EFFECTS OF RISING UTILITY COSTS ON HOUSEHOLD BUDGETS, 2000-2006

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ABSTRACT

Costs for utilities and fuels are high for Alaska households, particularly those in rural and remote places, and have increased significantly in recent years. The purpose of this study is to quantify these costs and the effects of rising prices. The Public Use Microdata Sample from the 2000 U.S. census is used to analyze utility costs as a share of household income for each of four regions in Alaska, and a projection of these costs to 2006 is made based on income and utility price panel data. We find that total costs for heat, electricity and water and sewer, as a median share of income, are nearly 50% higher now than in 2000 for remote and rural places, compared to about 20% in Anchorage, the Kenai Peninsula and Matanuska-Susitna Boroughs, and about 30% in other large or road-system communities. The lowest income quintile of households in remote communities pay a median of about one third of their total income on these utilities, compared to the wealthiest quintile of households in Anchorage that pay only 2% of their total income on heat, electricity and water and sewer.

ACKNOWLEDGEMENTS

The authors thank Molly Ridout and Clemencia Merrill for graphic design help, and Linda Leask for editorial assistance. Lance Howe provided much helpful assistance with the statistical software and also obtained data from the U.S. Census Data Center.

Executive Summary:

Effects of Rising Utility Costs on Household Budgets

Households in remote rural places face utility costs 50% higher now than in 2000. In Anchorage those costs are up 35% and in other large or road-system communities about 39%, as Figure 1 shows.

The share of household income going to utilities is also up. Utility costs in urban and rural areas are now anywhere from about 3% to 10% of income for the typical household.

Those are median figures for all households. Utilities take a much bigger share of income among low-income households. Utility costs now amount to more than a third of income among low-income households in remote places.

These are among the findings of an ISER analysis of how rising energy prices have increased utility costs for Alaska households since 2000. By "utility costs" we mean costs for heat, electricity, and water and sewer systems. We divided Alaska communities into three regions, based on their size and location. A map on the back page shows the areas in each region.

The 2000 costs we use are annual out-of-pocket costs Alaska households reported in the spring 2000 U.S. census. The spring 2006 figures are ISER estimates for the same households, based on increases in energy prices since the census.

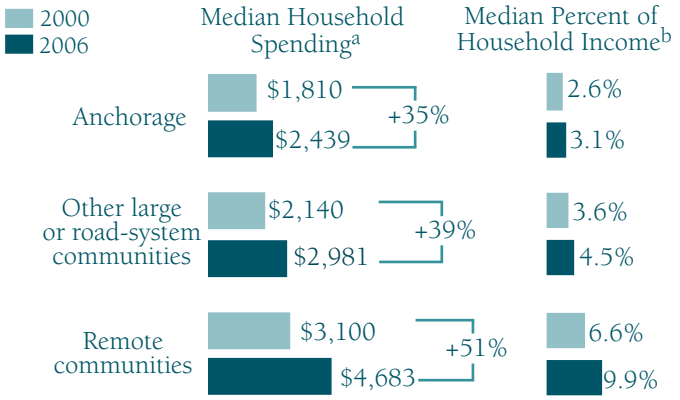
Utility costs were higher to start with and have increased more in remote places because they rely mostly on diesel for heating houses and generating power. Anchorage and a few other places have access to natural gas. (See map, page 2.) Both diesel and natural gas prices are up sharply, but diesel is still more expensive. Households paid on average four times more for diesel than for gas in 2005, measured by energy content (Figure 2).

Incomes in remote areas are also lower, which exacerbates the effect of higher utility costs. So it's not surprising that Alaskans in remote places use less household energy—roughly half as much per person as places with natural gas (Figure 3).

The inside pages show more about energy and utility costs. But to put utility costs in perspective, remember they're only a part of total housing costs—and total housing costs are significantly higher in urban Alaska (see back page). Also, higher energy prices directly affect transportation costs and indirectly affect many other costs. We only report effects on utility costs.

And "income" here includes only cash. Public programs that help households pay medical, housing, or other costs also effectively add to household incomes. So do the wild fish and game many Alaskans harvest. But the value of such non-cash contributions doesn't show up in traditional income measures.

Figure 1. Utility Costs for Alaska Households, Spring 2000 and Spring 2006



[a]Spring 2000 costs are out-of-pocket costs for previous year, reported by Alaska households in the 2000 U.S. census. Spring 2006 costs are ISER estimates for previous year, based on changes in energy prices from 1999 through 2005.

[b]Based on 1999 cash incomes Alaska households reported in 2000 U.S. census and estimated 2005 household cash incomes, adjusted for Permanent Fund Dividends not reported in the census.

Sources: See list of sources on page 4.

Figure 2. Comparing Costs of Natural Gas and Diesel Fuel, 2005

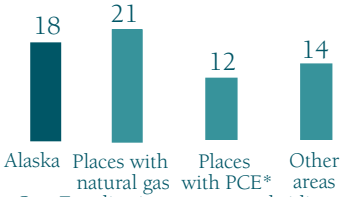
(In Equivalent Energy Content: Million BTUs*)

*British thermal units, a standard measure of energy content

Source: ISER calculations with data from Alaska Housing Finance Corporation and Regulatory Commission of Alaska

Figure 3. Estimated Annual Energy Consumption for Household Uses, Per Person

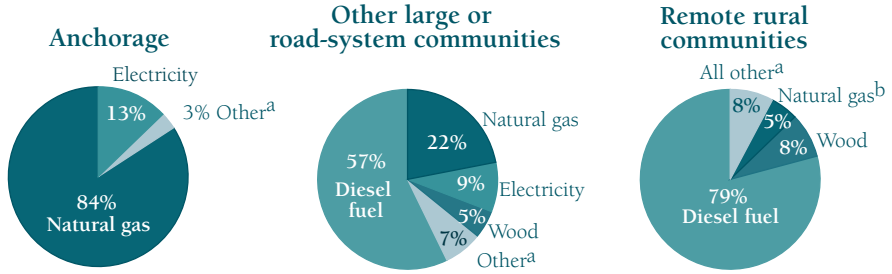
(Energy from All Sources, Converted to Barrels of Oil)



*The state Power Cost Equalization program subsidizes part of electricity costs in rural communities that generate electricity mainly with diesel.

Source: Steve Colt, ISER, revised September 2006.

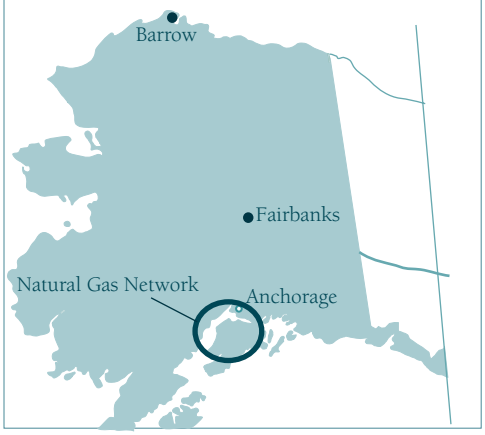
Figure 4. How Do Alaskans Heat Their Houses?
(Share of Households Using Various Energy Sources)



[a]Any fuel type not specified. Sources of heat include natural gas, propane, electricity, diesel fuel, coal, wood, and solar energy. [b]Barrow has access to natural gas from local wells.

Source: 2000 U.S. census

Places with Access to Natural Gas



Analysis Regions and Data Sources

Our baseline data are from the 2000 federal census, and we defined utilities the way the U.S. Census Bureau does: electricity, heating fuels, and water and sewer systems. But analysts don't all agree about what should be considered as "utilities."

Our analysis regions are based on five Alaska regions the U.S. Census Bureau uses for reporting detailed household information—Public Use Microdata Areas, which group communities based on size and proximity to road systems. For this summary, we combined the five into three: (1) Anchorage; (2) other large or road-system communities; and (3) remote communities. A map on the back page shows the regions.

We report median household utility costs—that is, the midpoint figure, with half of households spending more and half spending less. We report those medians for all households and for the wealthiest and the poorest households. Our data on energy prices come from a number of sources, cited in the figures and listed on the back page.

We used figures from the 2000 U.S. census and the 2005 American Community Survey to estimate changes in household income.

Sources of Energy

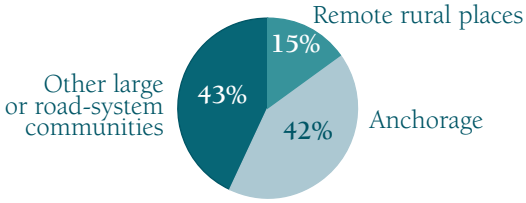
Natural gas and diesel are the two big sources of energy Alaskans use. For heating, households use gas or diesel directly. Electricity is mostly generated either with gas or diesel, depending on which is available. (For some towns, mostly in southeast Alaska, hydropower generates electricity.) Water and sewer utilities also get the power they need from gas or diesel.

Natural gas from Cook Inlet fields is available in Anchorage and some (but not all) places on the Kenai Peninsula to the south and the Mat-Su Borough to the north. Some Fairbanks households use liquified natural gas (LNG), which is trucked in, and Barrow has access to gas from local wells.

Other Alaska communities rely mainly on diesel. Figure 4 shows how households heat their houses. Only in Anchorage do most heat with gas. In remote places about 80% of households use diesel, as do more than half the larger or road-system communities.

The majority of Alaskans—about 85%—live in Anchorage and other large or road-system communities and 15% in remote places (Figure 5).

Figure 5. Where Do Alaskans Live?



2005 Alaska population: 663,661

Source: Alaska Department of Labor

Figure 6. Increase in Natural Gas Prices For Anchorage Households, 2000-2006

	2000	2006	Increase
Price per 100 cubic feet	$.324	$.61	88%

Sources: Regulatory Commission of Alaska and Enstar Natural Gas

Figure 7. Increase in Prices of Diesel for Home Heating, Per Gallon, Fall 2000 - Winter 2005

Anchorage	57%
Other large or road-system communities	70%
Remote rural communities	83%

Source: Population-weighted averages, based on Alaska Housing Finance Corporation surveys.

Figure 8. Range of Diesel Prices for Home Heating, Per Gallon, Winter 2005

Source: Alaska Housing Finance Corporation

Rising Energy Costs

Natural gas prices in Anchorage and diesel prices in remote places increased roughly the same percentage in recent years. Anchorage households paid nearly twice as much for natural gas in early 2006 as in 2000 (Figure 6). Diesel prices increased 83% in remote areas from fall 2000 through winter 2005 (Figure 7). Data on September 2006 diesel prices, collected by

the Alaska Division of Community Advocacy in a number of remote places, showed continuing increases in diesel prices.

And diesel prices have gone up more in remote places than in places closer to roads, because prices customers pay include the additional costs of transporting fuel and maintaining community storage tanks.

Fuel prices also vary a lot among remote places. In winter 2005, prices varied from a low of $1.80 per gallon among North Slope communities to $5.40 in Hughes, in the Interior (Figure 8). The average price in remote places was $3.30.

North Slope villages are among the state's most remote communities, but they pay lower prices because the borough government subsidizes residential fuel costs. In other places considered "remote," some are much more remote than others —so the costs of getting fuel to them are higher. Also, the price households pay varies by when the fuel was purchased and how long the community supply bought at a specific time lasts.

Electricity rates have also increased, but not as much. The rate for customers of Anchorage's largest electric utility was up 28% between March 2000 and March 2006. Many remote communities receive Power Cost Equalization—a state program that subsidizes electricity costs in places that generate electricity mainly with diesel. In those places, rates went up 40% between 2000 and 2005, even taking the subsidy into account.

Figure 9. Increase in Electricity Prices, Rural Communities and Anchorage

Effective Rate for PCE residential customers (Median price per Kwh for first 500 Kwh[a])

2000	2006	Increase
17¢	24¢	41%

Rate for Anchorage Households[b] (Per 1,000 KWh)

March 2000	March 2006	Increase
$94.79	$121.00	28%

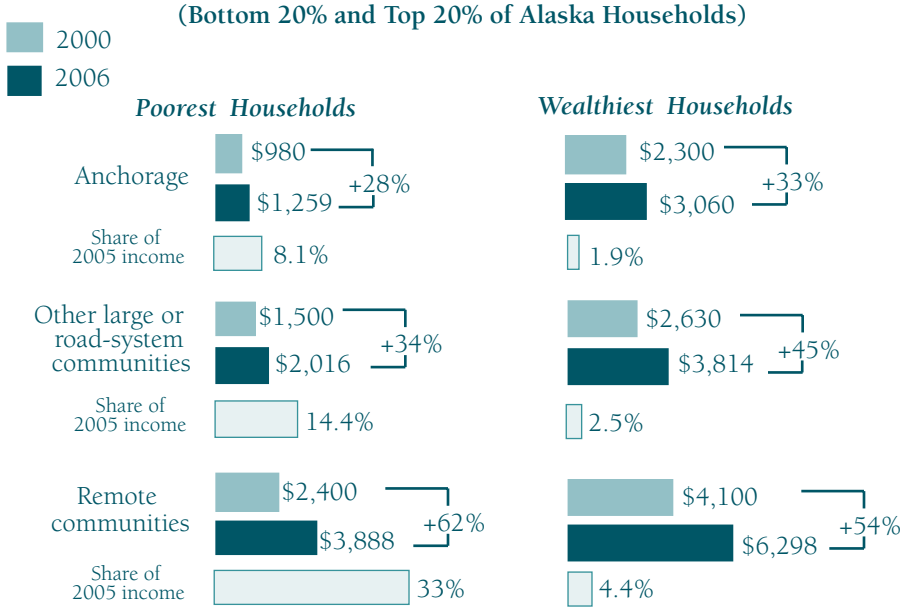
[a]Weighted by number of Power Cost Equalization customers per community

[b]For customers of Chugach Electric Association

Sources: Alaska Energy Authority and UA Cooperative Extension Service

Figure 10. Median Utility Costs for Poorest and Wealthiest Households, 2000 and 2006

(Bottom 20% and Top 20% of Alaska Households)



Source: See list of sources, page 4.

Poor and Wealthy Households

Figure 10 looks at how utility costs and shares of income going to utilities changed since 2000 among the state's wealthiest and poorest households—the 20% of households at the top of the income range and the 20% at the bottom.

Alaskans with lower incomes spend less for utilities than wealthier residents, because they live in smaller houses or apartments with fewer amenities.

In Anchorage and other urban places, many poor households rent and are more likely to heat with electricity. That's an expensive way to heat—but since prices for electricity didn't increase as much as prices of natural gas, utility costs for poor households in urban areas didn't increase as much as for wealthy households.

In remote areas, people with lower incomes are often homeowners who heat with diesel. In those places, poor households saw their annual utility costs increase 62%.

Costs for wealthier households statewide were higher to start with and went up more—because Alaskans with more money generally live in bigger houses that require more heat and electricity. Dollar costs for the wealthier households in urban areas went up 33% to 45% and in remote areas 54%.

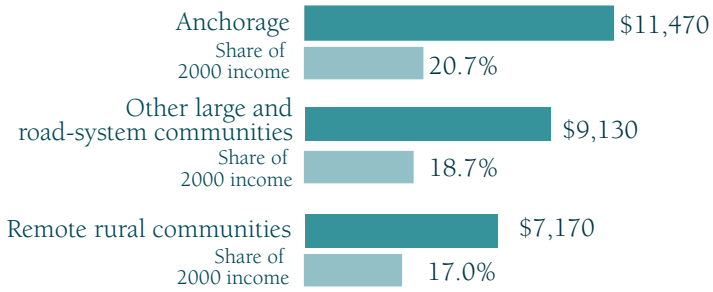
But even though dollar costs for utilities are higher among wealthy households, utility costs take a much bigger share of the smaller incomes of poor households. That's especially true in remote places, where incomes are lowest. Utility costs take from 8% to 33% of the income of poor households but about 2% to 4% among wealthy households.

Total Housing Costs

This analysis looks just at changing utility costs, but there are of course other housing costs—mortgages and rent payments being the biggest. Utility costs are higher in remote areas, but total housing costs are higher in urban areas. Most urban homeowners have mortgages, while many homeowners in remote places don't. Land values are higher in larger towns, and houses tend to be bigger and have more amenities.

Figure 11 shows that as of 2000, total housing costs were 60% higher in Anchorage than in remote places. We didn't estimate how total housing costs have changed since 2000, but we know they've gone up—since house prices, property taxes, and other costs are also up.

Figure 12. Total Household Housing Costs, 2000
(Median of Utility and All Others Housing Costs)



Source: 2000 U.S. census

What's Ahead?

It's not news to Alaskans that they're paying more to heat their houses and run their freezers than they did a few years ago. Many have probably done things like lowering their thermostats and increasing the insulation in their houses. We weren't able to estimate how household energy use may have changed as energy prices rose.

But economic studies tell us that Americans' energy use is relatively inelastic—that means they typically don't cut their energy use much, even when prices are rising. So to pay their energy bills, some may try to reduce what they spend on other things, or work longer hours.

Some just aren't paying their utility bills—which has a cascading effect on utilities and businesses they owe money. The largest utility in rural Alaska said in late 2006 that it was considering cutting off electricity for hundreds of customers who hadn't paid their bills.

Higher energy prices have also directly increased transportation costs (and increased many other costs indirectly)—which we haven't talked about in this summary. Higher utility and transportation costs affect budgets not only of households but of businesses, local governments, and schools too.

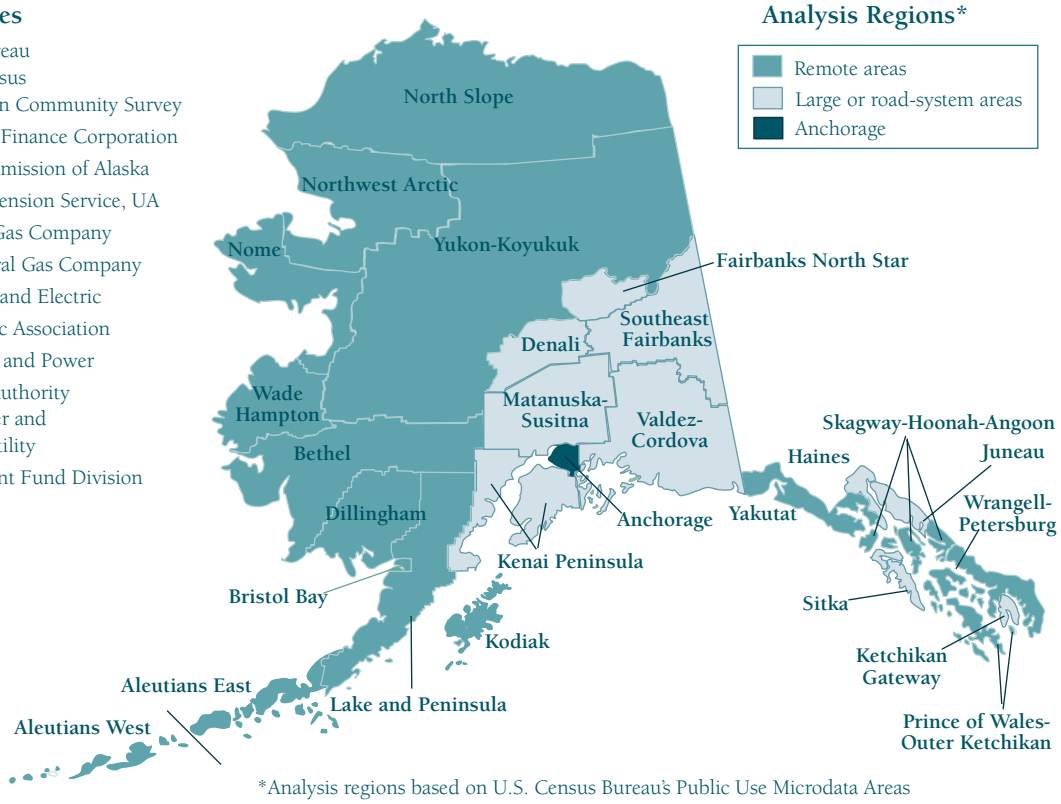
There are state, federal, and private programs that provide municipal grants, community loans, and other energy assistance to households and communities. But such aid programs come and go and funding changes from year to year—and in any case they can't resolve the persistent issue for small communities where cash incomes are low and costs are high. A few rural communities are investigating the use of wind power to generate electricity.

Where energy prices will go from here is unpredictable. By fall 2006, worldwide prices of oil and natural gas had dropped considerably from their recent highs. But energy prices are notoriously volatile—as Alaskans have seen many times—and the link between world energy prices and consumer prices for products like diesel are neither direct nor instantaneous. It seems unlikely that utility costs are going to drop much any time soon.

Data Sources

U.S. Census Bureau
- 2000 U.S. census
- 2005 American Community Survey

Alaska Housing Finance Corporation
Regulatory Commission of Alaska
Cooperative Extension Service, UA
Enstar Natural Gas Company
Fairbanks Natural Gas Company
Barrow Utilities and Electric
Chugach Electric Association
Municipal Light and Power
Alaska Energy Authority
Anchorage Water and Wastewater Utility
Alaska Permanent Fund Division



*Analysis regions based on U.S. Census Bureau's Public Use Microdata Areas

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I. INTRODUCTION AND METHODS

Rising fuel costs have generated a great deal of policy concern about effects on Alaska households and communities, particularly in rural Alaska, where the price increases for heating fuel have been particularly large. Crude oil prices today are over $50 per barrel, almost double the price three years ago. Prices for heating fuel have also risen more than 70% over three years.[1] In real (inflation-adjusted) terms, heating oil prices in 2006 were the highest recorded in the past 30 years. A typical small Alaska community (population 400) consumes more than 2,400 gallons of fuel per household per year for residential and commercial space heating and hot water, power generation and diesel and gasoline vehicles.[2] At current prices, this is more than $7,400 per household—more than 20% of the median household income for communities that size ($35,600).[3]

Over the last decade or more there also have been ongoing policy debates about the price and affordability of electricity and water and sewer utilities in rural Alaska. But there has been very little systematic information to inform these debates.

