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Consumer Federation of America

U.S. Consumer Attitudes Toward Appliance Efficiency Standards and Purchasing Behaviors by Income, Race, and Homeownership

OCTOBER 2022

Summary

This Issue Brief serves to inform the U.S. Department of Energy (DOE) and policymakers that there is widespread public support for federal appliance energy efficiency standards across key U.S. demographic groups. Supporting evidence is derived from a nationally-representative survey of 4,000 U.S. adults that asked about consumer attitudes towards national appliance standards and payback periods, and revealed new data on appliance purchasing decisions by race, income, and homeownership.[1] More stringent energy efficiency standards will benefit all consumers through energy bill savings.

Survey results indicate high levels of public support for federal energy efficiency standards. Among all respondents, 76% said they support standards. Among different demographic subsets broken out by race, income, and homeownership status, support remained high, ranging from 72% to 82%. Support remains strong in response to questions about support for efficiency standards with different payback periods. The survey showed that 71% of respondents support standards within a three-year payback period and 64% within a five-year payback period. A majority of all respondents, 54%, support standards within a ten-year payback period.

Consumer appliance purchasing behaviors illustrate a large opportunity for more stringent standards to benefit all Americans, including low-income households, households of color, and renters. According to the data collected, Americans are replacing major appliances at regular intervals. Nearly 70% of respondents had a major appliance replaced[2] within the past five years, including 60% of low-income respondents and renters. Half of all appliance replacements were due to product failure, underscoring the need for stronger standards, especially to address an emergency replacement situation when a consumer is more likely to purchase a product that is available immediately and less likely to make energy efficiency a high priority. Low-income renters and low-income households of color are the least likely demographic groups to have a major appliance replaced in their home, highlighting a need to develop or expand programs to better target these communities.

Finally, our results demonstrate a clear need for additional research on the used appliance market. Low-income, Black, and renter households are at least 50% more likely than the general population to replace a major appliance with a used product. More research on the size and growth trajectory of the used appliance market and consumer purchase behaviors and decision-making is needed to design appropriate interventions that benefit the most vulnerable consumers.

1. The CARAVAN omnibus survey was administered digitally by Big Village between July 29 and August 10, 2022.

2. We define a major appliance as one of the following: refrigerator, clothes washer, water heater, or major heating equipment.

Background and Purpose

DOE's national energy efficiency standards program has saved Americans billions of dollars on their utility bills—$500 per household, on average, every year by 2030.[3] The program is projected to save $2 trillion cumulatively and to prevent 8 billion tons of carbon dioxide pollution by 2030.[4] Advances in technology mean that significant additional savings are achievable with assistance from both new and updated efficiency standards.[5]

In July 2022, CFA[6] and CLASP[7] commissioned a survey of a demographically-representative sample[8] of 4,032 U.S. adults to measure public support for federal appliance efficiency standards and payback periods, and to gather fresh data about consumers' purchasing behaviors, e.g. the reason for their purchase, whether it was new or used, and how important energy efficiency was in decision-making. Respondents were asked specifically about refrigerators, clothes washers, water heaters, and major heating systems/ equipment, as these appliances are typically found in U.S. households, have an average lifespan of ten years or more, and generally involve significant costs, i.e. purchase price, installation charges and relatively high energy consumption.

The data were reviewed in the aggregate and by demographic subgroups: income (low or middle & high),[9] race/ethnicity (White, Black, Hispanic, Asian),[10] and homeownership status (homeowner or renter).

Low-income households, households of color, and renters are more likely to live in older, less energy-efficient housing with less efficient appliances,[11,12,13,14] and live in areas with less access to efficient appliances and equipment.[15] These situations contribute to a higher energy burden—where low-income households pay a disproportionately greater percentage of their income on utility bills.[16]
A household's energy burden is one of the key indicators to measuring energy insecurity—that is, the inability to adequately meet basic household heating, cooling, and energy needs over time. This multidimensional problem reflects the confluence of three factors: inefficient housing and appliances, limited economic resources, and coping strategies that may lead some residents to dangerously under-heat or under-cool their homes.[17] Responding to the needs of low-income households, households of color, and renters presents an opportunity for appliance energy efficiency
standards to alleviate high energy burdens and energy insecurity.[18]

3. U.S. Department of Energy, "Saving Energy and Money with Appliance and Equipment Standards in the United States." 2016.

4. U.S. Department of Energy. "Saving Energy and Money with Appliance and Equipment Standards in the United States." U.S. Department of Energy.

5. Mauer, J., & deLaski, A. A Powerful Priority: How Appliance Standards Can Help Meet U.S. Climate Goals and Save Consumers Money. American Council for an Energy Efficient Economy and Appliance Standards Awareness Project.

6. The Consumer Federation of America is an association non-profit consumer organization that was established in 1968 to advance consumer interest through research, advocacy, and education.

7. CLASP serves as the epicenter of collaborative, ambitious efforts to mitigate climate change and expand access to clean energy through appliance energy performance and quality.

8. The raw data are weighted by a custom program that automatically develops a weighting factor for each respondent based on the respondent's specific combination of age, sex, geographic characteristics, race, and education in order to reflect the demographic composition of the 18+ population, per U.S. Census data. Please see the supporting document titled *Methodology and Data Tables* for more.

