific risks** to facilitate emergency planning and other adaptations
- Measure the relative **effectiveness (cost and strategic)** of alternative adaptation responses and establish **best practices**
- Evaluate the **generalizability or transferability** of alternative adaptations




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Opportunities for Action: Communicating Risks

- Understand the **knowledge, attitudes, and behavior** of older adults regarding climate change
- Understand where older adults **get information** and how they **form opinions**
- Identify factors that affect older adults' **risk perceptions**
- **Evaluate the effectiveness** of communication materials:
  - **Simplicity and repetition** of the message
  - Use of **multiple media**
  - Making the connection between **health impacts** and climate risks
  - Use of **existing networks** & communities

Summary

- Older Americans are a **diverse and rapidly growing** subpopulation.
  - They are **living longer,** are more **educated,** are enjoying greater **prosperity**, and are more **politically active**.
  - Yet, they suffer significant health and income **disparities by race, gender, and age**.
  - The oldest old are an especially **high-risk** group.
- **Older Americans are vulnerable** to many of the threats to health and well-being posed by climate change, especially to the impacts of extreme weather events.
- Examining the impacts of climate change on a vulnerable population of older Americans is **a high priority for research, for communicating risk, and for adaptation planning**.


A society grows great when old men
plant trees in whose shade
they know they shall never sit.
Greek proverb

Thank you.

Janet L. Gamble, Ph.D.
703-347-8617
gamble.janet@epa.gov