This study aims to fill that gap. We analyzed data from the 2000 Census Public Use Microdata sample for Alaska. This is a representative five percent sample of Alaska households, including their reported income and utility costs. The data allow us to make comparisons between households in four geographic regions: Anchorage, Mat-Su and Kenai, other mid-size and road-accessible census areas, and remote rural census areas. We also break the analysis out by income quintile and by poverty status.

We then projected income and utility costs to 2006, to estimate how rising prices for heating fuel and other utilities have affected household budgets. Our projections use price and income series data from a wide variety of public sources. Each data source, including the U.S. census, has its own definitions and limitations—which presented many technical difficulties for the analysis. The methods we adopted to reconcile the data are referenced in the text and described in the appendixes to this report.

One of the limitations of this analysis is that it tells us nothing about how households are responding to rising costs. What expenditures are they cutting back on? Are they increasing their debt? Are they planning to move? Answering these questions would require a household survey.

METHODS

The 2000 U.S. census is the largest recent sample of household utility costs. The census long form questionnaire includes the following question: "What are the annual costs of utilities and fuels for this house, apartment, or mobile home?" The four utilities included in the question are electricity, gas, water and sewer, and "oil, coal, kerosene, wood, etc." Unfortunately, summary statistics of the reported costs are not among the tables published by the U.S. Census Bureau. They are a component of a figure called "selected

[1] Luick, Bret. "Alaska Food Cost Survey." University of Alaska Cooperative Extension Service. <http://www.uaf.edu/coop-ext/fcs/index.html>. Retrieved 1/10/2007.

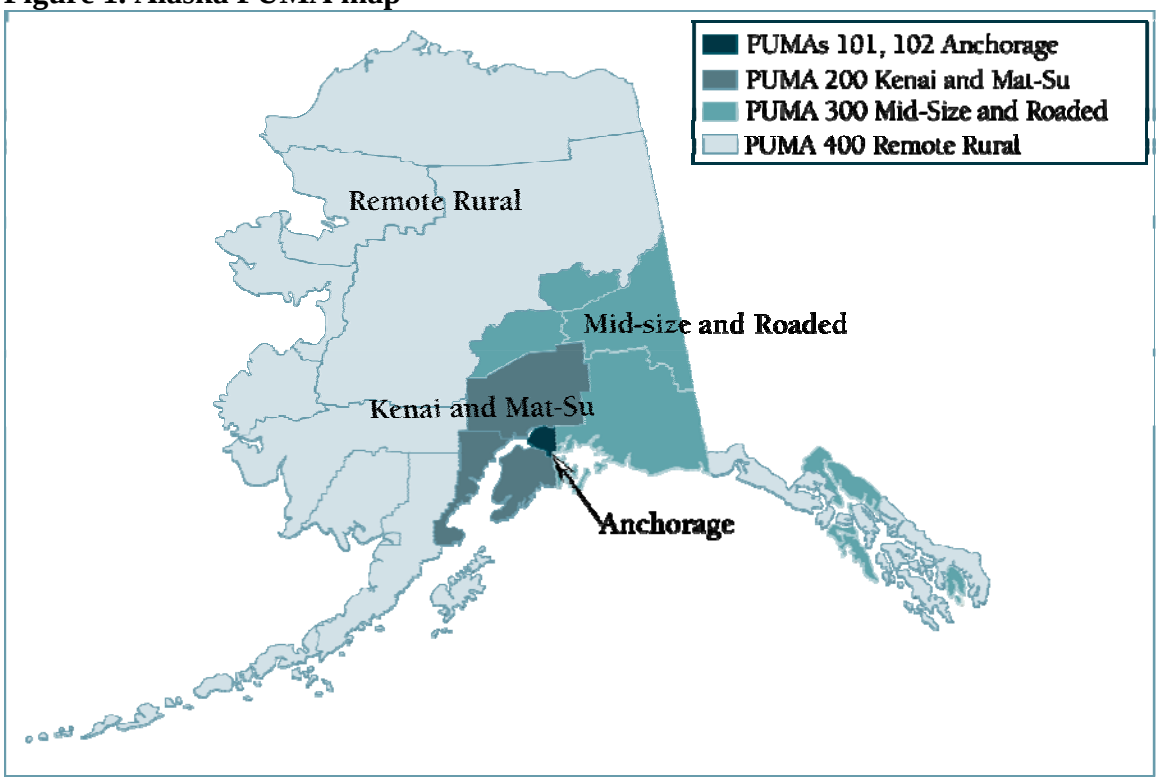
[2] "Village Alaska Energy Demand: A compilation of available data," Steve Colt, ISER, September 2005.

[3] 2000 Census data for Ak. communities with 300-500 population.

monthly owner costs," but this only applies to homeowners and includes mortgage costs, property taxes and insurance, condominium fees, and mobile home costs. The utility costs are not available separately. We resolved this problem by using the Public Use Microdata Sample (PUMS) released by the Census Bureau. The PUMS is a sub-sample of the census respondents (for 2000, a 5% sample of the population) and is comprised of individual observations that have been stripped of identifiers. The sample was drawn and weighted using methods designed make it as accurately representative of the population as possible. The responses to all questions in the census long form (excluding identifiers and potentially identifying information) are included. It gives the public the opportunity to calculate custom statistics and tabulations from individual observations.

Geographical information is one type of possibly identifying information. Therefore, the census removes precise geographical information and assigns a Public Use Microdata Area (PUMA) to each observation. A PUMA is a geographical area containing at least 100,000 residents. Depending on the population density, a PUMA can be part of a city, part of a county, or a group of counties, and PUMAs generally follow the boundaries of these geographical units.[4] In Alaska's case, there are only five PUMAs: two in the Anchorage municipality and three that are groups of other boroughs and census areas. The following map illustrates the PUMS geography for Alaska.

Figure 1. Alaska PUMA map



[4] Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. IPUMS-USA – PUMA. <http://usa.ipums.org/usa-action/variableDescription.do?mnemonic=PUMA>. Retrieved 1/10/2007.

For this study, we have aggregated PUMAs 101 and 102 – the ones that comprise the Anchorage municipality – into one, since we don't need any finer geographical resolution than that, and no data source that we use, other than the PUMS and published American Community Survey (ACS) tables, breaks Anchorage into these two regions. From here forward, we will refer to the area comprised of PUMAs 101 and 102 as "Anchorage," although it does contain places other than the Anchorage bowl, such as Girdwood and Eagle River.

We have also adopted short names to refer to the other three PUMAs. PUMA 200, which includes the Kenai Peninsula and Matanuska-Susitna Borough, we refer to as Kenai and Mat-Su. PUMA 300 includes the Denali, Fairbanks and Valdez-Cordova areas and larger towns in Southeast Alaska; we call this Mid-Size and Roaded. PUMA 400 includes the rest of Alaska, northern, western, and remote Southeast, which we call Remote Rural Alaska. Appendix A lists the boroughs and census areas in each PUMA.

Another measure taken by the census bureau in removing possible identifiers is called *topcoding.* Some variables have a maximum threshold, called a topcode, above which the actual value given by the respondent is not disclosed, but replaced by the average value of all observations in the state that are above the topcode. In remote rural Alaska in particular, a large share of households have fuel costs above the topcode, reducing the accuracy of our summary statistics. We adjusted the data to compensate for this using custom tables generated at the Census Data Center. This procedure is described in Appendix B.

IPUMS USA provides the PUMS data that we use. The Integrated Public Use Microdata Series (IPUMS) provides PUMS datasets from all surviving federal censuses from 1850 to 2000 as well as the ACS for every year from 2000 to 2005. They unify these samples for consistency, comparability, and ease of use, and provide comprehensive documentation.[5]

Using the 2000 PUMS allows us to perform analyses on the reported utility costs individually, and also allows us to break down these analyses by region and income level.

Our income levels are defined by quintiles – that is, the quantile groups resulting from sorting the sample of Alaska households by income, then dividing them into five groups of (as close as possible to) equal size. Note that non-household (group quarters) observations are excluded. The quintiles are defined across all households state-wide, so when we look at smaller regions the numbers of households in each quintile are not necessarily equal. In addition, we break down the household sample by poverty status. The measure of poverty we use is not the one used by the census bureau, but the one used by the U.S. Department of Health and Human Services. One reason for this is that the HHS Poverty Guidelines have separate poverty lines for Alaska and Hawaii, whereas the census poverty thresholds are the same for the entire U.S. Also, the HHS poverty

[5] Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. IPUMS-USA – PUMA. <http://usa.ipums.org/>.

guidelines, and not the census thresholds, are used for actual administrative purposes such as determining eligibility for certain federal programs, including parts of Medicaid, food stamps, Job Corps, the National School Lunch Program, and many others.[6] The HHS poverty guidelines are normally based on family size, but because we use households as the unit of analysis in this study, we use household size in the formulas instead.

We report average and median costs for a utility for households that pay anything for that utility. For all observations with a response of "no charge or not used" or "included in rent or condominium fee" for a particular utility, we code that utility cost as missing and exclude the observation from the summary statistics for that utility. When we report the total cost for all utilities, all households paying anything for any of the four utilities are included (only households with missing values for all utilities are excluded).

All dollar amounts reported and used in calculations are in nominal dollars. The numbers in which we are most interested are ratios with contemporaneous numerators and denominators – costs as a percentage of income – which are unaffected by inflation. Incomes in this report are pre-tax cash income, and exclude non-cash public assistance and things like subsistence harvesting, which effectively add to household incomes but don't show up in traditional income measures. Fuel and utility costs are out-of-pocket.

Alaska permanent fund dividends are underreported in the census. Income of children under age 15 is not reported at all – the questionnaire asks the respondent to skip a number of questions, including the income questions, if the person was "under 15 years of age on April 1, 2000". Also, careful examination of the 2000 PUMS data reveals that permanent fund dividends are underreported even for those reporting income. Therefore, we have adjusted household incomes in the census areas to account for unreported PFDs. This procedure is described in Appendix B.

It is worth keeping in mind the wording the census bureau uses on the questionnaire to refer to the timeframe of the amount in question. It asks for "income in 1999". Although the following sub-questions regarding separate categories of income say "annual amount," it is seems clear enough from the wording in the beginning of the income section that what is requested is 1999 calendar year income, so this is what we take as the actual timeframe of the amounts reported. The utility and fuel costs questions refer to the "annual cost." The timeframe referred to by the word "annual," from the respondent's point of view, probably depended on the time of response. The process of conducting the 2000 census happened in the beginning of 2000 from as early as January to as late as June for non-response follow-up,[7] so the time of response may have fallen anywhere between those months. However, the reference point chosen by the Census is April 1, 2000, so in this report we take "annual" to mean to the time period of roughly April 1, 1999 to April 1, 2000. The timeframe of total housing costs is not so straightforward to define: some housing cost questions ask for current monthly amounts, some "last year,"

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[6] "Frequently Asked Questions Related to the Poverty Guidelines and Poverty." Office of the Assistant Secretary for Planning and Evaluation, HHS. Updated December 4, 2006. U.S. Department of Health and Human Services. <http://aspe.hhs.gov/poverty/faq.shtml>. Retrieved 1/10/2007.

[7] "Census 2000, Frequently Asked Questions." U.S. Census Bureau. Updated May 24, 2006. <http://www.census.gov/dmd/www/genfaq.htm#milestone>. Retrieved 1/10/2007.

some “annual” or “yearly.” We multiply the monthly costs by 12 and assume the same approximate timeframe as with the utility costs.

After analyzing utility costs in 2000, we make a projection to estimate the corresponding figures for 2006. No more recent survey exists that is truly equivalent to the decennial census (including the Census Bureau’s American Community Survey – see Appendix B), so we use various sources of time series data on household income and utility prices to make a projection. Our results are described in Chapter III of this report. The methods used are detailed in the appendices.

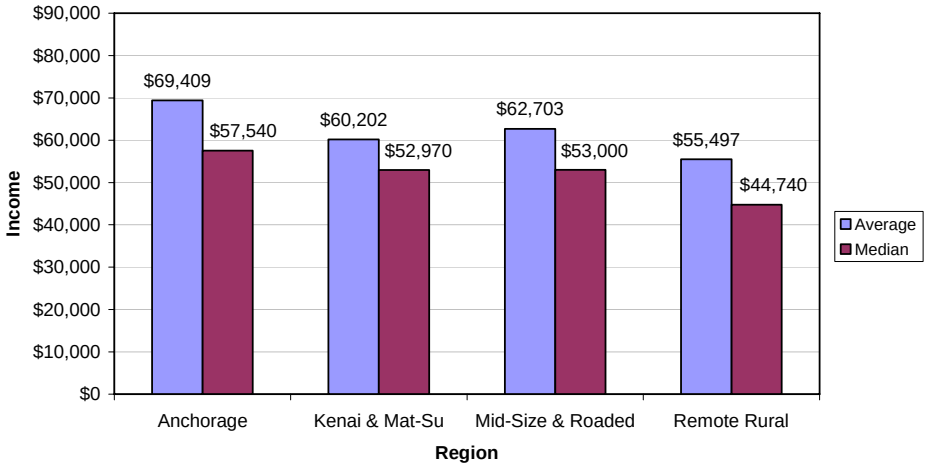
II. HOUSEHOLD UTILITY COSTS IN 2000

The first part of this study analyzes fuel and utility costs for Alaskan households as reported in the 2000 census. We break down the analysis by PUMA to show how these costs and other population characteristics vary geographically, and also by income level in two ways: by household income quintile and poverty status.

Housing costs, as another major household expense, are also considered. Annual housing costs are computed from various monthly and annual costs of housing reported in the census.

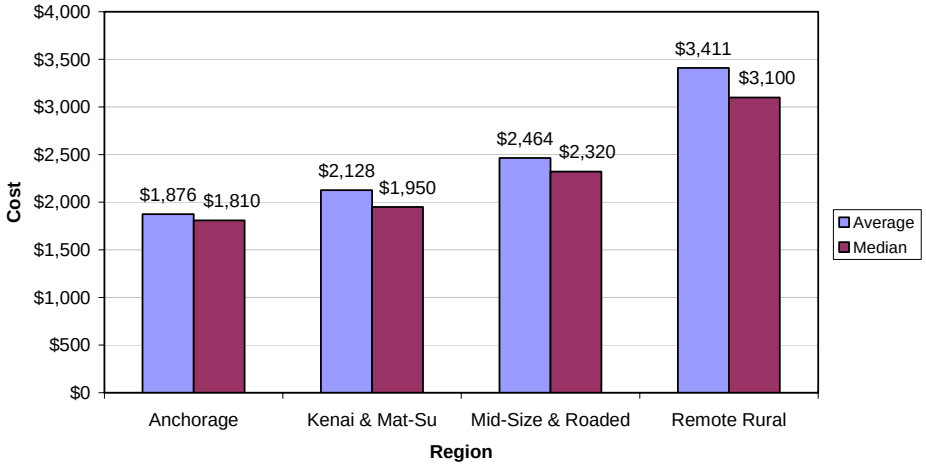
Figure 2 and Figure 3 show the general geographic trends in income and utility costs.

Figure 2. Household Income in 1999



Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Figure 3. Annual Utility Costs, 2000



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Sources: U.S. Census Bureau (IPUMS) and ISER calculations

It is clear from these charts that the more rural areas have lower income and pay more for utilities and fuels. The remote rural area has the lowest household incomes and highest household utility costs, significantly lower than road connected regions for income and significantly higher than other regions for total cost of utilities.

POPULATION AND INCOME

Before examining utility costs in detail, we look at the geographic and income distribution of the Alaska population. Table 1 shows that in Anchorage, the highest income quintile contains the largest share of households, while remote rural Alaska has a larger concentration of households in the lower quintiles. There is no clear pattern in the other two regions.

Table 1. Alaska Households by Income Quintile and Region

Quintile	Household Income	Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Number of Households			
1	$25,670 and below	15,700	8,466	12,082	8,044	44,292
2	$25,671 to $43,910	18,492	7,120	11,937	6,724	44,273
3	$43,911 to$ 64,500	18,757	8,611	11,401	5,525	44,294
4	$64,501 to $93,400	19,823	8,189	11,145	5,111	44,268
5	over $93,400	21,707	6,230	11,646	4,695	44,278
	Total	94,479	38,616	58,211	30,099	221,405
			Percent of Households			
1	$25,670 and below	16.6%	21.9%	20.8%	26.7%	20.0%
2	$25,671 to $43,910	19.6%	18.4%	20.5%	22.3%	20.0%
3	$43,911 to$ 64,500	19.9%	22.3%	19.6%	18.4%	20.0%
4	$64,501 to $93,400	21.0%	21.2%	19.1%	17.0%	20.0%
5	over $93,400	23.0%	16.1%	20.0%	15.6%	20.0%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
			Average Household Size			
1	$25,670 and below	1.9	2.0	1.8	2.2	2.0
2	$25,671 to $43,910	2.3	2.4	2.4	3.3	2.5
3	$43,911 to$ 64,500	2.7	2.9	2.8	3.3	2.8
4	$64,501 to $93,400	3.0	3.2	3.0	3.8	3.1
5	over $93,400	3.1	3.2	3.1	3.8	3.2
	Total	2.7	2.7	2.6	3.2	2.7

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Note that Table 1 and most of the other tables in this report are for households and do not include people living in group quarters (military barracks, college dormitories, institutions, etc.). Table 2, however, shows the distribution of people by region and income quintile, and people in group quarters too. Note first that the whole population is no longer evenly distributed across quintiles; this is because low income households tend to have fewer persons (see Table 1). Income quintiles here are still determined at the household level: each person is in the quintile of his or her household.

Table 2. Alaska Population by Income Quintile and Region

Quintile	Household Income	Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Number of Persons			
1	$25,670 and below	29,985	16,455	21,872	17,678	85,990
2	$25,671 to $43,910	42,808	18,024	28,765	22,062	111,659
3	$43,911 to$ 64,500	50,310	24,965	32,576	18,711	126,562
4	$64,501 to $93,400	60,291	26,333	33,226	19,408	139,258
5	over $93,400	68,536	19,830	36,833	18,228	143,427
	Group quarters	7,133	2,343	4,776	5,039	19,291
	Total	259,063	107,950	158,048	101,126	626,187
			Percent of Persons			
1	$25,670 and below	11.6%	15.2%	13.8%	17.5%	13.7%
2	$25,671 to $43,910	16.5%	16.7%	18.2%	21.8%	17.8%
3	$43,911 to$ 64,500	19.4%	23.1%	20.6%	18.5%	20.2%
4	$64,501 to $93,400	23.3%	24.4%	21.0%	19.2%	22.2%
5	over $93,400	26.5%	18.4%	23.3%	18.0%	22.9%
	Group quarters	2.8%	2.2%	3.0%	5.0%	3.1%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

In Anchorage the distribution is strongly skewed, with a higher percentage in the highest income quintile and a lower percentage in the lowest. The mid-size and roaded census areas, dominated by Fairbanks, Juneau, and Ketchikan, have a similar pattern with more of the population in the highest quintile and less in the lowest. The population of Kenai and Mat-Su tend to the middle income brackets, while in remote rural areas the population is more evenly distributed across the quintiles. That region also has the highest percentage of persons living in group quarters.

UTILITY COSTS

The four annual utility costs reported in the census are electricity, gas, water and sewer, and "oil, coal, kerosene, wood, etc." The last category refers to fuel other than gas (natural or LP), and these would primarily be used for heating, so we will call it heating fuel.

The following tables show utility costs as a percentage of household income. This percentage is calculated for each household in the sample data that pay anything for a given utility, and the numbers in the table are the averages and medians of this household-by-household percentage. We present medians (the midpoint number, with half of the households above and half below) as well as averages, because the median is in some ways a "fairer" figure, more representative of the middle household and less sensitive to outliers with unusually high or low costs.

Fuel oil is the most expensive of the four utility categories. It is used for heat in a large majority of households in mid-size and roaded areas and remote rural census areas. Very few Anchorage households use anything other than gas and electricity for heating, so the share of income spent on fuel oil is very low in Anchorage. As Table 3 shows, in remote rural census areas the cost of heating fuel takes up an especially large share of household

income, with the median share almost twice the median in Kenai and Mat-Su and mid-size and roaded areas.

Table 3. Cost of Heating Fuel (Liquid or Solid), for Those Who Pay

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$365	$901	$1,071	$1,409	$1,152
		median	$375	$700	$1,000	$1,200	$1,000
2	$25,671 to $43,910	average	$334	$929	$1,193	$1,447	$1,186
		median	$150	$720	$1,000	$1,200	$1,000
3	$43,911 to $64,500	average	$810	$1,056	$1,221	$1,646	$1,282
		median	$400	$900	$1,100	$1,400	$1,100
4	$64,501 to $93,400	average	$208	$1,008	$1,377	$1,662	$1,272
		median	$180	$1,000	$1,200	$1,500	$1,200
5	over $93,400	average	$322	$1,113	$1,394	$2,000	$1,399
		median	$180	$900	$1,200	$1,800	$1,200
	Total	average	$350	$996	$1,276	$1,595	$1,263
		median	$200	$800	$1,200	$1,300	$1,100
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	2.6%	10.9%	11.0%	14.3%	12.1%
		median	2.1%	5.7%	6.2%	8.8%	6.7%
2	$25,671 to $43,910	average	1.0%	2.8%	3.4%	4.2%	3.5%
		median	0.4%	2.0%	2.9%	3.6%	2.8%
3	$43,911 to $64,500	average	1.6%	2.0%	2.3%	3.1%	2.4%
		median	0.7%	1.6%	2.0%	2.6%	2.0%
4	$64,501 to $93,400	average	0.3%	1.3%	1.8%	2.2%	1.6%
		median	0.2%	1.2%	1.5%	1.8%	1.4%
5	over $93,400	average	0.3%	0.9%	1.1%	1.6%	1.1%
		median	0.1%	0.8%	1.0%	1.5%	0.9%
	Total	average	0.7%	3.9%	3.4%	6.0%	4.0%
		median	0.2%	1.7%	1.8%	3.1%	1.9%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

As Table 4 shows, electric costs average 3.4 percent of household income statewide. Most households, however, paid less than the average cost: the median household share (50% of households below and 50% above) was 1.6% of income. Looking at the geographic distribution, the share is lowest in Anchorage and highest in remote rural Alaska, with the other regions in between. The utility costs in the census are out-of-pocket costs, so these represent what households had to pay after energy assistance programs such as the Power Cost Equalization (PCE) program. Most places receiving PCE assistance are in the remote rural census areas.

