IS OUR HOUSING STOCK READY?

HOT & OLD AT HOME

SHERRY AHRENTZEN, PHD / SHIMBERG CENTER, UNIVERSITY OF FLORIDA
Presented at ACEEE Conference on Health, Environment, Energy  3-5 Dec 2018
CLIMATE CHANGE
Recent IPCC and US National Climate Assessment reports

DEMOGRAPHIC TRANSFORMATIONS
By 2032, # of Americans 65+ > # younger than 18

HEALTHCARE NEEDS + COSTS
Hospitals/clinics ↔ homes
Per capita health care spending skyrockets with age.

Per capita health care spending, by age group and source of payment, 2004

- **0-18:** $2,650
- **19-64:** $4,511
- **65+:** $14,797

Note: Other public: e.g. workers compensation. Other private: e.g. philanthropy.
Source: Centers for Medicare and Medicaid Services, 2009.
PUBLIC FOCUS TO DATE: HEATWAVES + MORTALITY
WIDENING OUR VISION OF THE PROBLEM

#1
Chronic indoor thermohygrometric conditions (may or may not be “heatwave” related)

Other health impacts: respiratory, pulmonary, heart attacks, sleep, agitation, and other

#2
IS GREEN HOUSING HEALTHY HOUSING FOR OLDER ADULTS?
KEY RENOVATIONS

Insulation and improvement in building roof
PTAC system upgrades
Energy Star exhaust fans, appliances
New bedroom ceiling fan with pull-cords
Double-pane, low-E sliding balcony door and window
Low-flow plumbing fixtures
Complete kitchen and bathroom remodel with low-VOC materials
Low-VOC flooring, paint, adhesives

$1.7M renovation from ARRA Green Retrofit Program
3-story, 116-unit, each unit 619 SF
FINDING:

REDUCTION # OF HOMES WITH MANY COUNTS OF EXTREME INDOOR TEMPERATURE

Count = # of times of 448 data points that indoor temperature exceeded 81°F
FINDING: REDUCTION IN TEMPERATURE “PEAKS” RELATED TO SELF-REPORT HEALTH OUTCOMES OF...

QUALITY OF LIFE/HEALTH

SLEEP

EMOTIONAL DISTRESS

Reductions in indoor temperatures over 81°F resulted in:

- **improved** quality of health/life
- **increased** hours of sleep
- **reduced** emotional distress

<table>
<thead>
<tr>
<th>Panel 1</th>
<th>Panel 3</th>
<th>Fixed-Effects Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>t-value</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2.085</td>
</tr>
</tbody>
</table>

Green Renovation

Intervention

n = 57
WHY AGING?

SOME PHYSIOLOGICAL FACTORS AFFECTING THERMAL

• Reduced efficiency of cold and warm defense mechanisms
• Decreased thermoregulatory response
• Lower metabolic rate
• Reduced vascular reactivity
• Lower cardiovascular flexibility and output

LIVING PATTERNS

• Sedentary. 90-100% time spent indoors, at home
• Higher usage of pharmaceuticals
• Live alone, social isolation, depression
• Tend to live in older homes than do younger adults
• Desire to “age in place” or “age in community”
ONE EXAMPLE:

**CYCLE OF DEMENTIA AND THERMAL CONDITIONS**

- Altered sensitivity to environmental conditions
- Increasingly reactive to their environment
- Behavioral problems (e.g. agitation) affect care staff and other residents
IS OUR HOUSING STOCK READY FOR AGING POPULATION IN THE ERA OF CLIMATE CHANGE?
Demand for Air-Conditioning

- # of a/c units worldwide rise from 1.6B to 5.6B by 2050
- Instrumental in cutting premature deaths on hot days by 75% since 1960
- Emissions and venting hot air outside home
- Routine maintenance
Power Outages

- Post-hurricane media coverage of nursing homes
- Response: Generators
- Approximately 5% of 65+ live in nursing homes, assisted living, board/care, etc.
Passive & Non-Mechanical Features

- Air flow
- Materials and insulation
- Solar orientation
- Shading
- Cool paving, low albedo
- Etc.
Urban Heat Island

- High albedo
- Trees and vegetation
- Green roofs, cool roofs
- etc
Social Connectivity

- Living alone strong risk factor during heatwaves for older adults
- Smart technologies: benefits and shortcoming
- Co-living models
Thank You

SHERRY AHRENTZEN, PhD

Shimberg Professor of Housing Studies, University of Florida

ahrentzen@ufl.edu