9. We define low-income households as households reporting a total household income of less than $50,000 before taxes (roughly 180% above the federal poverty level for a household of 4). We define middle- and high-income households as those reporting a total household income above $50,000 before taxes.

10. We define respondent's race/ethnicity if they select only one of the following options White non-Hispanic, Black/African American non-Hispanic, non-White Hispanic, or Asian and no other race. We define households of color as respondents who identified their race or ethnicity as Black (non-Hispanic), Hispanic (non-White), and Asian and no other race.

11. Brown et al., "High Energy Burden and Low-Income Energy Affordability."

12. Xu and Chen, "Energy Efficiency and Energy Justice for U.S. Low-Income Households."

13. Wang et al., "Racial Disparities in Energy Poverty in the United States."

14. Carliner, "Reducing Energy Costs in Rental Housing: The Need and the Potential."

15. Reames, Reiner, and Stacey, "An Incandescent Truth."

16. Drehobl, A., L. Ross, and R. Ayala. "How High are Household Energy Burdens?" Washington, DC: American Council for an Energy-Efficient Economy.

17. Hernández, D., Y. Aratani, and Y. Jiang. "Energy Insecurity among Families with Children". New York: National Center for Children in Poverty, Columbia University Mailman School of Public Health.

18. Drehobl et al. "How High Are Household Energy Burdens?"

Our research questions[19] address the following:

- The extent of support for appliance energy efficiency standards compared to prior surveys in 2011[20] and 2018[21];
- Changes in levels of support with different payback periods—the time it takes for utility bill savings to pay for the incremental cost increase in the appliance purchase price associated with the technology utilized to meet the higher energy efficiency standard, e.g. three, five, and ten years. (After the payback period, the homeowner breaks even and continues to enjoy lower energy bills; renters who pay the utility bill benefit immediately.);
- Consumer behaviors regarding the replacement and purchase of major appliances, including the specific household product replaced, the reason for replacement, and if the replacement appliance was new or used;
- The importance of energy efficiency in major appliance purchase decisions.

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19. A full list of survey questions is available in *Annex A: Methodology and Data Tables.*https://www.clasp.ngo/research/all/us-consumer-attitudes-survey/.
20. Cooper, Mark. "Public Attitudes Toward Energy Efficiency and Appliance Efficiency Standards: Consumers See the Benefits and Support the Standards."
21. Cooper, Mark. "Public Attitudes Toward Energy Efficiency and Appliance Efficiency Standards: Consumers See the Benefits and Support the Standards."

Attitudes Toward Efficiency Standards

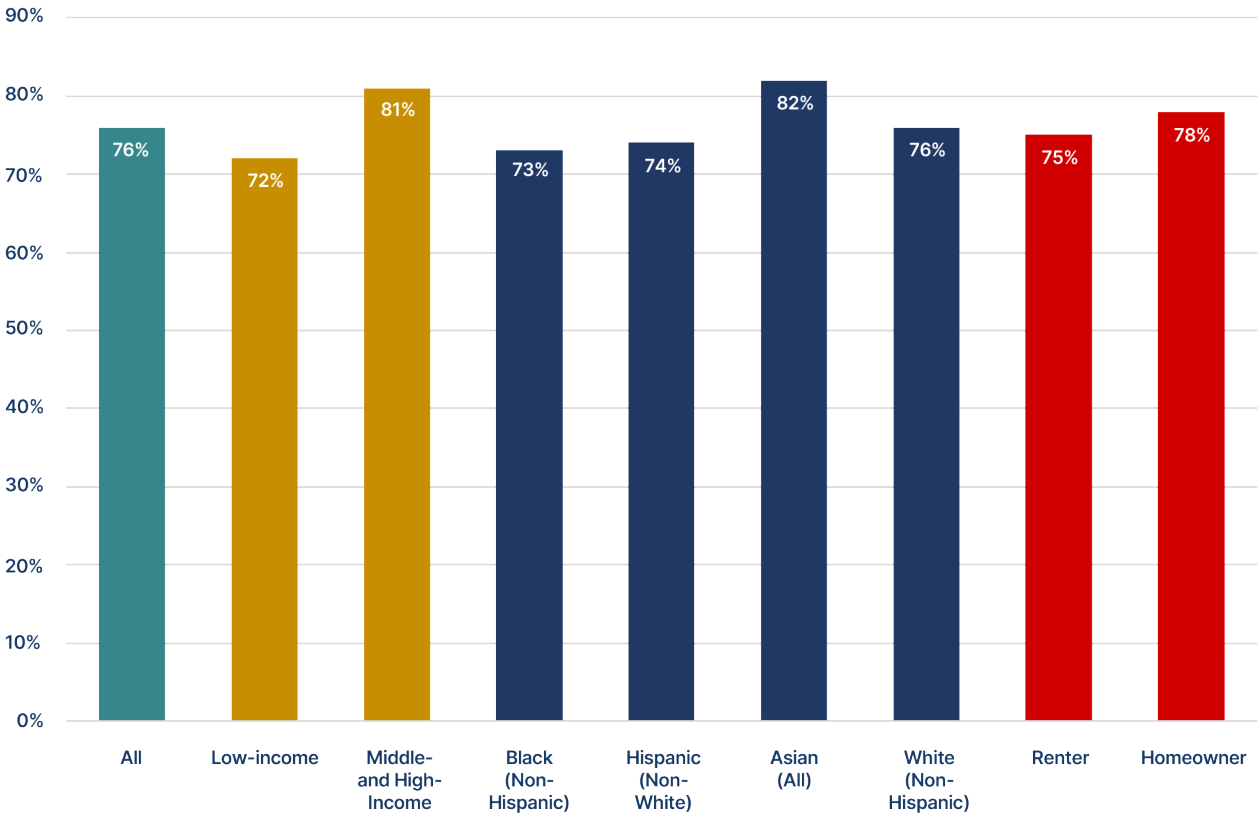
SUPPORT FOR APPLIANCE EFFICIENCY STANDARDS