Table 4. Cost of Electricity (Among Those Who Pay)

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$756	$1,013	$998	$1,190	$962
		median	$600	$800	$730	$1,000	$720
2	$25,671 to $43,910	average	$736	$1,139	$1,016	$1,316	$971
		median	$600	$960	$900	$1,200	$800
3	$43,911 to $64,500	average	$860	$1,166	$1,160	$1,492	$1,074
		median	$720	$1,000	$1,000	$1,200	$900
4	$64,501 to $93,400	average	$957	$1,157	$1,266	$1,664	$1,149
		median	$840	$1,100	$1,200	$1,400	$1,000
5	over $93,400	average	$1,122	$1,289	$1,384	$1,758	$1,276
		median	$1,000	$1,200	$1,200	$1,600	$1,200
	Total	average	$913	$1,150	$1,179	$1,441	$1,096
		median	$800	$1,000	$1,000	$1,200	$960
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	7.1%	10.9%	13.9%	11.9%	10.7%
		median	3.6%	5.6%	5.1%	7.0%	4.9%
2	$25,671 to $43,910	average	2.1%	3.3%	3.0%	3.9%	2.8%
		median	1.7%	2.8%	2.5%	3.2%	2.3%
3	$43,911 to $64,500	average	1.6%	2.2%	2.2%	2.8%	2.0%
		median	1.3%	1.9%	1.9%	2.4%	1.7%
4	$64,501 to $93,400	average	1.2%	1.5%	1.6%	2.2%	1.5%
		median	1.1%	1.4%	1.4%	1.7%	1.3%
5	over $93,400	average	0.9%	1.0%	1.1%	1.4%	1.0%
		median	0.8%	0.9%	1.0%	1.3%	0.9%
	Total	average	2.2%	3.7%	4.1%	5.2%	3.4%
		median	1.2%	1.8%	1.7%	2.7%	1.6%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Looking at the distribution by income quintile, the average share of income paid for electricity was ten times higher for low income households than for high income households. A comparison of the median shares paid is less extreme: about five times greater for the lowest income quintile than for the highest.

Unlike electric and fuel costs, gas costs for remote rural census areas are not higher than for other regions (Table 5). This has to do with the fact that a much smaller share of households in remote rural census areas use gas for heat (and most of those using gas are actually using propane – only some North Slope residents have access to natural gas), while a majority of Anchorage households use gas. The share of households using gas for heat in Kenai & Mat-Su and mid-size and roaded areas is in between. This will be examined later in this report.

Table 5. Cost of Gas (Among Those Who Pay)

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$749	$718	$361	$698	$673
		median	$600	$540	$200	$400	$540
2	$25,671 to $43,910	average	$706	$836	$496	$861	$737
		median	$650	$700	$310	$500	$600
3	$43,911 to $64,500	average	$770	$755	$557	$669	$739
		median	$660	$700	$340	$500	$650
4	$64,501 to $93,400	average	$819	$747	$671	$825	$791
		median	$800	$700	$400	$500	$730
5	over $93,400	average	$948	$855	$627	$765	$894
		median	$900	$800	$360	$600	$840
	Total	average	$825	$780	$545	$761	$782
		median	$760	$700	$300	$500	$700
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	7.5%	6.8%	7.0%	8.1%	7.3%
		median	3.9%	3.5%	1.7%	3.1%	3.3%
2	$25,671 to $43,910	average	2.0%	2.4%	1.4%	2.6%	2.1%
		median	1.8%	2.0%	0.9%	1.5%	1.7%
3	$43,911 to $64,500	average	1.4%	1.4%	1.0%	1.3%	1.4%
		median	1.3%	1.3%	0.6%	0.9%	1.2%
4	$64,501 to $93,400	average	1.1%	1.0%	0.9%	1.1%	1.0%
		median	1.0%	0.9%	0.6%	0.7%	0.9%
5	over $93,400	average	0.7%	0.7%	0.5%	0.7%	0.7%
		median	0.7%	0.6%	0.2%	0.4%	0.6%
	Total	average	1.8%	2.2%	2.2%	3.3%	2.1%
		median	1.0%	1.1%	0.7%	1.2%	1.1%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Of the four utility categories in the census, water and sewer unsurprisingly has the lowest cost, although it is about twice as high as a share of income in remote rural census areas as in Anchorage (Table 6).

Table 6. Cost of Water and Sewer, for Those Who Pay

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$530	$524	$619	$621	$587
		median	$550	$490	$540	$500	$500
2	$25,671 to $43,910	average	$555	$526	$641	$632	$592
		median	$580	$500	$600	$520	$570
3	$43,911 to $64,500	average	$565	$568	$675	$721	$617
		median	$580	$500	$600	$600	$580
4	$64,501 to $93,400	average	$518	$566	$654	$910	$607
		median	$560	$500	$650	$720	$580
5	over $93,400	average	$525	$628	$661	$966	$617
		median	$570	$530	$600	$830	$580
	Total	average	$535	$565	$653	$758	$607
		median	$570	$500	$600	$600	$580
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	5.1%	5.0%	4.8%	6.0%	5.3%
		median	2.9%	2.8%	3.3%	3.4%	3.1%
2	$25,671 to $43,910	average	1.6%	1.6%	1.8%	1.8%	1.7%
		median	1.5%	1.6%	1.6%	1.5%	1.5%
3	$43,911 to $64,500	average	1.1%	1.1%	1.2%	1.3%	1.2%
		median	1.0%	0.9%	1.1%	1.1%	1.0%
4	$64,501 to $93,400	average	0.7%	0.7%	0.8%	1.2%	0.8%
		median	0.7%	0.7%	0.8%	0.9%	0.7%
5	over $93,400	average	0.4%	0.5%	0.5%	0.8%	0.5%
		median	0.4%	0.4%	0.5%	0.6%	0.4%
	Total	average	1.1%	1.6%	1.5%	2.4%	1.5%
		median	0.7%	0.9%	0.9%	1.2%	0.8%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Table 7 represents the cost of all four utilities for all households who pay anything for any of the utilities. The numbers are steadily increasing as the geography becomes increasingly "rural" or "remote", as well as decreasing across the income quintiles. As with the individual utility tables, we can see that households in remote rural Alaska and those in the poorest quintile are the ones with the highest utility costs in proportion to their incomes. The difference between costs for the poorest quintile (the first) and costs for the second quintile is much greater than the difference between other adjacent quintiles: the median of the first quintile is double that of the second, while the average is almost triple. Similarly, the increase from mid-size and roaded areas to remote rural areas is greater than the differences between other areas. Remote rural households pay significantly more for utilities, primarily due to the high cost of heating fuel and electricity whose generation depends on expensive diesel.

Table 7. Total Utility Costs (Among Those Who Pay)

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$1,291	$1,814	$1,849	$2,842	$1,870
		median	$980	$1,600	$1,300	$2,400	$1,500
2	$25,671 to $43,910	average	$1,439	$2,113	$2,003	$3,136	$1,980
		median	$1,300	$1,920	$1,800	$2,880	$1,700
3	$43,911 to $64,500	average	$1,818	$2,143	$2,445	$3,460	$2,242
		median	$1,700	$1,950	$2,300	$3,200	$2,000
4	$64,501 to $93,400	average	$2,027	$2,170	$2,752	$3,816	$2,430
		median	$2,030	$2,020	$2,620	$3,520	$2,240
5	over $93,400	average	$2,401	$2,445	$3,096	$4,309	$2,775
		median	$2,300	$2,200	$2,900	$4,100	$2,500
	Total	average	$1,876	$2,128	$2,464	$3,411	$2,283
		median	$1,810	$1,950	$2,320	$3,100	$2,060
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	12.0%	19.3%	22.7%	28.9%	19.9%
		median	6.2%	10.6%	9.5%	18.5%	9.6%
2	$25,671 to $43,910	average	4.2%	6.2%	5.8%	9.2%	5.8%
		median	3.6%	5.6%	5.1%	8.1%	4.8%
3	$43,911 to $64,500	average	3.4%	4.0%	4.5%	6.5%	4.2%
		median	3.2%	3.6%	4.2%	5.9%	3.6%
4	$64,501 to $93,400	average	2.6%	2.8%	3.5%	5.0%	3.1%
		median	2.6%	2.6%	3.3%	4.6%	2.8%
5	over $93,400	average	1.8%	1.9%	2.5%	3.5%	2.2%
		median	1.7%	1.8%	2.3%	3.3%	2.0%
	Total	average	4.1%	6.9%	7.5%	12.5%	6.6%
		median	2.6%	3.4%	3.7%	6.6%	3.2%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Notice that in most cases, the average in these tables are greater than the medians, suggesting that a small proportion of households pay exceptionally high shares of their incomes for these utilities.

REMOTENESS AND POVERTY STATUS

In the following tables, we break down the analysis by poor vs. non-poor and remote vs. non-remote households. This provides an alternative and more compact view, and on a practical level allows the table columns to be used for both geography and income, freeing the rows to represent categorical data.

In the following tables, "Remote Rural" is defined as being within PUMA 400, and "non-remote" as being within any other region. Remote households comprise 13.6% of households statewide and 16.1% of the population.

The definition of poverty here is based on the poverty guidelines issued by the U.S. Department of Health and Human Services. To correspond with the other measures in this report, it has been modified to use the household as the unit of analysis rather than the family. It was chosen instead of the poverty thresholds issued by the Census Bureau because there is a different set of guidelines developed for Alaska (and also for Hawaii), while the thresholds are the same for all states. The poverty guidelines are also the basis

for many income-tested assistance programs. The poverty guidelines depend on family (household) size, so poverty status does not correspond directly with household income quintile. The 2000 HHS poverty guidelines for Alaska are $10,430 plus $3,630 for each family (household) member beyond the first.

Table 8 shows that remote households are twice as likely to be poor. In general, households in remote rural Alaska have more members, and households in poverty have fewer. Because rural households are larger, and the poverty guidelines depend on household size, the average poverty line for rural households is higher, and more rural households of higher income fall below the line. Table 10 shows that the income of rural poor is higher than that of urban poor, which is primarily due to the larger household sizes.

Table 8. Population by Remote/Non-remote and Poverty Status

	Non-remote			Remote Rural		
	Non-poor	Poor	Total	Non-poor	Poor	Total
Household Count	177,634	13,672	191,306	25,543	4,556	30,099
	92.9%	7.1%	100.0%	84.9%	15.1%	100.0%
Population in Households	476,772	34,037	510,809	82,227	13,860	96,087
	93.3%	6.7%	100.0%	85.6%	14.4%	100.0%
Average Household Size	2.68	2.47	2.66	3.19	3.07	3.17

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, and ISER calculations

Table 9 describes the distribution by race of population in households. The first part shows what percentage of the poor are Native or white, and the second part shows what percentage of the each race is in poverty.

Table 9. Race and Poverty Status

	Non-remote			Remote Rural		
	Non-poor	Poor	Total	Non-poor	Poor	Total
	Racial Distribution of Poverty					
Native	9.9%	18.6%	10.5%	58.7%	85.8%	62.6%
White	78.1%	61.0%	77.0%	33.0%	12.1%	30.0%
Other	12.0%	20.4%	12.6%	8.3%	2.1%	7.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Poverty Rates by Race					
Native	88.1%	11.9%	100.0%	80.2%	19.8%	100.0%
White	94.7%	5.3%	100.0%	94.2%	5.8%	100.0%
Other	89.2%	10.8%	100.0%	95.9%	4.1%	100.0%
Total	93.3%	6.7%	100.0%	85.6%	14.4%	100.0%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, and ISER calculations

The population of remote rural Alaska is 63 percent Native, while the population of urban and non-remote rural areas is 77 percent white. In both remote and non-remote Alaska, the Native population has the highest percentage in poverty, nearly 20 percent and 12

percent respectively. Poverty rates for Natives are quite similar to other racial and ethnic groups in non-remote areas while the white population has the lowest rates of poverty.

Table 10 shows the average and median incomes of households, their average and median utility costs, and costs as a percentage of household income.[8] Remote rural Alaska households pay more than twice the percentage of their income for utilities as compared to the share households in other regions of the state pay. But when we compare poor households in remote and non-remote areas, the picture is more complex. Poor remote households pay a smaller share of their income for most utilities than do poor non-remote households. This is because remote rural poor households have larger household sizes and therefore higher average incomes, partially offsetting higher utility costs. But because of the dominance of the utilities they do pay more for, specifically median electricity and heating fuel costs, their median cost for all utilities is 24% of household income, almost double the share paid by non-remote poor households.

[8] The average and median costs as a percentage of income here can't be calculated by dividing the dollar cost figures by the corresponding income figures, for two reasons. First, while the income figures are for all households, cost figures are only for those households who pay for the given utility. Second, the percentage figures are the averages and medians of the cost/income ratios which are calculated for each household, not ratios of the averages and medians. That is, average(cost/income) ≠ average(cost) / average(income), and the figures we present are the former. Also, the totals can't be calculated by adding the averages and medians of the individual utilities, again, because these figures are for different sets of households. Each utility cost figure is only for those households who pay for the given utility, while the total figures are for households who pay for any utility.

Table 10. Household Income and Utility Costs, for Those Who Pay

		Non-remote			Remote Rural		
		Non-poor	Poor	Total	Non-poor	Poor	Total
		Household Income, 1999					
Income	average	$69,794	$9,856	$65,510	$63,223	$12,177	$55,497
	median	$59,110	$8,770	$55,000	$52,790	$10,300	$44,740
		Utility Cost					
Heating Fuel	average	$1,146	$968	$1,134	$1,622	$1,458	$1,595
	median	$1,000	$700	$1,000	$1,400	$1,200	$1,300
Electricity	average	$1,051	$911	$1,042	$1,480	$1,232	$1,441
	median	$900	$700	$900	$1,200	$1,000	$1,200
Gas	average	$789	$687	$784	$731	$909	$761
	median	$720	$540	$720	$500	$500	$500
Water & Sewer	average	$577	$519	$575	$784	$592	$758
	median	$580	$500	$570	$620	$480	$600
Total	average	$2,136	$1,639	$2,106	$3,478	$3,051	$3,411
	median	$2,000	$1,300	$2,000	$3,200	$2,640	$3,100
		Cost as a Percentage of Household Income					
Heating Fuel	average	2.2%	18.6%	3.3%	3.6%	18.3%	6.0%
	median	1.5%	8.5%	1.6%	2.6%	11.3%	3.1%
Electricity	average	2.0%	19.8%	3.1%	3.2%	15.6%	5.2%
	median	1.4%	7.0%	1.5%	2.3%	8.7%	2.7%
Gas	average	1.4%	12.6%	1.9%	1.6%	11.2%	3.3%
	median	1.0%	5.1%	1.0%	0.9%	4.7%	1.2%
Water & Sewer	average	1.0%	8.3%	1.2%	1.6%	7.8%	2.4%
	median	0.7%	4.4%	0.7%	1.1%	4.0%	1.2%
Total	average	4.0%	32.5%	5.7%	7.6%	38.6%	12.5%
	median	2.9%	12.7%	3.0%	5.8%	24.0%	6.6%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, and ISER calculations

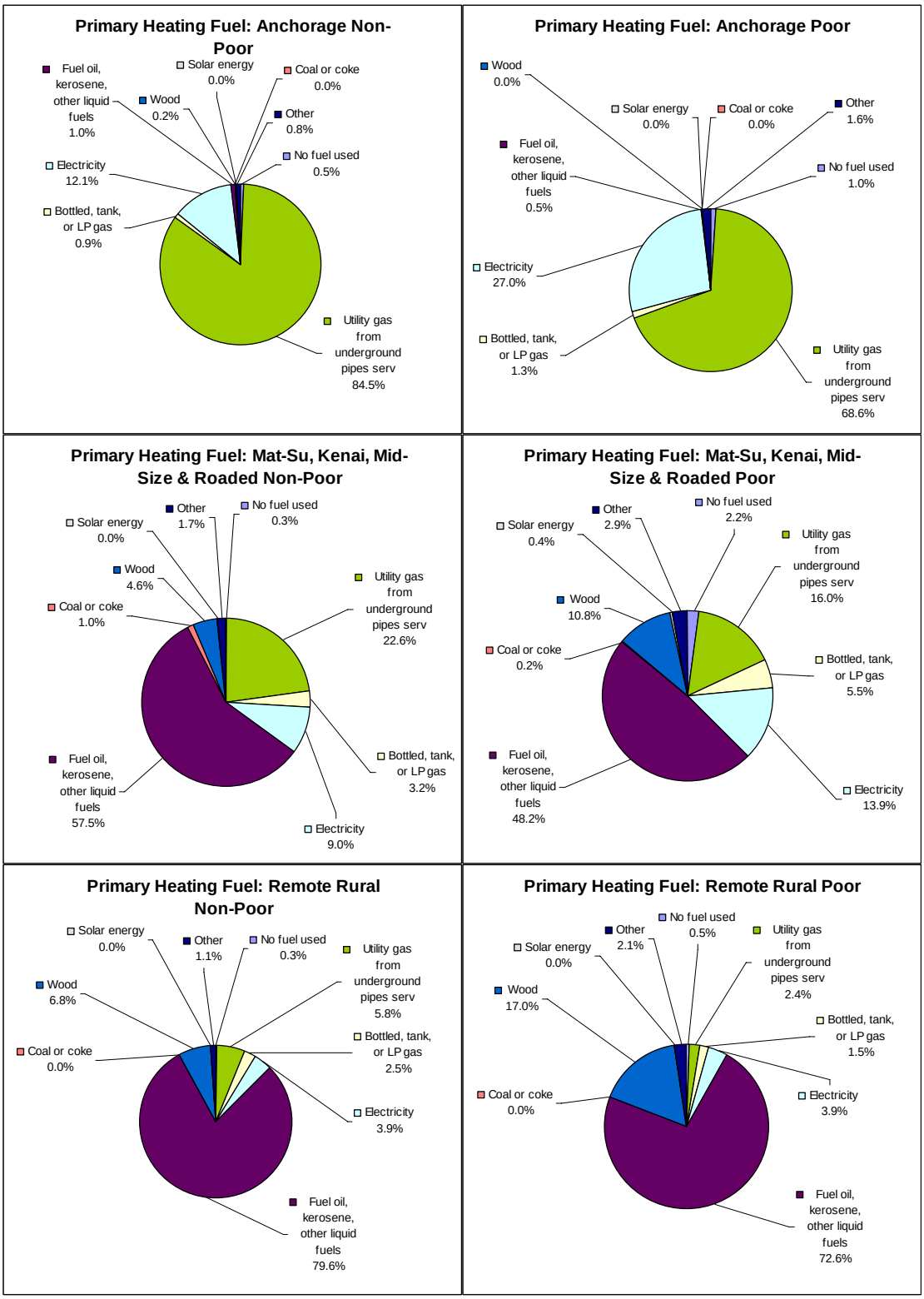
TYPES OF HEATING FUEL

As we mentioned earlier, heat is the biggest utility cost for Alaska households in every region, but the types of fuel used for home heating differ from region to region.

Figure 4 shows the mix of types of fuel used to heat homes in three regions: Anchorage, remote rural, and the Kenai, Mat-Su and mid-sized and roaded areas combined.

In Anchorage, utility gas is available to most homes and is the primary fuel used for heating. Electricity is the only other significant source of energy for heat in Anchorage – in particular, many poor households rely on electricity rather than gas, although gas is still the dominant heating fuel. Outside of Anchorage, liquid fuels are much more widely used, and in remote rural Alaska fuel oil is the primary heating fuel used by a large majority of households.

Figure 4. Primary Heating Fuel



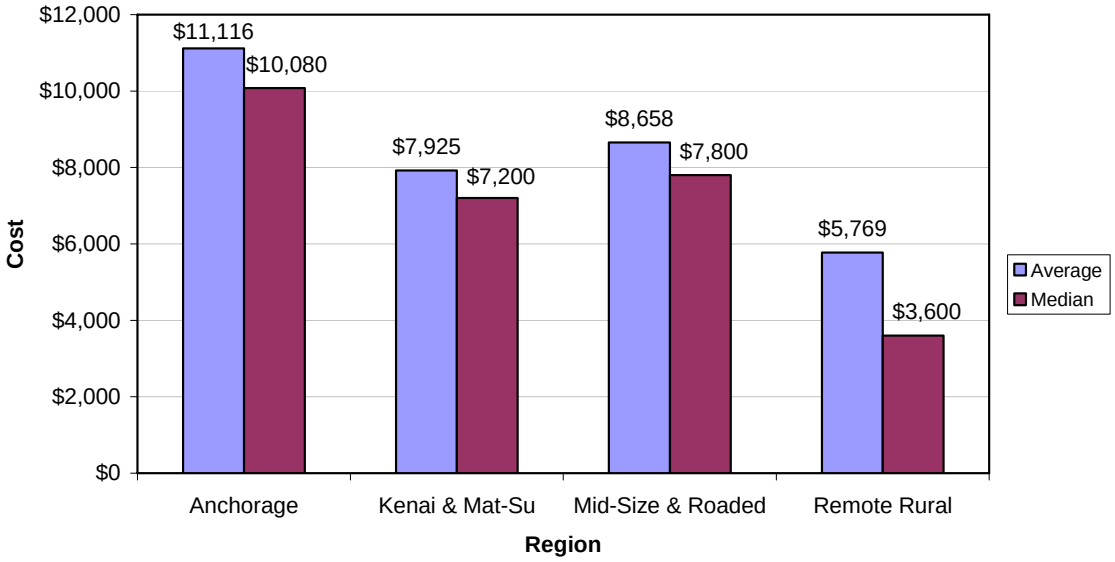
Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, and ISER calculations

Wood is the secondary heating fuel used in remote areas, used mostly by poor households. Much of that wood may be cut by the households themselves rather than bought, which would bring down the average cost of heating for those households. The rest of the state uses a mix of fuel oil, natural gas, electricity and other energy sources.

