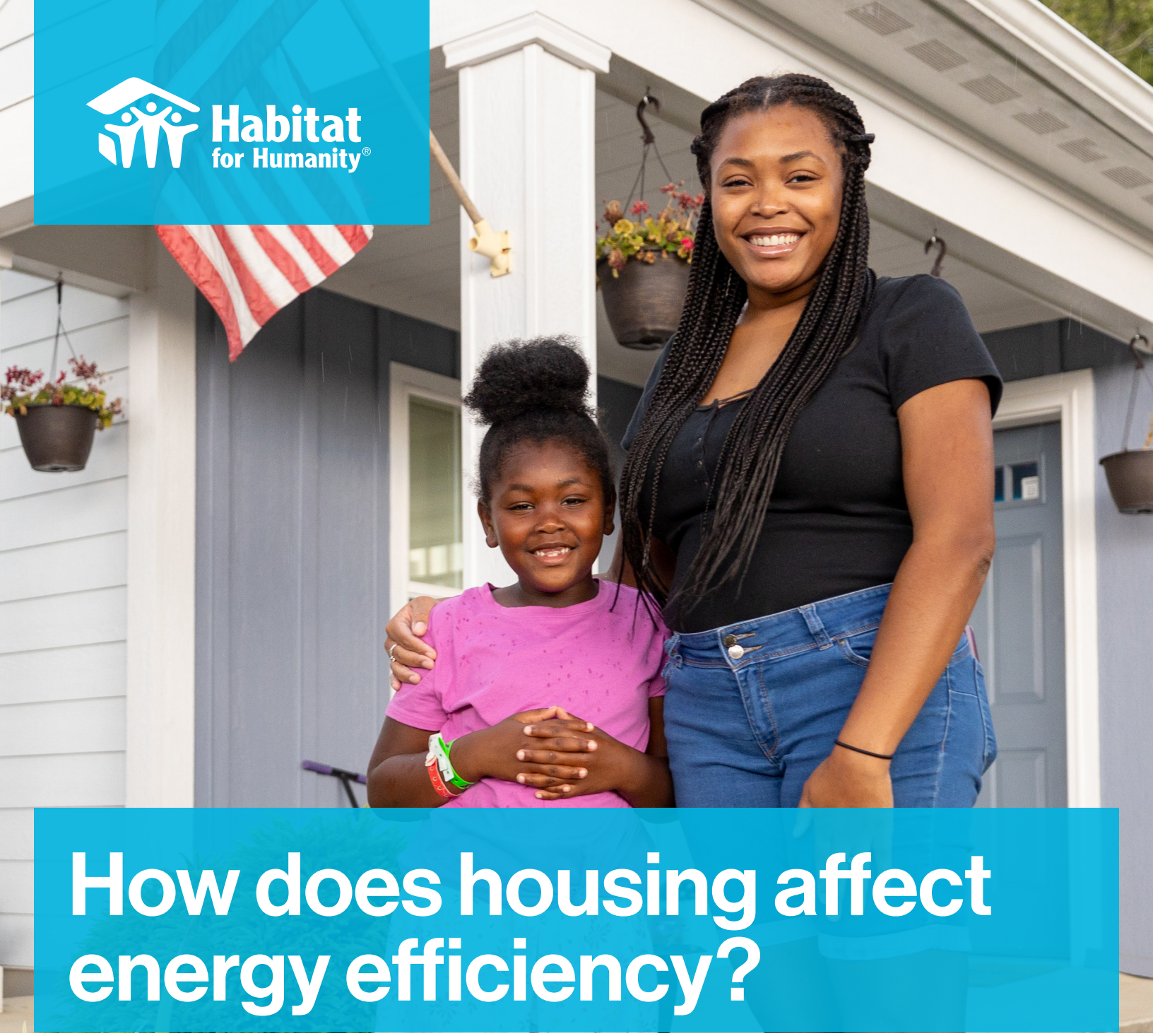
Habitat for Humanity®



How does housing affect energy efficiency?

Residential buildings consume substantial amounts of energy, contributing to environmental concerns and climate change. The International Energy Agency has lauded improved residential energy efficiency as one of the most cost-effective mechanisms to reduce greenhouse gas emissions.[1] Improved energy efficiency reduces greenhouse gas emissions and energy costs, especially for families with low incomes who face the double burden of high costs for housing and energy. Lowering the energy costs of families with low incomes will help to free up their resources to minimize trade-offs between keeping their homes at a comfortable temperature or paying for food, medical care and shelter.

This evidence brief:

- Summarizes research on key factors to improve energy efficiency through housing in populations with low incomes.
- Highlights the key barriers that Black and Hispanic/Latino populations confront in improving energy efficiency.
- Illustrates how the work of Habitat for Humanity contributes to positive energy efficiency.

