# University of Michigan Energy Survey

Results through April 2014

John DeCicco, Diego Horna Muñoz and Lisa Neidert

University of Michigan
Energy Institute and
Institute for Social Research

August 2014


www.energy.umich.edu


www.home.isr.umich.edu

## Preface

This report is the third in a series that summarizes regular findings from the University of Michigan Energy Survey, a joint project of the University of Michigan Energy Institute (UMEI) and Institute for Social Research (ISR). Launched in October 2013 as a quarterly rider on the Thomson Reuters / University of Michigan Surveys of Consumers ("SCA"), the U-M Energy Survey is an independent effort made possible through discretionary seed funding and in-kind support by UMEI and ISR. This report's authors constitute the analytic team. The design, development and testing of the survey were led by Ting Yan and Florian Keusch of ISR and included contributions by Patrick Shields and Michael Sadowsky of ISR and Bruno Vanzieleghem of UMEI. The authors are also grateful to a number of individuals at U-M and other organizations for guidance and input as acknowledged in the initial Energy Survey report,[1] which can be referenced for additional background.

## Table of Contents

# University of Michigan Energy Survey

Results through April 2014

## Introduction

What do American consumers really think about energy? That's a very broad question and one commonly examined through the lens of matters of concern to energy companies, policymakers and other interests with a professional stake in the subject. But to really understand consumers' perceptions and beliefs about energy, the topic must be explored in terms of the aspects of energy that directly affect individuals' lives. It is also crucial to respect the fact that most consumers lack expert knowledge of the subject and therefore understand energy mainly through how it meets everyday needs and otherwise touches their personal concerns.

Just such an approach is taken in the University of Michigan Energy Survey. This report summarizes analyses of data collected through the first three sets of interviews conducted for the survey, which is applied as an 18-question rider on the university's long-running Surveys of Consumers (SCA).[2] First executed in October 2013, the U-M Energy Survey runs quarterly in January, April, July and October of each year. The findings presented below reflect data from the interviews conducted in October 2013, January 2014 and April 2014, including both comparative and combined results from these first three samples. Further information about the design and methodology can be found in the initial report[1] on Energy Survey and results based on the first two samples can be found in the second report.[3]

The Energy Survey's growing data base strengthens the notable findings first reported. We have increasing statistical confidence in the relatively high degree of concern consumers have about the impact of energy on the environment, which they worry about just as much as they worry about how well they can afford their energy bills and fuel costs. The data also consistently show that consumers express a greater degree of concern about increases in the price of gasoline than they do about higher home energy bills.

As elaborated below, a number of other findings were consistent across the three samples and so see their significance strengthened in the combined sample that pools the October 2013, January 2014 and April 2014 data. In other cases, we found similar patterns throughout the three

samples and, although the differences were not large enough to be statistically significant in any single sample, the pooled sample yielded significant results and therefore sheds light on some of the issues. Such cases include the regional variability of the belief about the degree to which energy affects the environment; how often consumers say they reduce their energy use for environmental reasons; and the degree of concern about the environmental impact of energy by self-reported knowledge of energy. We find a hint of seasonal and energy price volatility effects that may reflect the higher prices experienced for some fuels and some regions over the past winter. Thus, for several items, we are finding greater statistical power while for others the analysis is only suggestive and must await additional data.

## Degree of Concern about Energy-Related Issues

The April 2014 sample further strengthens one of the most notable findings from the October 2013 and January 2014 samples, namely, that respondents are at least as concerned about the effect of energy on the environment as they are about the affordability of energy. Results on the degree of concern about these two issues did not differ significantly across the three samples taken to date and with the combined sample (pooling data from the October, January and April surveys) the error bars narrow (Figure 1 on next page).

According to the combined sample results, 59 (±3) percent of consumers worry a great deal or a fair amount on the environmental impact of energy while 54 (±3) percent have the same level of concern about the affordability of energy. The results seem to be trending toward a somewhat greater degree of concern about the environment than about affordability, but the difference is not yet significant at the 95% confidence level. On the other hand, respondents remain less concerned about reliability; only 31 (±3) percent of them claimed to worry at least a fair amount on the reliability of their energy according to the combined sample results.

## Energy Affordability

Home energy bills and gasoline expenditures are two main items that comprise typical American households' energy budgets. Therefore, to probe consumers' notions of energy affordability, we focused on these two items. Consumers were asked separately about the dollar amount at which home energy bills and gasoline prices respectively would be seen as unaffordable, meaning cost so much that respondents believe they would have to make changes in their energy or fuel use or