HOUSING COSTS

While rural Alaskans pay more for utilities than urban Alaskans, on average they pay less for housing. As Figure 5 shows, housing costs are significantly higher in Anchorage than other areas of the state, with an average of almost twice and a median of almost three times those in remote rural Alaska. These expenses as reported in the census include mortgage, rent, mobile home costs, condominium fees, property tax, and property insurance, but do not include maintenance costs.

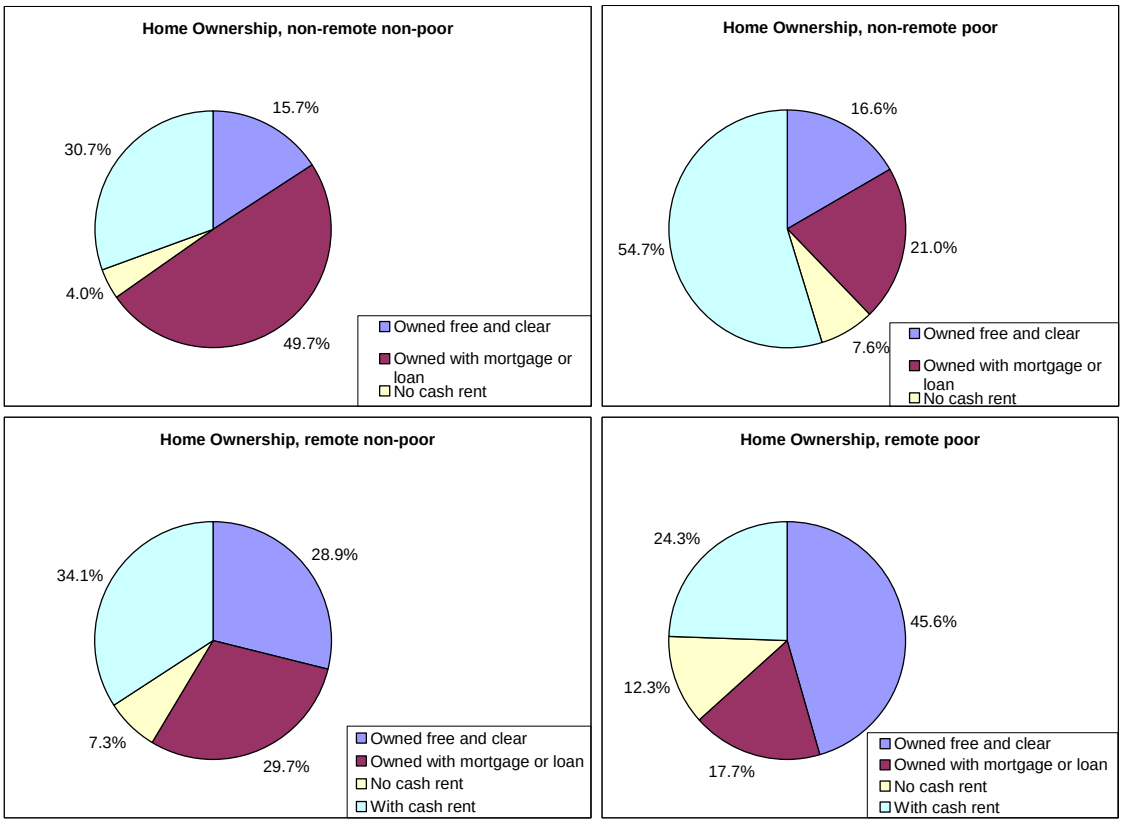
Figure 5. Annual Housing Costs Excluding Utilities, 2000



Sources: U.S. Census Bureau (IPUMS) and ISER calculations

Why do households in remote rural Alaska spend so much less on housing? Housing subsidies for rural Alaskans, along with different ownership patterns and lower rent and mortgages, are the main reasons for this. Housing subsidies exist for both low income and Native households, both of which make up a larger share of remote rural areas than they do of non-remote areas. Figure 6 shows home ownership characteristics. In non-remote areas, half of all non-poor households pay a mortgage, while more than half of poor households pay rent. Few own their homes free and clear. Among poor remote households, the largest share own their houses free and clear. Among non-poor remote households, less than a third pay a mortgage, and a large share own their houses free and clear. Property values are higher in urban areas, and houses are larger with more amenities.

Figure 6. Home Ownership



Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, and ISER calculations

Table 11 reports average and median housing costs in dollars and as a percent of income. Median housing costs as a share of income are highest in Anchorage and lowest in remote rural census areas for all income quintiles. The numbers for mid-size and roaded areas show a large positive skew, and it has the highest average cost. In Anchorage, Kenai/Mat-Su, and mid-size and roaded areas, non-utility housing costs take a much larger share of household income, while in remote rural census areas, the share is only moderately higher than utility costs, and for the lowest income households is actually slightly lower.

Table 11. Cost of Housing, Excluding Utilities, for Those Who Pay

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$7,030	$4,578	$5,594	$3,050	$5,447
		median	$6,960	$3,600	$4,800	$1,800	$4,855
2	$25,671 to $43,910	average	$8,235	$6,627	$6,472	$4,701	$6,965
		median	$8,040	$6,525	$6,600	$3,125	$7,200
3	$43,911 to $64,500	average	$10,425	$8,089	$8,164	$5,872	$8,821
		median	$10,150	$7,800	$7,875	$4,200	$8,400
4	$64,501 to $93,400	average	$12,606	$9,737	$10,337	$7,729	$10,941
		median	$12,810	$9,480	$10,650	$7,080	$10,800
5	over $93,400	average	$15,760	$11,349	$12,955	$9,704	$13,760
		median	$15,600	$10,800	$13,200	$9,240	$13,200
Total		average	$11,116	$7,925	$8,658	$5,769	$9,186
		median	$10,080	$7,200	$7,800	$3,600	$8,400
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	69.3%	49.2%	77.9%	27.9%	60.3%
		median	42.1%	27.2%	32.3%	15.2%	33.2%
2	$25,671 to $43,910	average	24.0%	19.6%	18.9%	13.5%	20.3%
		median	23.4%	18.8%	19.4%	9.1%	20.7%
3	$43,911 to $64,500	average	19.5%	14.9%	15.0%	10.9%	16.4%
		median	19.0%	14.7%	14.9%	8.2%	16.1%
4	$64,501 to $93,400	average	16.3%	12.6%	13.3%	10.0%	14.1%
		median	15.9%	12.2%	13.5%	8.9%	13.9%
5	over $93,400	average	11.8%	9.0%	10.3%	7.8%	10.6%
		median	11.6%	8.8%	10.6%	7.3%	10.4%
Total		average	26.2%	21.8%	27.6%	15.4%	24.3%
		median	18.1%	13.8%	15.1%	9.3%	15.6%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

Utility costs could be considered a component of total housing costs. When we look at housing costs and utilities together (Table 12), the numbers are more even across regions. Anchorage has the highest median share of income, while remote rural census areas have the lowest. Even though costs of utilities are so much higher in remote rural census areas, the lower cost of housing seems to even things out.

Table 12. Cost of Housing, Including Utilities, for Those Who Pay

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,670 and below	average	$7,931	$6,164	$7,034	$5,581	$6,922
		median	$7,300	$5,321	$6,140	$4,790	$6,290
2	$25,671 to $43,910	average	$9,377	$8,586	$7,980	$7,462	$8,582
		median	$8,860	$7,980	$7,660	$6,455	$8,160
3	$43,911 to $64,500	average	$12,013	$10,149	$10,216	$8,872	$10,796
		median	$11,500	$9,580	$9,505	$7,839	$10,015
4	$64,501 to $93,400	average	$14,468	$11,882	$12,932	$10,988	$13,201
		median	$14,400	$11,660	$12,960	$9,600	$12,930
5	over $93,400	average	$18,083	$13,785	$15,942	$13,483	$16,428
		median	$17,820	$13,550	$15,830	$12,000	$16,170
Total		average	$12,729	$9,941	$10,763	$8,756	$11,186
		median	$11,470	$9,000	$9,241	$7,200	$9,790
			Cost as a Percentage of Household Income				
1	$25,670 and below	average	77.1%	66.0%	95.1%	53.7%	75.6%
		median	45.6%	38.5%	41.2%	35.3%	41.5%
2	$25,671 to $43,910	average	27.3%	25.3%	23.3%	21.6%	25.0%
		median	26.0%	23.6%	23.0%	18.5%	24.1%
3	$43,911 to $64,500	average	22.4%	18.8%	18.8%	16.6%	20.1%
		median	21.4%	18.1%	18.2%	15.0%	18.8%
4	$64,501 to $93,400	average	18.7%	15.3%	16.6%	14.3%	17.0%
		median	18.1%	14.9%	16.3%	12.9%	16.5%
5	over $93,400	average	13.6%	10.9%	12.7%	10.8%	12.7%
		median	13.3%	10.5%	12.9%	10.2%	12.4%
Total		average	29.7%	28.3%	33.9%	26.3%	30.1%
		median	20.7%	17.9%	19.2%	17.0%	19.3%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, and ISER calculations

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III. HOUSEHOLD INCOME AND UTILITY COSTS PROJECTED TO 2006

Energy costs have increased greatly since 2000. Prices for fuel oil increased by 83% in remote communities between 2000 and 2005. Between 2000 and 2006, natural gas prices for Anchorage residential customers went up 91%, and electric rates increased 41% for PCE residential customers and 28% for Anchorage residential customers. These increases exceed the increases in income over those years, causing the cost of energy for households to make up a much larger share of income.

There is no household data for 2005 or 2006 that is comparable to the 2000 census that would allow us to directly measure the change in household utility costs since 2000. (The American Community Survey is not usable for this purpose for a number of reasons explained in Appendix B). To estimate how household utility costs have changed since then, we made projections based on the households in the 2000 PUMS and the best available utility price and income time-series data. This projection does not account for demographic changes, changes in housing costs (we omit them from the projection), or changes in the amount of fuel, electricity, or gas consumed. Our estimated changes in household costs for a utility are based only on changes in price for that utility. In reality we expect that people will moderate their use of fuel, gas, and electricity as prices rise. Our estimate of cost based on a constant level of consumption is therefore high, but the degree of overstatement may not be great, because economic studies tell us that Americans' energy use is relatively inelastic, meaning they typically don't cut their energy use much, even when prices are rising.

In this chapter we estimate 2006 costs as a share of 2005 income. To calculate this percentage, we project both changes in utility costs and changes in household income.

UTILITY PRICES

Table 13 shows heating oil prices per gallon for selected years. The prices are population-weighted averages. Alaska Housing Finance Corporation's (AHFC) fuel price survey is conducted late in each year. 1999 survey data was not available, so the 1999 figures are estimated (Appendix C describes the estimation procedure). Prices increased greatly in all regions, from about 55% in Anchorage to nearly doubling in remote rural areas.

Table 13. Average Heating Oil Price Per Gallon by Region

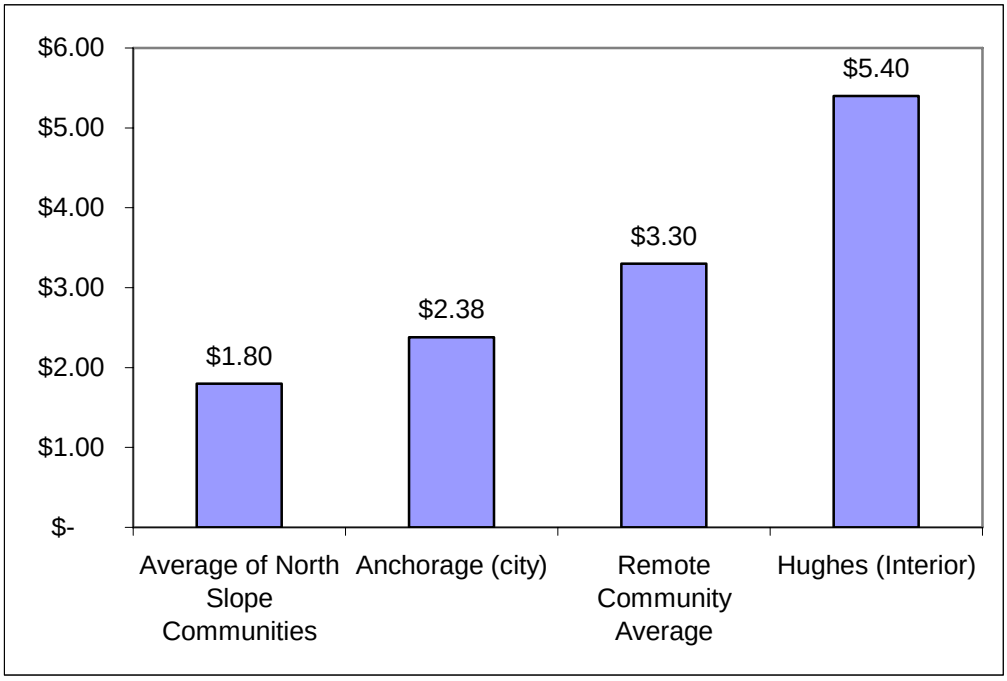
Region	1999 (estimated)	2000	2004	2005	Increase 1999-2005
Anchorage	$1.53	$1.51	$2.05	$2.36	54.6%
Kenai & Mat-Su	$1.39	$1.38	$2.00	$2.30	64.7%
Mid-Size & Roaded	$1.47	$1.49	$2.16	$2.55	73.3%
Remote Rural	$1.70	$1.81	$2.59	$3.30	94.4%

Sources: U.S. Census Bureau, Alaska Housing Finance Corporation and ISER calculations

Fuel prices vary a lot among remote places (Figure 7). In December 2005, prices varied from a low of $1.80 per gallon among North Slope communities to $5.40 in Hughes, in

the interior. The average and median price in remote communities was $3.30, as Figure 7 shows. Costs of fuel in remote communities varies depending on costs of transporting the fuel to the village's location, when the fuel was purchased, and how long the community supply bought at a specific time lasts. North Slope villages are among the state's most remote communities, but they pay lower prices because the borough government subsidizes residential fuel costs. Anchorage is included in Figure 7 for comparison. Note that this price is for the Anchorage bowl, which is why it differs slightly from the Anchorage figure above, which is for the entire municipality (including other places such as Girdwood and Eagle River). Appendix E shows 2005 AHFC heating oil price data for each community.

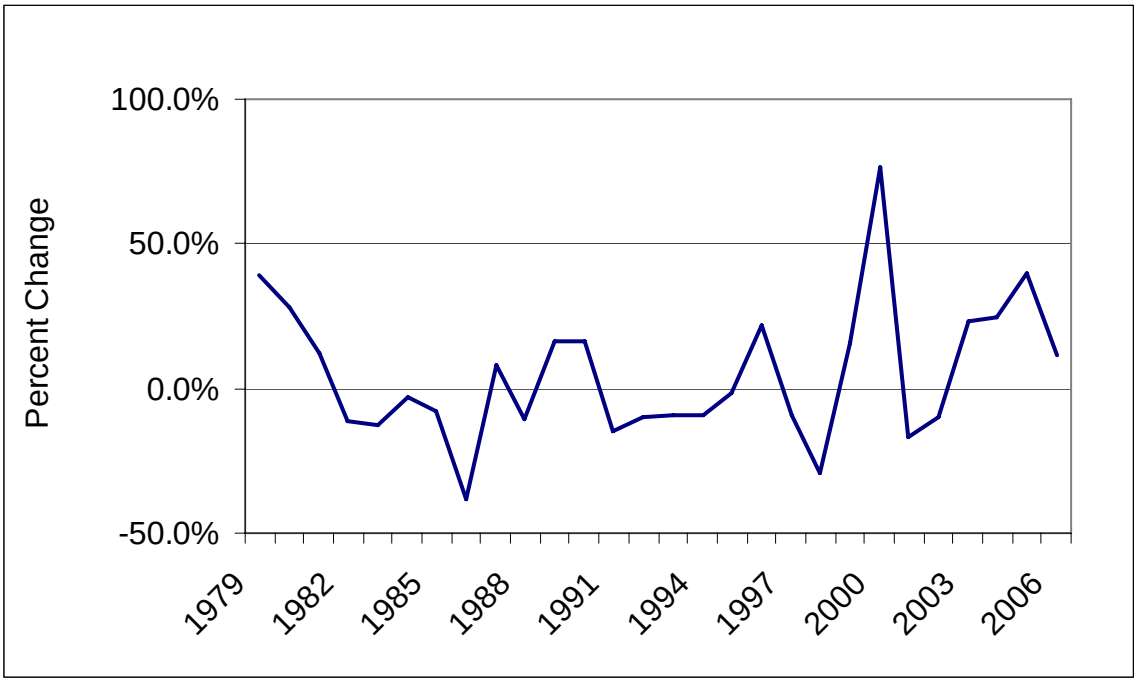
Figure 7. Range of Heating Oil Prices, December 2005



Source: Alaska Housing Finance Corporation

While the price change over six year is the focus for this analysis, it is notable that the year-to-year price changes are very volatile. As the saw-tooth pattern in Figure 8 shows, increases in the real, inflation-adjusted price of heating fuel alternate with real price decreases. The largest price hike on record was 1999 to 2000. The second largest price jump in 2005-2005 matched an equally large real price jump in 1978-1979.

Figure 8. Year-to-year Change in Real Price of No. 2 Fuel Oil, 1978 to 2006.



Source: Energy Information Administration Monthly Energy Review, February 2007, Table 9.6 and ISER calculations: percent change in national average price per gallon, adjusted to 2006 dollars using the Anchorage CPI

Because most of the electric generators in rural Alaska run on diesel, much of the volatility of oil prices transfers over to electric rates as well.

Electric rates have increased substantially. Table 14 shows population-weighted averages of price per kilowatt-hour. Again the increase was greatest in remote rural places at 36.7%, followed by mid-size and roaded places at 34.1%. Many remote communities receive Power Cost Equalization, a state program that subsidizes electricity cost in places that generate electricity mainly with diesel. These figures take this subsidy into account.

Table 14. Average Electric Prices Per kWh, 1999 and 2005

Region	1999	2005	Increase
Anchorage (based on cost of 1000 kWh)	$0.092	$0.116	25.9%
Kenai & Mat-Su (based on cost of 1000 kWh)	$0.111	$0.129	16.2%
Mid-Size & Roaded (based on cost of 1000 kWh)	$0.113	$0.152	34.1%
Remote Rural (based on PCE effective rates)	$0.172	$0.237	37.6%

Sources: U.S. Census Bureau, Alaska Housing Finance Corporation, UA Cooperative Extension Service, Chugach Electric Association, Municipal Light and Power, Alaska Energy Authority, and ISER calculations

Enstar provides natural gas from Cook Inlet fields to Anchorage customers and some (but not all) places on the Kenai Peninsula to the sound and the Mat-Su Borough to the north. Some Fairbanks households use liquefied natural gas (LNG) from Fairbanks Natural Gas, which is trucked in, and Barrow Utilities and Electric provides gas from local wells.

Natural gas pricing is somewhat complex, usually including several components such as a fixed monthly customer charge, base price per CCF (hundred cubic feet), Gas Cost Adjustment charge per CCF, Gas Supply Agreement charge per CCF, and a Regulatory Cost Charge as a percentage of the total monthly bill. Table 15 shows only the sum of per-CCF rates, although the other charges are factored into our household-level calculations.

Enstar and Barrow prices both increased by about 50%, while Fairbanks rates increased less than 10%. However, the LNG available in Fairbanks is much more expensive than the piped natural gas available elsewhere.

Table 15. Natural Gas Prices Per CCF, 1999 and 2005

Company	1999	2005	Increase
Enstar Natural Gas	$0.342	$0.504	47.5%
Fairbanks Natural Gas	$1.186	$1.297	9.4%
Barrow Utilities and Electric	$0.191	$0.288	51.1%

Sources: Alaska Housing Finance Corporation, Enstar Natural Gas, Fairbanks Natural Gas, Barrow Utilities and Electric, Regulatory Commission of Alaska

Some households use propane, and gas costs reported in the census include propane costs. As with heating oil prices, we estimated the 1999 prices because AHFC fuel price survey data was not available for 1999. Propane prices increased greatly, especially in Kenai and Mat-Su and mid-size and roaded communities (Table 16). Remote communities experienced a slightly smaller increase, although the prices were about double the prices in other regions.

Table 16. Average Propane Price Per Gallon by Region

Region	1999 (estimated)	2000	2005	Increase 1999-2005
Anchorage	$1.85	$1.94	$2.45	32.5%
Kenai & Mat-Su	$1.42	$1.56	$2.47	74.2%
Mid-Size & Roaded	$1.57	$1.72	$2.70	71.4%
Remote Rural	$3.22	$3.42	$5.09	57.9%

Sources: Alaska Housing Finance Corporation and ISER calculations

Data on water and sewer rates was the most difficult price data to obtain. We were only able to find real price data for Anchorage, and this came from bills from Anchorage Water and Wastewater Utility, which charges a fixed monthly rate. For other regions, due to lack of any workable alternatives, we used the 2000 census and 2005 ACS PUMS household data to calculate the increase. However, in one respect this may be better than using price data, because many non-urban and remote households probably do not pay a utility company for water. Table 17 shows changes in water and sewer costs between 1999 and 2005.

