AARP Public Policy Institute

Affordable Home Energy and Health: Making the Connections

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Research Report

AARP

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AARP's Public Policy Institute (PPI) informs and stimulates public debate on the issues we face as we age. Through research, analysis, and dialogue with the nation's leading experts, PPI promotes development of sound, creative policies to address our common need for economic security, health care, and quality of life.

The views expressed herein are for information, debate, and discussion, and do not necessarily represent official policies of AARP.

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EXECUTIVE SUMMARY

Unaffordable home energy bills pose a serious and increasing threat to the health and well-being of a growing number of older people in low- and moderate-income households. For many of these households, high and volatile home energy prices jeopardize the use of home heating and cooling and increase the prospect of exposure to temperatures that are too hot in summer and too cold in winter. The potential consequences of exposure to such temperatures and related financial pressures include a host of adverse health outcomes, such as chronic health conditions made worse, food insecurity, and even the premature death of thousands of people in the United States each year.

Home energy service provides a buffer against the impact of unsafe temperatures and is particularly important for older adults. Aging can impair the body's ability to maintain a normal temperature because of physiological changes, such as the loss of physical fitness, reduction in body mass, and decline in body temperature. Older adults are more likely to have chronic medical conditions and to take multiple prescription medicines, which can further reduce the body's ability to sense and respond to changes in temperatures. These characteristics may indicate particular risk for older adults living in urban areas, where the heat-retaining properties of roads, buildings, and other urban infrastructure magnify and extend hot weather events compared with rural areas.

The significant risks associated with unaffordable home energy are unlikely to diminish any time soon. To the extent that climate change accelerates in the coming years and oppressive temperatures occur more frequently and for longer periods of time, adverse health outcomes are both more likely and more severe. In addition, unaffordable home energy undermines national priorities in the areas of long-term care services and livable communities, destabilizing efforts to support aging in place and hindering opportunities to facilitate independent living.

PRINCIPAL FINDINGS

Evidence connects temperature, health, and safety. Heat and cold challenge the body's ability to maintain a steady core temperature. Anything that impairs the body's ability to regulate its own temperature heightens vulnerability. Significant risk factors include the following:

- Age
- Chronic diseases such as heart disease, stroke, respiratory disease, and diabetes
- Medications that impair thermoregulation (such as antihistamines, tricyclic antidepressants, beta-blockers, and vasodilators)
- Dependency and frailty signaled by cognitive impairment or limited mobility

While exposure to heat and cold kills thousands of people prematurely in the United States each year, the death toll underestimates the true impact of temperature on health. For example, mortality statistics do not distinguish between outdoor and indoor exposure to unsafe temperatures as the cause of death and do not account for a range of

adverse health consequences that fall short of premature death. For many older adults, it is the aggravation of existing health conditions from exposure to even moderate temperature changes, rather than extreme exposure, that is both of concern and difficult to measure.

Adverse health outcomes, including death, become more likely as temperatures deviate from a moderate range. Temperature thresholds beyond which adverse health outcomes occur reflect local climate, access to resources (such as prevalence of central air-conditioning), and acclimatization (how adapted the population is to local conditions). Greater numbers of temperature-related deaths occur in warmer regions exposed to unseasonable cold and colder regions experiencing atypical warming. Lack of acclimatization also explains why heat waves early in the summer are more deadly than those later in the season.

Lower socioeconomic status is associated with a greater risk of temperature-related death, particularly for older adults. Strong evidence points to indoor cooling, particularly central air-conditioning, and lower temperatures in upstairs sleeping areas as key to mitigating the health effects of hot weather. Research suggests that access to, use of, and efficacy of home heating and cooling increases as household income increases.

High and volatile home energy costs make heating and cooling increasingly unaffordable to millions of low- and moderate-income households, many of which include older persons. Since 2005, the average cost to heat homes in winter has risen about 27.3 percent and the price of residential electrical service has jumped 22 percent. While energy prices rose, median incomes stagnated, especially for low- and moderate-income households. These trends increased the proportion of a household's budget allocated for utility bills. The average low-income household spends 16 percent of its annual income on home energy costs—more than four times the level that all households, on average, devote to home energy bills.

The Low-Income Home Energy Assistance Program (LIHEAP) improves access to home energy, but it has not kept pace with need and does not guarantee basic, affordably priced utility service. In fiscal year 2009, the federal appropriation for LIHEAP nearly doubled from $2.57 billion to $5.1 billion, yet the 7.7 million households that received LIHEAP during 2009 was less than one-quarter of the number estimated to be income-eligible. Moreover, most states offer limited protections against the shutoff of home utility service for nonpayment.

Unaffordable home energy subjects many older adults to direct and indirect threats to their health and safety. For example, 74 percent of households that include older adults report that they cut back on the purchase of household necessities because of high home energy bills. Thirty-two percent of LIHEAP households that include an older person report going without medical or dental care as a result of high home energy bills in the past five years.

Policies and programs to address the health threats posed by high home energy prices can build on existing efforts in the areas of energy, long-term care and health care reform, and livable communities:

Energy: Affordable energy policies can and do promote public health. For example, energy assistance, shutoff protection rules and other policies that protect vulnerable

households against the involuntary loss of home utility service promote health and safety. Conversely, policies that address home energy costs by shifting or dampening consumer demand for energy pose a potential threat to health and safety for consumers who may have to choose between paying more for their energy or going without life-saving air-conditioning during summer heat because they cannot shift their usage from higher cost peak times to lower cost off-peak times.

Health Services and Long-Term Care: Published studies document the greater use of health services that result from exposures to excessive heat or cold and the potential of high home energy burdens to make aging in place and independent living more difficult. One implication of these findings is that efforts to strengthen access to affordable energy and ensure protections against shutoffs of basic service for nonpayment can reduce the economic costs of avoidable health care services, improve patient health status, and facilitate independent living.

Livable Communities: Ultimately, policies that promote adequate and affordable home energy use, and that acknowledge the role of home energy as a support for the effective delivery of long-term care and health services to older adults, in turn promote community dwelling that facilitates personal independence and quality of life.

POLICY RECOMMENDATIONS

- Ensure that subsidies and discounts help make home energy affordable and sustainable for households that include older adults.

- Assess the need for LIHEAP and the total amount of energy assistance for households in terms not only of lowering the home energy burden but also of recognizing the value added through improved health and reduced threats to safety.

- Expand categorical eligibility for LIHEAP, weatherization services, and other affordable energy programs to target groups identified as most at risk of adverse health outcomes, for example, through their eligibility for state Medicaid waiver programs and the Medicare Part D Low-Income Subsidy.

- Ensure that state-regulated utility consumer protections and policies (such as shutoff policies) specifically recognize and address the needs of groups identified as most at risk of adverse health outcomes.

- Ensure that demand-response programs for consumers balance the need to reduce energy consumption with the protection of health and safety for older adults and persons living with serious or disabling conditions.

- Design evaluations of weatherization and energy efficiency programs to assess their impact on health and safety as a way to demonstrate the importance of home energy for health.

- Ensure that intake services for state Medicaid waiver program participation and long-term care case management services include referrals for LIHEAP, weatherization, and other affordable energy programs.

- Support education and outreach efforts to increase awareness—both within the health care community and among older adults, their families, and caregivers—of resources that can help them maintain access to healthy and comfortable temperatures.

- Give priority in home repair or modification programs that serve medically frail participants (such as under a state Medicaid waiver) to cost-effective energy efficiency measures that protect health and safety, for example, special coatings for flat-roofed rowhouses that lower indoor temperatures in summer.

- Identify and implement best practices for communicating with the public, especially older adults, their families, and caregivers, about the risks of heat waves and cold temperatures, the links between temperature and health, and the most effective prevention, education, and response efforts.

CONCLUSION

As the U.S. population ages, as the U.S. health care system shifts toward support for independent living and aging in place, and as urban infrastructure and global warming present new environmental challenges, demand for affordable home energy is growing. Increased demand combined with the rising cost of basic utility service jeopardizes the stability and capacity for self-sufficiency of households that include older adults. Understanding and addressing the implications for energy policy of public and population health priorities, as well as the implications for public health of affordable energy and energy efficiency priorities, requires a fresh approach. Such an approach should unite two diverse groups of practitioners, in the energy and health fields, to craft new solutions to help American households maintain both economic security and good health.

INTRODUCTION

In July 1995, a week of sustained hot weather in Chicago killed hundreds of people, most of whom were low-income, older residents living independently. The extreme heat also hospitalized close to a thousand people with strokes, heart attacks, renal failure, and other conditions.[1] Chicago's experience highlighted the value of social connections, walkable neighborhoods, affordable housing, and basic utility services during extreme weather conditions. Extreme heat events in the United States are still rare, but growth in urban infrastructure and climate change are contributing to a gradual rise in ambient temperature and greater seasonal variation in the weather.[2]

This report has two primary goals: first, to explore the implications of affordable home energy for health services, long-term care, and livable communities; and second, to consider low-income energy assistance and other approaches to lowering household energy burdens (the ratio of a household's energy expenditures to its income) in light of this more explicit connection between affordable home energy and health.