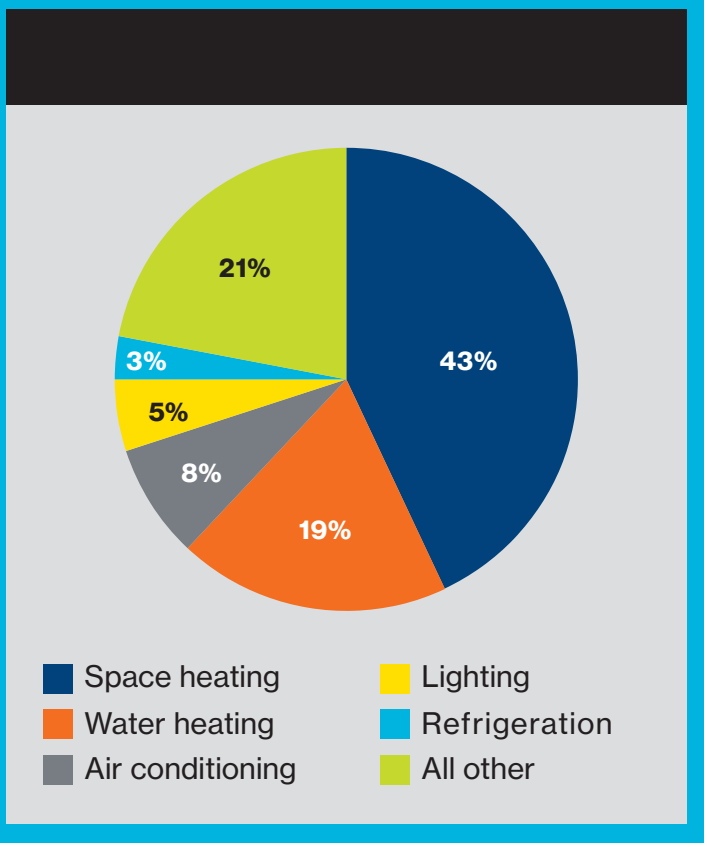
EVIDENCE BRIEF

Energy efficiency of affordable housing for households with low incomes

In the U.S., residential buildings account for 22% of total energy consumption and 19% of total carbon dioxide emissions.[2] Much of the energy consumption in residential buildings stems from heating and cooling the home (51%), water heating (19%), and lighting (5%)(see Figure 1).[3] Heating and cooling the home and heating water contribute almost one-third of carbon dioxide emissions from residential buildings.[4]

One out of 4 U.S. households face a high energy burden, spending more than 6% of their income on energy.[5] Households with low incomes tend to consume less energy — and emit less greenhouse gas — than wealthier households[6] but experience higher energy burdens. Alarmingly, 67% of households with low incomes face a high energy burden, and of those, 60% spend more than 10% of their income on energy. Furthermore, households with low incomes spend almost four times as much on household energy costs as households with higher incomes (8.1% vs. 2.3% of their total income).[5]

Households with low incomes tend to reside in housing that is less energy efficient, which drives their energy burden. Building age and intensity of energy use are highly correlated. Newer homes tend to use less energy per square foot than older homes, partly because building codes have become more stringent.[7] Households with low incomes are more likely to live in lower-quality and older housing and to have energy-intensive heating systems and appliances, which escalate their energy costs.[8] Offering energy-efficient homes to these households can reduce both greenhouse gas emissions and the homes' energy costs and resulting energy burden.



Key factors for improving the energy efficiency of housing

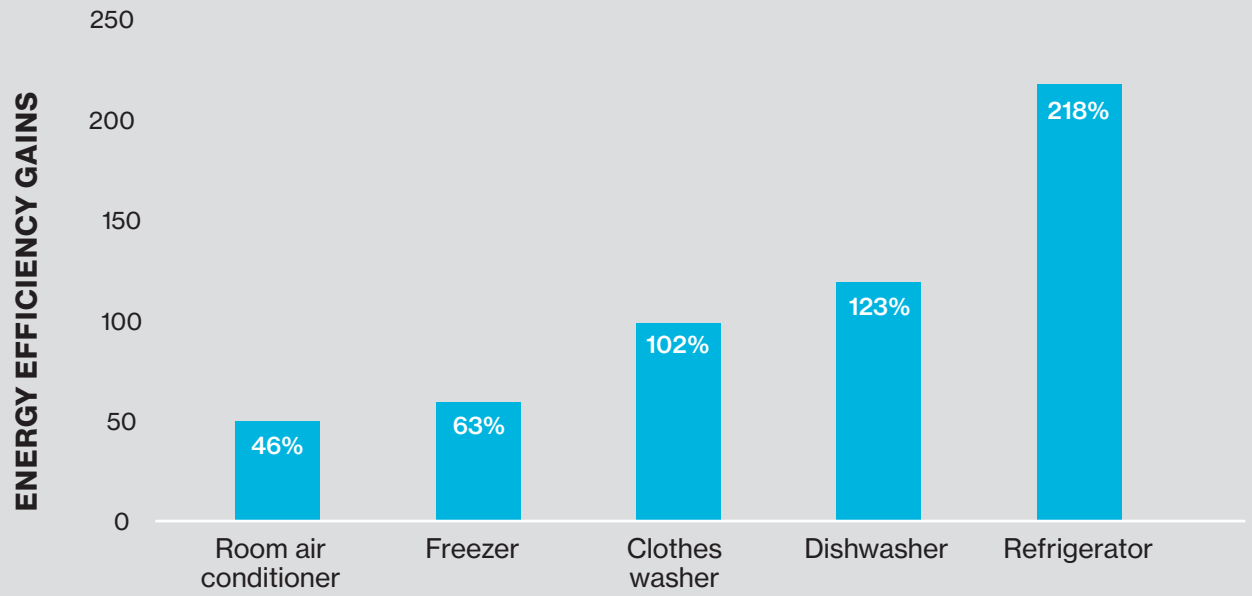
Educating homeowners about energy usage can encourage them to adopt energy-saving behaviors and appliances.

