Appendix A: Energy Cost Analysis: American Community Survey versus Alaska Retrofit Information System Data

Overview

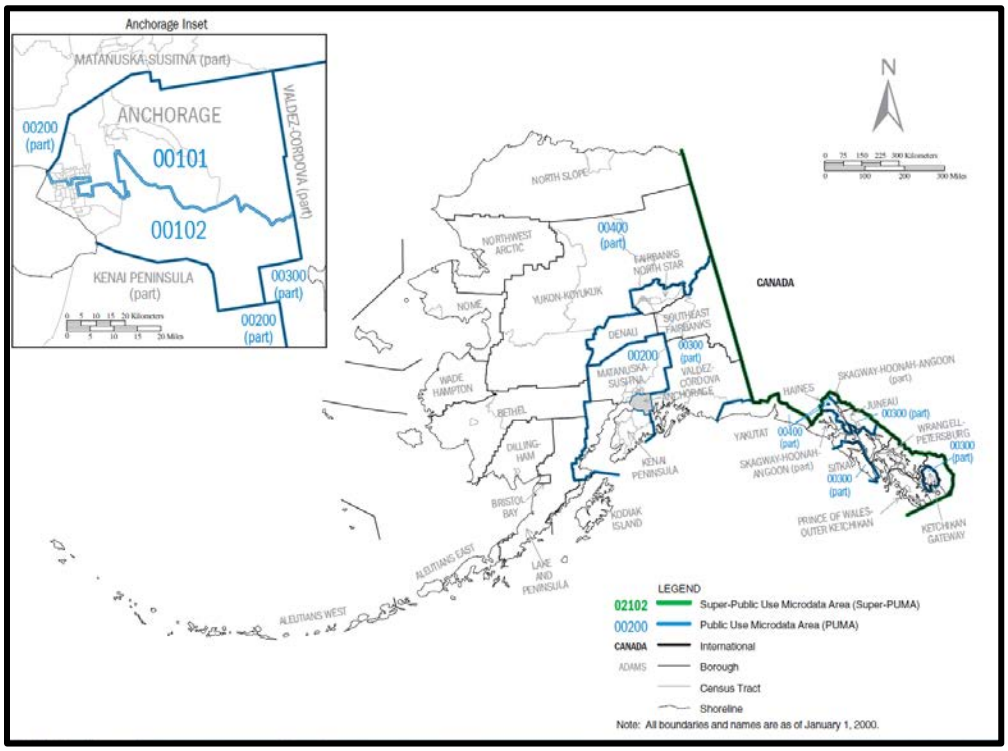
Two sources of available data for energy costs were used in this assessment. As part of the American Community Survey (ACS), data are collected on residents' costs for mortgages, rents, taxes, fees, utilities and fuels to report combined total housing costs for both the homeowner and renter populations. The Alaska Retrofit Information System (ARIS) database contains estimated home energy costs from more than 112,800 AkWarm energy ratings across Alaska at 85,800 unique addresses. A discrepancy between the energy cost estimates provided by these two different datasets was first highlighted in the 2014 Housing Assessment. The discovery of the discrepancy was prompted by the relatively low estimates of cost-burdened housing in rural Alaska, which contradicted anecdotal evidence highlighting the high cost of living and the lack of strong cash economies in many of these areas. Further analysis found that while the Anchorage energy cost estimates were similar in the two datasets, the ACS energy cost estimates for rural Alaska were the same or lower than Anchorage, which seemed unlikely given the colder climates and much higher cost of fuel in rural areas. The 2010–2014 five-year ACS estimates used in the 2018 Housing Assessment also reported low levels of housing cost-burden in many rural areas, and so a similar analysis of the data was conducted and is detailed in this appendix.

Both the ACS and ARIS data sets are important for fully evaluating housing challenges in Alaska. Each cover different aspects of the overall situation faced by homeowners and renters, and each represents the best data available on statewide and subregional areas of Alaska for the data they cover.

Public Use Microdata Sample Analysis

The ACS data are reported for housing costs only in aggregate at the community, census area, ANCSA region and statewide levels. In order to analyze the ACS energy cost data separately from all ACS housing cost data, the U.S. Census Bureau's Public Use Microdata Sample (PUMS) data was used. The PUMS data contain the individual household responses to the ACS survey, but no individual locations are associated with the responses. Unlike the ACS aggregate data, all individual survey responses in the PUMS data for the state of Alaska are divided into five Public Use Microdata Areas (PUMA), shown in Figure A-1 below. The five areas are defined as follows: (1) North Anchorage; (2) South Anchorage; (3) the Matanuska-Susitna and Kenai Boroughs; (4) urban areas connected to road, rail or marine highway; and (5) rural off-road areas.