The report begins with a review of literature to characterize the health threats posed by weather and high home energy costs and to describe how affordable home energy protects health and reduces inappropriate use of health services. It then describes the energy burden faced by households across the income spectrum, ways to trace the health impacts of unaffordable home energy, and evidence of these impacts documented through telephone surveys. Next, it frames the discussion of affordable home energy and health in the context of policy interests in energy, health services and long term care reform, and livable communities. Finally, the report offers recommendations that promote adequate and affordable home energy use and that acknowledge the role of home energy in helping older adults and people of all ages maintain both economic security and good health.

1 E. Klinenberg, *Heat Wave. A Social Autopsy of Disaster in Chicago* (Chicago: University of Chicago Press, 2002). Other key sources include J. Dematte, K. O'Mara, J. Buescher, C. G. Whitney, S. Forsythe, T. McNamee, R. B. Adiga, and I. M. Ndukwu, "Near-Fatal Heat Stroke during the 1995 Heat Wave in Chicago," *Annals of Internal Medicine* 129 (1998): 173–81; R. Kaiser, A. Le Tetre, J. Schwartz, C. A. Gotway, W. R. Daley, and C. H. Rubin, "The Effect of the 1995 Heat Wave in Chicago on All-Cause and Cause-Specific Mortality," *American Journal of Public Health* 97 (2007): 158–62; R. J. Rydman, D. P. Rumoro, J. C. Silva, T. M. Hogan, and L. M. Kampe, "The Rate and Risk of Heat-Related Illness in Hospital Emergency Departments during the 1995 Chicago Heat Disaster," *Journal of Medical Systems* 23 (1999): 41–56; J. Semenza, "Acute Renal Failure during Heat Waves," *American Journal of Preventive Medicine* 17 (1999): 97; J. C. Semenza, J. E. McCullough, W. D. Flanders, M. A. McGeehin, and J. R. Lumpkin, "Excess Hospital Admissions during the July 1995 Heat Wave in Chicago," *American Journal of Preventive Medicine* 16 (1999): 269–77; J. Semenza, C. Rubin, K. Falter, J. D. Selanikio, W. D. Flanders, H. L. Howe, and J. L. Wilhelm, "Heat-Related Deaths during the July 1995 Heat Wave in Chicago," *New England Journal of Medicine* 335, no. 2 (1996): 84–90.

2 G. Luber and M. McGeehin, "Climate Change and Extreme Heat Events," *American Journal of Preventive Medicine* 35, no. 5 (2008): 429–35.

EVIDENCE ON TEMPERATURE, HEALTH, AND SAFETY

The use of home energy for heating and cooling buffers the impact of outdoor temperatures. Publication of epidemiological studies on the adverse effects on health of both heat (from heat waves and predicted changes in global climate) and cold (from exposures connected with substandard, energy-inefficient housing during wintertime in temperate climates) has increased appreciation of the importance of this buffering effect.[3]

Heat and cold challenge the body's ability to maintain a steady core temperature. Anything that impairs the body's ability to regulate its own temperature heightens vulnerability. Significant risk factors include the following:[4]

- Age (infants and young children are at greater than average risk, and old age increases risk because of the loss of physical fitness and related physiological changes associated with the aging process)
- Chronic diseases that slow the heart's response to stress; the circulatory system's capacity to dilate or contract blood vessels that convey heat (cardiovascular and cerebrovascular disease); the body's ability to change fluid levels in plasma or through sweating (diabetes, kidney and metabolic conditions, scleroderma, cystic fibrosis, and dehydration)
- Medications that impair thermoregulation (such as antihistamines, tricyclic antidepressants, beta-blockers, and vasodilators)
- Frailty signaled by cognitive impairment or limited mobility (nervous system disorders such as Parkinson's disease)

The most commonly recognized adverse outcomes of heat and cold exposure are hyperthermia (and the range of effects from heat cramps and exhaustion to heat stroke) and hypothermia, but many less severe ailments also exist. For many older adults, it is the aggravation of existing health conditions from exposure to even moderate temperature changes, rather than an extreme exposure, that is both of concern and more difficult to measure.

3 For this research report, a literature review was conducted using the PubMed search engine and the MeSH search terms "heat/adverse effects" and "cold/adverse effects" for publications that included human subjects, reviewing all publications starting in 1990. In addition, a citation searching strategy was used to identify peer-reviewed publications dated before 1990 and those in subject areas not covered comprehensively by Pub Med, such as journals in the areas of meteorology and housing. Approximately 300 peer-reviewed journal articles and monographs and a small number of grey literature reports were identified.

4 Discussion in this paragraph based on E. M. Kilbourne, "Temperature and Health," in *Wallace/Maxcy-Rosenau-Last. Public Health and Preventive Medicine*, ed. Robert B. Wallace, 725–34, 15th ed. (New York: McGraw Hill Medical, 2008); R. S. Kovats and S. Hajat, "Heat Stress and Public Health: A Critical Review," *Annual Review of Public Health* 29 (2008): 41–55; F. Matthies, G. Bickler, N. C. Marin, and S. Hales, *Heat Health Action Plans. Guidance* (Denmark: World Health Organization, Regional Office for Europe, 2008).

EXPOSURE TO HEAT AND COLD

Exposure to heat and cold kills thousands of people prematurely in the United States each year; however, the death toll underestimates the true impact of temperature on health. Accounts of the impact of temperature on health typically focus on the number of deaths reported based on death certificates or estimated by looking at seasonal patterns of excessive numbers that correlate with weather extremes.

Death certificates: The most recent annual count for the United States identifies 688 heat-related deaths and 1,152 cold-related deaths, with older adults accounting for 40 to 50 percent of these deaths.[5] Such counts likely underestimate the impact of exposure to unsafe temperatures, reflecting differences from state to state in how such deaths are defined. In this regard, the more narrow definition taken by many coroners' offices hinges on the body temperature of the deceased, whereas in those counties or states where a medical examiner (physician) determines causation, a broader view is more likely to take into account the circumstances in which a victim is found, such as in an overheated apartment.[6]

Attributable deaths: For heat-related deaths alone in the United States, studies converge on an annual number of between 1,700 and 1,800 per year.[7] These estimates are derived by looking at the experiences of populations statistically, measuring deaths from all causes or deaths from conditions linked to heat or cold exposure (for example, seasonal rises in cardiovascular or respiratory disease), adjusting these measures to account for influences unrelated to temperature exposures or home energy burden (the ratio of a household's expenditures to its income), and counting the estimated number of deaths over and above what is observed at other times of year or during the same time period in the absence of extreme weather. One study of deaths during California's 2006 heat wave finds that the attributed number of deaths is two to three times higher than the number reported by coroners' offices.[8]

Using counts or estimates of deaths as the sole measure of temperature's impact neglects the range of nonfatal health consequences. Such estimates are also of limited utility in understanding the impact of home energy use on health, as most studies fail to distinguish between outdoor and indoor exposure to unsafe temperatures or to account for other risk

5 G. E. Luber, C. A. Sanchez, and L. M. Conklin, "Heat-Related Deaths—United States, 1999–2003," *Morbidity and Mortality Weekly Review* 55 (2006): 796–98; T. Murphy, R. Zumwalt, and F. Fallico, "Hypothermia-Related Deaths—United States, 1999–2002 and 2005," *Morbidity and Mortality Weekly Review* 55 (2006): 282–84.

6 H. G. Mirchandani, G. McDonald, I. C. Hood, and C. Fonseca, "Heat-Related Deaths in Philadelphia—1993," *American Journal of Medical Pathology* 17, no. 2 (1996): 106–08; B. D. Ostro, L. A. Roth, R. S. Green, and R. Basu, "Estimating the Mortality Effect of the July 2006 California Heat Wave," *Environmental Research* 109, no. 5 (2009): 614–19.

7 C. E. Reid, M. S. O'Neill, C. Gronlund, S. J. Brines, D. G. Brown, A. V. Diez-Roux, and J. Schwartz, "Mapping Community Determinants of Heat Vulnerability," *Environmental Health Perspectives*, epub 11 (June 2009); Environmental Protection Agency, *Excessive Heat Event Guidebook*, EPA 430-B-06-005 (Washington, DC: EPA, 2006).

8 Ostro et al., "Estimating the Mortality Effect."

factors not directly related to home heating or cooling (such as the prevalence of influenza or the adequacy of clothing in protecting from cold).[9]

ADVERSE HEALTH OUTCOMES

Adverse health outcomes, including death, become more likely as temperatures deviate from a moderate range. Although mortality rates offer only one perspective on the consequences of inadequate home heating and cooling, they do convey information that is useful for guiding policy choices, for example, in establishing threshold temperatures above and below which public health precautions are needed. For a population, the relationship between temperature and death resembles a U, V, or J shape, with a dip or flat area in moderate temperature ranges and greater numbers of deaths at temperatures both lower and higher than thresholds specific to a given area.[10]

Temperature thresholds reflect local climate, infrastructure (such as prevalence of central air-conditioning), and acclimatization (how adapted the population is to local conditions). More temperature-related deaths occur in warmer regions exposed to the cold and colder areas experiencing unseasonable warming. Heat waves tend to have a stronger impact in the Northeast and Midwest than the South and West, and an index of heat vulnerability mapped nationally indicates that the 20 most vulnerable cities are clustered on the East and West Coasts, while most of the least vulnerable cities are in the Southeast.[11] During California's July 2006 heat wave, the highest rate of heat-related emergency department visits was seen in the Central Coast region, where more moderate temperatures are the norm.[12] The lack of time to acclimatize explains why heat waves early in the summer are more deadly than those later in the season.[13]

For U.S. cities, deaths increase by an estimated 2 to 4 percent per degree Fahrenheit above an area's heat threshold (during a heat wave, daily death rates climb even more quickly), and up to an estimated 6 percent per degree Fahrenheit below the cold threshold.[14] Temperature-related respiratory and cardiovascular deaths are more likely

9 K. L. Ebi, "Climate Change, Ambient Temperature, and Health in the U.S.," unpublished presentation at AARP Roundtable, December 2008; T. A. Reichert, L. Simonsen, A. Sharma, S. A. Pardo, D. S. Fedson, and M. A. Miller, "Influenza and the Winter Increase in Mortality in the United States, 1959–99," *American Journal of Epidemiology* 160, no. 5 (2004): 492–502.