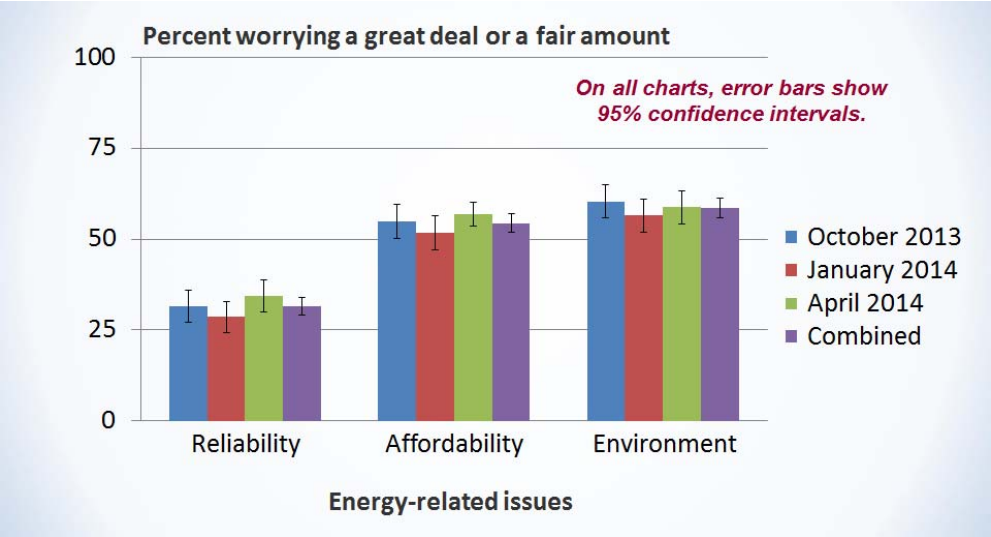


Figure 1. American consumers' energy-related concerns

other aspects of household activity. These responses were compared with the costs that consumers were currently experiencing for these items. To make such comparisons for gasoline, we used the national average price during the month of each survey sample as the point of reference. For home energy, we used consumers' self-reported energy bills as the point of reference. Consumers were also asked about how high, in dollars, they thought home energy bills and gasoline prices would be five years from now.

Answers to these sets of questions allowed us to compute the percentage by which gasoline prices and home energy bills would have to increase in order to be seen as unaffordable. The responses also enable us to estimate the fraction of consumers who implicitly view current energy costs as unaffordable (i.e., we did not ask that question specifically, but rather compared respondents' answers about the levels they said they would consider unaffordable to the current energy costs that they reported).

In the previous report when comparing the January 2014 to the October 2013 responses, we found a notable drop in the average percentage increase in home energy bills that consumers would consider unaffordable and discussed how that change appears to have been related to the seasonally higher home energy bills that many consumers experienced in January relative to October. In April, the percentage increase at which home energy bills would be viewed as

unaffordable remained relatively steady but there was a decline in the percentage price increase at which respondents thought that gasoline would be considered unaffordable.

**Views on the price of gasoline**

Based on the combined responses from the three samples, on average U.S. consumers believe that gasoline would become unaffordable if it reached $5.89 (±0.16) per gallon. In the October 2013 and January 2014 samples, respondents believed that gasoline would become unaffordable if it reached around $5.95 a gallon. In April, the average response to the same question dropped to $5.77 a gallon. This drop in the estimated threshold of unaffordability is not statistically significant, but it does affect our calculation of the relative increase in price that consumers would find unaffordable.

Figure 2 shows a plot of weekly data for the national average gasoline price[4] along with bars giving the average price for the survey months. (The latter was computed as the average for regular gasoline over the 4-week period that best matched the period when each set of interviews was conducted, which typically starts toward the end of the calendar month prior to the nominal month of the SCA sample.) As the figure shows, in October 2013 consumers had recently seen declining gasoline prices; in January 2014, prices had been fairly stable for the prior three

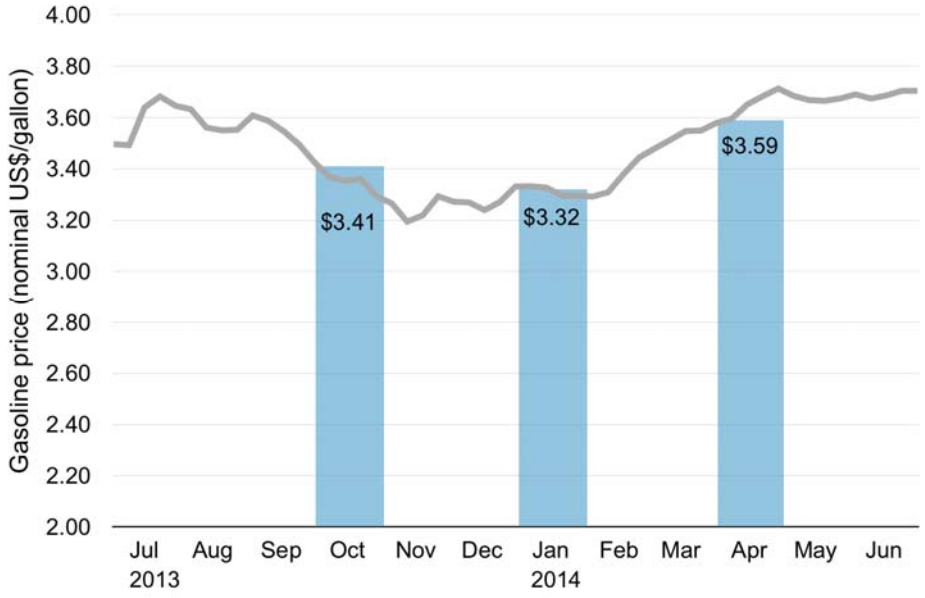


Figure 2. U.S. average retail gasoline price: weekly average (curve) and 4-week average during survey months (bars). Source: EIA[3]