- The projected savings from increased home energy efficiency are often not realized because of the way homeowners interact with the features of their homes. Homeowner behavior influences a house's energy performance and can result in up to 25% variation in energy use.[9]
- The greatest potential for energy savings can be attained from behavioral changes in the use of energy-efficient appliances (dishwashers, clothes washers), lighting, water heating and air conditioning.[9]
- Advanced metering initiatives that provide real-time feedback to homeowners on their energy consumption generate energy savings of 4% to 12%.[10]
- Information-based incentives, such as peer monetary feedback, which compares monetary spending with community, neighbors, etc., and increased frequency of usage feedback, reduce energy consumption by 6.2% on average.[11]

Weatherizing and insulating homes helps to reduce greenhouse gas emissions and increase energy savings.

- Home weatherization includes low-cost improvements such as installing weatherstripping around doors and windows, along with whole-house approaches that address the home's envelope (i.e., the foundation, wall and roof), heating and cooling systems, the electrical system, and conversion to electric-based home appliances.
- Households in single-family homes who weatherize their homes, on average, save 12% ($372) of their annual energy bill and help to reduce carbon emissions that equate to over 2,400 gallons of gasoline consumed.[12] The extent of the annual energy savings varies by type of energy used. Households that use gas heating save more (16%) than those with electric heating (8%). For every dollar invested in weatherization, $1.01 is generated in energy benefits.[13] A typical weatherization program includes wall insulation, ceiling insulation, air sealing, heating system replacement, and refrigerator replacement (for electrically heated homes).[14]
- Weatherization also generates $2.78 in non-energy benefits for every $1 invested in weatherization assistance.[15] These benefits result from economic growth within communities, reductions in the environmental impact, and improvements in the safety and health of the family residing in the weatherized homes.
- A less comprehensive approach of air sealing and adding insulation also can achieve cost savings. The average homeowner can save 15% on heating and cooling costs by air-sealing their homes and adding insulation to attics and floors over basements and crawl spaces.[16] The estimated heating and cooling savings vary by climate zone and range from 7% in the South (climate zone 1) to 20% in the North (climate zone 4c).
- The U.S. Department of Energy estimates that insulating hot water pipes can generate energy savings of 3% to 4% annually.[17] There is also the benefit of shorter wait times when running water from the shower or a faucet, thus reducing water usage.

FIGURE 2: INCREASES IN THE ENERGY EFFICIENCY OF HOUSEHOLD APPLIANCES, 1981-2013



Equipping homes with energy-efficient systems, appliances and lighting contributes to large reductions in energy costs.

- Installation of higher-efficiency heating and cooling equipment can reduce energy use by 50% for electric heating and cooling systems and 10% for gas furnace heating systems.[18]
- The heating and cooling equipment, however, must be properly installed and commissioned, otherwise performance problems can lead to a 30% increase in annual energy consumption.[19]
- Running ductwork through conditioned spaces reduces annual cooling energy usage by up to 17% and required cooling capacity and peak cooling demand by up to 24%.[20]
- With expanding federal efficiency standards, home appliances have increasingly become more energy efficient over the past few decades, while becoming less costly (see Figure 2).[21] This means that equipping homes with newer models of appliances, especially refrigerators, can reduce energy consumption.
- Estimates indicate that a global transition to highly efficient lighting, such as light-emitting diodes, or LEDs, and away from incandescent bulbs can substantially reduce greenhouse gas emissions, offsetting the emissions of nearly 700 coal-fired power plants for a year.[22]

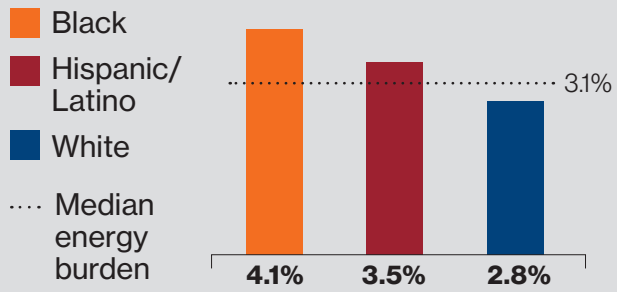
Locating homes closer to places of employment or public transportation substantially reduces the number of vehicle miles driven and greenhouse gas emissions.