Figure A-1: Alaska's public use microdata areas



Using the PUMS data, an analysis was completed on a subset of all occupied housing units in Alaska except homes that had utilities included in the price of rent, because the energy costs cannot be split out for these homes. In Table A-1 these estimates of average annual energy cost for each PUMS area costs are compared with the annual energy cost estimates calculated using data from the ARIS database following the 2018 Housing Assessment methodology.[1]

[1] Housing assessment costs use fuel and utility prices reported in January 2017. PUMS costs are in 2016 dollars; they were converted using the 2016 Consumer Price Index available at https://www.bls.gov/cpi/researchseries_allitems.pdf

Table A-1: Estimates of average annual energy cost from ACS and ARIS for single family units

SINGLE FAMILY					
PUMA Code	PUMA Description	Housing Units	PUMS Ann. Energy Cost	ARIS Ann. Energy Costs	Percent Difference
101	North Anchorage	26,378	$3,224	$3,368	4%
102	South Anchorage	40,264	$3,410	$3,368	-1%
200	Mat-Su / Kenai Peninsula	45,250	$3,485	$3,850	10%
300	Fairbanks North Star Borough, urban southeast, on road system / marine highway	42,724	$4,418	$4,979	13%
400	Rural off road system	24,770	$4,619	$4,530	-2%

The estimated energy costs for each region are fairly similar between the two datasets (the ARIS data was not separated into north and south regions for this analysis) with the largest discrepancy being in the Interior / Urban Southeast Public Use Microdata Area (PUMA), where the 2018 Housing Assessment analysis showed an energy cost that was approximately 13 percent higher than the PUMS estimates. Overall, the discrepancy between the estimates from the two datasets has decreased significantly since the 2014 Housing Assessment. For example, the current differences between the Interior/Urban Southeast PUMA and the Rural PUMA are 13 percent and 2 percent, where the difference in 2014 was 188 percent and 154 percent, respectively.

Table A-2 shows the multifamily energy cost comparison between the ARIS dataset and the PUMS estimates. These numbers show a larger discrepancy between the PUMS estimates and the ARIS numbers, with the energy modeling estimates from the ARIS dataset being significantly higher than the PUMS numbers for multifamily housing units.

Table A-2: Estimates of average annual energy cost from ACS and ARIS for multifamily housing units

MULTIFAMILY				
PUMA Code	PUMA Description	PUMS Ann. Energy Cost	ARIS Ann. Energy Cost	Percent Difference
101	North Anchorage	$1,569	$2,560	63%
102	South Anchorage	$1,644	$2,560	56%
200	Mat-Su / Kenai Peninsula	$1,773	$2,807	58%
300	Fairbanks North Star Borough, urban southeast, on road system / marine highway	$2,357	$3,615	53%
400	Rural off road system	$2,061	$3,520	71%

The sample size of multifamily units in both the ACS PUMS data and the ARIS data are significantly smaller than the single-family sample, which may be influencing these results.

Discussion

In 2014 there was a significant difference between the ACS Public Use Microdata energy cost estimates and those developed from AkWarm energy ratings using the 2014 Housing Assessment methodology. The difference between these two data sets for single-family housing in Alaska has decreased significantly, with the 2018 Housing Assessment estimates ranging from 2 percent lower to 13 percent higher than the current PUMS estimates. This suggests that the relatively low levels of housing cost-burdening reported for rural Alaska in the current ACS estimates are not being driven by underestimation of energy costs, as was suggested in 2014. Given the high costs of building and maintaining housing in remote areas of Alaska and the typically lower median incomes found in these areas, it is likely that the housing cost-burden numbers do not include the full societal costs. U.S. Census Bureau staff members previously had indicated that the housing costs are all reported by respondents, and no subsidies are extracted from the reported costs.[2] Thus the low cost-burdening estimates in rural Alaska may be because any subsidies, such as from the Low Income Heating Assistance Program, Housing Choice Vouchers, Native American Housing Assistance and Self-Determination Act, etc. are reducing costs to residents.

There are still significant differences between the ACS and Housing Assessment multifamily estimates, with the 2018 Housing Assessment estimating annual energy costs to be approximately 53 to 71 percent higher than the ACS PUMS estimates. The relatively low sample sizes in each of these data sets may be contributing to these large differences.

[2] Christy, James T., regional director, Los Angeles Region, U.S. Census Bureau. Personal communications, June 12 and September 9, 2015.

Another potential cause of this large difference in estimated energy cost is from discrepancies related to utilities being included in the rent. Housing units that indicated utilities were included in the rent were removed from the PUMS analysis; this could cause a difference in estimated energy costs if these units systematically used higher amounts of energy than housing units where utilities were not included in the rent. Additionally, rentals occasionally include some, but not all, utilities in the rent, which could cause problems in the PUMS data if these housing units were classified as not having utilities in the rent.