10 A. Braga, A. Zanobetti, and J. Schwartz, "The Time Course of Weather-Related Deaths," *Epidemiology* 12 (2001): 662–67; R. Basu and J. Samet, "An Exposure Assessment Study of Ambient Heat Exposure in an Elderly Population in Baltimore, Maryland," *Environmental Health Perspectives* 110 (2002): 1219–24.

11 Environmental Protection Agency, *Excessive Heat Events Guidebook*, 13–14.

12 K. Knowlton, M. Rotkin-Ellman, G. King, H. G. Margolis, D. Smith, G. Solomon, R. Trent, and P. English, "The 2006 California Heat Wave: Impacts on Hospitalizations and Emergency Department Visits," *Environmental Health Perspectives* 117, no. 1 (2009): 61–67.

13 Braga et al., "The Time Course of Weather-Related Deaths"; F. Curriero, K. Heiner, J. Samet, S. Zeger, L. Strug, and J. Patz, "Temperature and Mortality in 11 Cities of the Eastern United States," *American Journal of Epidemiology* 155 (2002): 80–87.

14 Braga et al., "The Time Course of Weather-Related Deaths"; S. Hajat, R. S. Kovats, and K. Lachowycz, "Heat-Related and Cold-Related Deaths in England and Wales: Who Is at Risk?" *Occupational and Environmental Medicine* 64, no. 2 (2007): 93–100; M. Medina-Ramon and J. Schwartz, "Temperature, Temperature Extremes, and Mortality: A Study of Acclimatization and Effect Modification in 50 United States Cities," *Occupational and Environmental Medicine*, epub (2007); R. Basu, W. Y. Feng, and B. D. Ostro, "Characterizing Temperature and Mortality in Nine California Counties," *Epidemiology* 19 (2008): 138–45; A.

during the summertime for older adults, with premature or what are known as excess deaths seen from kidney failure and electrolyte imbalance.[15] In temperate climates, the winter months bring excess deaths for older adults from circulatory system disease (particularly heart attacks and congestive heart failure), respiratory disease (influenza, bronchitis, emphysema, and chronic obstructive pulmonary disorder),[16] and diabetes.[17]

No consensus yet exists on how global climate change will influence current patterns of heat- and cold-related deaths.[18] Some see an increase in heat-related deaths that will more than exceed an anticipated decrease in cold-related deaths.[19] Others anticipate that new weather extremes will mean more respiratory disease deaths in cities with colder climates.[20] Regardless of any future shift in the range of ambient temperatures related to climate change, many other factors, such as personal behavior (in terms of energy use and decisions about appropriate clothing and outdoor gear) and urban infrastructure capacity to respond to shifts in outdoor temperature, will affect the rate of temperature-related deaths and other adverse health outcomes. The fact that heat waves bring greater adverse health impacts to areas that typically experience moderate temperatures, compared with areas accustomed to a broad range of temperatures, underscores the significance of a population's overall capacity to adapt over time.[21]

Zanobetti and J. Schwartz, "Temperature and Mortality in Nine U.S. Cities," *Epidemiology*, epub (2008); Ostro et al., "Estimating the Mortality Effect."

15 A. Braga, A. Zanobetti, and J. Schwartz, "The Effect of Weather on Respiratory and Cardiovascular Deaths in 12 U.S. Cities," *Environmental Health Perspectives* 110 (2002): 859–63; H. Johnson, R. S. Kovats, G. McGregor, J. Stedman, M. Gibbs, H. Walton, L. Cook, and E. Black, "The Impact of the 2003 Heat Wave on Mortality and Hospital Admissions in England," *Health Statistics Quarterly* 25 (2005): 6–11; Hajat et al., "Heat-Related and Cold-Related Deaths"; A. Ishigami, S. Hajat, R. S. Kovats, L. Bisanti, M. Rognoni, A. Russo, and A. Paldy, "An Ecological Time-Series Study of Heat-Related Mortality in Three European Cities," *Environmental Health* 7 (2008): 5.

16 Braga et al., "The Effect of Weather"; G. S. Davies, M. G. Baker, S. Hales, and J. B. Carlin, "Trends and Determinants of Excess Winter Mortality in New Zealand: 1980 to 2000," *BMC Public Health* 7 (2007): 263; Hajat et al., "Heat-Related and Cold-Related Deaths"; Medina-Ramon et al., "Temperature, Temperature Extremes, and Mortality."

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INTERIOR HEATING AND AIR-CONDITIONING

Interior heating in the wintertime and air-conditioning in the summertime protect against deaths from heart disease, stroke, and respiratory disease. For populations over time and in regions facing episodes of extreme weather, adequate heating in winter and air-conditioning in summer play key roles in promoting public health:[22]

- Poorly insulated dwellings and low indoor temperatures in bedrooms and living rooms are associated with greater numbers of deaths, especially in regions with warmer winters.[23] Among people living with chronic obstructive pulmonary disorder, those whose living rooms in the wintertime are warm (21 degrees Celsius or 70 degrees Fahrenheit and higher) fewer than nine hours per day have significantly poorer respiratory health than those whose living rooms are warm for at least nine hours per day.[24] Older residents in East London are 60 to 70 percent more likely to experience an emergency hospitalization in wintertime if they live in a neighborhood where high home energy burdens are more common.[25] Central heating lowers the odds of wintertime death for older residents,[26] and studies from the United Kingdom and New Zealand as well as the United States document the improved health and quality of life reported by low-income residents of newly weatherized dwellings.[27]

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25 J. Rudge and R. Gilchrist, "Excess Winter Morbidity among Older People at Risk of Cold Homes: A Population-Based Study in a London Borough," *Journal of Public Health* 27 (2005): 353–58.

26 P. Aylin, S. Morris, J. Wakefield, A. Grossinho, L. Jarup, and P. Elliott, "Temperature, Housing, Deprivation and Their Relationship to Excess Winter Mortality in Great Britain, 1986–96," *International Journal of Epidemiology* 30, no. 5 (2001): 1100–108.

27 E. L. Lloyd, C. McCormack, M. McKeever, and M. Syme, "The Effect of Improving the Thermal Quality of Cold Housing on Blood Pressure and General Health: A Research Note," *Journal of Epidemiology and Community Health* 62 (2008): 793–97; P. Howden-Chapman, A. Matheson, J. Crane, H. Viggers, M. Cunningham, T. Blakely, C. Cunningham, A. Woodward, K. Saville-Smith, D. O'Dea, M. Kennedy, M. Baker, N. Waipara, R. Chapman, and G. Davie, "Effect of Insulating Existing Houses on Health Inequality: Cluster Randomised Study in the Community," *British Medical Journal* 334, no. 7591 (2007): 460; N. Shortt and J. Rugkasa, "'The Walls Were So Damp and Cold': Fuel Poverty and Ill Health in Northern Ireland: Results from a Housing Intervention," *Health Place* 13, no. 1 (2007): 99–110.

- Indoor cooling, especially central air-conditioning, is key to saving lives and mitigating the heat-related impacts of climate warming.[28] Studies of heat waves in Philadelphia, Chicago, and Cincinnati confirm the risk posed by high temperatures in upstairs sleeping areas and the efficacy of air-conditioning to reduce the frequency of heat-related death.[29] Looking at the general population over time, people living in homes with central air-conditioning are 42 percent less likely to die than those living in homes without air-conditioners, with positive effects seen for window air-conditioning units in smaller residences.[30] And a study of deaths in Pittsburgh, Chicago, Detroit, and Minneapolis-St. Paul finds a 5 percent higher heat-related death rate among African Americans than white residents and concludes that more than two-thirds of this racial disparity reflects the lack of central air-conditioning among African-American households surveyed.[31]

LOWER SOCIOECONOMIC STATUS

Lower socioeconomic status is associated with a greater risk of temperature-related death, particularly for older adults. Poverty and low-income status in the United States are associated with unsafe indoor temperatures and, through this link, with adverse health outcomes.[32] Research suggests that access to, use of, and efficacy of home heating and cooling increase as household income increases.

28 E. M. Kilbourne, K. Choi, T. S. Jones, and S. B. Thacker, "Risk Factors for Heatstroke: A Case-Control Study," *Journal of the American Medical Association* 247 (1982): 3332–36; Mirchandani et al., "Heat-Related Deaths in Philadelphia–1993"; M. P. Naughton, A. Henderson, M. C. Mirabelli, R. Kaiser, J. L. Wilhelm, S. M. Kieszak, C. H. Rubin, and M. A. McGeehin, "Heat-Related Mortality During a 1999 Heat Wave in Chicago," *American Journal of Preventive Medicine* 22 (2002): 221–27; G. C. Donaldson, W. Keatinge, and S. Nayha, "Changes in Summer Temperature and Heat-Related Mortality Since 1971 in North Carolina, South Finland, and Southeast England," *Environmental Research* 91, no. 1 (2003): 1–7; Barnett, "Temperature and Cardiovascular Deaths"; Medina-Ramon et al., "Temperature, Temperature Extremes, and Mortality"; Ebi et al., "Effects of Global Change on Human Health."