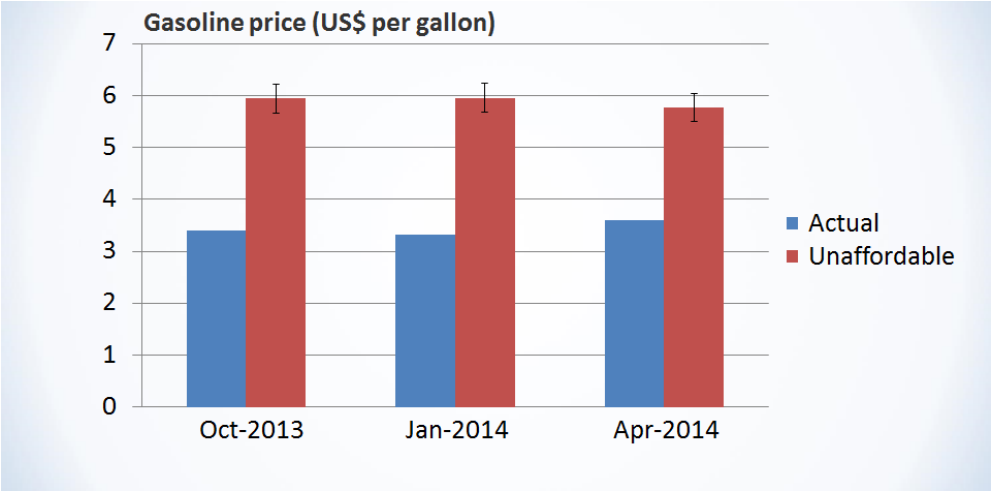


Figure 3. Gasoline prices that consumers consider unaffordable compared to actual gasoline prices the month a survey sample was taken

months; however, by April gasoline prices had been rising.

The ratio of the price that respondents consider unaffordable and the actual average gasoline price when the interviews were conducted represents, in relative terms, the degree of price increase that consumers believe they could not afford (i.e., so high that they would have to change how they travel or otherwise modify their activities). As shown in Figure 3, the average gasoline price that consumers consider unaffordable did not vary significantly across the three samples. However, the percentage increase deemed unaffordable (as derived from the data) declined in light of the higher gasoline prices experienced in April 2014 compared to the prices in October 2013 and January 2014. For the first two samples, the implied degree of increase averaged 84%, but for the April sample it was roughly 60% due to the higher actual level of the base gasoline price and the drop (which was not statistically significant) in the average price that respondents said would be unaffordable. Based on responses over the three samples, consumers on average would view a 75% increase in the price of gasoline as unaffordable.

When asked how they thought gasoline prices would change over the next five years, April 2014 respondents reported an average expectation of $4.22 per gallon, a level significantly higher than the $3.72 and $3.73 per gallon reported by respondents of the January 2014 and October 2013 surveys, respectively. These consumer views contrast with government projections of slightly declining gasoline prices; for example, the current *Annual Energy Outlook* projects an

average gasoline price of $3.38 per gallon five years from now (in 2019).[5] Combining consumers' price expectations with their views on the price they consider unaffordable enables us to compute the share of the population that implicitly expects gasoline to become unaffordable in five years. This works out to roughly 23% of consumers for the April 2014 data, a share notably higher than the 12% obtained for both the October 2013 and January 2014 samples.

**Home energy costs**

The average self-reported monthly energy bill of $202 based on the April 2014 sample was not significantly different from the $208 average based on the January 2014 sample. As would be expected for bills during the heating season, both of these values are significantly higher than the $170 average from October 2013. The average for the three samples combined is $193 (±9).

On the other hand, consumers' estimates of how high their home energy bills would have to get to become unaffordable did not change significantly. The average dollar amount stated in response to the question about energy bill unaffordability remained fairly steady over the three samples and averages $406 (±33) for the combined sample. Thus, in spite of seasonal differences in the actual bills as reported when they were interviewed, consumers appear to hold consistent views about home energy cost level they consider unaffordable. This finding about consumers' consistently stated threshold of unaffordability for home energy bills is similar to the consistency seen in the gasoline price that they say would be unaffordable, and it will be interesting to see how these findings hold up over time.