Table 17. Average Monthly Water & Sewer Cost, 1999 and 2005

Region	1999	2005	Increase
Anchorage	$47.91	$55.59	16.0%
Kenai & Mat-Su	$47.12	$49.26	4.5%
Mid-Size & Roaded	$54.43	$68.22	25.3%
Remote Rural	$63.17	$67.83	7.4%

Sources: U.S. Census Bureau (IPUMS), Anchorage Water and Wastewater Utility

INCOME

Income is projected using a combination of the 1999-2004 Statistics of Income (SOI) from the IRS, the 2000 census, and the 2005 ACS PUMS. These provide sufficient geographic information to project changes in aggregate household income for each PUMA region. We projected three types of income separately: wage and salary income, business and farm (self employment) income, and non-earned income. The SOI provide per capita wage and salary income from 1999 to 2004, which we extrapolated to 2005 using linear regression. The 2000 census PUMS and 2005 ACS PUMS provide per capita self employment income and non-earned income in 1999 and 2005. The two PUMS datasets also allowed us to differentiate changes in wage and salary income by income quintile. Using the ratios of change calculated from these data sets, we projected each type of income for every household in the 2000 PUMS, then added the results to obtain a total 2005 projected income for each household. Appendix D provides a detailed description of the procedure we used to project household income.

Note that these income figures and all money amounts in this report are in nominal dollars (not adjusted for inflation). Costs as a share of income are what we are most interested in, and adjusting both the numerator and denominator for inflation would not change these ratios.

Table 18 shows the 1999 household incomes and projected 2005 household incomes. It shows both average and median incomes (the midpoint number, with half of the households above and half below) for each income quintile and region. Households in lower income quintiles had smaller increases in income, with those in the lowest income quintile having decrease. Remote rural households had the smallest overall increase, with the average income increasing 6.1% and the median increasing only 1.9%. Some contributing factors to this are that per capita wage and salary had the smallest increase in remote rural Alaska, business and farm income the next to smallest increase, and non-earned income the greatest decrease. Also, the remote rural population is more concentrated in the lower income quintiles, whose income had the smallest increase.

Table 18. Household Income by Region and Quintile, 1999 and 2005 Projected

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Household Income in 1999				
1	$25,670 and below	average	$15,743	$14,633	$15,290	$14,402	$15,164
		median	$16,300	$14,770	$16,300	$14,440	$15,770
2	$25,671 to $43,910	average	$34,869	$34,623	$34,667	$34,823	$34,768
		median	$35,100	$34,580	$34,570	$34,210	$34,770
3	$43,911 to $64,500	average	$53,729	$54,171	$54,365	$53,886	$53,998
		median	$52,910	$53,940	$54,020	$53,390	$53,540
4	$64,501 to $93,400	average	$77,998	$77,865	$78,201	$77,259	$77,939
		median	$77,840	$77,300	$78,370	$76,840	$77,710
5	over $93,400	average	$143,356	$136,479	$133,959	$133,717	$138,895
		median	$122,270	$115,170	$118,400	$116,910	$119,000
	Total	average	$69,409	$60,202	$62,703	$55,497	$64,149
		median	$57,540	$52,970	$53,000	$44,740	$53,540
			Projected Household Income in 2005				
1	$25,743 and below	average	$15,223	$13,520	$14,795	$13,300	$14,401
		median	$16,248	$13,940	$15,416	$13,341	$14,790
2	$25,744 to $46,854	average	$36,982	$36,566	$36,639	$36,204	$36,707
		median	$37,086	$36,371	$36,925	$35,651	$36,808
3	$46,855 to $71,013	average	$58,177	$58,878	$58,418	$58,331	$58,394
		median	$57,557	$59,179	$58,754	$58,257	$58,203
4	$71,014 to $107,602	average	$86,771	$87,887	$88,445	$85,900	$87,324
		median	$86,658	$87,650	$88,420	$84,903	$86,926
5	over $107,602	average	$174,358	$162,496	$163,272	$155,356	$167,896
		median	$146,239	$140,759	$144,614	$137,257	$143,485
	Total	average	$80,102	$66,795	$72,635	$58,876	$72,933
		median	$62,739	$56,338	$59,007	$45,599	$58,203
			Projected Change in Household Income				
1		average	-3.3%	-7.6%	-3.2%	-7.7%	-5.0%
		median	-0.3%	-5.6%	-5.4%	-7.6%	-6.2%
2		average	+6.1%	+5.6%	+5.7%	+4.0%	+5.6%
		median	+5.7%	+5.2%	+6.8%	+4.2%	+5.9%
3		average	+8.3%	+8.7%	+7.5%	+8.2%	+8.1%
		median	+8.8%	+9.7%	+8.8%	+9.1%	+8.7%
4		average	+11.2%	+12.9%	+13.1%	+11.2%	+12.0%
		median	+11.3%	+13.4%	+12.8%	+10.5%	+11.9%
5		average	+21.6%	+19.1%	+21.9%	+16.2%	+20.9%
		median	+19.6%	+22.2%	+22.1%	+17.4%	+20.6%
	Total	average	+15.4%	+11.0%	+15.8%	+6.1%	+13.7%
		median	+9.0%	+6.4%	+11.3%	+1.9%	+8.7%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, IRS Statistics of Income Division, and ISER calculations

Table 19 shows the projected 2005 population in poverty. We determined 2005 poverty levels based on the U.S. Department of Health and Human Services' 2006 poverty guidelines for Alaska[9], which reflect price changes through calendar year 2005, and we apply them to households rather than families. The 2006 HHS poverty guidelines for Alaska are $12,250 plus $4,250 for each family (household) member beyond the first. (In

[9] "Poverty Guidelines, Research, and Measurement." Office of the Assistant Secretary for Planning and Evaluation, HHS. Updated January 4, 2007. <http://aspe.hhs.gov/poverty/>. Retrieved 1/10/2007.

the 1999 poverty table, repeated above for comparison, we used the 2000 HHS poverty guidelines for Alaska.) The projection shows a large increase in the share of households in poverty, greater than what Census data reports. Appendix D (Income Projection) addresses this issue.

Table 19. Population in Poverty, 1999 and 2005 Projected

	Non-remote			Remote Rural		
	Non-poor	Poor	Total	Non-poor	Poor	Total
	1999 Population in Poverty					
Household Count	92.9%	7.1%	100.0%	84.9%	15.1%	100.0%
Population in households	93.3%	6.7%	100.0%	85.6%	14.4%	100.0%
	Projected 2005 Population in Poverty					
Household Count	89.5%	10.5%	100.0%	76.4%	23.6%	100.0%
Population in Households	90.2%	9.8%	100.0%	76.3%	23.7%	100.0%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, IRS Statistics of Income Division, and ISER calculations

Our projection also shows an increase in income inequality. The Gini coefficient measures income inequality on a scale from 0 (perfect equality – everyone has the same income) to 1 (perfect inequality – one person has all the income, while everyone else has zero income). The Gini coefficient for households in the 2000 PUMS (with our PFD adjustment) is 0.38704, and the Gini coefficient of our projected 2005 incomes for the same households is 0.41855.

UTILITY COSTS

We projected annual utility costs in 2006 by estimating change in utility prices from a number of data sources. By "annual", we mean what households might have reported as their annual costs in a census conducted in April of 2006, exactly six years after the 2000 Census. We assume no change in consumption levels, and so the projected percentage change in costs is equal to the estimated price change. We estimated price increases separately for each of the four utility costs in the Census and for each PUMA. Appendix C contains describes the procedure used to project utility costs.

We present medians as well as averages, and focus much of our discussion on the medians, because the median is in some ways a "fairer" figure, more representative of the middle household and less sensitive to outliers with unusually high or low costs.

The Alaska Housing Finance Corporation conducts an annual survey of fuel prices across Alaska. We aggregated these to the PUMA regions, weighting each place by population, and used them to project household expenditures on heating oil and propane. We only used the fuel oil price change to project costs where appropriate for the household – other fuel types are used by some households and included in the reported fuel cost, but lacking sufficient price series data and given the dominance of fuel oil in this category, we did not project changes in fuel costs for these households.

Table 20 shows that the cost of heating fuel is highest and has increased the most for remote rural households, for whom the projected 2006 cost had a median of 5.5% and an average of 14.3% of household income, more than double the share paid by households in

mid-size and roaded communities. Remote rural households in the lowest income quintile paid a median of 17.6% and an average of 35.5%.

Table 20. Cost of Heating Fuel (Liquid or Solid), for Those Who Pay, 2006 Projected

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,743 and below	average	$412	$1,391	$1,758	$2,627	$2,022
		median	$400	$1,070	$1,400	$2,333	$1,647
2	$25,744 to $46,854	average	$413	$1,476	$1,996	$2,738	$2,061
		median	$150	$1,000	$1,733	$2,333	$1,733
3	$46,855 to $71,013	average	$1,207	$1,567	$2,094	$3,171	$2,232
		median	$500	$1,317	$1,733	$2,722	$1,944
4	$71,014 to $107,602	average	$206	$1,565	$2,313	$3,082	$2,160
		median	$150	$1,317	$2,080	$2,722	$1,907
5	over $107,602	average	$404	$1,758	$2,365	$3,806	$2,406
		median	$180	$1,482	$2,080	$3,499	$2,080
Total		average	$436	$1,536	$2,156	$2,991	$2,182
		median	$200	$1,235	$1,907	$2,527	$1,847
			Cost as a Percentage of Household Income				
1	$25,743 and below	average	3.2%	25.6%	19.1%	35.5%	27.0%
		median	2.5%	8.5%	10.6%	17.6%	12.3%
2	$25,744 to $46,854	average	1.1%	4.2%	5.4%	7.7%	5.7%
		median	0.4%	3.0%	4.5%	6.7%	4.5%
3	$46,855 to $71,013	average	2.2%	2.7%	3.6%	5.5%	3.9%
		median	0.9%	2.4%	3.1%	4.6%	3.2%
4	$71,014 to $107,602	average	0.2%	1.8%	2.6%	3.6%	2.5%
		median	0.2%	1.6%	2.3%	3.1%	2.2%
5	over $107,602	average	0.3%	1.2%	1.5%	2.6%	1.6%
		median	0.1%	1.0%	1.3%	2.4%	1.3%
Total		average	0.8%	7.9%	5.4%	14.3%	8.1%
		median	0.2%	2.5%	2.6%	5.5%	3.0%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, Alaska Housing Finance Corporation, IRS Statistics of Income Division, and ISER calculations

We projected electricity costs using price series data from Municipal Light & Power electric bills, the Food Cost Survey from UAF's Cooperative Extension Service, and annual PCE statistical reports from the Alaska Energy Authority. Anchorage households paid the least for electricity, with a median of 1.4% of household income, while households in remote rural places paid over twice as much as a share of income (Table 21). Rural households in the lowest income quintile paid a median of over 10% and an average of 20% of their income for electricity, while low-income Anchorage households paid just under 5% as a median and about 12% on average.

Table 21. Cost of Electricity, for Those Who Pay, 2006 Projected

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,743 and below	average	$951	$1,178	$1,323	$1,669	$1,253
		median	$755	$929	$966	$1,376	$963
2	$25,744 to $46,854	average	$930	$1,350	$1,377	$1,834	$1,260
		median	$755	$1,162	$1,207	$1,651	$1,007
3	$46,855 to $71,013	average	$1,084	$1,362	$1,531	$2,090	$1,373
		median	$906	$1,162	$1,341	$1,651	$1,133
4	$71,014 to $107,602	average	$1,196	$1,316	$1,700	$2,274	$1,458
		median	$1,058	$1,162	$1,609	$1,926	$1,259
5	over $107,602	average	$1,410	$1,500	$1,855	$2,409	$1,630
		median	$1,259	$1,394	$1,609	$2,064	$1,394
Total		average	$1,149	$1,336	$1,581	$1,983	$1,406
		median	$1,007	$1,162	$1,341	$1,651	$1,207
			Cost as a Percentage of Household Income				
1	$25,743 and below	average	11.8%	16.6%	14.1%	22.0%	15.7%
		median	4.7%	6.9%	6.8%	10.9%	6.7%
2	$25,744 to $46,854	average	2.6%	3.8%	3.9%	5.2%	3.5%
		median	2.1%	3.2%	3.1%	4.3%	2.8%
3	$46,855 to $71,013	average	1.9%	2.3%	2.7%	3.6%	2.4%
		median	1.5%	2.1%	2.3%	3.1%	2.0%
4	$71,014 to $107,602	average	1.4%	1.5%	1.9%	2.7%	1.7%
		median	1.2%	1.4%	1.7%	2.2%	1.4%
5	over $107,602	average	0.9%	1.0%	1.2%	1.7%	1.1%
		median	0.8%	0.9%	1.1%	1.5%	0.9%
Total		average	2.9%	5.1%	4.4%	9.0%	4.5%
		median	1.4%	2.0%	2.1%	3.7%	1.8%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, UA Cooperative Extension Service, Chugach Electric Association, Municipal Light and Power, Alaska Energy Authority, IRS Statistics of Income Division, and ISER calculations

We projected gas costs using data from the Regulatory Commission of Alaska, Alaska Housing Finance Corporation, Enstar Natural Gas, Fairbanks Natural Gas, and Barrow Utilities and Electric. As the cost of gas as reported in the census can represent natural gas (either piped or bottled liquefied natural gas) or propane, we chose which price change to apply based on other variables indicating which type of gas the household would normally use.

Anchorage contains the largest share of households using natural gas. The average and median gas costs as a share of income are about the same as electricity for Anchorage households, except in the lowest income quintile, which pays a median of 6.1% of income for gas (Table 22). However, as shown in Figure 4, a large share of lower income Anchorage households use electricity rather than gas for heating (they are not included in Table 22).

Table 22. Cost of Gas, for Those Who Pay, 2006 Projected

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,743 and below	average	$1,116	$1,172	$580	$1,165	$1,060
		median	$911	$911	$343	$632	$823
2	$25,744 to $46,854	average	$1,057	$1,302	$861	$1,267	$1,127
		median	$954	$1,058	$600	$790	$911
3	$46,855 to $71,013	average	$1,148	$1,196	$955	$1,086	$1,137
		median	$999	$1,087	$514	$790	$999
4	$71,014 to $107,602	average	$1,232	$1,114	$1,145	$1,235	$1,198
		median	$1,205	$1,014	$840	$693	$1,102
5	over $107,602	average	$1,410	$1,328	$1,032	$1,094	$1,346
		median	$1,337	$1,264	$514	$790	$1,264
Total		average	$1,233	$1,216	$917	$1,176	$1,193
		median	$1,131	$1,058	$514	$758	$1,058
			Cost as a Percentage of Household Income				
1	$25,743 and below	average	14.8%	14.8%	8.0%	19.1%	14.7%
		median	6.1%	6.3%	2.5%	5.8%	5.7%
2	$25,744 to $46,854	average	2.9%	3.6%	2.4%	3.7%	3.1%
		median	2.6%	2.9%	1.6%	2.2%	2.5%
3	$46,855 to $71,013	average	2.0%	2.0%	1.6%	1.9%	2.0%
		median	1.7%	1.9%	1.0%	1.2%	1.7%
4	$71,014 to $107,602	average	1.4%	1.3%	1.3%	1.5%	1.4%
		median	1.4%	1.2%	0.9%	0.9%	1.3%
5	over $107,602	average	0.9%	0.9%	0.7%	0.8%	0.9%
		median	0.8%	0.8%	0.3%	0.5%	0.8%
Total		average	2.8%	4.1%	2.8%	7.0%	3.5%
		median	1.4%	1.6%	1.1%	1.8%	1.4%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, Alaska Housing Finance Corporation, Regulatory Commission of Alaska, Enstar Natural Gas, Fairbanks Natural Gas, Barrow Utilities and Electric, IRS Statistics of Income Division, and ISER calculations

Table 23 shows the 2006 projected water and sewer costs, which we projected using bills from Anchorage Water and Wastewater for Anchorage, and the 2005 ACS for other regions.

Table 23. Cost of Water & Sewer, for Those Who Pay, 2006 Projected

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,743 and below	average	$603	$539	$790	$669	$672
		median	$627	$502	$702	$537	$580
2	$25,744 to $46,854	average	$643	$551	$771	$678	$673
		median	$673	$523	$627	$580	$644
3	$46,855 to $71,013	average	$654	$611	$851	$786	$717
		median	$673	$523	$752	$666	$673
4	$71,014 to $107,602	average	$605	$578	$829	$1,000	$706
		median	$650	$523	$815	$773	$661
5	over $107,602	average	$610	$662	$827	$1,051	$719
		median	$661	$575	$752	$891	$673
	Total	average	$621	$591	$819	$814	$703
		median	$661	$523	$752	$644	$661
			Cost as a Percentage of Household Income				
1	$25,743 and below	average	7.2%	7.4%	7.5%	8.7%	7.9%
		median	3.4%	3.1%	4.5%	4.0%	3.8%
2	$25,744 to $46,854	average	1.8%	1.6%	2.1%	1.9%	1.9%
		median	1.6%	1.6%	1.9%	1.6%	1.7%
3	$46,855 to $71,013	average	1.1%	1.1%	1.5%	1.3%	1.2%
		median	1.1%	1.0%	1.3%	1.1%	1.1%
4	$71,014 to $107,602	average	0.7%	0.7%	0.9%	1.2%	0.8%
		median	0.7%	0.6%	0.9%	0.9%	0.7%
5	over $107,602	average	0.4%	0.4%	0.6%	0.7%	0.5%
		median	0.4%	0.3%	0.5%	0.6%	0.4%
	Total	average	1.2%	1.9%	2.0%	3.3%	1.8%
		median	0.7%	0.8%	1.0%	1.3%	0.8%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, Anchorage Water & Wastewater Utility, IRS Statistics of Income Division, and ISER calculations

All households paying any amount for any of the four utility categories are included in Table 24. Other costs of housing are not included in these projected figures. Remote rural census areas households paid a median of nearly 10% of income on utilities, more than triple the share that Anchorage households paid. The lowest income households in remote rural census areas pay a median of one third of household income on utilities, up from 18.5% in 2000, over four times the share that low-income Anchorage households paid.

Table 24. Total Utility Costs, for Those Who Pay, 2006 Projected

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Cost in Dollars				
1	$25,743 and below	average	$1,689	$2,427	$2,673	$4,508	$2,730
		median	$1,259	$2,091	$1,849	$3,888	$2,033
2	$25,744 to $46,854	average	$1,895	$2,856	$2,958	$4,862	$2,815
		median	$1,711	$2,571	$2,609	$4,323	$2,305
3	$46,855 to $71,013	average	$2,421	$2,821	$3,525	$5,383	$3,142
		median	$2,296	$2,550	$3,309	$4,781	$2,653
4	$71,014 to $107,602	average	$2,695	$2,767	$4,063	$5,666	$3,365
		median	$2,696	$2,537	$3,912	$5,250	$3,010
5	over $107,602	average	$3,185	$3,232	$4,586	$6,566	$3,873
		median	$3,060	$2,893	$4,247	$6,298	$3,403
Total		average	$2,491	$2,803	$3,632	$5,223	$3,214
		median	$2,439	$2,547	$3,424	$4,697	$2,806
			Cost as a Percentage of Household Income				
1	$25,743 and below	average	20.9%	35.3%	28.7%	61.3%	35.0%
		median	8.1%	14.6%	13.8%	33.0%	14.2%
2	$25,744 to $46,854	average	5.2%	7.9%	8.2%	13.8%	7.8%
		median	4.6%	6.9%	6.9%	12.1%	6.2%
3	$46,855 to $71,013	average	4.2%	4.8%	6.1%	9.3%	5.4%
		median	3.9%	4.3%	5.5%	8.3%	4.5%
4	$71,014 to $107,602	average	3.1%	3.2%	4.6%	6.7%	3.9%
		median	3.1%	2.9%	4.4%	6.0%	3.4%
5	over $107,602	average	2.0%	2.2%	3.0%	4.6%	2.5%
		median	1.9%	2.0%	2.8%	4.4%	2.2%
Total		average	5.8%	10.9%	9.6%	24.6%	10.3%
		median	3.1%	4.2%	4.7%	9.9%	4.0%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, Alaska Housing Finance Corporation, Regulatory Commission of Alaska, UA Cooperative Extension Service, Enstar Natural Gas, Fairbanks Natural Gas, Barrow Utilities and Electric, Chugach Electric Association, Municipal Light and Power, Alaska Energy Authority, Anchorage Water & Wastewater Utility, IRS Statistics of Income Division, and ISER calculations

Table 25 shows the increase in the share of income spent on utilities, calculated as the ratio of the projected 2006 percentage to the 2000 percentage $\left(\frac{\%_{2006}}{\%_{2000}} - 100\%\right)$. Note that this is not a difference in percentage points, but a ratio expressed as a percentage.

While the increase in the median share of income spent on utilities was high at 20% for Anchorage households, it was even higher in the other regions of the state. Remote rural Alaska experienced an almost 50% increase over the six year period in the median share of household income spent on utilities, while the increase in the average share for those households was nearly 100%.

These utility cost increases had the most impact on low income households, whose average income declined 5% over six years, and the least impact on high income households, whose average income rose 21%. Low income households in remote rural communities experienced the greatest increase in the median share of income spent on utilities at almost 80%, and the average share, at 112%.