A significant majority of Americans support the government setting or updating minimum energy efficiency standards (Figure 1: 76% favor, 39% favor strongly). The support for efficiency standards is consistent across the demographic variables of income, race[22] and homeownership status. Public support for standards has remained high over the last decade, with previous surveys asking the same question conducted in 2011 and 2018 showing support levels of 72% and 71%, respectively.

Consumers across demographics recognize the importance of energy efficiency, with three-quarters of Americans consistently supporting the federal government setting or updating minimum efficiency standards.

FIGURE 1. SUPPORT FOR FEDERAL APPLIANCE ENERGY EFFICIENCY STANDARDS

Sorted by Income, Race, and Homeownership Status (Renter vs. Owner)



Note: We define support as the proportion of respondents that replied "strongly support" and "somewhat support".

22. Asian support for standards is statistically higher compared to all respondents; there are no other significant differences in either bivariate and multivariate analyses.

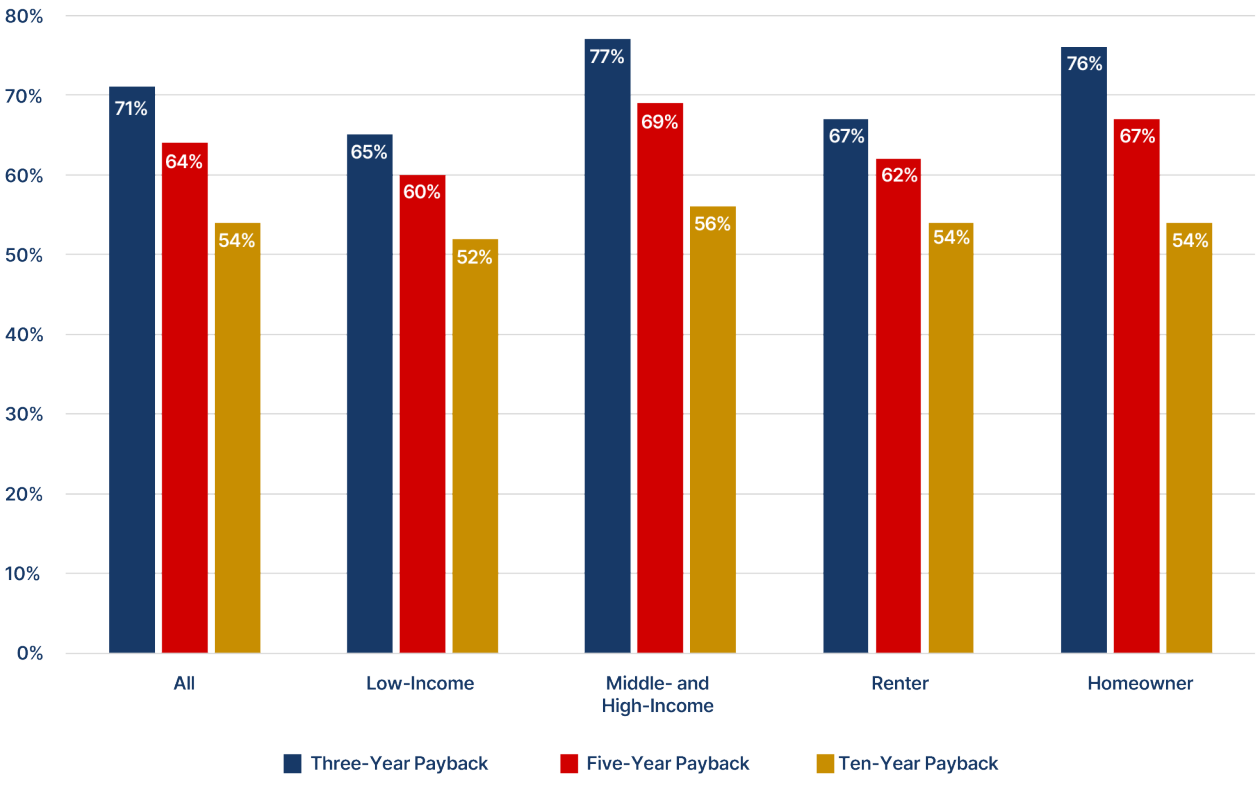
ATTITUDES TOWARD PAYBACK PERIODS

The initial purchase price of an appliance may increase as a result of energy efficiency improvements. To determine if consumers would accept a higher 'first cost' for an appliance, knowing that savings on utility bills would eventually pay for the efficiency technology and that they would save money after being 'paid back', we asked respondents about their level of support for standards within three-year, five-year, and ten-year payback periods.