Figure 4 compares the implied percent increases in home energy bills that consumers consider unaffordable to the percent increases in gasoline prices that they consider unaffordable. As was the case for gasoline prices, the average absolute (dollar) level of energy bills seen as unaffordable did not change significantly; however, because consumers' bills increased from October into the winter months, there was a decrease in the implied percentage increase needed for energy bills to become unaffordable. The October 2013 survey indicated that a home energy bill increase of around 170% (by factor of 2.7) would be considered unaffordable. But compared to the higher energy bills reported in January and April 2014, a relative increase of roughly 125% (factor of 2.25) would be considered unaffordable. For the combined sample, the implied threshold of unaffordability is roughly 140%. That value can be compared to the roughly 75% increase in gasoline prices that consumers on average consider unaffordable. Therefore, as seen

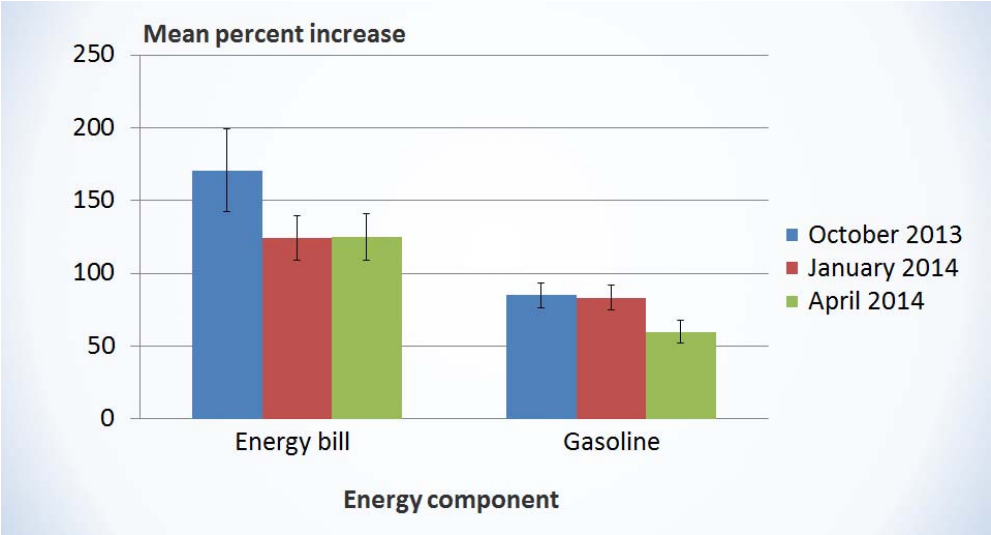


Figure 4. Degrees of increase in home energy bills and gasoline prices that consumers consider to be unaffordable

in previous U-M Energy Survey results, consumers appear to be about twice as tolerant of higher home energy bills than they are of higher gasoline prices.

Consumers were also asked about the how high they believe their home energy bills will become in five years. The responses average out to an expected increase of roughly 30%, a value that has remained fairly consistent throughout the three survey samples. Analyzing responses about the expected increase in home energy bills in conjunction with those on the degree of increase considered unaffordable enables us to compute the share of consumers who implicitly expect their energy bills to become unaffordable in five years. This fraction averages roughly 20% overall.

## Breakdowns by household income and home status

Our analysis includes cross tabulations of the responses by several control variables, including self-reported income, home status (referring to renter vs. owner tenure and self-reported property value for homeowners), geographic region and self-reported knowledge of energy. In general, responses on the reliability and affordability of energy varied by income and home status, resulting in findings as summarized here.

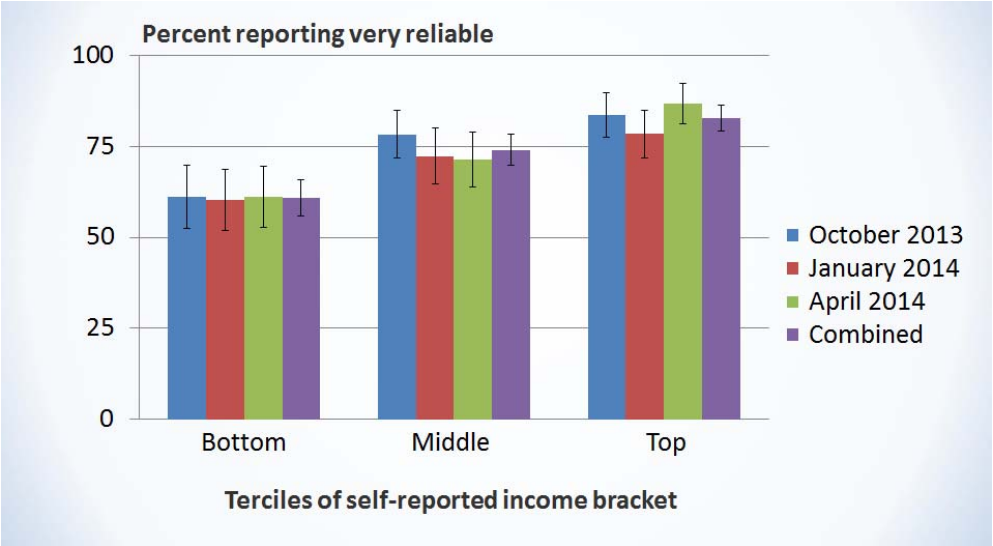


Figure 5. Consumer perceptions of energy reliability by income

**Views on energy reliability**

Concerns about reliability were found to stratify inversely to household income, for which we used tercile of self-reported income as the classification variable. Based on the combined sample, 43 (±5) percent of consumers in the bottom income tercile, 30 (±4) percent of the middle income tercile and 20 (±4) percent of the top income tercile said that worry a great deal or a fair amount about the reliability of energy.