29 Naughton et al., "Heat-Related Mortality"; Mirchandani et al., "Heat-Related Deaths in Philadelphia—1993"; Semenza et al., "Heat-Related Deaths During the July 1995 Heat Wave"; R. Kaiser, C. H. Rubin, et al., "Heat-Related Death and Mental Illness During the 1999 Cincinnati Heat Wave," *American Journal of Forensic Medical Pathology* 22 (2001): 303–07.

30 E. Rogot, P. D. Sorlie, and E. Backlund, "Air-Conditioning and Mortality in Hot Weather," *American Journal of Epidemiology* 136 (1992): 106–16.

31 M .S. O'Neill, A. Zanobetti, and J. Schwartz, "Disparities by Race in Heat-Related Mortality in Four U.S. Cities: The Role of Air Conditioning Prevalence," *Journal of Urban Health* 82, no. 2 (2005): 191–97.

32 The relationship between indoor exposures and poverty or socioeconomic status in European Union (EU) countries differs from that in the United States, given stronger supports for affordable housing in EU countries and the quality of the housing stock more generally. P. Wilkinson, M. Landon, B. Armstrong, et al., *Cold Comfort: The Social and Environmental Determinants of Excess Winter Death in England, 1986–1996* (Bristol: The Policy Press, 2001); N. Gouveia, S. Hajat, and B. Armstrong, "Socioeconomic Differentials in the Temperature-Mortality Relationship in Sao Paulo, Brazil," *International Journal of Epidemiology* 32 (2003): 390–97; F. Canoui-Poitrine, E. Cadot, A. Spira, Groupe Régional Canicule, "Excess Deaths During the August 2003 Heat Wave in Paris, France," *Revue d'Epidemiologie et de Sante Publique* 54 (2006): 127–35; Hajat, Kovats, and Lachowycz, "Heat-Related and Cold-Related Deaths in England and Wales"; P. Wilkinson, S. Pattenden, B. Armstrong, A. Fletcher, R. S. Kovats, P. Mangtani, and A. J. McMichael, "Vulnerability to Winter Mortality in Elderly People in Britain: Population Based Study," *British Medical Journal* 329, no. 7467: 647.

Heating:[33]

- Almost all households have space-heating equipment, but households eligible for the Low-Income Home Energy Assistance Program (LIHEAP)[34] are less likely to have such equipment (1.6 percent, versus 1.1 percent of all households) and twice as likely to not use heating equipment that they have (1.6 percent, versus 0.7 percent of all households).

- LIHEAP-eligible households are more likely to live in homes that lack adequate insulation (24.9 percent, versus 18.4 percent of all households) and are more likely to report that their home is too drafty most of the time (14.5 percent, versus 10.5 percent of all households).

Cooling*:*

- LIHEAP-eligible households with air-conditioning are much more likely than all households with air-conditioning to have window or wall air conditioning units (45.3 percent versus 30.9 percent, respectively).[35]

- A recent national survey of LIHEAP-recipient households finds that only 62 percent use air-conditioning as a primary means to keep cool in summer.[36]

Lower socioeconomic status means greater risk of temperature-related death, especially for older adults.[37] Other socioeconomic indicators of temperature-related death include social isolation, gender, black ethnic or racial identity, and housing conditions that

33 Data in this section are from the U.S. Department of Energy, Energy Information Administration (2009), Table HC7.5, "Space Heating Usage Indicators by Household Income, 2005," http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc5spaceheatingindicators/pdf/tablehc7.5.pdf (accessed 04/08/10).

34 Federal statute limits LIHEAP eligibility to households with incomes that do not exceed 150 percent of the federal poverty level or 60 percent of the state median income, whichever is greater.

35 U.S. Department of Energy, Energy Information Administration (2009), Table HC7.6, "Air Conditioning Usage Indicators by Household Income, 2005," http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc7airconditioningindicators/pdf/tablehc7.7.pdf (accessed 04/08/10).

36 National Energy Assistance Directors Association (NEADA), "2008 National Telephone Sample Survey" (Washington, DC: Apprise, Inc., unpublished and available from NEADA).

37 Kilbourne, "Temperature and Health."

concentrate heat indoors.[38] The income gradient widened by high home energy prices also contributes to health disparities related to home energy, such as food insecurity:[39]

- Older residents in low-income households of the northern United States are more likely to go hungry in late winter, while similar households in the South are more likely to go hungry in late summer, reflecting the costs of heating and cooling.[40]

- In northern states, poor families with children spend less on food and more on home fuel, and their children have lower caloric intake during the winter months, than higher income families.[41]

HIGH AND RISING HOME ENERGY PRICES: A THREAT TO LOW- AND MODERATE-INCOME HOUSEHOLDS

According to data from the Energy Information Administration, the average cost to heat homes in winter has increased by 27.3 percent since 2005.[42] During the same time period, the use of air conditioning has also become more expensive as the price of residential electrical service (cents per kilowatt hour) has jumped 22 percent.[43] The trend is likely to continue as electrical utilities invest in more modern infrastructure, pay more for fuel, and respond to new regulatory policies related to climate change.[44]

38 Curriero et al., "Temperature and Mortality in 11 Cities"; J. Diaz, A. Jordan, R. Garcia, C. Lopez, J. C. Alberdi, E. Hernandez, and A. Otero, "Heat Waves in Madrid 1986–1997: Effects on the Health of the Elderly," *International Archives of Occupational and Environmental Health* 75 (2002): 163–70; Kaiser et al., "The Effect of the 1995 Heat Wave in Chicago"; Naughton et al., "Heat-Related Mortality"; M. O'Neill, A. Zanobetti, and J. Schwartz, "Modifiers of the Temperature and Mortality Association in Seven U.S. Cities," *American Journal of Epidemiology* 157 (2003): 1074–82; O'Neill, Zanobetti, and Schwartz, "Disparities by Race in Heat-Related Mortality"; M. Medina-Ramon, A. Zanobetti, D. P. Cavanagh, and J. Schwartz, "Extreme Temperatures and Mortality: Assessing Effect Modification by Personal Characteristics and Specific Cause of Death in a Multi-City Case-Only Analysis," *Environmental Health Perspectives* 114 (2006): 1331–36; J. Schwartz, "Who Is Sensitive to Extremes of Temperature? A Case-Only Analysis," *Epidemiology* 16 (2005): 67–72; Zanobetti and Schwartz, "Temperature and Mortality in Nine U.S. Cities."

39 N. Adler and D. Rehkopf, "U.S. Disparities in Health: Descriptions, Causes, and Mechanisms," *Annual Reviews in Public Health* 29 (2008): 235–52; M. S. O'Neill, A. J. McMichael, J. Schwartz, and D. Wartenberg, "Poverty, Environment, and Health: The Role of Environmental Epidemiology and Environmental Epidemiologists," *Epidemiology* 18 (2007): 664–68.

40 M. Nord and L. S. Kantor, "Seasonal Variation in Food Insecurity Is Associated with Heating and Cooling Costs among Low-Income Elderly Americans," *Journal of Nutrition* 136 (2006): 2939–44.

41 J. Bhattacharya, T. DeLeire, S. Haider, and J. Currie, "Heat or Eat? Cold-Weather Shocks and Nutrition in Poor American Families," *American Journal of Public Health* 93 (2003): 1149–54.

42 Expenditures are in nominal terms and not adjusted for inflation. U.S. Department of Energy, Energy Information Administration, Short-Term Energy Outlook (March 2010), Table WF01, "Average Consumer Prices and Expenditures for Heating Fuels During the Winter," http://www.eia.doe.gov/pub/forecasting/steo/oldsteos/mar10.pdf (accessed 5/18/2010).

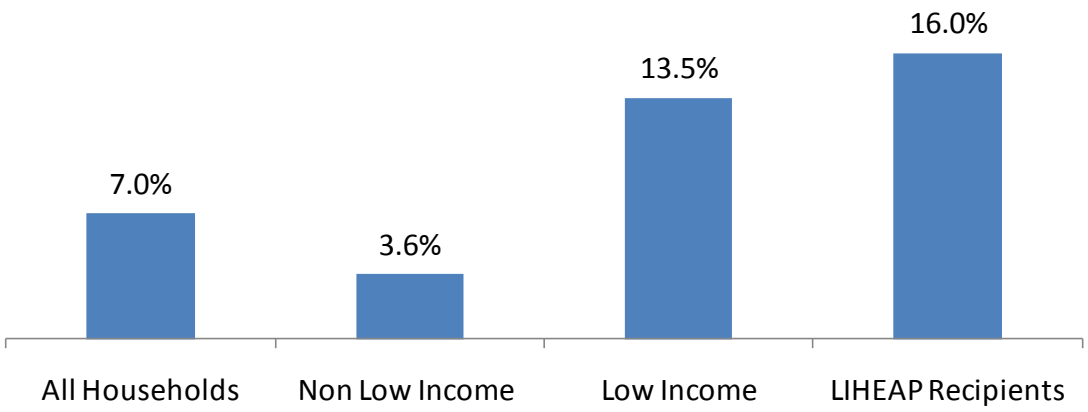
43 U.S. Department of Energy, Energy Information Administration (2010), Table 5.3, "Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector, 1996 through February 2010," http://www.eia.doe.gov/cneaf/electricity/epm/table5_3.html (accessed 5/18/2010).