Table 25. Projected Increase in Household Utility Costs, 2000 to 2006

Quintile	Household Income		Anchorage	Kenai & Mat-Su	Mid-Size & Roaded	Remote Rural	Total
			Increase in Dollar Cost				
1	$25,743 and below	average	30.8%	33.8%	44.6%	58.6%	45.9%
		median	28.5%	30.7%	42.2%	62.0%	35.5%
2	$25,744 to $46,854	average	31.7%	35.2%	47.7%	55.0%	42.2%
		median	31.6%	33.9%	45.0%	50.1%	35.6%
3	$46,855 to $71,013	average	33.2%	31.6%	44.2%	55.6%	40.1%
		median	35.0%	30.8%	43.9%	49.4%	32.7%
4	$71,014 to $107,602	average	32.9%	27.5%	47.6%	48.5%	38.5%
		median	32.8%	25.6%	49.3%	49.1%	34.4%
5	over $107,602	average	32.7%	32.2%	48.1%	52.4%	39.5%
		median	33.0%	31.5%	46.4%	53.6%	36.1%
	Total	average	32.8%	31.7%	47.4%	53.1%	40.8%
		median	34.7%	30.6%	47.6%	51.5%	36.2%
			Increase in Share of Household Income				
1	$25,743 and below	average	74.6%	83.3%	26.6%	112.0%	76.0%
		median	31.3%	37.8%	45.4%	78.5%	47.8%
2	$25,744 to $46,854	average	25.4%	28.6%	40.2%	50.1%	36.0%
		median	25.6%	22.5%	33.6%	50.4%	29.2%
3	$46,855 to $71,013	average	23.4%	21.0%	34.1%	42.9%	29.5%
		median	21.8%	19.1%	31.4%	39.4%	24.8%
4	$71,014 to $107,602	average	19.6%	12.8%	30.9%	33.7%	23.6%
		median	19.8%	12.0%	32.7%	31.8%	19.1%
5	over $107,602	average	10.7%	11.4%	21.7%	31.4%	16.7%
		median	10.2%	11.6%	23.0%	34.8%	14.3%
	Total	average	40.4%	58.6%	27.5%	97.6%	54.8%
		median	19.9%	20.9%	28.8%	49.4%	24.0%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, Alaska Housing Finance Corporation, Regulatory Commission of Alaska, UA Cooperative Extension Service, Enstar Natural Gas, Fairbanks Natural Gas, Barrow Utilities and Electric, Chugach Electric Association, Municipal Light and Power, Alaska Energy Authority, Anchorage Water & Wastewater Utility, IRS Statistics of Income Division, and ISER calculations[10]

Table 26 groups the data by remote and non-remote, and classifies households as poor or non-poor using the U.S. Department of Health and Human Services' poverty guidelines. As we explained in the last chapter, these guidelines rise with household size, so poor rural households, which tend to have more members, also tend to have higher income thresholds for poverty. Poor remote households pay a median of *over* one third of income on utilities, with almost 20% on heating fuel. The average for all utilities is over two thirds of income. Poor non-remote households pay about one sixth of their incomes for utilities.

[10] Note that you may get slightly different results from calculating these increases yourself; this is because the percentages in the tables are displayed at a precision of one digit past the decimal point, while the numbers used in our calculations have higher precision.

Table 26. Household Utility Costs, for Those Who Pay, 2006 Projected

		Non-remote			Remote Rural		
		Non-poor	Poor	Total	Non-poor	Poor	Total
		Cost in Dollars					
Heating Fuel	average	$1,897	$1,589	$1,867	$3,071	$2,753	$2,991
	median	$1,733	$1,213	$1,647	$2,527	$2,333	$2,527
Electricity	average	$1,332	$1,160	$1,317	$2,040	$1,805	$1,983
	median	$1,146	$906	$1,133	$1,651	$1,513	$1,651
Gas	average	$1,204	$1,080	$1,195	$1,125	$1,329	$1,176
	median	$1,087	$911	$1,087	$758	$758	$758
Water & Sewer	average	$681	$624	$679	$853	$667	$814
	median	$661	$602	$661	$677	$537	$644
Total	average	$2,958	$2,300	$2,898	$5,342	$4,857	$5,223
	median	$2,716	$1,876	$2,661	$4,811	$4,211	$4,697
		Cost as a Percentage of Household Income					
Heating Fuel	average	3.1%	29.7%	5.7%	5.8%	39.4%	14.3%
	median	2.1%	12.4%	2.4%	4.3%	19.4%	5.5%
Electricity	average	2.2%	20.1%	3.8%	3.8%	24.9%	9.0%
	median	1.5%	8.0%	1.7%	2.9%	12.2%	3.7%
Gas	average	1.8%	18.9%	3.1%	2.2%	21.4%	7.0%
	median	1.3%	7.1%	1.4%	1.3%	7.0%	1.8%
Water & Sewer	average	1.1%	10.4%	1.5%	1.5%	9.9%	3.3%
	median	0.7%	4.8%	0.8%	1.1%	4.5%	1.3%
Total	average	4.8%	40.0%	8.0%	10.1%	69.6%	24.6%
	median	3.4%	15.4%	3.6%	7.5%	36.2%	9.9%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, Alaska Housing Finance Corporation, Regulatory Commission of Alaska, UA Cooperative Extension Service, Enstar Natural Gas, Fairbanks Natural Gas, Barrow Utilities and Electric, Chugach Electric Association, Municipal Light and Power, Alaska Energy Authority, Anchorage Water & Wastewater Utility, IRS Statistics of Income Division, and ISER calculations

Table 27 shows the projected increase in the average and median utility costs for poor and non-poor, remote and non-remote households. Poor remote rural households experienced a 94% increase in the median dollar cost of heating fuel, and a 72% increase in the share of income spent on heating fuel. The increase in median share of income spent on all utilities increased was about 50% for remote rural households, compared to about 20% for non-remote households.

Table 27. Projected Increase in Household Utility Costs, 2000 to 2006

		Non-remote			Remote Rural		
		Non-poor	Poor	Total	Non-poor	Poor	Total
		Increase in Dollar Cost					
Heating Fuel	average	65.6%	64.2%	64.6%	89.4%	88.9%	87.5%
	median	73.3%	73.3%	64.7%	80.5%	94.4%	94.4%
Electricity	average	26.8%	27.4%	26.3%	37.9%	46.5%	37.6%
	median	27.3%	29.4%	25.9%	37.6%	51.3%	37.6%
Gas	average	52.7%	57.3%	52.4%	53.8%	46.2%	54.5%
	median	51.0%	68.7%	51.0%	51.6%	51.6%	51.6%
Water & Sewer	average	18.2%	20.1%	18.1%	8.8%	12.7%	7.4%
	median	14.0%	20.3%	16.0%	9.1%	11.9%	7.4%
Total	average	38.5%	40.3%	37.6%	53.6%	59.2%	53.1%
	median	35.8%	44.3%	33.0%	50.4%	59.5%	51.5%
		Increase in Share of Household Income					
Heating Fuel	average	40.1%	59.4%	73.5%	62.1%	115.0%	139.6%
	median	40.6%	45.7%	44.4%	64.7%	72.4%	81.6%
Electricity	average	9.3%	1.3%	24.5%	18.3%	59.5%	73.8%
	median	8.8%	14.5%	13.0%	23.4%	40.2%	36.7%
Gas	average	32.3%	50.2%	60.8%	36.1%	91.5%	116.4%
	median	32.4%	39.4%	35.7%	35.8%	47.7%	52.7%
Water & Sewer	average	3.8%	24.6%	21.3%	-4.9%	27.9%	34.8%
	median	2.8%	9.8%	3.8%	-2.0%	10.8%	6.3%
Total	average	19.3%	23.0%	40.1%	32.8%	80.4%	97.6%
	median	17.6%	21.4%	21.2%	30.0%	50.9%	49.4%

Sources: U.S. Census Bureau (IPUMS), Alaska Permanent Fund Division, U.S. Department of Health and Human Services, Alaska Housing Finance Corporation, Regulatory Commission of Alaska, UA Cooperative Extension Service, Enstar Natural Gas, Fairbanks Natural Gas, Barrow Utilities and Electric, Chugach Electric Association, Municipal Light and Power, Alaska Energy Authority, Anchorage Water & Wastewater Utility, IRS Statistics of Income Division, and ISER calculations

IV. CONCLUDING REMARKS

This study aims to quantify, as accurately as possible given the best available data, the financial burden of rising utility and fuel costs on Alaska households in recent years. For 2000, these figures were calculated directly from a sample of Alaska households included in the census, so while they are subject to certain data limitations – confidentiality restrictions imposed by the Census, lack of reported (PFD) income for children, sampling error, and reporting error of respondents – they should be fairly accurate and representative. The 2006 figures were carefully estimated based on the best available data, and while they are not as good as a true sample of the population and do not account for changes in demographics or energy use, should give a good approximate picture of the current situation. We have shown that Alaska households, particularly those outside urban areas, must pay an increasingly large share of income to keep up with their utility bills. We also know that some are unable to, which has a cascading effect on the utilities and businesses to which they owe money; the largest utility in rural Alaska said in late 2006 that it was considering cutting off electricity for hundreds of customers who hadn't paid their bills.

The data used in this analysis ends in December 2005. What might it look like now, in 2007? Two more recent surveys of fuel prices, one conducted in December 2006 by the Alaska Housing Finance Corporation and one conducted by the Division of Community Advocacy in September 2006,[11] show that prices are continuing to rise. The results of the AHFC survey are presented in Table 28. These numbers show that while prices have generally increased across the approximately 130 communities surveyed (except in mid-size and roaded communities), the rate of increase seems to be slowing. The DCA survey, which includes 29 communities, shows an increase in average price of about 17% – greater than the AHFC survey shows. We attribute this disagreement to the differing timeframes and sample sizes, because we know that energy prices are volatile and highly variable among communities, as noted by the DCA report. We would tend to favor the AHFC survey as more representative of the current situation because it is more recent and includes more communities.

Table 28. Change in Average Heating Oil Prices, 2005 to 2006

PUMA	1999 to 2005 average yearly	Survey Year 2005	2006	**change**
Anchorage	7.5%	$2.364	$2.435	**3.0%**
Kenai & Mat-Su	8.7%	$2.295	$2.508	**9.3%**
Mid-Size & Roaded	9.6%	$2.553	$2.479	**-2.9%**
Remote Rural	11.7%	$3.297	$3.357	**1.8%**

Sources: Alaska Housing Finance Corporation, U.S. Census Bureau (IPUMS), and ISER calculations

Where energy prices will go from here is unpredictable. There is a good deal of variation in local diesel prices for home heating and electric power generation due to the idiosyncrasies of local supply and demand, transportation and time lags, but the overall trends follow world prices of oil.

[11] State of Alaska, Department of Commerce, Community, and Economic Development, Division of Community Advocacy, Research and Analysis Section. Current Community Conditions: Fuel Prices Across Alaska, September 2006 Supplement. 2006.

World oil prices peaked in August 2006 (WTI at $77.05 per barrel), but by January, 2007, had dropped considerably (WTI at $50.51 per barrel).[12] Friedman Billings Ramsey forecasts an average WTI price of $60 per barrel for 2007 and $55 per barrel for 2008.[13] Longer term forecasts show a very wide spread. Lord Browne, CEO of British Petroleum, went on record predicting world oil prices would fall to $40 per barrel in five years, and could go as low as $25 per barrel in a decade.[14] Roger Herrera finds the $40 per barrel scenario plausible as a short-term aberration, but the dominant trend he expects is prices trending upward to over $80 per barrel.[15] The U.S. Energy Information Administration price outlook includes three scenarios to 2030: high low and reference case. While in the reference case real oil prices end up quite similar to current price levels, the high scenario is almost 70% higher and the low scenario is about 40% lower.

Oil prices are unpredictable and highly volatile because they are primarily governed by political and economic developments, not technical or geological conditions:

> Resources are not expected to be a key constraint on world demand to 2030. Rather more important are the political, economic, and environmental circumstances that could shape developments in oil supply and demand…. Limits to long-term oil price escalation include substitution of other fuels (such as natural gas) for oil, marginal sources of conventional oil that become reserves (i.e. economically viable) when prices rise, and unconventional sources of oil that become reserves at still higher prices. Advances in exploration and production technologies are likely to bring prices down when such additional oil resources become part of the reserve base.[16]

This volatility and unpredictability in fuel prices is a problem for budgeting and planning for households, utilities, businesses and governments alike. The problem is compounded when household incomes also vary month to month and year to year, as they do in seasonal and highly variable industries such as fishing, tourism, and construction.

Households with rising incomes of course find it easier to adjust to rising costs, while households with falling incomes find it especially difficult. During the same years that household energy costs were increasing dramatically, households at the low end of the spectrum were experiencing declining average incomes. One of the striking findings from our analysis is that income poverty in Alaska increased 50 percent from 1999 to 2005. This is 21 percentage points higher than the 19 percent increase in poverty shown in the Census/ACS data. This dramatic difference in estimated poverty rates is primarily due to the fact that the Census and ACS under-report Alaska Permanent Fund Dividend income, which is a major source of income in poor households (See Appendix B). The PFD amount dropped from $1,769.84 in October, 1999 to $845.76 in October 2005—a 52 percent decrease. If we back out the PFD adjustments to Census income, our estimate of the change in poverty rates drops to 23 percent—only four percentage points higher than the Census/ACS estimate (See Appendix D).[17] The PFD for 2006 was up again to

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[12] http://tonto.eia.doe.gov/dnav/pet/hist/rwtcd.htm

[13] Reuters, Dec. 18, 2006. This matches well with the U.S. Energy Information Administration's most recent (Feb. 18, 2007) price projection of $59.50 for West Texas Intermediate crude.

[14] The Independent, June 13 2006, http://news.independent.co.uk/business/news/article890812.ece.

[15] Petroleum News, January 28, 2007. http://www.petroleumnews.com/pnarchpop/070128-05.html.

[16] EIA International Energy Outlook 2006, Chapter 3 http://www.eia.doe.gov/oiaf/ieo/oil.html

[17] We believe this 4 point remainder reflects the difference between the "poverty threshold" that the Census uses in all 50 states and the "poverty guideline" that we use. The poverty guideline is 25 percent higher than the poverty threshold, and serves as the reference income in Alaska for federal and state program

$1106.96; it is estimated to be over $1,390 for 2007, and higher again the year following. Rising PFDs will moderate poverty rates for Alaska households and ease somewhat the burden of rising utility prices, but won't take households back to 1999 levels.

Conceptually, there are four types of policy approaches to the problem of affordable energy: income support, price subsidy or smoothing, conservation and energy efficiency, and alternative energy sources. Box 1 lists a variety of state, federal, and private programs that provide energy assistance to households and communities. The Low Income Energy Assistance program provides grants to qualifying households to assist with winter home heating costs. The power cost equalization program established in 1985 subsidizes electric costs for rural Alaska. RuralCAP's weatherization program has been helping poor households conserve home heating since the 1960s; weatherization can save rural residents up to half their heating costs.

Box 1. Alaska Energy Assistance and Conservation Programs

- **Power Cost Equalization** - The PCE program, administered by the Alaska Energy Authority, subsidizes the cost of electricity for residential consumers and community facilities in rural Alaska. The PCE program pays approximately 30% of all kilowatt hours sold by participating utilities. The current value of the endowment is about $365 million and provides about $25 million a year in subsidies.
- **Municipal Energy Assistance Program** – The state's MEAP financial assistance program helps municipalities defray increased energy and other related costs. FY07 funding totaled $48 million.
- **Low Income Home Energy Assistance Program** – LIHEAP, a federally funded program administered by the state Division of Public Assistance, provides grants to low-income households for heating fuel.
- **Bulk Fuel Revolving Loan Fund** – The Alaska Energy Authority provides loans to communities, utilities, or fuel retailers in rural communities to purchase emergency, semi-annual, or annual bulk fuel supplies for power generation, heating fuel, municipal heavy equipment, business and residential motor vehicles, and subsistence.
- **Fuel Bridge Loan Program** - This program provides loan assistance to communities that are ineligible for AEA's Bulk Fuel Revolving Loan Fund. Managed by Rural Alaska Fuel Services, the FBLP provides "at risk" communities an opportunity to repair their credit and become eligible for more traditional fuel funding sources.
- **Power Project Loan Fund** - The Power Project Loan Fund provides loans to local utilities, local governments, or independent power producers for the development or upgrade of electric power facilities, which includes bulk fuel storage facilities, waste energy conservation, or potable water supply projects.
- **Bulk Fuel Upgrades Program** - Alaska Energy Authority in partnership with the Denali Commission provides funding for the design, engineering, business planning, and construction management services to build bulk fuel farms in rural communities.

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eligibility. The major factor driving increased poverty rates as measured by the Census is increasing inequality in wage and salary income.

- **Power, Fuel and Hydro Training** - Alaska Energy Authority, in partnership with the Denali Commission, provides training to local residents for energy projects and infrastructure. The purpose of the training is to ensure community personnel have the appropriate skills to maintain bulk fuel infrastructure in a consistent and sustainable manner.
- **Weatherization Assistance** and **Enhanced Weatherization Programs** - RurAL CAP provides home insulation, caulking, weather stripping and repair of doors and windows, repairs and tune-ups for heating units, and energy-efficient heaters to increase the safety, energy-efficiency and comfort of homes. The weatherization program serves Juneau; the enhanced program serves western Alaska from the Yukon-Kuskokwim Delta to the Northwest Arctic Borough. Both programs give priority to the elderly, handicapped individuals and households with children under six years old. The program is funded by the U.S. Department of Energy, the U.S. Department of Agriculture, the U.S. Department of Health and Human Services, and the Alaska Housing Finance Corporation.
- **Alternative Energy and Energy Efficiency** - Alaska Energy Authority's suite of programs provide grants and loans for projects to increase efficiency of existing power production, improve energy conservation, and develop alternatives to diesel-based energy technology, including wind, wood or sawmill waste, geothermal and tidal energy and biodiesel.

Source: *Current Community Conditions: Fuel Prices Across Alaska*, Fall-Winter 2006 Update. Division of Community Advocacy, Alaska Department of Commerce, Community and Economic Development, January 2007.

There are many promising alternative energy projects in progress or under study, drawing on wind, hydroelectric, geothermal, biomass, and tidal resources. Box 2 lists and briefly describes these. But many of these alternative technologies depend on location, and none are likely to occur on a large enough scale over the next decade to displace natural gas in urban Alaska or diesel fuel in rural Alaska as the primary energy sources.

Box 2. Alaska Alternative Energy Projects[18]

- **Wind Energy** is among the most promising alternative energy technologies for Alaska, particularly in coastal areas and western Alaska. Wind turbine generators are in use in Kotzebue, Wales, St. Paul, Port Heiden/Pilot Point, Selawik, Toksook Bay, and Kasigluk. These wind turbines typically provide less than 30% of total electricity generated. The Fire Island wind project, scheduled for completion in 2011, will supply energy to the railbelt power grid. (The railbelt is from Seward on the Kenai Peninsula to Fairbanks in the Interior.)
- **Hydroelectric and Ocean Power.** Hydroelectric power is currently the most widely used alternative energy technology in the railbelt and Southeast Alaska, but it has typically proved to be more expensive than diesel in rural areas. The economics of small hydro may be changing, however, as diesel prices rise. Emerging tidal energy technology also holds promise for Alaska, which has over half the nation's potential wave energy.
- **Geothermal Power.** Currently there is one geothermal unit operating at Chena Hot Springs in the Interior, and other sites are under consideration, but the costs of development are high, especially in remote roadless areas.
- **Biomass Energy.** Wood, sawmill waste, and garbage can be burned to produce energy. Fish oil as a byproduct from fish processing can be mixed with diesel to produce biodiesel. Wood is already in wide use by individual households, and there is currently a resurgence of activity toward larger scale sawmill waste energy production. Biodiesel from fish oil is in limited but increasing use as an engine fuel.
- **Solar Power.** Utility-scale solar power is in limited use in Lime Village and Kotzebue, and a small number of individual households use it for electricity. Unfortunately, the solar resource in Alaska is not well-matched to the seasonal patterns of demand—that is, there's little sun in the winter, when fuel needs are high.
- **Coal** is abundant in Alaska, but has higher CO_2 emissions than other energy sources. Coal can be used to produce synthetic "natural" gas with and without carbon capture, but these gasification technologies are expensive and still under development. Finally, coal-bed methane has been identified in the Susitna Basin, but its economic potential has not been established. Coal-bed methane may also exist in specific locations close to some remote communities.
- **Nuclear Power.** A small-scale (10,000 kilowatts) nuclear power project has been proposed to begin in Galena in 2012. Nuclear power is controversial due to issues such as the risk of accidents, storage of nuclear waste, and long-term land use.

A largely unexplored policy approach would target price smoothing to temper the unpredictability of energy costs for households and businesses. Programs that smooth the rate of change in retail fuel bills help people adjust to rapid price escalation by smoothing the combined effects of monthly consumption and price variability. For example, Enstar

[18] The reader is referred to the Alaska Energy Authority web site, http://www.akenergyauthority.org/, for more information on alternative energy in Alaska.

Natural Gas offers its residential customers a level pay or "budget billing" program where the amount due each month is one twelfth of the estimated annual cost based on historic consumption. About 25 percent of their customers have signed up. A number of small rural utilities have informal policies allowing customers to catch up on their expensive winter bills over the summer and into the following fall. Formal or informal, a small utility has a harder time financing this sort of consumer credit program than a large utility that has access to low-interest, revolving lines of credit. A publicly funded program of revolving credit to utilities that smooth, average or cap the rate of change in residential billings might go a long way to make the market more efficient and moderate the burden on households.

There are important effects of rising energy costs that this study has not addressed. This report has focused on households, leaving the impacts on businesses, utilities, governments, and other local organizations unexplored. Furthermore, the income and expenses in this analysis are limited to the data collected in the census, so we did not include fuel used for transportation or other energy-related expenditures. We know that higher energy prices have directly increased transportation costs, and increased many other costs indirectly. Higher utility and transportation costs affect budgets not only of households but of businesses, local governments, and schools too. This study has not inquired about how households and other local entities are coping with rising costs. And finally, this study is limited to the geography of the PUMS, which does not allow for a community-level analysis.