We found a similar stratification by income tercile when examining only the fraction of respondents who said that their energy was very reliable. Results from each of the three samples and the combined sample are shown in Figure 5. The combined sample results are that 61%, 74% and 83% of consumers in the bottom, middle and top income terciles, respectively, consider the energy they use to be very reliable. The combined average across all terciles is that 72% of consumers believe that energy is very reliable.

Cross-tabulating by home status, the share of renters and share of homeowners in the bottom tercile by property value who consider their energy to be very reliable appears smaller than the corresponding share for homeowners in the middle and top property value terciles. However, the data do not yet reveal differences significant enough to show a stratification by property value tercile as clear as that seen by income tercile.

**Views on energy affordability**

Consumers' degrees of concern about how well they can afford the cost of energy also depend on income, a finding that is also in line with expectations. In this case, no statistically significant difference was found in the fractions of bottom and middle income tercile households who say they worry a great deal or a fair amount about the affordability of energy, which are 63 (±5) percent and 56 (±5) percent, respectively. However, both are significantly higher than the 44 (±4) percent of top income tercile consumers who report the same degrees of concern. Although the bottom and middle income responses have not differed statistically, they have been ordinally consistent in that all samples to date yield fractions for the middle income tercile between those for the bottom and top terciles. If this pattern is maintained, the differences between the three income categories are likely to become statistically significant as data accumulate.

A similar trend occurs for the percent increase in home energy bills that consumers of different incomes say they would deem unaffordable. As shown in Figure 6, the average percent increase that top income tercile consumers consider unaffordable is significantly higher than that for middle and bottom income households. Compared to the roughly 140% increase in home energy bills when averaged over all respondents, the degree of increase considered unaffordable is 102 (±18) percent for consumers in the bottom tercile, 126 (±16) percent for consumers in the

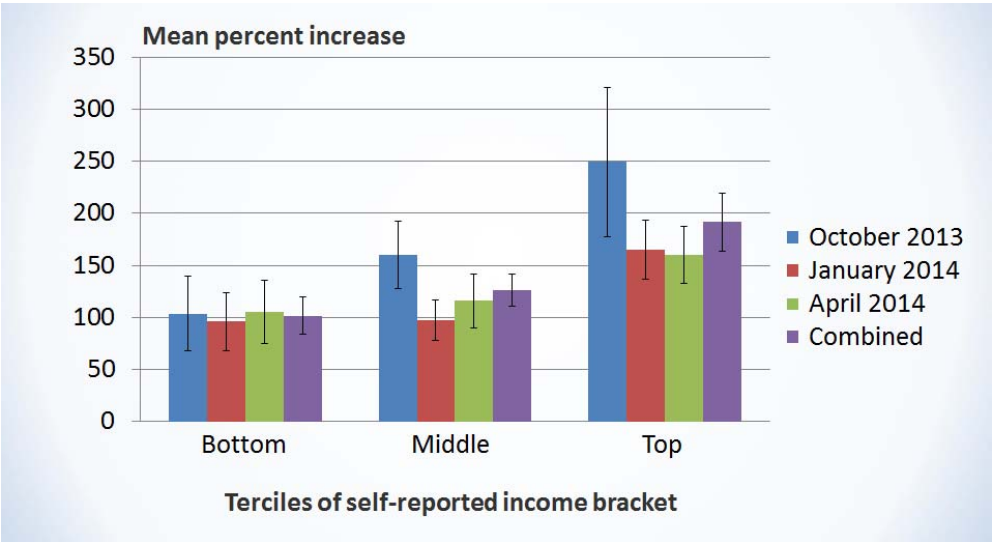


Figure 6. Percent increase in energy bill that would be unaffordable, by income

middle tercile and 192 (±27) percent for consumers in the top tercile according to self-reported household income (all of these estimates reflect combined sample results). In round numbers, lower income tercile consumers believe that energy bills would be unaffordable if they were to double, but for upper income tercile consumers energy bills would have to triple before they are considered unaffordable. Analogous patterns (not shown) hold when comparing responses on this topic by home status.

Consumers' expectations about how much their energy bills will increase over the next five years also varies by income and home status. According results from the combined sample, respondents in the top tercile by self-reported household income expect their energy bills to rise by 26 (±3) percent within five years in contrast to the 38 (±6) percent increase expected by respondents in the bottom tercile. A similar pattern is seen when cross-tabulating the responses by home tenure and terciles of the homeowners' self-reported property values, with those in the top tercile expecting a smaller percentage increase in their energy bills than homeowners in the bottom tercile and renters.