- For every dollar a working family saves on housing, it spends 77 cents more on transportation, as most families locate far from their workplace in search of lower-cost housing.[23]
- Locating homes closer to transportation hubs, jobs and amenities through transit-oriented development, or TOD, reduces the number of vehicle miles driven and, consequently, traffic congestion and air pollution.
- Residents who live close to TODs in Washington, D.C., and Baltimore, Maryland, reduced the number of vehicle miles traveled by 38% and 21%, respectively, compared with residents of non-TOD areas with similar land use patterns.[24]
- In metropolitan Chicago, greenhouse gas emissions within one-half mile of rail public transportation were 43% lower than the regional average, and the emissions in central business districts — areas that generally have the highest concentrations of transit, jobs, housing and related destinations — were 78% lower than regional averages.[25]

The racial gap in improving energy efficiency

Compared with white households, Black households, particularly those with low incomes, suffer higher rates of energy poverty, paying significantly more in energy costs as a share of their household income.[26] Their energy burden, along with that of Hispanic/Latino households, greatly outpaces that of white households, being 43% higher for Black households and 20% higher for Hispanic/Latino households (see Figure 3).[5] The higher energy poverty of Black and Hispanic/Latino households can partly be attributed to the history of racist housing policies that relegated these households, especially Black households, to low-resource neighborhoods. Black households, in particular, are more likely to live in older, energy-inefficient and structurally deficient homes with outdated appliances and defective energy systems.[27] These homes require more energy to heat and cool.

FIGURE 3: ENERGY BURDENS BY RACE AND ETHNICITY



Key barrier to improving the energy efficiency of Black and Hispanic/ Latino populations

An inability to afford energy-efficient appliances or make necessary upgrades restricts Black and Hispanic households from living in energy-efficient homes.

- Black and Hispanic/Latino households have less disposable income and wealth to afford the high upfront costs of improving the energy efficiency of their home or purchasing a newer, more energy-efficient home. Compared with the average white household, the average Black or Hispanic/Latino household earns about half as much and holds 15% to 20% as much net wealth.[28]
- Access to credit is limited, and when Black and Hispanic/Latino households do access credit, they are more likely to face high-cost loans, even when controlling for credit score and other risk factors.[29]
- Some evidence suggests that Black households are 3% less likely to receive a rebate or tax credit for upgrading their appliance as compared with their white counterparts.[26]
- Black and Hispanic/Latino households are more likely to be renters[30–32] and unable to make the necessary energy efficiency upgrades.

How Habitat for Humanity responds

- Habitat mortgage payments consume no more than 30% of a homeowner's income. Habitat meets this goal by offering financial packages composed of affordable and forgivable loans. By offering an affordable mortgage, Habitat lowers the cost of homeownership and makes it easier for future homeowners to access quality housing.
- Habitat builds new homes sustainably, using green building techniques and materials that increase the energy efficiency of the home and use less resources. Many homes are Leadership in Energy and Environmental Design, or LEED, and Energy Star certified.
- Habitat equips newly constructed homes with appliances that have earned the Energy Star label and exceed the strict energy efficiency specifications set by the U.S. Environmental Protection Agency.

- Habitat's repair programs offer longtime homeowners the opportunity to affordably address acute housing maintenance problems and improve the quality of their homes. This work ranges from exterior maintenance issues to more structural problems requiring significant repairs, such as roofing repairs and HVAC system repairs that lower utility costs, which are typically the second greatest monthly expense after mortgage payments.
- Habitat advocates at all levels of government for programs and policies that support new construction and rehabilitation of affordable homes; increase access to affordable mortgages; optimize land use regulations for affordable homes; promote investment and homeowner and renter stability in revitalizing neighborhoods; and increase affordability in healthy, well-resourced communities. These policies help homeowners reduce their housing cost burdens and free up financial resources to invest in energy-efficient features that reduce greenhouse gas emissions.
- Habitat also advocates to expand public resources for programs that help lower-income homeowners make needed repairs and improve energy efficiency.

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everyone

needs a place to call home

A Habitat for Humanity U.S. Research and Measurement Team evidence brief

Habitat for Humanity®

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