A strong majority of consumers support appliance energy efficiency standards with three and five year payback periods. There is a slightly lower, but still a clear majority, level of support for a ten-year payback period. For a three-year payback period: 71% favor with 29% favoring strongly; for five-years, 64% favor with 25% favoring strongly; and for ten-years, 54% favor with 22% favoring strongly (Figure 2). A majority of consumers support appliance efficiency standards at all three payback periods, but there is stronger support for shorter payback periods. While there is no statistical difference between the level of support between three-year and five-year payback periods, there is a statistically significant difference in support for both three- and five-year payback periods compared to ten-years. It is noteworthy, however, that a large majority of consumer products with DOE efficiency standards have payback periods under five years. The few appliances with payback periods longer than five years are the largest consumer appliances whose average lifetime is fifteen years or more, e.g., furnaces and central air conditioners.

FIGURE 2. SUPPORT FOR APPLIANCE EFFICIENCY STANDARDS WITH THREE, FIVE, AND TEN YEAR PAYBACK PERIODS

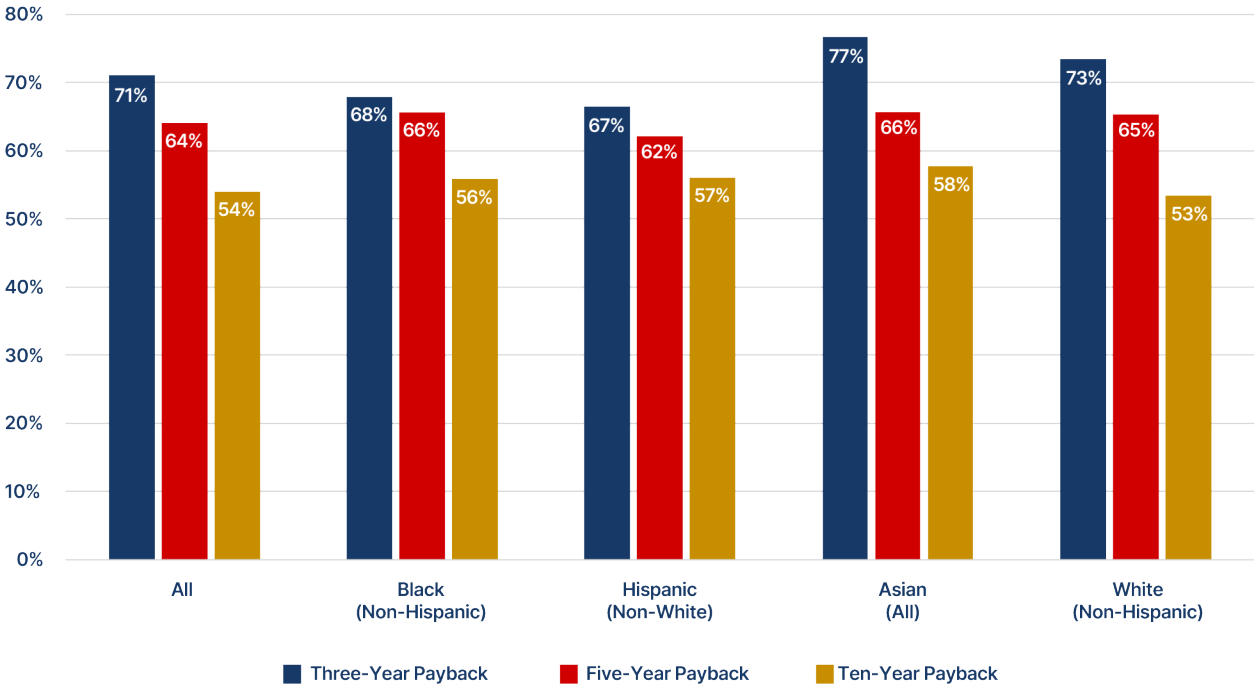
Sorted by Income and Homeownership Status (Renter vs. Owner)



Note: We define support as the proportion of respondents that replied "strongly support" or "somewhat support".

FIGURE 3. SUPPORT FOR APPLIANCE EFFICIENCY STANDARDS WITH THREE, FIVE, AND TEN YEAR PAYBACK PERIODS

Sorted by Race



Note: We define support as the proportion of respondents that replied "strongly support" or "somewhat support".