In keeping with these results, the share of consumers who implicitly expect their energy bills to reach unaffordable levels in five years declines as self-reported household income rises. Figure 7 shows these results for each of the three samples and the combined sample. Using the

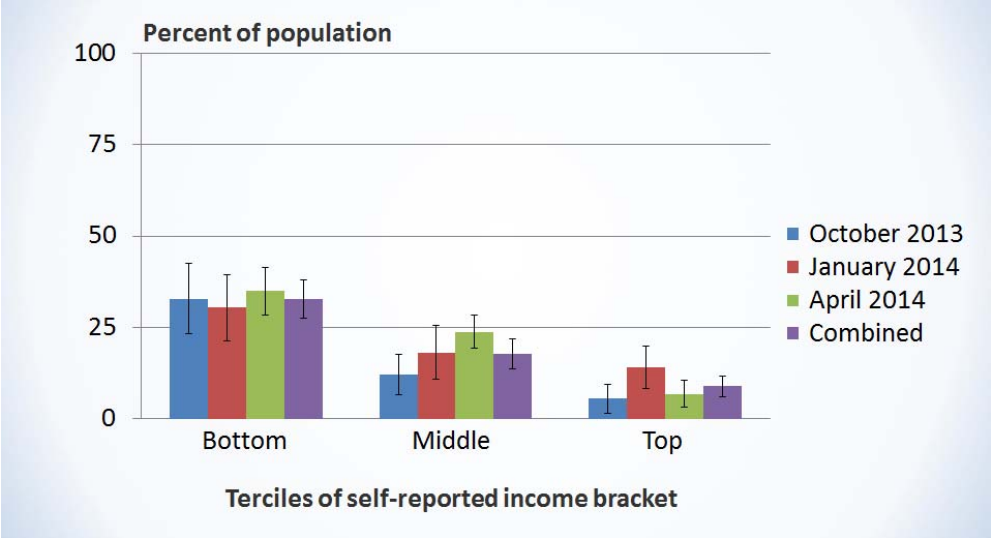


Figure 7. Fraction of U.S. consumers who expect their home energy bills to become unaffordable in five years by income tercile

combined sample, 33 (±5) percent of respondents in the bottom income tercile, 18 (±4) percent in the middle tercile and 9 (±3) percent in the top tercile expect their home energy bills to reach a level that they would consider to be unaffordable. Again, we found similar patterns when analyzing the responses by home status.

For gasoline, the price considered unaffordable by consumers in the top income tercile averages $6.56 per gallon, which is roughly $1.00 per gallon higher than the level stated by consumers in the middle and bottom income terciles, which did not differ significantly from each other and averaged $5.54 per gallon. Comparing respondents' gasoline price expectations to the levels they consider unaffordable, we estimate that 22 (±5) percent of bottom income tercile consumers implicitly expect gasoline to become unaffordable for their households in five years while only 8 (±3) percent of consumers in the top income tercile expect so.

## Classification findings by region and self-reported knowledge of energy

Significant differences across regions and self-reported knowledge were found for only a few topics, but where such differences were seen the implications are interesting.

Consistently for the U-M Energy Surveys taken to date, close to three-quarters of respondents say that energy affects the environment a lot or a fair amount. Although responses on this topic have not differed significantly by income or home status, the combined sample now reveals regional differences. As shown in Figure 8, relatively fewer consumers in the South say that they believe that energy affects the environment by at least a fair amount than in the West and Northeast. The difference between the 69 (±4) percent of respondents from the South and 77 (±4) percent from the Midwest is not statistically significant. Nevertheless, the South has consistently reported a lower numerical average than other regions for the fraction of consumers who say that they believe that energy affects the environment by at least a fair amount. If this pattern is maintained in future samples, the difference between the South and the Midwest is likely to become statistically significant.

Regarding concerns about reliability, electricity consistently has been the source of energy that consumers say they had in mind. However, the share of consumers who think mainly about electricity when it comes to reliability is larger in the South than it is in the Northeast. Such a result is consistent with the South having a greater reliance on electricity than the Northeast, where a relatively more households have natural gas.