44 U.S. Department of Energy, Energy Information Administration (2010), *Annual Energy Outlook 2010*, p.66; Rebecca Smith, "Utilities Seek Round of Rate Increases," *Wall Street Journal* November 27, 2009; Scott DiSavino, "U.S. Power Bills Down, But Not For Long," *Reuters*, August 25, 2009.

In fiscal year (FY) 2007, the most recent year for which such data are available, the average residential energy expenditure for all households was $1,986, the mean home energy burden (the proportion of a household's budget allocated for utility bills) was 7 percent, and heating costs and cooling costs accounted for about 41 percent (28 percent and 13 percent, respectively) of residential energy expenditures.[45] Households *eligible* for LIHEAP spend less on energy ($1,715) on average but carry nearly twice the home energy burden (13.5 percent), while households *enrolled* in LIHEAP spent about an average amount ($1,900) but 16 percent of their annual income (see Figure 1). On average, LIHEAP-enrolled households have lower incomes than LIHEAP-eligible households.

Figure 1.

Low Income Households Carry Heavy Home Energy Burden



Source: U.S. Department of Health and Human Services, Administration for Children and Families, Office of Community Services, Division of Energy Assistance. *LIHEAP Home Energy Notebook for FY 2007* (Washington, DC: USDHHS, 2009).

High and rising energy prices have a disparate impact on households that include older adults, even though they consume less energy than households without older adults. In fact, households that include older adults use about 5 percent less energy, reflecting smaller homes, and among these households, those at or below the federal poverty level use about one-third less energy.[46] Nationally, and in all regions of the country (Northeast, Midwest, South) except the West, low-income households that include older adults use energy more intensively—that is, they consume more energy per square foot of living

45 U.S. Department of Health and Human Services, Administration for Children and Families, Office of Community Services, Division of Energy Assistance, *LIHEAP Home Energy Notebook for FY 2007* (Washington, DC: USDHHS, June 2009).

46 J. Howat and P. Taormina, "Home Energy Costs: The New Threat to Independent Living for the Nation's Low-Income Elderly," *Clearinghouse REVIEW. Journal of Poverty Law and Policy* 41 (2008): 552–68.

space—than do households above the poverty line. This use reflects the fact that these households are more likely to have older, less energy-efficient appliances such as refrigerators and heating equipment. Because of this disparity, these households pay more and receive less, in terms of home energy, than the average household.[47]

While energy prices have risen, median incomes have stagnated, especially for low- and moderate-income households. As a result, home energy burdens, have increased:

- Between 2001 and 2006, home energy burdens for poor, older adults living in two-person households rose significantly.[48] For such households whose incomes are less than 150 percent of the federal poverty levels, average energy burdens grew by almost 25 percent in the Northeast (to 9.6 percent) and South (to 8.2 percent), and by more than 10 percent in the Midwest (to 7.5 percent).[49]

- The home energy affordability gap, which illustrates differences between what low-income households are billed and what they can afford to pay, has more than doubled between 2002 and 2007.[50]

- Since the early 1970s, while median household incomes have risen, the volatility of income has increased; and the chance that a household headed by a working-age adult (ages 25 through 65) will experience a significant loss of income has increased by almost 50 percent.[51]

LIHEAP IMPROVES ACCESS TO HOME ENERGY

LIHEAP improves access to home energy, but it has not kept pace with need and does not guarantee basic, affordably priced utility service. LIHEAP, the single largest source of federal income support for home energy costs, provides eligible low-income households with financial assistance to offset the costs of heating and cooling their homes. According to the most recent data from the U.S. Department of Health and Human Services (FY 2007), an estimated 5.3 million households received an average of $320 in winter heating or winter crisis assistance, and 600,000 households received an average of $171 in summer cooling or summer crisis assistance.[52]

47 Howat and Taormina, "Home Energy Costs: The New Threat."

48 Ibid.

49 Ibid. These figures do not reflect significant energy price increases seen in 2007 and those predicted for the future.

50 This measure aggregates county-level measures of total energy bills, weighted by the proportion of low-income residents (households earning less than 185 percent of the poverty level); see http://www.homeenergyaffordabilitygap.com. A home energy burden is defined as affordable if bills are less than 10 percent of household income.

51 P. Gosselin and S. Zimmerman, "Trends In Income Volatility and Risk, 1970–2004," Urban Institute Working Paper (Washington, DC: The Urban Institute, 2008).

52 USDHHS, *LIHEAP Home Energy Notebook for FY 2007*.

Unfortunately, LIHEAP benefits cover only a portion of home energy costs. In fact, the percentage of the total home heating bill covered by LIHEAP benefits decreased from 23 percent in 1981 to 10 percent in FY 2007.[53]

Moreover, the number of households that receive LIHEAP assistance represents only a small fraction of income-eligible households. More than 33.8 million households—which included more than 13.7 million households that had at least one member 60 years of age or older—were income-eligible for LIHEAP in FY 2007.[54] Millions more households became eligible during FY 2009 as many states increased their maximum income eligibility guidelines for LIHEAP from 60 percent to 75 percent of state median income.

Congress nearly doubled the federal allocation for LIHEAP from $2.6 billion in FY 2008 to $5.1 billion for FY 2009. The increase provided a much-needed infusion of support for the program:

- The purchasing power of LIHEAP dollars jumped to approximately 56 percent of the average cost to heat a home, the highest percentage since the program began.
- The average grant increases modestly to an estimated $543.
- The number of households served rose by 25 percent, or an additional 1.9 million households.[55]

Nevertheless, the 7.7 million households who received LIHEAP during 2009 was less than one-quarter of the number estimated to be income-eligible.[56]

Households that cannot afford to pay their utility bills face the possibility of having their utility service disconnected. While LIHEAP can help prevent shutoff of essential utility service by making payment more affordable, millions of residential consumers, including many LIHEAP-eligible and -assisted households, have their electricity or natural gas service terminated for failing to pay their bills.[57] Most states offer only limited protections to prevent the shutoff of regulated home utility service for nonpayment, and there are no regulatory protections governing delivered fuels, such as heating oil, propane, and wood. According to the National Center for Appropriate Technology's LIHEAP Clearinghouse, 40 states have seasonal moratoria on the shutoff of electricity or natural gas during the wintertime, 10 states have seasonal moratoria for the summer

53 USDHHS, *LIHEAP Home Energy Notebook for FY 2007*.

54 The number of eligible households is calculated using state-level income guidelines. USDHHS, *LIHEAP Home Energy Notebook for FY 2007*.

55 NEADA, "Low Income Home Energy Assistance Program – Program Purchasing Power," (unpublished memo: NEADA, October 6, 2008, available from Mark Wolfe, mwolfe@neada.org),**;** NEADA, "Table 1: LIHEAP Winter Heating Households Served FY 09 & FY 10 Projected (Revised 02-23-10)," press release available at http://www.neada.org/communications/press/2010-02-22/Table1-LIHEAP10ProjServed.pdf (accessed 04/08/10).

56 Ibid.

57 S. Sloane, M. Miller, B. Barker, and L. Colosimo, "2008 National Association of Regulatory Utility Commissioners (NARUC) Collections Survey Report," http://www.naruc.org/Publications/2008%20NARUC%20Collections%20Survey%20Report.pdf (accessed 04/08/10).

months, and 43 states have limited protections against shutoffs on the grounds of life-threatening or serious illness (usually a delay in a scheduled shutoff for nonpayment if a health care practitioner certifies poor health).[58] Only eight states have utility shutoff protections specifically for older adults, two of which protect against shutoffs during summertime and wintertime, while six offer protection only during the wintertime.

Low-income energy assistance, and related utility rate discount programs, where offered, help increase access to moderate indoor temperatures and temper the stress that high utility bills place on household budgets. Smart public policy, however, also involves weatherization and energy efficiency measures, utility shutoff protections, and guaranteed basic levels of service, as well as public education to inform individual decision making about using and conserving home energy.