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Consumer Behavior

APPLIANCE REPLACEMENTS

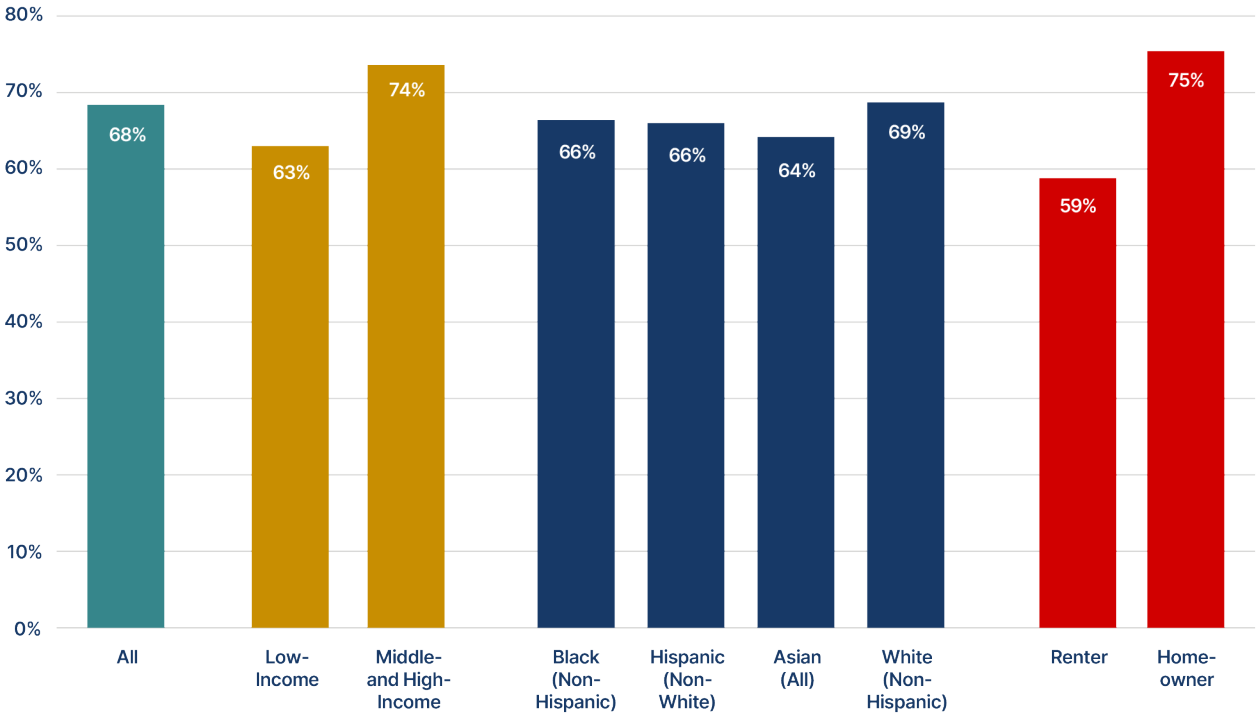
68% of consumers have had at least one major appliance replaced in their home within the last five years (Figure 4). Low-income respondents are significantly less likely to have had a major appliance replaced compared to the national average. Low-income renters are the least likely economic group to have had an appliance replaced in their home, with 58% of respondents reporting a major appliance replacement in their home within the past five years. Renters have little control over the appliances and equipment in their dwelling unit and many live in multi-family buildings with centralized space and water heating equipment. Similarly, low-income Black, Hispanic, and White respondents are also less likely to have had a major appliance replaced in their home, with 59%, 60%, and 63% of respondents reporting replacements, respectively.

When income is not taken into consideration, the difference in proportion of appliance replacements does not vary significantly by race.

While low-income and renter respondents are less likely to have had an appliance replaced in their home, the majority of households reported at least one major appliance replacement. This finding has implications for appliance efficiency standards impacts. DOE has not updated standards for residential refrigerators, clothes washers, water heaters and furnaces in at least ten years.[23] It is encouraging that active rulemakings are currently underway. Considering and/or raising standards without unnecessary delay will ensure that products on the market in the future will deliver additional energy and cost savings to low-income households, renters, and other households with a high energy burden.

FIGURE 4. PERCENTAGE OF RESPONDENTS THAT HAVE HAD AT LEAST ONE MAJOR APPLIANCE REPLACED WITHIN THE LAST FIVE YEARS

Sorted by Income, Race, and Homeownership Status (Renter vs. Owner)



Note: This study defines a major appliance as a refrigerator, clothes washer, water heater or major space heating equipment/system.