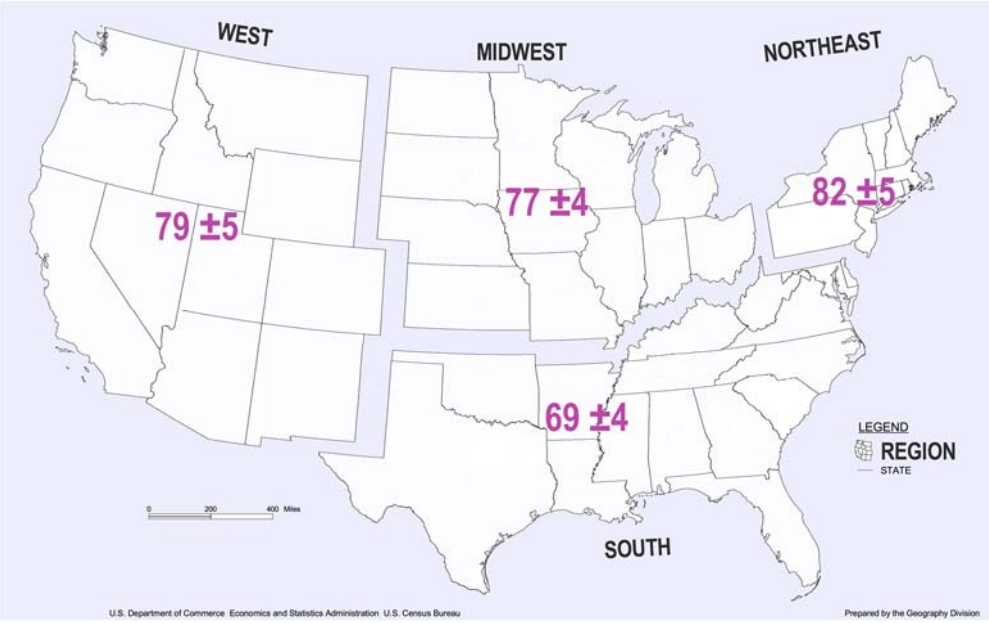


Figure 8. Percent of U.S. consumers who believe energy affects the environment a lot or a fair amount, by region

One of the 18 questions asked in the U-M Energy Survey is how much knowledge consumers say they have about energy. In the combined sample that pools the Oct. 2013, Jan. 2014 and April 2014 data, 59(±3) percent of the respondents say that they feel they know at least a fair amount about energy issues, a fraction that has not varied significantly across the samples. This self-assessment by the respondents is useful when examining attitudes and behaviors regarding energy costs and energy conservation. Analyzing the responses by this classification variable did not reveal significant patterns with the single-month samples, but statistical significance is now emerging in the combined sample.

Figure 9 shows that more respondents who self-identify as knowledgeable about energy issues say that they worry at least a fair amount about the environmental impact of energy than those who do not self-identify as knowledgeable; the combined sample results are 62(±3) percent versus 53(±4) percent, respectively. Although this pattern was evident in each of the three single-month samples, the difference did not become statistically significant until the data were pooled into the combined sample.

Those that consider themselves knowledgeable about the energy issues are also significantly more likely to reduce energy for environmental reasons, with combined sample

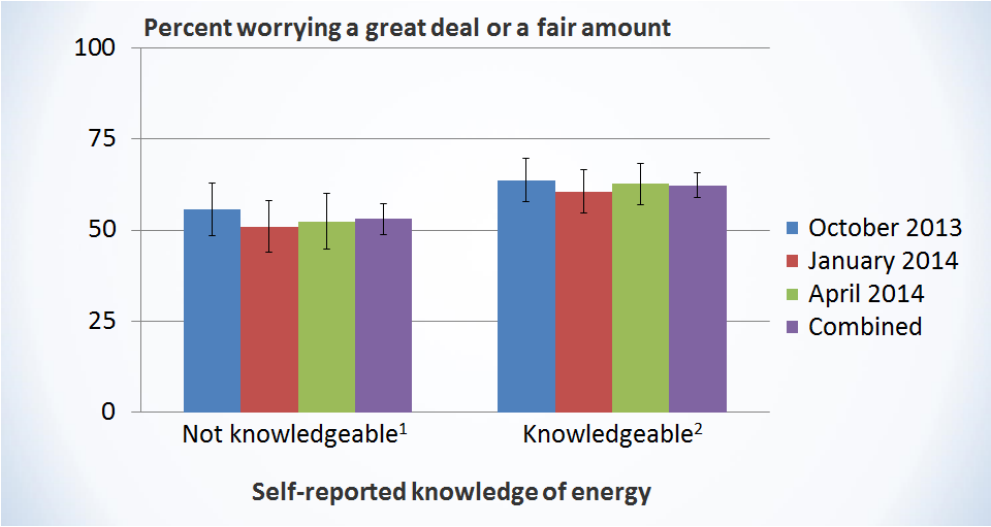


Figure 9. Percent worrying a great deal or a fair amount about energy's impact on the environment, by self-reported knowledge of energy
(1) Respondents who said they knew a little or nothing about energy
(2) Respondents who said they knew a fair amount or a lot about energy

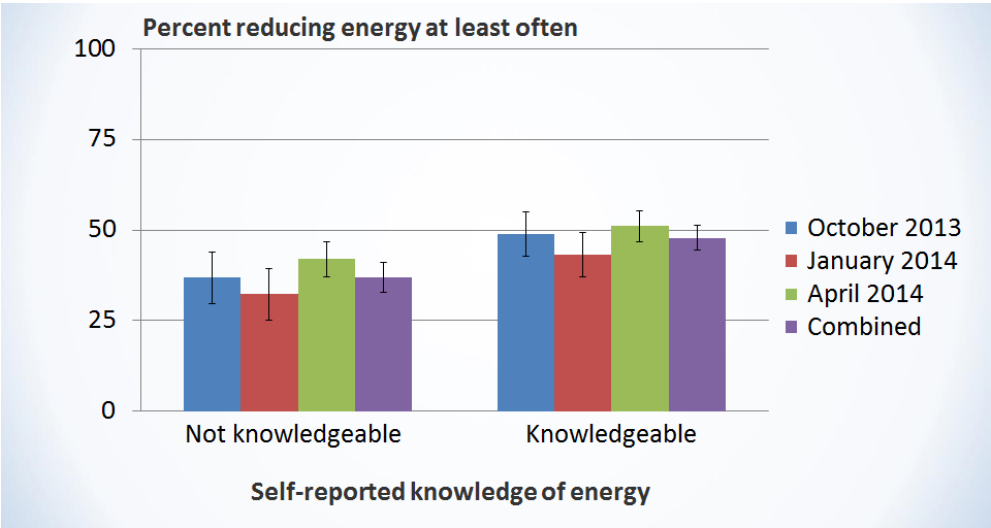


Figure 10. Percent reducing energy at least often for environmental reasons by self-reported knowledge