NATIONAL ENERGY ASSISTANCE SURVEY

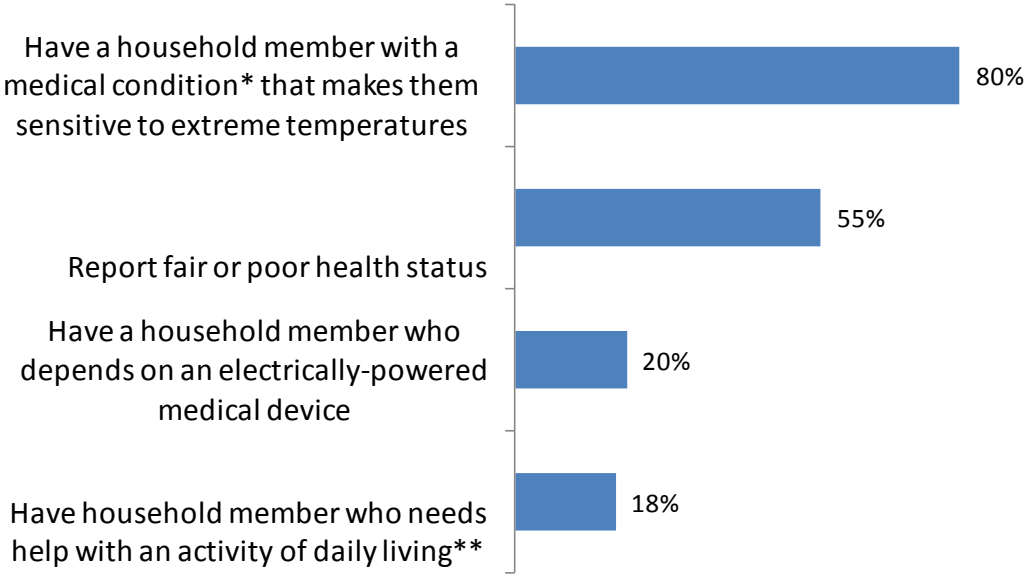
Unaffordable home energy subjects many older adults to direct and indirect threats to their health and safety. A survey released by the National Energy Assistance Directors' Association indicates that LIHEAP-enrolled households that include an older adult are particularly vulnerable to adverse health outcomes related to high home energy burdens (see figure 2) and frequently make difficult choices that pose both *direct* and *indirect* risks to health.[59]

58 LIHEAP Clearinghouse, "Seasonal Termination Protection Regulations," table prepared by the National Center for Appropriate Technology, 2009, http://liheap.ncat.org/Disconnect/SeasonalDisconnect.htm (accessed 12/25/09).

59 The concept of two main pathways through which household energy burden affects health is developed in Child Health Impact Working Group, *Unhealthy Consequences: Energy Costs and Child Health* (Boston, MA: Child Health Impact Working Group, 2006). Unless otherwise noted, all findings reported in this section are from a 12-state telephone sample survey of households receiving an LIHEAP benefit. See NEADA, "2008 National Energy Assistance Survey" (Washington, DC: Apprise, Inc., 2009), available from Mark Wolfe, mlwolfe@neada.org.

Figure 2.

Health Status Makes LIHEAP Households with an Older Adult Particularly Vulnerable to Unaffordable Home Energy



* including asthma, emphysema, chronic obstructive pulmonary disorder (COPD), diabetes, high blood pressure, heart disease, or stroke

** help with personal care needs because of a physical, mental or emotional problem

Source: National Energy Assistance Directors' Association. *2008 National Energy Assistance Survey* (Princeton, NJ: Apprise, Inc., 2009). Available from Mark Wolfe, mwolfe@neada.org.

Direct threats to health:

Health is at risk *directly* through exposure when heat is turned down in winter or air-conditioning is turned off in summer, when unsafe means are used to heat or light homes, and when utility service is lost due to nonpayment. Substandard dwellings may be hard or impossible to keep within a moderate temperature range, and excessive humidity may lead to mold growth that increases the likelihood of respiratory disease. The following statistics pertain to LIHEAP-enrolled households that include an older adult:

- In response to high home energy prices perceived as unaffordable, 46 percent report closing off part of their home for at least one month a year, 24 percent maintain their home at what they perceived as an unsafe or unhealthy temperature, and 17 percent

report leaving their home for part of the day because they were unable to maintain moderate indoor temperatures.[60]

- More than one-quarter (27 percent) report using the kitchen stove or oven for heat, and 4 percent use candles or lanterns because of loss of utility service for nonpayment.[61]

- More than one-quarter (28 percent) report skipping payment of a utility bill or paying less than the full amount, 19 percent received a shutoff notice for nonpayment within the past year, and 6 percent report the loss of either electrical or natural gas service for nonpayment.[62]

- One in six (17 percent) report that they were unable to use their main heating source at some point during the previous year because they did not have the money to accomplish one or more of the following: fix or replace a broken furnace; purchase bulk fuel such as heating oil, propane, or wood; or prevent the shutoff of utility service for nonpayment.[63]

- One in eight (12 percent) report that they were unable to use their air-conditioning at some point during the previous year because they did not have the money to accomplish one or both of the following: fix or replace a broken air conditioner; or prevent the shutoff of electricity for nonpayment.[64]

Indirect threats to health:

Financial stress poses *indirect* threats when households must make difficult decisions in the face of competing demands for limited dollars. This scenario is commonly described as "heat or eat," making vivid the trade-offs between paying a utility bill and purchasing groceries or medications. The following statistics pertain to LIHEAP-participating households that include an older adult:

- Three-quarters (74 percent) report cutting back on the purchase of household necessities because of high home energy bills.[65]

- Nearly one-quarter (24 percent) report going without food for at least one day because of energy bills in the past five years.[66]

60 NEADA, "2008 National Energy Assistance Survey," Table IV-17B, Table IV-18B, Table IV-19B.

61 Ibid., Table IV-20B, Table IV-37B.

62 Ibid., Table IV-22B, Table IV-23B, Table IV -27B.

63 Ibid., Table IV-31B.

64 Ibid., Table IV-34B.

65 Ibid., Table IV-14B.

66 Ibid., Table IV-50B.

- Almost one-third (32 percent) report going without medical or dental care because of energy bills in the past five years, and 31 percent report neglecting to fill a medical prescription or taking less than a full dose because of high energy bills.[67]

- One in six (15 percent) report being unable to pay energy bills because of medical or prescription drug expenses during the past year.[68]

MAKING THE CONNECTIONS: HIGH HOME ENERGY BURDENS AND POLICY PRIORITIES

Policies and programs to address the health threats posed by high home energy prices can build on existing efforts in the areas of energy, long-term care and health care reform, and livable communities.

ENERGY

The high cost of basic home utility service threatens the economic security of low- and moderate-income households and by extension, the health and well-being of household members. Affordable energy policies promote population health.

The ultimate goal of home heating and cooling is to maintain moderate indoor temperatures. Meeting energy needs affordably has been a consistent challenge for too many households and could become even more problematic as energy prices increase in response to efforts to reduce greenhouse gas emissions. Full funding of LIHEAP in recent years has enabled many states to raise their maximum income eligibility guidelines, the size of individual awards, and the numbers of households enrolled. However, LIHEAP still services only about one-quarter of eligible households.[69]

Recognizing that a host of issues can make young children and older adults more vulnerable to temperatures that deviate from a moderate range, some states prohibit or limit the disconnection of residential energy services for households with members of certain ages.[70] Many states offer a limited protection against involuntary loss of home utility service for people facing life-threatening circumstances or serious illness. Typically, these protections take the form of a delay or extension in the schedule for a shutoff, which is set in motion by the periodic filing of a medical certification with the state energy office or utility company.[71] Only a handful of states prohibit shutoffs

67 Ibid., Table IV-51B, Table IV-52B.

68 Ibid., Table IV-53B.

69 NEADA, '"LIHEAP Program Purchasing Power," unpublished memo, November 11, 2009, available from Mark Wolfe, mlwolfe@neada.org .

70 LIHEAP Clearinghouse, "State Disconnection Policies," table prepared by the National Center for Appropriate Technology, 2009, http://liheap.ncat.org/Disconnect/disconnect.htm (accessed 12/25/09).

71 LIHEAP Clearinghouse, "Seasonal Termination Protection Regulations," table prepared by the National Center for Appropriate Technology, 2009, http://liheap.ncat.org/Disconnect/SeasonalDisconnect.htm (accessed 12/25/09).

altogether for people facing significant health challenges. Current practice does not acknowledge the difficulty that the average low-income household has in maintaining regular access to appropriate health care so that a medical provider can file such a notice.

Some recent policy initiatives pose threats to the health of older people. At the local, state, regional, and national levels, policymakers and industry groups have initiated efforts to shift and dampen consumer demand for electricity. These efforts have focused on the deployment of advanced metering technology and a variety of new pricing programs that vary the price of electricity based on the time of day.[72] These demand-response policies not only create financial incentives and indirect pressure to reduce consumption but also pose a potential threat to health and safety for consumers who must pay more for electricity because they cannot shift their usage from higher cost peak times to lower cost off-peak times. These policies raise other concerns as well:

- Installing advanced meters, and related technology is expensive and expected to be financed by utility customers, adding to the cost of residential electricity.

- While traditional meter technology requires a visit to the customer's premises to disconnect service for nonpayment or other reasons, advanced meters typically include a switch that allows the utility to disconnect service from a remote location. The use of this functionality could result in an increase in the volume of disconnections for nonpayment and have adverse impacts on health and safety if utilities do not visit the customer's premises at the time of disconnection. In this regard, a site visit allows utility field personnel to observe individual customer circumstances and identify signs of potential medical emergencies and other safety risks associated with the loss of service. It also provides customers with opportunity to pay any delinquencies on their bill and ensures that they are aware of the impending action. The potential danger of remote disconnections is exemplified in the case of a 93-year-old Michigan resident who died of hypothermia inside his home, the result of a service limiter being tripped.[73]

HEALTH SERVICES AND LONG-TERM CARE

Exposures to extreme temperatures and lack of access to home energy assistance are associated with greater use of health services, especially by older adults with chronic health conditions. Published studies document the greater use of health services that result from exposures to excessive heat or cold and the potential of high home energy burdens to destabilize the national movement to promote aging in place and independent living.

