
Data Sources and Limitations

Introduction

This 2014 Alaska Housing Assessment presents many types of data from various sources, with varying degrees of resolution, reliability, time frames, and methods of calculation. Understanding the limitations of the data's accuracy and generalizability are important for drawing conclusions from this report.

Scope and Data Sources

In 2005 and again in 2009, the Alaska Housing Finance Corporation (AHFC) contracted with the Cold Climate Housing Research Center (CCHRC) to conduct an Alaska Housing Assessment. In both instances, CCHRC partnered with Information Insights. The research method was to conduct phone surveys and use census data to produce information about housing units and types, housing size, housing age, condition of the housing unit, number of occupants, occupant income level, construction costs, population trends, and overcrowding.

In 2012 AHFC contracted with CCHRC to generate another housing assessment. CCHRC's research method for the 2014 Housing Assessment combines information from the Census, American Community Survey (ACS), and Alaska Retrofit Information System (ARIS) to produce housing information relating to general housing and population characteristics, and characteristics of energy, affordability, and overcrowding. Each of these characteristics is reported at the community level (where information is available), census area level, ANSCA level, and statewide level.

ARIS contains the energy rating and assessment files produced as homes pass through AHFC's three home energy efficiency programs—the Home Energy Rebate Program (HERP), the Weatherization Assistance program (Wx), and the Building Energy Efficiency Standard (BEES) for new construction certification program. In these programs, homes receive energy ratings using the AkWarm modeling software to characterize the basic features and construction in addition to their energy performance. Data from the ratings are uploaded into ARIS. In November of 2012 when the data for this study was retrieved, ARIS contained data from over 95,800 ratings and assessments gathered from either pre- or post-energy retrofit homes or from new construction certifications. These ratings and assessments cover more than 71,900 unique locations, approximately 25% of Alaska's roughly 300,000 total housing units and approximately 30% of Alaska's occupied housing stock. The combination of ARIS data and census information from the recently completed 2010 decennial census and 2007 - 2011 American Community Survey 5-year Estimates (ACS) provides a unique tool to assess Alaska's current housing stock.

For this 2014 Housing Assessment, U.S. Census and ACS data provide information on total population, total housing units, income, household size, home age, occupancy, overcrowding, housing costs, and affordability. ARIS rating data provide information on energy use and efficiency, energy costs, building envelope characteristics, air tightness, ventilation, and rates of participation in energy programs. Census and ACS data are reported at all levels of spatial resolution: statewide, ANCSA region, census area, and community or census designated place (CDP). ARIS data is reported at the state, ANCSA region, and

census area level. For communities, ARIS data are reported where there are sufficient records to provide reliable averages and to ensure householder's privacy.

Depending on the amount of data available in a community, ARIS data can be reported at finer levels of resolution. In addition to Census and ACS data, 56 Alaska communities or census-designated places (CDPs) have sufficient data to display current information on housing and energy characteristics (ARIS data) by decade built. A further 118 communities or CDPs have sufficient records to display ARIS data by pre- or post- retrofit status or by new construction status; 114 communities or CDPs had insufficient data to protect householder confidentiality and make statements about housing and energy characteristics.

The combination of information in this assessment is not directly conclusive, with causal links established between the data and outcomes or conclusions. Instead, it is illustrative, providing foundational information to be cited elsewhere, and provides suggestions for areas of future research. It should be noted that all of the data sources used in the assessment have shortcomings. The following sections detail the data limitations and caveats that readers should keep in mind when interpreting the data.

American Community Survey (ACS)

The ACS is a statistically random sample survey conducted every year by the U.S. Census Bureau intending to target 2.5% of the population. While the decennial census counts numbers of people, the ACS gather data on demographic, social, economic, and housing characteristics. Results are released in 1-, 3- and 5-year period-averaged estimates. This report uses the 2007-2011 5-year estimates for Alaska, which is based on an average of 6,243 randomly sampled surveys per year. These surveys are conducted via questionnaires, telephone surveys, and in the case of Rural Alaska, in-person interviews. While the data does have its drawbacks, it is based on a considerably larger sample than the 1,700 telephone surveys conducted in previous versions of the Housing Assessment, and is the most reliable source for much of the demographic information reported in this version of the Housing Assessment.

It should be noted that the ACS data are estimates based on statistical samples and thus have margins of error. The size of the margins of error varies based on the size of the area sampled and the number of households surveyed. The ACS data are reasonably reliable in larger urban areas, but can have large margins of error in small communities due to the smaller sample sizes. For brevity, margins of error are not included with ACS data reported herein, but researchers can use the American Fact Finder website (factfinder2.census.gov) to access the margins of error for particular quantities or contact the Cold Climate Housing Research Center Policy staff for details. In smaller communities where margins of error are of the same order of magnitude as number of housing units in a given decade built, specific, on-the-ground or local knowledge of housing stock is likely more reliable with respect to conclusions about specific numbers of existing units.

CCHRC's analysis of the ACS Public Use Microdata Sample for Alaska also found that the ACS systematically underestimates the energy costs in areas outside of Southcentral Alaska. While these energy costs are not directly reported in this Housing Assessment, they are a part of the estimates of

cost-burdened housing reported at every geographical level. Thus it is likely that the ACS data underestimates the percentage of cost-burdened housing in Rural Alaska. For more details of this analysis, please see Appendix A, "American Community Survey Energy Cost Estimates."