shares of 47(±3) percent versus 37(±4) percent, respectively, as shown in Figure 10. This difference was also statistically significant in the April sample. These results hint at some relation between concern and action among consumers who deem themselves knowledgeable about energy. It appears that such consumers worry more about the impact of energy on the

environment and that they also are more likely to say that they translate this concern into action by reducing their energy consumption because of environmental concerns.

Respondents who consider themselves to be knowledgeable about energy tend to be in the top tercile by income and homeowners in the top tercile by property value (figures not shown). As seen above when we discussed the findings about how much such costs would have to rise before being viewed as unaffordable, these more well off respondents seem to believe that they can better absorb higher energy bills and fuel prices. Nevertheless, respondents who say that they are relatively more knowledgeable about energy are also more likely to reduce their energy usage for cost reasons, with combined sample shares of 54 (±3) percent versus 44 (±4) percent, respectively. This result is consistent with the finding that those who consider themselves knowledgeable about energy worry more about its affordability than those who do not consider themselves as knowledgeable, 58 (±3) percent versus 49 (±4) percent, respectively.

Although the U-M Energy Survey asks a variety of attitudinal questions about energy, the self-reported assessment of knowledge about energy issues is the only attitudinal variable among our controls. All of the other classification variables are based on demographic measures (region of residence, household income, and home tenure and value). As further data come in it seems likely that they will reveal additional associations between self-described knowledge of energy issues and other energy-related beliefs.

## Conclusion

The U-M Energy Survey data gathered through April 2014 confirm key findings from the first two samples of Oct. 2013 and Jan. 2014. Moreover, new findings are coming to light on the basis of the pooled data set that combines data from the three samples. Notable findings that have been confirmed include:

- American consumers consistently say that they worry about the impact of energy on the environment at least as much as they worry about its affordability.
- Consumers worry much less about the reliability of energy than they do about its affordability and impact on the environment.
- On average, U.S. consumers believe that gasoline would become unaffordable if it were to reach roughly $5.89 per gallon, a level that is about 70% higher than the U.S. average gasoline price of $3.44 per gallon for the months the survey was taken.

- Consumers on average believe that a home energy bill of roughly $400 per month would be unaffordable for their households, a level about 110% higher than (a bit more than double) the average self-reported energy bill of roughly $190 per month.
- Consumers appear to be notably more sensitive to increases in the price of gasoline than they are to increases in their home energy bills.

Although the degrees of concern about reliability and affordability vary according to tercile by household income and by home tenure and property value, concern about the impact of energy on the environment remains uniform across these variables. Moreover, the consistency (within the limits of statistical significance) in the dollar levels of gasoline prices and home energy bills that consumers see as unaffordable have held up in spite of the variations in pump prices and the seasonal changes in home energy bills over the months the surveys were taken.

Among the notable new findings that have emerged through analysis of the larger sample size based on three sets of survey data are that:

- Consumers in the lower tercile by income say home energy would become unaffordable if their bills were to double on average, but for consumers in the upper tercile by income, home energy bills would have to triple before they would be seen as unaffordable.
- Respondents in the South are less likely to believe that energy affects the environment by at least a fair amount than those in the West and Northeast.
- Respondents who consider themselves to be relatively more knowledgeable about energy issues tend to be more concerned about the impact of energy on the environment.
- Respondents who consider themselves more knowledgeable about energy also say that they are more likely to conserve energy for reasons of both cost and impact on the environment.

As we cross-tabulate the accumulating Energy Survey data using our several classification variables we are seeing hints of other relationships, and it seems likely that some of these will become significant as additional data are gathered and analyzed in the months ahead.

**ENDNOTES**

[1] University of Michigan Energy Survey, initial report (published March 2014), access via http://www.energy.umich.edu/research/projects/university-michigan-energy-survey

[2] Thomson Reuters/University of Michigan Surveys of Consumers, http://www.sca.isr.umich.edu/

[3] University of Michigan Energy Survey, Results through January 2014 (published June 2014), access via http://www.energy.umich.edu/research/projects/university-michigan-energy-survey

[4] U.S. Energy Information Administration. "U.S. Gasoline and Diesel Retail Prices," accessed 13 July 2014. www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm/; all prices in nominal US$ dollars.

[5] U.S. Energy Information Administration. *Annual Energy Outlook 2014*, Table A3, "Energy Price by Sector and Source," Reference Case nominal price projections, accessed 27 July 2014 via www.eia.gov/forecasts/aeo/.