23. ASAP, "National Standards."

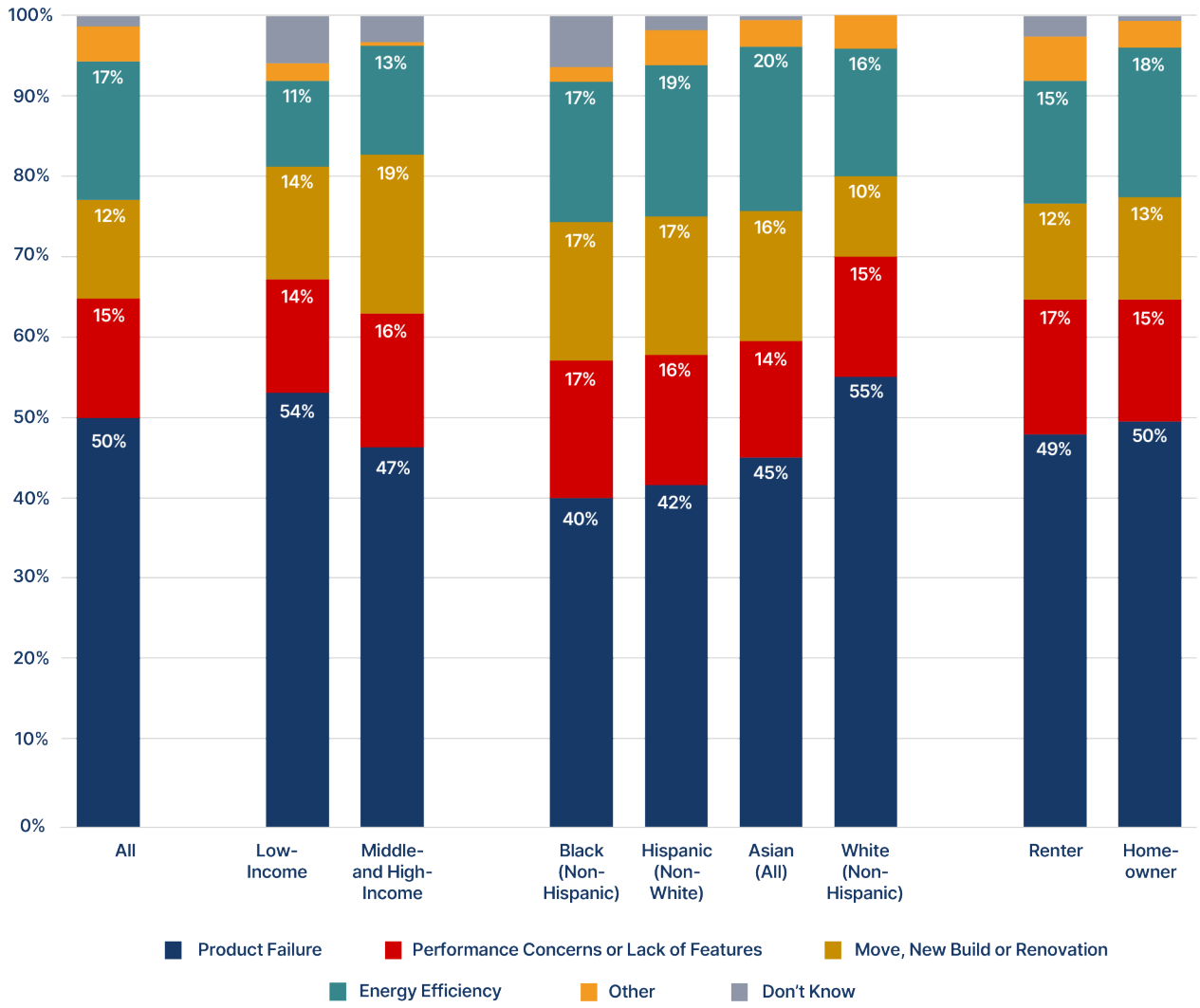
REPLACEMENT REASON

Among all refrigerator and clothes washer replacements in the past five years, 50% were due to product failure (Figure 5). Low-income renter respondents are the most likely demographic group to wait to replace their refrigerator or clothes washer until it fails. When a major appliance fails, the purchaser wants to find a replacement as quickly as possible. They are less likely to factor energy efficiency heavily in their purchase decision. More stringent standards ensure that the replacement appliance, even in an emergency situation, will be more efficient than one that wastes energy unnecessarily due to outdated standards.

Many respondents, including low-income respondents, have had a major appliance replaced before it failed, presenting a large opportunity for energy efficiency programs beyond national standards. 50% of appliance replacements made in the last five years were due to a reason other than failure, e.g. performance features or concerns, renovation, or poor energy efficiency (Figure 5). This trend is relatively consistent across demographic groups, including households of color and renters. In these scenarios, buyers may be more likely to consider a product's efficiency when making a purchase or take time to research or consider utility, state, or federal incentives for efficient appliances.

FIGURE 5. MAJOR REASON FOR PRODUCT REPLACEMENT (REFRIGERATORS AND CLOTHES WASHERS)

Sorted by Income, Race, and Homeownership Status (Renter vs. Owner)



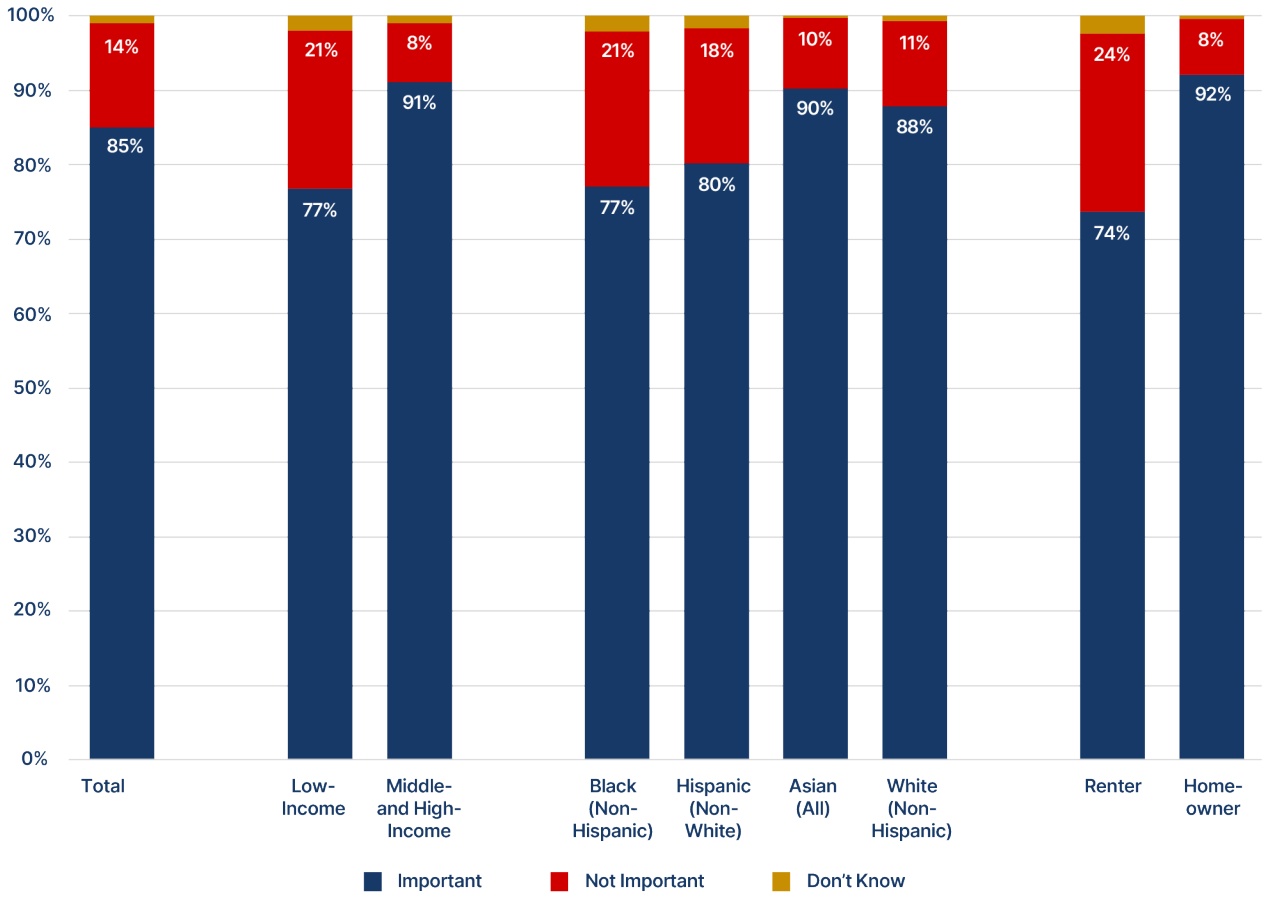
REPLACEMENT APPLIANCE CONDITION (NEW VS. USED)