72 B. Alexander, "Smart Meters, Real Time Pricing, and Demand Response Programs: Implications for Low Income Electric Customers," unpublished paper, revised May 30, 2007, available from Barbara Alexander, barbalex@ctel.net.; N. Brockway, "Advanced Metering Infrastructure: What Regulators Need to Know about Its Value to Residential Customers" (Silver Spring, MD: National Regulatory Research Institute, 2008); N. Walters, *Can Advanced Metering Help Reduce Electricity Costs for Residential Consumers?* AARP Insight on the Issues no. 18 (Washington, DC: AARP, 2008).

73 D. Eggert, "Freezing Death of Michigan Man, 93, Inside House Sparks Anger; City Utility Cut Power with Limiter," Associated Press, January 28, 2009.

One implication of these findings is that efforts to strengthen access to affordable energy and ensure protections against shutoffs of basic service can reduce the economic costs of avoidable health care services, improve patient health status, and facilitate independent living. This relationship between home energy and health services is analogous to the connection between the use of primary health care and potentially avoidable hospitalization. Hospitalizations can be avoided with sufficient access to primary care.[74] Similarly, in the context of high home energy burdens, avoidable hospital visits and admissions for heat- and cold-sensitive conditions suggest the need to strengthen access to affordable energy and to ensure protections against shutoffs of basic service.

In the federal LIHEAP statute, Congress recognizes that affordable home energy has important implications for the health and safety of older adults (defined as at least 60 years of age), young children (up to age 6), and people living with a disability. The statute identifies these three populations in its definition of households that have the "highest home energy needs" and identifies them as priorities for outreach and enrollment.

The federal statute gives each state and tribal LIHEAP program the option of allowing households to demonstrate eligibility for the program based on their participation in other means-tested programs rather than having to provide evidence of income. Known as categorical eligibility, the option of using other low-income assistance programs, including Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), and the Supplemental Nutrition Assistance Program (food stamps), as proxies for income eligibility gives states more flexibility and provides the opportunity to identify and serve households that are at risk of adverse health outcomes from high home energy burdens. For instance, SSI provides monthly benefits to 7.5 million low-income individuals who live with a significant disabling condition, who are legally blind, or who are at least 65 years old.[75] States likely would reach even more of those most at risk of adverse health outcomes if categorical eligibility were extended to targeted groups of medically frail individuals, as identified through their participation in health services and receipt of long-term care services. For example, consider the following statistics that pertain to approximately 12.6 million Medicare beneficiaries who are at least 65 years old and who live in households that are income-eligible for LIHEAP (earning no more than 150 percent of the federal poverty level):[76]

74 A. B. Bindman, K. Grumbach, D. Osmand, M. Komaromy, K. Vranizan, N. Lurie, J. Billings, and A. Stewart A, "Preventable Hospitalizations and Access to Care," *Journal of the American Medical Association* 274, no. 4 (1995): 305–11.

75 SSI is a federal entitlement program providing monthly income support for members of low-income households who live with a significant disabling condition, who are legally blind, or who are at least 65 years of age. Social Security Administration, *SSI Annual Statistical Report, 2007*, SSA Pub. No. 13-11827 (Washington, DC: SSA, 2008).

76 Estimates cited in this paragraph are from Kaiser Family Foundation (KFF), Urban Institute, and Kaiser Commission on Medicaid and the Uninsured, based on the U.S. Census Bureau, "March 2007 and 2008 Current Population Survey," CPS: Annual Social and Economic Supplements (Washington, DC: U.S. Census Bureau, 2008, 2009), http://statehealthfacts.org (04/20/09).

- Nearly 9.4 million are eligible to enroll in the Medicare Part D Low-Income Subsidy for assistance paying for prescription drugs.[77]

- About 6.2 million are fully eligible for Medicaid subsidy of health care expenses not covered under Medicare.[78]

Long-term care arrangements for older adults who are seriously ill or disabled should acknowledge the importance of affordable home energy. Most states have Medicaid waiver programs that pay for home- and community-based services for income-eligible people who otherwise might enter a nursing home. Some 1.3 million people receive support to stay in their homes under Medicaid waivers, and many more are eligible and

Box 1.
Extreme Temperatures, LIHEAP, and Potentially Avoidable Hospitalization

- **Hospital admissions attributed to exposure:** In 2005, about 12,700 people were hospitalized in the United States for weather-related reasons, with residents of lower income communities more than twice as likely as those from higher income areas to be hospitalized.[a] Aggregate costs for these admissions are significant—$38.7 million for heat-related stays and $81.5 million for cold-related stays.

- **Hospital visits and admissions during heat waves:** During a two-week heat wave in California in July 2006, emergency department visits rose more than sixfold and hospital admissions more than tenfold for heat-related diagnoses for the state as a whole.[b] Chicago's July 1995 heat wave boosted hospital admissions 35 percent over the average for older Americans.[c]

- **Positive impact of energy assistance:** Young children in families eligible for but not enrolled in LIHEAP are more likely to need hospital admission on the day of a health care visit.[d]

a C.T. Merill, M. Miller and C. Steiner, "Hospital Stays Resulting From Excessive Heat and Cold Exposure Due to Weather Conditions in U.S. Community Hospitals, 2005," *Healthcare Cost and Utilization Project*, Statistical Brief No. 55 (Rockville, MD: U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality, 2008).

b Knowlton et al., "The 2006 California Heat Wave."

c Semenza et al., "Excess Hospital Admissions."

d D.A. Frank, N.B. Neault, A. Skalicky, J.T. Cook, J.D. Wilson, S. Levenson, A.F. Meyers, T. Heeren, D.B. Cutts, P.H. Casey, M.M. Black and C. Berkowitz, "Heat or Eat: the Low Income Home Energy Assistance Program and Nutritional and Health Risks Among Children Less Than 3 Years of Age," Pediatrics 118, no.5 (2006): e1293-1302.

77 KFF statehealthfacts.org, estimate for 2008 from Centers for Medicare and Medicaid Services (CMS), Office of External Affairs, released January 31, 2008.

78 KFF, statehealthfacts.org, Urban Institute estimates for 2003 based on data from the Medicaid Statistical Information System (MSIS) prepared for the Kaiser Commission on Medicaid and the Uninsured.

on waiting lists for waiver slots.[79] Affordable home energy and adequate indoor temperatures are an important support for the success of home- and community-based services, stabilizing the home environment and freeing up dollars in the household budget. Although federal Medicaid funds may not be used to pay for home utility service, some states, such as Florida, have carried out demonstration projects (cash and counseling) that give participants greater latitude in how funds for long-term care services are used, including to pay utility bills.[80] Access to basic home utility service can be considered part of accommodations made under the Americans with Disabilities Act to guarantee that people who are ill or disabled enough to live in a nursing home have the option to live in a community setting instead.[81]

Strengthening the connections between affordable home energy and health requires a greater understanding of affordable energy issues among clinicians, health care administrators, and analysts. Many in the health care community fail to recognize the role of home energy as a support for the effective delivery of health services and long-term care. Various studies indicate that health care and public health professionals, and the clients and family caregivers they serve, need better information about the health and safety threats posed by inadequately heated and cooled homes and the high home energy burdens borne by low- and moderate-income households.[82] Preparing the health care community for climate change will involve training providers and safety net workers to recognize heat-related ailments and making them aware of the resources that can help at-risk patients maintain access to healthy and comfortable temperatures. For example, a health care practitioner's ability to protect people facing life-threatening circumstances or serious illness against involuntary loss of home utility service (as discussed above) depends significantly on the practitioner's awareness of and able to comply with the consumer protection regulations that govern utility service shutoffs.[83]

LIVABLE COMMUNITIES

Ultimately, policies that promote adequate and affordable home energy use, and that acknowledge the role of home energy as a support for the effective delivery of long-term

79 Estimate for 2004 from AARP, *A Balancing Act: State Long-Term Care Reform* (Washington, DC: AARP, 2008), Table A3.

80 On the cash and counseling demonstration in Florida, see B. Phillips and B. Schneider, "Commonalities and Variations in the Cash and Counseling Programs across the Three Demonstration States," *Health Services Research* 42, no. 1 (2007): 397–413.

81 A state's Olmsted plan, required under federal law, details how the state will provide long-term care supports to residents in the least restrictive setting available. R. Desonia, *Is Community Care a Civil Right?* National Health Policy Forum Background Paper, 2003, http://www.nhpf.org (12/14/09).

82 R. Jackson and K. N. Shields, "Preparing the U.S. Health Community for Climate Change," *Annual Reviews in Public Health* 29 (2008): 57–73; F. Matthies, G. Bickler, N. C. Marin, and S. Hales S., eds., *Heat-Health Action Plans. Guidance* (Copenhagen, Denmark: World Health Organization, 2008); J. Balbus, K. Ebi, L. Finzer, C. Malina, A. Chadwick, D. McBride, M. Chuk, and E. Maibach, *Are We Ready? Preparing for the Public Health Challenges of Climate Change* (New York: Environmental Defense Fund, 2008), http://www.edf.org/documents/7846_AreWeReady_April 2008.pdf (accessed 04/08/10).