Much of the data in this report is displayed by decade built. It is important to note that these estimates are of the housing stock as it currently exists, not what housing was like in the 1960s, 1970s, etc. Statewide data for the amount of recent new construction in Alaska is quite sparse, and as such the ACS estimates are used, which may have large margins of error in smaller areas.

Decennial Census

The decennial census was last conducted in 2010, and unlike the ACS survey is an actual count of residents and housing units throughout the United States. While this is the best and most complete dataset available, it is slightly limited in that it ignores "guests" and non-permanent individuals at residences. In Rural Alaska, this can lead to underestimation of the people per household and general population counts.

Alaska Retrofit Information System (ARIS)

While there are certainly limitations and caveats to estimates derived from the ARIS database, it should be noted that these data are based on professional energy ratings, which are fairly objective and numerous, representing 30% of occupied housing in Alaska. In comparison, the national Residential Energy Consumption Survey (RECS) uses a computer aided personal interview survey on 12,100 households in the U.S. (approximately 0.01% of occupied U.S. housing) to estimate energy use and consumption for the nation.

The energy rating information does have challenges, mostly notably sparse data in communities where energy efficiency programs have not made inroads. Additionally, given the various requirements of the AHFC's three energy programs, they each tend to serve specific segments of the population rather than serving the whole population, which may confound relations with factors such as income, home age, etc. The Weatherization program typically serves a lower income population and serves a higher proportion of elderly and single-parent households. The Home Energy Rebate Program requires homeowners to fund energy retrofits upfront and thus will tend to serve a population with higher disposable income than Weatherization. The Alaska Building Energy Efficiency Standard certification program serves two population segments: those with higher income populations who value energy efficiency and can afford new construction and those inhabiting housing that has been built with partial funding provided through the Alaska Housing Finance Corporation. Despite these issues, the data can still provide information about trends that can be used to create housing development and remediation plans and provide a basis for examining need.

There may also be slight variations in the data due to software and database details. The AkWarm software and energy rating procedures have both changed since AkWarm's adoption by AHFC in 1996. However, care has been taken with updates and new features to minimize the impact to rating points and stars while increasing the functionality and accuracy of energy modeling. All estimates developed using ARIS data are based on the housing unit characteristic data that has been collected through these

AkWarm ratings. The effects of home retrofits that were done but were not captured as part of an official energy rating would not be represented as a part of CCHRC's analysis. Further, some data that did not meet quality control was removed during analysis. Energy prices used by AkWarm, and stored in the ARIS database, are updated bi-annually based on the Alaska Department of Commerce, Community and Economic Development's survey of community fuel prices. Actual fuel prices may vary slightly from the January 2013 prices used in this report.

The energy information reported in the Housing Assessment is based on computer modeling of home characteristics. When compared to industry standard energy modeling software developed by the Department of Energy, AkWarm was within 5% on several metrics, and within 10% overall. Like most modeling software, it does not take into account user behavior, which can be unpredictable. For a rated home, energy use estimates from AkWarm are divided into categories of space heating, domestic hot water, and appliances. User behavior can affect space heating estimates through variations in occupancy schedules, temperature setpoints, ventilation equipment, and air leakage from opening windows and doors. Generally the estimates will be accurate as there are many user independent details of the home such as insulation levels, natural air leakage, and mechanical equipment types that are measured and input into the energy model. Domestic hot water (DHW) usage estimates and energy costs are based on the installed equipment, and national per-person usage numbers, but the actual amount of DHW used per day is variable based on occupant behavior. "Appliance" use and costs are estimates based on few inputs and can be highly variable based on installed equipment and user behavior.

Occupants are transient, whereas modeled energy use provides estimates based on physical characteristics of the house and standardized inputs. Comparing communities and regions based on modeled energy use eliminates the possibility of incentivizing regions that use more energy because of inefficient occupant behavior.

Occupant behavior will have a significant effect on whether housing units are at risk for moisture and indoor air quality-related issues. This Housing Assessment bases the labels of "high risk" and "low risk" for air quality and moisture issues on an estimated natural air change rate of less than 0.5 per hour occurring in a home with no continuous mechanical ventilation. While this is a good indicator of a housing unit at high-risk, the occurrence of actual issues within the housing units depends heavily on user behavior and other factors, including operation of any intermittent fans, proper household drainage and water management, and occupancy levels.

Information is not shown at the census-designated place level (i.e. Ester, Wasilla, Houston, etc.) in the Matanuska-Susitna Borough and Fairbanks North Star Borough (FNSB) because of differences between census-designated place names and AkWarm community names. For example, many homes in the FNSB are listed as being located in "North Pole," but are actually located in the census-designated place named "Badger." Neither postal addresses nor residents' identification or affiliation with place names is cross-referenced with U.S. Census mapping, thus limiting the ability to report ARIS data linked with Census and ACS data at spatial scales finer than borough for these areas. However, for parameters relevant to energy modeling—energy pricing, climate and selection of utility providers—the AkWarm community names are appropriate and lead to no errors.