85% of the appliances replaced in the past five years were replaced with a new product. However, a surprising proportion of replacement products were purchased used, particularly among low-income households, households of color, and renters (Figure 6). Low-income Black, Hispanic, and renter respondents are significantly more likely to purchase a used appliance, with 28%, 25%, and 26% of all appliances replaced were reported as used, respectively. The larger share of used appliances among low-income and renter households is likely due to their lower cost. Used appliances are often heavily discounted compared to their original purchase price, making them more accessible to households with limited discretionary funds and appealing to some landlords looking to replace appliances in rentals with the most economical option in the short term.

Our results suggest that the used appliance market in the United States is large. Of all of the major appliances replaced over the last five years, 17% of washing machines, 15% of refrigerators, and 7% of water heaters were replaced with a used product. Data on the used appliance market in the US are limited, but trends for the global market show it grew by nearly 6% in 2018, with refrigerators and clothes washers making up the largest share of the market at 14% and 11%, respectively.[24] The increasing popularity of digital marketplaces like Craigslist, OfferUp, and Facebook Marketplace, coupled with rising online sales and supply chain disruptions for new products due to the COVID-19 pandemic, may be lowering the barriers to finding and purchasing used appliances.[25]

FIGURE 6. CONDITION OF REPLACEMENT APPLIANCE (REFRIGERATORS, CLOTHES WASHERS, AND WATER HEATERS)

Sorted by Income, Race, and Homeownership Status (Renter vs. Owner)