83 One such strategy, the Energy Clinic, has been developed at the Boston Medical Center. Energy Clinic activities include training for clinicians about how to prepare medical certification letters to prevent shutoffs of home utility services for the families of pediatric patients –Adam Sege, Utility Access and Health. A Medical-Legal Partnership Patients-to-Policy Case Study (Boston, MA: National Center for Medical Legal Partnership, 2010). Available at http:// www.medical-legalpartnership.org.

care and health services to older adults, promote community dwelling that facilitates personal independence and quality of life.

For example, prudent land-use planning recognizes that the urban heat island effect, or how buildings and paved space retain heat locally, increases ambient temperatures and raises the risk of premature death.[84] Studies of differences in neighborhood temperatures during the summer underscore the importance of access to air-conditioning in protecting against the heat. In urban St. Louis, older adults are more likely to die during a heat wave if they live in the more crowded blocks adjacent to the central business district, where older, red brick buildings are more likely to retain heat overnight and where residents tend to be from lower-income households and therefore less likely to have air-conditioning.[85] In Phoenix, Arizona, temperatures vary by up to 7 to 12 degrees Fahrenheit among urban, suburban, and urban fringe neighborhoods.[86] The highest temperatures are seen in the poorest neighborhoods, which are densely populated and have little green or open space, and in newer middle-class areas that by design also feature homes built in close proximity and that substitute desert landscaping for green space. For residents of these middle-class Phoenix neighborhoods, access to central air-conditioning and to swimming pools lowers the risks associated with the heat.

Policies that make affordable housing energy efficient lower the costs of heating and cooling, preserve household budgetary assets, and protect the health and safety of occupants. As such, these policies leverage the impact of public benefit dollars spent for health care (Medicaid, Medicare) and food (Supplemental Nutrition Assistance Program, Commodity Foods).

Policies that promote walkable neighborhoods discourage crime, nurture intergenerational social networks, and minimize (through these networks) social isolation and the chances that weather extremes will lead to premature deaths, hospitalizations, and an increased burden of disability and disease among low- and moderate-income households that include older adults.[87] For example, the Philadelphia Department of Health maintains a partnership with a network of neighborhood block captains to support the outreach efforts of city's heat health warning/watch system during heat waves. Working with city Health Department staff, the block captains—volunteers elected by residents to organize neighborhood activities and projects with the city—disseminate information as a heat wave develops and identify and evaluate the health status of vulnerable local residents.[88] This active and personal approach to conveying public health information is particularly important for socially isolated and older adults, who

84 K. E. Smoyer, "Putting Risk in Its Place: Methodological Considerations for Investigating Extreme Event Health Risk," *Social Science and Medicine* 47, no. 11 (1998): 1809–24.

85 Ibid.

86 S.L. Harlan, A.J. Brazel, L. Prashad, W.L. Stefanov and L. Larsen, "Neighborhood Microclimates and Vulnerability to Heat Stress," *Social Science and Medicine* 63, no. 11 (2006): 2847-2863.

87 During heat waves, the most vulnerable are older people who live alone, have limited mobility, and are socially isolated. E. Klinenberg, *Heat Wave. A Social Autopsy of Disaster in Chicago* (Chicago: University of Chicago Press, 2002); Kovats and Hajat, "Heat Stress and Public Health."

88 Environmental Protection Agency, *Excessive Heat Event Guidebook*.

tend to be less responsive to information disseminated through brochures and other more passive means.[89]

Finally, effective risk communication efforts help the public understand the threats to health and safety posed by inadequate home heating and cooling, as well as exposures to outdoor temperatures that are likely to vary dramatically and to change from historic patterns because of climate change.[90] For example, in implementing heat health warning and watch systems in their communities, policymakers have taken advantage of various communication strategies, including the following:

- Developing and disseminating information that summarizes health and safety risks
- Instructing members of the public about available municipal services to mitigate summertime heat or winter cold
- Targeting messages to specific groups of at-risk residents
- Developing warnings that function effectively, for example, to discourage older adults from using electric fans as a cooling strategy when temperatures climb into the upper nineties[91]

The reviews of the heat health warning/watch system in Philadelphia indicate impressive results.[92] Over its first three years (1995–1998), Philadelphia's Hot Weather-Health Watch/Warning System is estimated to have saved about 2.6 lives per day when a warning is issued and for the three-days following the warning, for a total of 117 lives, at an estimated total cost of $210,000.[93] This cost is about 5 percent of the valuation of a statistical life of one older adult, as estimated by the Environmental Protection Agency, making a communications-based strategy a practically no-cost approach to saving lives.

POLICY RECOMMENDATIONS

The following recommendations could help address the serious and increasing health threats posed by unaffordable home energy:

- Ensure that subsidies and discounts help make home energy affordable and sustainable for households that include older adults. These households should have

89 Matthies et al., *Heat-Health Action Plans*.

90 E. W. Maibach, C. Roser-Renouf, and A. Leiserowitz, "Communication and Marketing as Climate Change-Intervention Assets: A Public Health Perspective," *American Journal of Preventive Medicine* 35, no. 5: 488–500.

91 Environmental Protection Agency, *Excessive Heat Event Guidebook*.

92 Environmental Protection Agency, *Excessive Heat Event Guidebook*, citing M. A. Palecki, S. A. Chagnon, and K. E. Kunkel, "The Nature and Impacts of the July 1999 Heat Wave in the Midwestern United States: Learning from the Lessons of 1995," *Bulletin of the American Meteorological Society* 82: 1353–67.

93 K. L. Ebi, T. J. Teisberg, L. S. Kalkstein, L. Robinson, and R. F. Weiher, "Heat Watch/Warning Systems Save Lives. Estimated Costs and Benefits for Philadelphia 1995–1998," *Bulletin of the American Meteorological Society* 85, no. 8: 1067–73.

the option to pay down utility arrearages (amounts due) while not jeopardizing current payments, and should have priority access to energy-efficiency and conservation services and to appliance replacement programs.

- Assess the need for LIHEAP and the total amount of energy assistance for households in terms not only of lowering the home energy burden (the percentage of household income that must be spent for essential home energy services) but also the value added through improved health and reduced threats to safety. Such an approach is rooted in the perspective of the household, rather than that of the utility company.

- Expand categorical eligibility for LIHEAP, weatherization services, and other affordable energy programs to target groups identified as most at risk of adverse health outcomes through their eligibility for Medicaid and Medicare programs, such as state Medicaid waiver programs and the Medicare Part D Low-Income Subsidy.

- Ensure that state-regulated utility consumer protections and policies specifically recognize and address the needs of groups identified as most at risk of adverse health outcomes. For example, shutoff protections based on certification of serious illness should be extended to at least 120 days or one full year (before requiring recertification). In addition, states should adopt policies to lessen the likelihood of a shutoff, such as in-person notification of intent to disconnect and the option to make alternative payment arrangements.

- Ensure that demand-response programs for consumers balance the need to reduce energy consumption with the protection of health and safety for older adults and persons living with serious or disabling conditions.

- Design evaluations of weatherization and energy-efficiency programs to assess their impact on health and safety to demonstrate the importance of home energy for health, for example, how improvements in asthma symptoms can lower health care costs.

- Ensure that intake services for state Medicaid waiver program participation and long-term care case management services include referrals for LIHEAP, weatherization, and other affordable energy programs.

- Support education and outreach efforts to increase awareness both within the health care community and among older adults, their families, and caregivers of the resources that can help at-risk individuals maintain access to healthy and comfortable temperatures. For example, in each state, clinicians and public health officials should be trained in regulated utility consumer protections and in procedures to prepare letters to certify medical shutoff protections for their patients.

- Give priority in home repair or modification programs that serve medically frail participants (such as under a state Medicaid waiver) to cost-effective energy-efficiency measures that protect health and safety (for example, special coatings for flat-roofed rowhouses that lower indoor temperatures in summer).

- Identify and implement best practices for communicating with the public, especially older adults, their families, and caregivers, about the risks of heat waves and cold temperatures, about the links between temperature and health, and about which prevention, education, and response efforts are most effective. Implementation should bring together public officials from health departments, energy offices, and state emergency preparedness.

CONCLUSION

As the U.S. population ages, as our health care system shifts toward support for independent living and aging in place, and as urban infrastructure and global warming present new environmental challenges, the rising cost of basic utility services jeopardize the stability and capacity for self-sufficiency of households that include older adults. Understanding and addressing the implications for energy policy of public and population health priorities, and the implications for public health of affordable energy and energy efficiency priorities, requires a fresh approach. Such an approach should unite two diverse groups of practitioners, in the energy and health fields, to craft new solutions to help American households maintain both economic security and good health.

When a heat wave recurred in Chicago in 1999, four years after hundreds of deaths and hospitalizations during the July 1995 heat wave, city officials and civic groups responded with an effective, coordinated approach informed by the research done in the wake of the 1995 disaster. Chicago implemented a heat health emergency plan that included the opening of cooling centers and outreach to homebound older adults. Far fewer residents died prematurely on account of this second heat wave. Nevertheless, the summer of 1999 in Chicago exposed a number of critical issues, including the following:

- High home energy burdens
- Limited subsidies under LIHEAP and related programs
- Lack of coordination among Medicaid and other public benefit programs with low-income home energy subsidies or residential utility consumer protections
- The realities of life in neighborhoods that remained unsafe and socially isolating for older adults

Ten years later, these and many other related issues remain unresolved, a fact that must change if the United States is to address the widespread problem of insufficient access to affordable heating and cooling as the public health threat it has become.

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