These questions for the most part cannot be answered with existing data. These questions will require in-depth research and original data collection methods such as household surveys and field interviews.

DATA SOURCES

U.S. Census Bureau

- 2000 U.S Census
- 2005 American Community Survey

Integrated Public Use Microdata Series

Alaska Housing Finance Corporation

Regulatory Commission of Alaska

Cooperative Extension Service, UA

Enstar Natural Gas Company

Fairbanks Natural Gas Company

Barrow Utilities and Electric

Chugach Electric Association

Municipal Light and Power

Alaska Energy Authority

Anchorage Water and Wastewater Utility

Alaska Permanent Fund Division

U.S. Department of Health and Human Services

Internal Revenue Service, Statistics of Income Division

APPENDIX A. PUBLIC USE MICRODATA AREAS – ALASKA

PUMA	Census Areas
100	Anchorage Municipality
200	Kenai Peninsula Borough Matanuska-Susitna Borough
300	Denali Borough Fairbanks North Star Borough Haines Borough Juneau City and Borough Ketchikan Gateway Borough Sitka City and Borough Southeast Fairbanks Census Area Valdez-Cordova Census Area
400	Aleutians East Borough Aleutians West Census Area Bethel Census Area Bristol Bay Borough Dillingham Census Area Kodiak Island Borough Lake and Peninsula Borough Nome Census Area North Slope Borough Northwest Arctic Borough Prince of Wales-Outer Ketchikan Census Area Skagway-Hoonah-Angoon Census Area Wade Hampton Census Area Wrangell-Petersburg Census Area Yakutat City and Borough Yukon-Koyukuk Census Area

Source: IPUMS

APPENDIX B. CENSUS DATA ISSUES

TOPCODING

In the PUMS, for purposes of preserving confidentiality, the Census does not disclose values above a certain threshold for some variables, such as income variables, housing costs, and utility costs. This threshold, called a *topcode*, is determined on the national level in such a way that some share of the highest observed values fall above it. Any observed values above the topcode are replaced with the average of all topcoded values in the state for that variable.

Topcoded observations are not a problem for most PUMS variables used in the calculations for this report. However, fuel oil in rural Alaska is more expensive than it is in other places, so a significant share of households has fuel expenses above the topcode. In the 2000 PUMS, 15.5% of household observations in remote rural census areas (weighted to entire population) have a topcoded value for the cost of fuel. The topcode threshold is $2,100, and the state average is $3,000. Only 2.6% of household observations in the other PUMAs combined are topcoded. This helps to show that fuel costs are much higher in rural Alaska than other places in the state and the U.S., but also biases the numbers reported in the tables somewhat.

We obtained data from the Census Data Center describing the distribution of households with topcoded utility costs, and used this to replace the topcoded values for fuel oil and gas, originally set to the state average, with estimates of the PUMA averages. Table 29 shows these estimates.

Table 29. Estimated PUMA Averages of Topcoded Observations

PUMA	Average heating fuel cost	Average gas cost
101	3,450	3,886
102	3,968	4,187
200	3,177	4,300
300	2,991	3,920
400	3,149	4,051

Applying these averages to topcoded observations changed the summary statistics slightly. The figures in this report incorporate this adjustment.

UNDERREPORTED PERMANENT FUND DIVIDENDS

An important thing to note about the household incomes reported in the census is that income of children under 15 is not reported. For Alaska, this means that Permanent Fund Dividends received by children are not reported, and thus do not count toward household income. It was also apparent upon examining the PUMS data that fewer people reported having received PFDs than the number of people known to have received them. This means that household and family incomes for Alaska available from the Census are underestimates, especially for poorer households for which PFDs contribute a larger

share of total income (the amount of the 1999 PFD was $1,769.84). To correct for this, we imputed the total number of PFDs received by each household as well as the number of PFDs received that were not reported, and adjusted total household income by adding the amount of the 1999 PFD times the number of unreported PFDs. The procedure we used is as follows:

For people 15 and over (income is not reported for children under 15):

1. If the person reported $1700 or more in either "Interest, dividends, net rental income, royalty income, or income from estates and trusts" OR "Any other sources of income...", then he or she received a PFD and reported receiving a PFD.
2. If the person lived in Alaska 5 years, then he or she received a PFD.
3. If the person had lived in current residence for 2 or more years, then he or she received a PFD.

For children at least 1 year old through 14 years old:

4. If anyone else in the household received a PFD, then the child received a PFD.

Only by applying all 4 conditions do we approach the actual percentage of the population that received the PFD in 1999.

To household income, we now add any **received** but **unreported** PFDs of household members (resulting in income figures a bit higher than the Census reports).

When we projected household income to 2005, we took PFDs into account separately, again accounting for unreported PFDs. Appendix D describes the income projection procedure.

SAMPLING ERROR AND OTHER AMERICAN COMMUNITY SURVEY ISSUES

In taking utility cost figures from the 2000 census and projecting them based on utility price increases, we assume that consumption does not change. This means that the projected costs reported in this paper may not be the true costs, because consumption levels may have changed. In reality, we would expect consumption to decrease as prices increased, so our estimates may overstate 2006 costs. However, because Americans' energy use is relatively inelastic, the degree of overstatement may be small.

Since the 2005 American Community Survey data has been published, why did we not use that instead of projecting 2000 Census numbers? There are a number of problems and unresolved issues with the quality of ACS data for Alaska and rural areas. A much smaller sample size than the 2000 census, very low response rate and high sampling error in Alaska, variation in season of enumeration affecting soundness of geographical comparison, large differences between some figures calculated from the PUMS and the corresponding published figures, and other issues contributed to the decision to use the 2005 ACS only for income projection and not for utility and housing costs. More specifically:

- Not all of the questions in the ACS are the same as in the 2000 census. Particularly relevant to this study, the ACS asks for the costs of electricity and gas

in the past *month* rather than the past year. The ACS is conducted year-round. There is purposely no way to know when a particular household was surveyed. In places like Alaska, which is very cold and dark in the winter, there is a lot of seasonal variation in energy costs, so knowing only what a household paid in one unknown month does not say much about annual costs. Therefore, the gas and electric costs as reported in the ACS are not useful for Alaska.

- The ACS is a much smaller sample than the decennial census. The 2000 census sampled about 50% of remote rural households, while the ACS projected about a 7% annual sample of remote rural Alaska. The ACS PUMS is a subsample of an already small sample (1% of the population).

- The response rate in Alaska was among the lowest state response rates.

- Different places were surveyed at different times of the year, so with an unknown time of enumeration, geographical and seasonal variation are not separable.

- Some figures calculated from the PUMS differ from the corresponding published figures by more than the margin of error specified by the Census.

APPENDIX C. UTILITY COST PROJECTION

The methodology used for projecting household utility costs from 2000 to 2006 is as follows, performed individually for each PUMA (combining 101 and 102 into "100" to represent Anchorage):

1. Obtain the average December 1999 and December 2005 prices for the utility in each PUMA.
2. Take the ratio of the two prices (the 2005 price divided by the 1999 price). This number represents the change in price over that time period.
3. For each household record in the 2000 PUMS in the current PUMA, multiply the utility cost by the above ratio.

The result is the estimated amount the household would have reported paying in an "imaginary" Census 2006, assuming no change in the usage or consumption of that utility.

December was chosen as the reference month because it is the month in which most of Alaska Housing Finance Corporation's fuel price surveys were conducted.

This methodology could not always be followed exactly without extra steps – for example, there was no 1999 fuel price survey, so the December 1999 average fuel prices had to be extrapolated from existing data.

HEATING FUEL

In the census questionnaire, the question asking for the cost of fuel reads "Oil, coal, kerosene, wood, etc." Of these, fuel oil is by far the most commonly used, and lacking data to project the other types, we projected only the cost of fuel oil, and only for households reporting fuel oil as the primary heating fuel. Our sources of data for the fuel price projections were the Alaska Housing Finance Corporation's annual fuel price surveys from 2000 to 2005. Most of these were conducted in approximately December. 1999 survey data was not available, so we had to extrapolate the 1999 prices. The procedure used for extrapolating the average 1999 price by PUMA is as follows:

For each of the 3 regions: Anchorage and Kenai/Mat-Su; mid-size and roaded areas; and remote rural census areas,

1. Select the set of communities in this region included in both the 2000 and 2003 surveys.
2. a = average 2000 price weighted by population
   b = average 2003 price weighted by population
3. $f = \left(\frac{b}{a}\right)^{\frac{1}{3}}$ is the average yearly price increase factor.
4. c = weighted average 2000 price for all communities in the 2000 survey in this region.
5. $d = \frac{c}{f}$ is the extrapolated 1999 fuel price.

Rationale: Looking at graphs of unweighted average price by region over time to get a sense of the overall price trends, PUMAs 100 and 200 are close enough in shape to group together. After doing that, prices seem to start increasing sharply starting between 2003 and 2004, and before that look like they could be reasonably approximated by a constant factor of change. $f = \left(\frac{b}{a}\right)^{\frac{1}{3}}$ is the average factor of change per year from 2000 to 2003, so following that trend backward 1 year from 2000 should give a reasonable guess at the 1999 prices.

The ratio of change in fuel price is the average price, weighted by population, for each PUMA, for 2005, divided by the corresponding extrapolated 1999 average price. The projected 2005 cost of fuel for all households using fuel oil is the 1999 cost multiplied by this price increase for the household's PUMA.

ELECTRICITY

The sources of data for obtaining the average electricity prices were the UAF Cooperative Extension Service's Food Cost Survey, bills from Municipal Light & Power, and Power Cost Equalization (PCE) statistical reports from Alaska Energy Authority.

UAF's Cooperative Extension Service conducts a quarterly Food Cost Survey (FCS) of about 20 Alaskan communities and regions. This survey also includes the costs of several non-food items, including the cost of 1000 kWh of electricity. The December 1999 and December 2005 FCS were the only sources of price data used for PUMAs 200 and 300. For each of these two PUMAs, we chose the set of communities and regions common to both surveys and took the average price in those communities for each survey. Table 30 illustrates how we used this data.

Table 30. Electric Costs in 1999 and 2005 from FCS

Costs are for 1000 kWh in December

PUMA	place	2000 population	1999 cost	2005 cost
200	Homer	3,946	117.28	131.74
	Kenai-Soldotna	10,701	119.34	*137.08*
	Matanuska-Susitna	59,322	97.63	119.46
300	Cordova	2,454	192.18	276.30
	Delta	840	88.09	140.14
	Fairbanks	30,224	88.26	137.92
	Juneau	30,711	103.96	107.37
	Ketchikan	7,922	94.09	*98.10*

Costs for Kenai-Soldotna & Ketchikan were unavailable for Dec-2005, so were interpolated from previous and next quarters

PUMA	total 2000 population	represented population	avg. 1999 cost	avg. 2005 cost	ratio
200	109,013	73,969	111.42	129.43	1.162
300	157,110	72,151	113.32	151.97	1.341

Sources: UAF Cooperative Extension Service, U.S. Census Bureau, and ISER calculations

For Anchorage, we also used the FCS numbers, but because they represent the price only for Chugach Electric Customers, we calculated the corresponding prices for 1000 kWh

from Municipal Light & Power bills, and calculated averages for the two companies weighted by the number of residential customers each serves.[19]

Table 31. Anchorage Electric Costs in 1999 and 2005

Company	Approx. residential customers	Dec. 1999 cost of 1000 kWh	Dec. 2005 cost of 1000 kWh	
ML&P	24,000	$90.59	$101.45	
Chugach	67,000	$92.83	$121.39	ratio
weighted average:		$92.24	$116.13	1.259

Sources: UAF Cooperative Extension Service, Municipal Light & Power, Chugach Electric

The FCS data was not sufficient to obtain average prices for remote rural census areas, because these remote rural communities are small and numerous, and most of the few represented in the FCS are among the largest, and thus not very representative. (The PUMA 400 communities included in the December 1999 survey are Bethel, Craig/Klawock, Dillingham, Kodiak, Nome, Thorne Bay, and Wrangell.) Instead, we used the PCE statistical reports from the Alaska Energy Authority, which included the effective residential rates for the approximately 180 communities eligible for PCE assistance. The "effective residential rate" means the base rate per kWh minus the PCE amount per kWh. Most of these communities are in remote rural census areas, so the change in the average price of these communities should be a good approximation of the change in the average remote rural census areas price. We weighted by the number of residential customers in each community to obtain the average 1999 and 2005 effective rates after PCE assistance.

Table 32. Effective Residential Electric Rates for PCE Communities, 1999-2005

fiscal year	mean effective residential rate, weighted by number of customers	
1999	*0.171920*	*(from linear regression: y = 0.009612t - 19.0434)*
2000	0.173467	
2001	0.206319	
2002	0.213446	
2003	0.178657	
2004	0.224976	**2005/1999 ratio:**
2005	0.236518	**1.375744**

GAS

In the census, gas may be piped natural gas, or bottled, tank, or LP gas (propane). For each PUMA, we used two projections for the change in the cost of gas: one for piped natural gas (or liquefied natural gas for customers of Fairbanks Natural Gas), and one for propane.

To determine whether a household used natural gas from one of the three natural gas companies whose prices we used to calculate the ratio (Enstar, Fairbanks Natural Gas, and Barrow Utilities and Electric), we applied the following conditions: (1) if the

[19] Sources for residential customer counts: Municipal Light & Power 2005 Annual report and estimate from Chugach Electric

household is in Anchorage and is not a mobile home, or (2) if the household's primary heating fuel is piped natural gas, then apply the natural gas cost projection.

To project 2005 natural gas costs, we did not just use the ratio of 2005 price to 1999 price, but took into account the flat monthly customer charge, base rate per CCF, gas cost adjustment (GCA) per CCF, and regulatory cost charge (RCC), a percentage of the total monthly bill. The first step was to estimate the amount of gas consumed by the household in the year based on the total cost. The following equation shows how total annual cost can be determined (assuming the charges do not change during the year):

$$c = (ccf \times (base + gca) + 12cc) \times (1 + rcc)$$

where *ccf* is the amount of gas consumed in hundreds of cubic feet, *c* is the total annual cost, *rcc* is the regulatory cost charge expressed as a decimal number, *cc* is the monthly customer charge, *base* is the base rate, and *gca* is the gas cost adjustment. The annual gas consumption in CCF can be determined as follows:

$$ccf = \frac{\left(\frac{c}{1 + rcc} - 12cc\right)}{base + gca}$$

For Enstar and Fairbanks Natural Gas, the values were provided by the RCA. Barrow rates were obtained from the AHFC survey and the Barrow Utilities and Electric web site. We used Enstar for PUMAs 100 and 200, FNG for PUMA 300, and BUE for PUMA 400. After determining whether a household used natural gas and the quantity consumed (using the 1999 charges), we applied the formula for *c*, using the 2005 charges, to obtain the estimated 2005 cost of gas.

We applied the propane price increase to any households who did not use utility gas. The propane ratio was obtained from the Alaska Housing Finance Corporation's fuel price surveys. Because the earliest available data is from 2000, we estimated the 1999 average price by PUMA using the following formulas, for each PUMA:

$$f = \left(\frac{p_{2005}}{p_{2000}}\right)^{\frac{1}{5}}$$

where *f* is the average yearly price change factor, p_{2005} is the population-weighted average 2005, and p_{2000} is the weighted average 2000 propane price, with both weighted averages including only communities included in the survey in both years. Then,

$$P_{1999} = \frac{P_{2000}}{f}$$

where P_{1999} is the estimated average 1999 propane price and P_{2000} is the weighted average 2000 propane price, this time using *all* communities with data for 2000. The estimated propane price change ratio from 1999 to 2005 is then P_{2005} / P_{1999}, where P_{2005} is the weighted average 2005 price for all communities.

WATER AND SEWER

For Anchorage water rates, we consulted household bills from Anchorage Water and Wastewater, which gave us both the 1999 and 2005 flat rates, and multiplied the water costs of Anchorage households by the ratio.

No good sources existed for water rates for other PUMAs. Because most are unregulated, the RCA's records did not help. Attempts to obtain 1999 rates from individual utilities were unfruitful, as few of them kept records that far back. The best available data is the 2005 ACS PUMS, so we used the ratio of the average water costs by PUMA from the 2005 and 2000 PUMS (a separate ratio for each PUMA).

APPENDIX D. INCOME PROJECTION

The projection of household income from 1999 to 2005 was the most complex and difficult projection, and the least certain. Sources of data on income vary in definitions of different types of income, how they account for place of residence (whether the income reported for a particular geography is for people who live there or people who work there), geographic detail, and how current the most recent available data is. The data we used for our first attempt at an income projection was from the U.S. Bureau of Economic Analysis (BEA) (with 2005 income extrapolated, because the most recent available with geographic detail below the state level was from 2004), and the result was an increase in income that was much higher than the increase shown by the recently released 2005 American Community Survey (ACS). In the end, we chose to use a combination of the IRS' Statistics of Income (SOI) and the 2005 ACS. Despite many unresolved issues with the reliability of ACS data for Alaska and rural areas, it is the most current, the most comparable to the 2000 census, and allowed separate projection of income for each of the income quintiles by using the PUMS. The SOI is aggregated personal income tax return data by census area. While the most recent SOI data is for 2004 income, it is reliable data and its wage and salary component is comparable to the census wage and salary component.

(You may notice small differences between the 2006 projected figures in this report and in the October, 2006 Research Summary; this is because the projected incomes used in the summary used only census and ACS data, but we subsequently revised our methods to utilize the SOI data as well).

One limitation of the ACS data is that it is not exactly comparable with the 2000 Census, which gives 1999 calendar year income, while ACS gives "income in the past 12 months" as reported sometime during 2005, adjusted to July 2005 dollars. However, the version of the ACS PUMS released by the IPUMS project is adjusted to calendar year dollars.[20]

All income figures and calculations in this report are expressed in nominal dollars, because this report mostly concerns costs as shares of income -- ratios which would be unaffected by an inflation adjustment.

To project the income of each household in the 2000 PUMS from 1999 to 2005, we first separated income into three categories: wage and salary income, business and farm income (including fishing), and non-earned income. We projected each one separately and then added the projected numbers to obtain the total 2005 income for each household.

WAGE AND SALARY INCOME

The IRS Statistics of Income provide the most reliable income figures, but the only category comparable (i.e. having essentially the same definition) to a census income category is wage and salary income. Also, the most recent SOI are for 2004, so we had to extrapolate these numbers to 2005.

[20] The adjustment was erroneously not applied to their initial data release, but they told us what it was and we applied it.

The SOI are available by county (boroughs and census areas), and so can be aggregated by PUMA. Dividing the aggregate wage and salary income by the number of exemptions approximates per capita wage and salary income. For each PUMA, we calculated this number for all years from 1999 through 2004, calculated the percent change from year to year, used a linear regression over time to predict the percent change from 2004 to 2005, and multiplied 2004 income by this number to obtain an extrapolated 2005 number in dollars. Table 33 illustrates this calculation (money amounts are in thousands of dollars).

Table 33. SOI Wage and Salary Income, 1999-2005

PUMA		1999	2000	2001	2002	2003	2004	2005
100	(A) number of exemptions	219,902	223,143	228,539	231,856	235,051	237,098	
	(B) wages & salaries	4,100,618	4,358,605	4,617,564	4,755,855	4,916,034	5,092,260	
	(C=B/A) per capita W&S	18.647	19.533	20.205	20.512	20.915	21.477	**21.734**
	(D) change in C		1.047	1.034	1.015	1.020	1.027	*1.012*
200	(A) number of exemptions	90,153	92,457	95,424	98,240	102,222	104,952	
	(B) wages & salaries	1,254,083	1,360,743	1,485,145	1,563,259	1,643,782	1,754,533	
	(C=B/A) per capita W&S	13.911	14.718	15.564	15.913	16.081	16.717	**16.926**
	(D) change in C		1.058	1.057	1.022	1.011	1.040	*1.012*
300	(A) number of exemptions	138,616	138,502	139,498	141,333	143,506	145,154	
	(B) wages & salaries	2,213,897	2,307,887	2,402,520	2,483,696	2,592,538	2,734,048	
	(C=B/A) per capita W&S	15.971	16.663	17.223	17.573	18.066	18.835	**19.429**
	(D) change in C		1.043	1.034	1.020	1.028	1.043	*1.031*
400	(A) number of exemptions	79,150	78,761	78,707	79,330	80,215	79,999	
	(B) wages & salaries	937,361	963,073	986,950	1,029,452	1,057,175	1,079,575	
	(C=B/A) per capita W&S	11.843	12.228	12.540	12.977	13.179	13.495	**13.743**
	(D) change in C		1.033	1.025	1.035	1.016	1.024	*1.018*

Sources: IRS Statistics of Income Division and ISER calculations

where $C_{2005} = C_{2004} \times D_{2005}$

The rightmost column contains the predicted *change* in per capita wage and salary income from 2004 to 2005 (in italic) and the resulting extrapolated 2005 per capita wage and salary income (in bold). From this, we can calculate the change in wage and salary income from 1999 to 2005, as shown in Table 34.

Table 34. Change in SOI Wage and Salary Income, 1999-2005

	year		
PUMA	1999	2005	**2005/1999**
100	18.647	21.734	**1.166**
200	13.911	16.926	**1.217**
300	15.971	19.429	**1.216**
400	11.843	13.743	**1.160**

The rightmost column contains the ratio of predicted 2005 per capita wage and salary income to 1999.