24. Research Nester Pvt. Ltd, "Global Second Hand Appliances Market Outlook 2025."

25. Staebe et al., "Covid-19 Catapults White Goods Makers into the Digital Future."

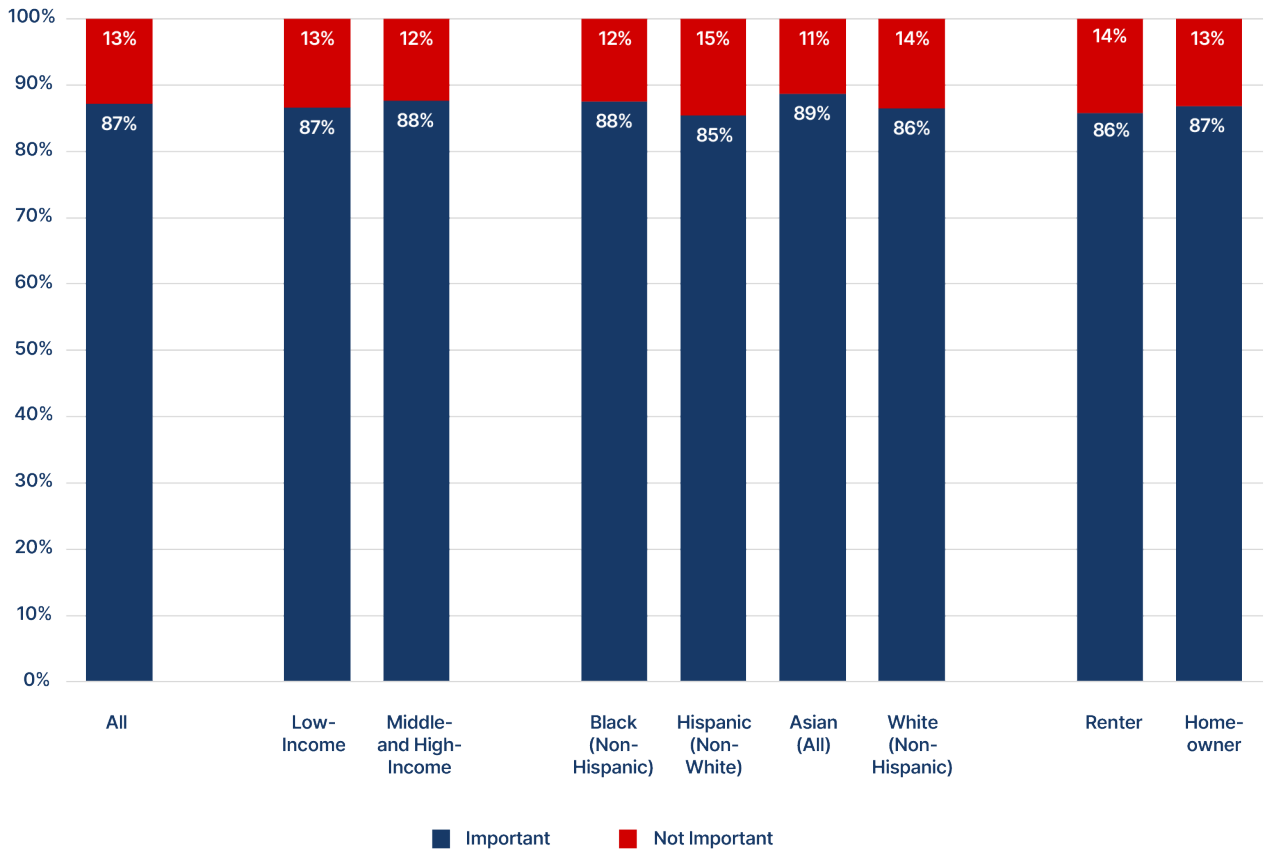
THE ROLE OF ENERGY EFFICIENCY IN APPLIANCE PURCHASING DECISIONS

While energy efficiency is not a leading reason for replacement, the vast majority of respondents (87%) considered it an important factor when they last purchased a major appliance (Figure 7). The relative importance of energy efficiency in appliance purchasing decisions does not vary significantly by income, race or homeownership.

Nearly 90% of respondents that replaced a major appliance indicated that energy efficiency was an important factor in their purchase decision.

FIGURE 7. IMPORTANCE OF ENERGY EFFICIENCY IN LAST MAJOR APPLIANCE PURCHASE

Sorted by Income, Race, and Homeownership Status (Renter vs. Owner)



Note: We define energy efficiency as an important factor in a respondent's last major appliance purchase if they indicated it was "very important" or "somewhat important" in their decision.

Recommendations

The U.S. Department of Energy (DOE) must meet its legally binding deadlines provided under the National Appliance Energy Conservation Act (NAECA) of 1987 for updating appliance efficiency standards in a timely manner. Our findings show strong support for federal energy efficiency standards and that energy efficiency was an important factor during the last major appliance purchase. This should encourage DOE to update existing standards as technology advances and, when warranted, to implement new standards for products not currently covered; otherwise, inefficient products will remain on the market, leading to unnecessary energy waste, higher operating costs, and increased pollution. Updating efficiency standards will be particularly beneficial for households dealing with a high energy burden which can lead to energy insecurity.

Expand appliance efficiency outreach efforts and incentivize efficient appliance purchases, especially among low-income households and households of color. These demographic groups are more likely to be renters and have little influence over appliance purchase decisions or the efficiency of their home. State and local governments, utilities, non-profits, and consumer advocacy groups should aggressively promote opportunities for savings to both homeowners and landlords available through federal funding and programs—e.g. the Inflation Reduction Act, ENERGY STAR, efficient appliance rebate programs, and sales tax holidays for efficient appliances—to help mitigate the disproportionately high energy burden experienced by low-income households, households of color and renters.

Conduct additional research on the used appliance market in the United States. 14% of major appliance replacements made in the past five years were used products. Approximately 20% of low-income households, households of color, and renters had a major appliance replaced in their homes with a used product. Our findings suggest that there is a sizable secondhand market in the US that effectively extends the lifetime of appliances and could impact the cost effectiveness calculations of standards, but data is limited. DOE, utilities, non-profits, and research institutions should fund or undertake research to better understand its size, growth trajectory, and demographics. Efforts should also characterize purchasing behaviors, including the types of appliances and equipment that were purchased used, and where those sales are made (e.g., Craigslist, social media marketplaces, appliance repair shops, etc.). Upon further research, energy efficiency programs should determine if there are effective methods to 'disincentivize' the resale of the most inefficient major appliances nationally. Existing examples include utility 'Cash for Appliances' recycling programs and the Environmental Protection Agency's Responsible Appliance Disposal (RAD) Program for air conditioners, dehumidifiers, refrigerators, and standalone freezers.[26]

Conclusion

Energy efficiency is an important factor for consumers when purchasing an appliance, and the public strongly supports appliance efficiency standards. With the knowledge that higher energy efficiency may increase the purchase price of an appliance but will be offset by reduced energy bills over time, the public remains supportive of standards. Consumer support has been consistent over the last decade and across all demographic groups.

Our data on consumer appliance purchasing behaviors shows that two-thirds of Americans have had at least one major appliance replaced in the past five years. Replacement of appliances necessitates more stringent standards to remove inefficient products from the market to benefit all Americans, including low-income households, households of color, and renters, by ensuring that future purchases are energy efficient.

26. US EPA, "Responsible Appliance Disposal (RAD)."

Acknowledgements and Citation

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