To use only these four ratios to project household wage and salary income would assume that change in income was independent of income level – that is, that the income of the poor and the income of the rich increased by the same degree. We know, however, that income inequality in the U.S. has been growing[21] and so the income projection should be sensitive to the difference in income change between richer and poorer households. An advantage of using census data for the projection is that the PUMS enables us to do this. Because of the high sampling error of the 2005 ACS in Alaska, and thus the even higher

[21] Bernstein, Jared, Elizabeth McNichol, and Karen Lyons. Pulling Apart. Washington, DC: Center on Budget & Policy Priorities. 2005.

sampling error in the corresponding PUMS, which is a sub-sample of the total ACS sample, we use the ratios calculated from the SOI as a base, but adjusted them by income quintile using tables generated from the PUMS. This adjustment was made as follows:

From the 2000 census PUMS and 2005 ACS PUMS, we calculated per capita wage and salary income by household income quintile, and the ratio of change for each quintile. The "change" row in Table 35 shows this result, and it is clear that the higher income quintiles also experienced greater increases in wage and salary income than did the lower quintiles. The bottom row is the ratio of the change for a particular quintile to the change for the total population.

Table 35. Change in Per Capita Wage and Salary Income by Income Quintile from 2000 Census to 2005 ACS

	quintile					
year	1	2	3	4	5	Total
1999	3,685	9,668	14,234	19,819	31,056	17,156
2005	3,924	10,925	16,000	22,794	38,219	20,082
(C) change	1.065	1.130	1.124	1.150	1.231	1.171
(F) fraction of total	0.910	0.965	0.960	0.983	1.051	1.000

where $F_q = \frac{C_q}{C_{total}}$ for quintile q.

We take these ratios to total change, and apply them to the total change in each PUMA obtained from the SOI:

Table 36. Wage and Salary Income from SOI Adjusted by Quintile from PUMS

	quintile					
PUMA	1	2	3	4	5	Total
100	1.060	1.125	1.119	1.145	1.225	1.166
200	1.107	1.175	1.169	1.196	1.279	1.217
300	1.107	1.174	1.168	1.195	1.279	1.216
400	1.056	1.120	1.114	1.140	1.220	1.160

where $cell_{p,q} = F_q \times cell_{p,total}$ for PUMA p and quintile q.

(You may get slightly different results due to rounding error – although the numbers in these tables are limited to four significant digits, high precision was preserved in the actual calculations.)

Each household in the 2000 PUMS belongs to one of these cells, depending on its quintile and PUMA. We multiply its wage and salary income by the corresponding ratio of change to determine its predicted 2005 wage and salary income:

$$W_{2005} = W_{1999} \times cell_{p,q}$$

BUSINESS AND FARM INCOME

The SOI do not contain business and farm income, so we made this projection using only the PUMS. Because of the small sample size of the 2005 ACS, we calculated ratios of change only by PUMA and not by household income quintile. Table 37 shows per capita business and farm income in 1999 and 2005 and the ratio of the two which is used in the income projection. Business and farm income includes fishing.

Table 37. Business and Farm Income from PUMS, 1999 and 2005

	year		
PUMA	1999	2005	change
100	1,747.40	2,728.35	1.561381
200	1,785.80	1,870.25	1.047291
300	1,371.50	2,040.73	1.487961
400	1,537.21	1,795.66	1.168130

NON-EARNED INCOME

In the Census, "earnings" are defined as the sum of wage and salary income and business and farm income. We define non-earned income as total income minus earned income. Again, we use the 2000 and 2005 PUMS to calculate the ratio of increase by PUMA.

We actually divide non-earned income into two subcategories: permanent fund dividend and all other non-earned income. The ratio of change we compute from the PUMS is for non-earned income excluding PFDs. To obtain this, we subtract the 1999 PFD amount ($1769.84) from each individual's income who included a PFD in their reported income.

Table 38 shows the per capita non-earned income from the 2000 Census and 2005 ACS, excluding PFDs, and the ratio of change for each PUMA.

Table 38. Non-earned Income from PUMS, 1999 and 2005

	year		
PUMA	1999	2005	change
100	4,981.35	5,543.59	1.1129
200	4,961.70	4,675.03	0.9422
300	5,064.05	5,113.12	1.0097
400	3,895.42	3,394.02	0.8713

To project each household's non-earned income, we subtract any reported PFDs, multiply the remaining non-earned income by the appropriate ratio, then add the amount of the 2005 PFD ($845.76) for each household member who received a 1999 PFD (reported or unreported but received, as determined by the criteria above).

Having projected 2005 income in each of these three categories, we add them to obtain projected total 2005 income for each household. 2005 income quintiles and poverty status are calculated using these projected values (and poverty status using the HHS 2006 Poverty Guidelines for Alaska).

INCOME DISTRIBUTION AND POVERTY

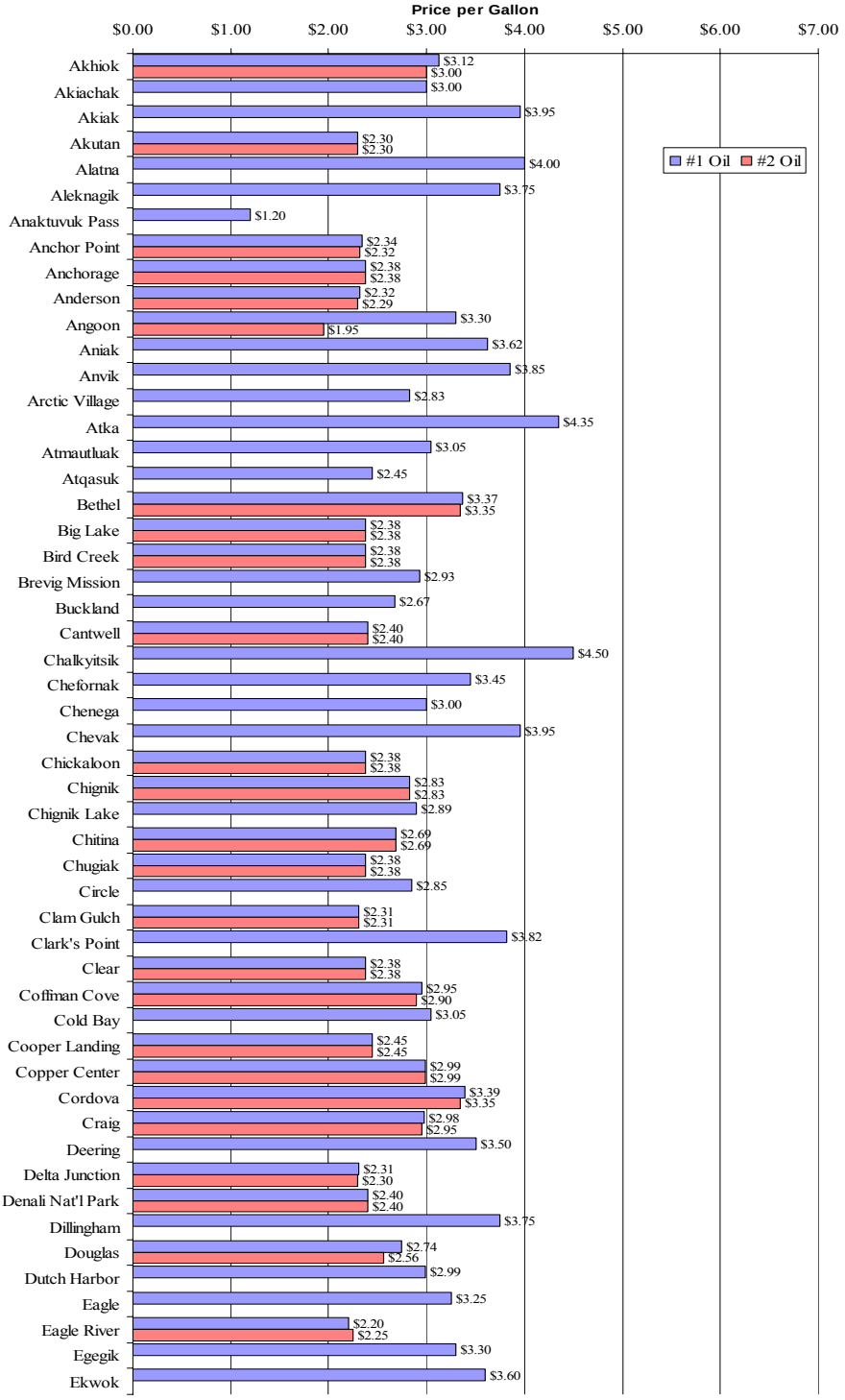
Our income projection takes into account the change in income distribution over time in three ways: by projecting wage and salary, self employment, and non-earned income separately, by adjusting for unreported PFDs, and by adjusting increases in wage and salary income by quintile using the 2005 ACS PUMS. As a result, it estimates a significantly higher increase in income for households in the upper income quintiles than for those in the lower quintiles. It also results in an increase in the statewide poverty rate of about 50%, compared to about 19% as shown by the published figures from the Census.

There are a number of reasons for the disagreement between the Census figures and our own projection. We believe our numbers are the better measure.

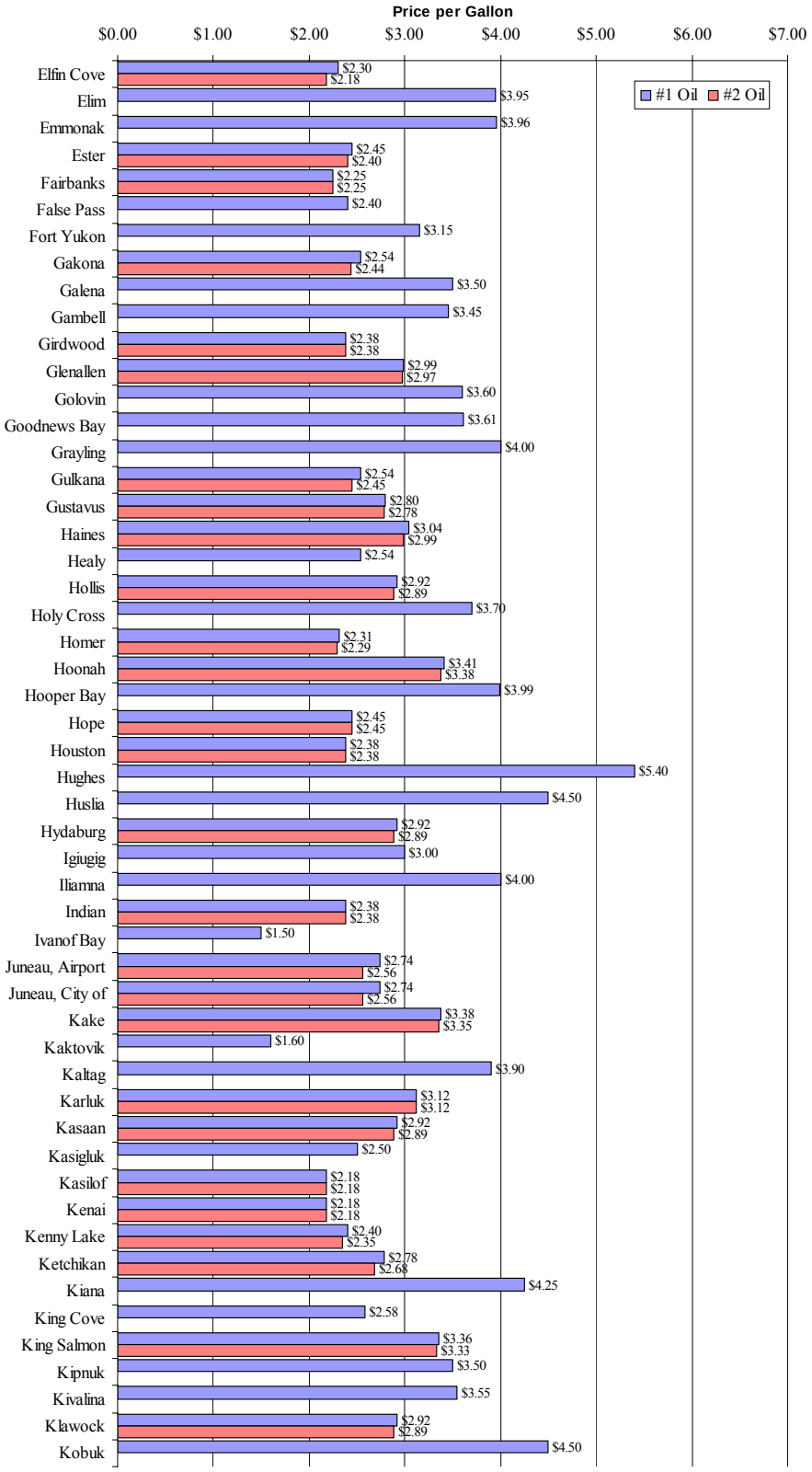
- Permanent fund dividends play a significant role. Because so many PFDs go unreported in the census, the increase in the census poverty rates understates the effect of the declining dividend amount, a significant component in the income of poorer households. If we run our projection model without adjusting for unreported PFDs, the result is a 23% increase in poverty, much closer to the 19% Census number.
- We use a different measure of poverty than the Census poverty thresholds—the U.S. Department of Health and Human Services' Poverty Guidelines—which for Alaska are about 25 percent higher than the Census thresholds. With more households at incomes close to the line, a small decline in income, or a small increase in the guideline, affects more households.
- When we examined food stamp caseload records from the Alaska Division of Public Assistance, we found that the number of food stamp recipients per capita increased about 39% between 2000 and 2006, suggesting an increase in poverty closer to the one we projected.
- IRS Statistics of Income (SOI) data also indicate declining incomes among low income households. We looked at the change in per capita income—calculated as total adjusted gross income divided by total exemptions—from tax year 1998 to 2004 for different income classes. We found a 26% *decrease* in per capita income for tax filers with AGI below $25,000, and a 12% *increase* for filers with AGI $25,000 and above. This strongly suggests that lower income filers lost income and higher income filers gained income. The evidence is not conclusive, however, because we were not able to rule out other possible confounding factors, such as a change in the percentage of population filing returns and a change in the mix of non-dependents vs. dependents in each income group. Comparing classes of returns below and above $50,000 AGI, while farther from the poverty guideline, has the advantage that the share of exemptions these classes represent—56 percent and 44 percent respectively—were stable between 1998 and 2004. For filers with AGI below $50,000, there was an 11% *decrease* in AGI per exemption, while filers with AGI $50,000 and above enjoyed an 11% *increase* in per capita AGI.

APPENDIX E. PRICE OF FUEL OIL BY COMMUNITY

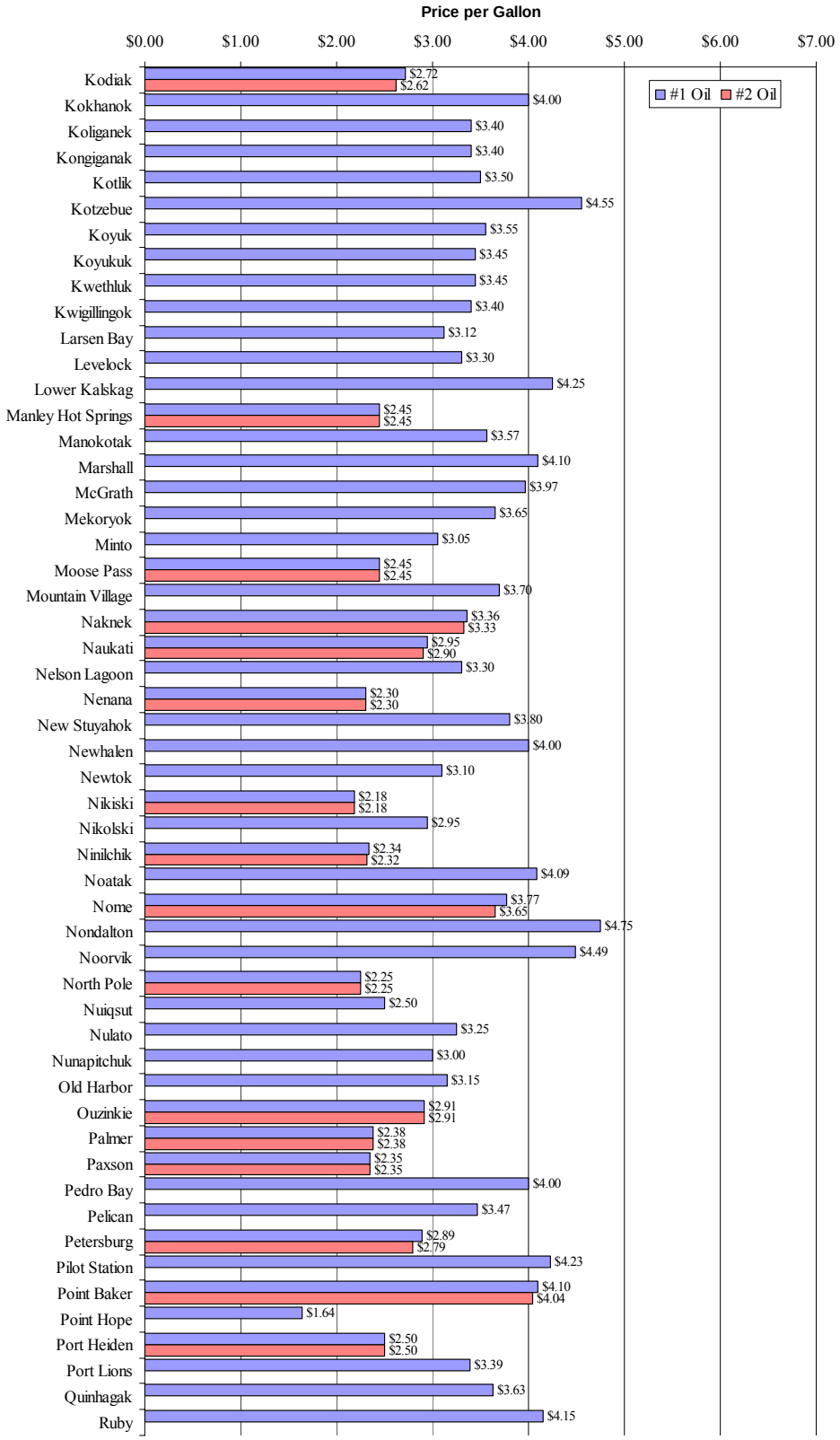
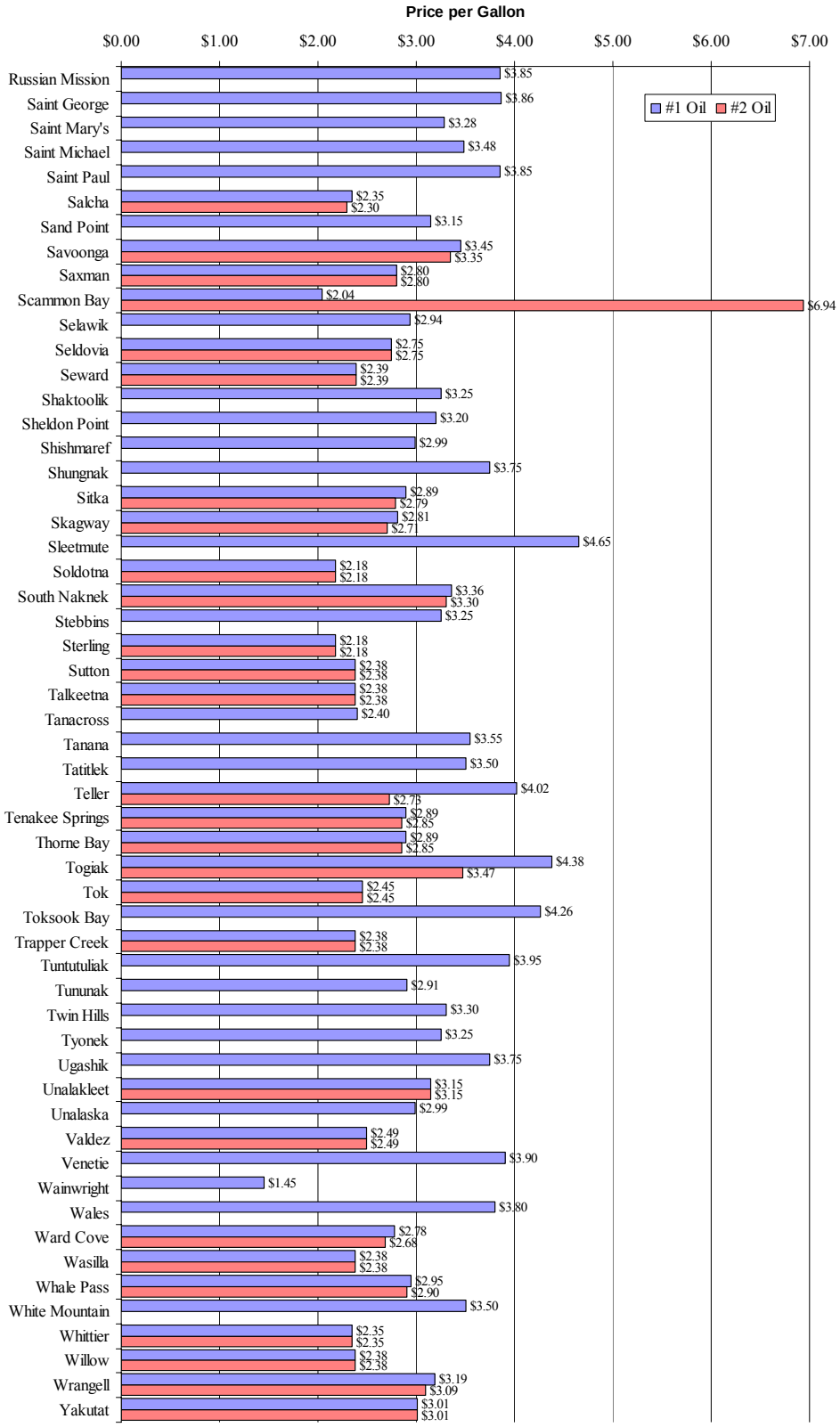
AHFC SURVEY, DECEMBER 2005



Price of Fuel Oil, AHFC Survey, December 2005



Price of Fuel Oil, AHFC Survey, December 2005



Price of Fuel Oil, AHFC Survey, December 2005