

A Nationwide Look at the Affordability of Water Service

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Introduction

The affordability of water service has become an increasingly important topic. As early as 1992, those who work with low-income consumers began to express concerns about the price of water escalating much faster than either the rate of inflation or the increase in household incomes. (1) Within two years, similar concerns were being expressed by state public service commissions, the water industry, consumer advocates, and others involved in the water industry. (2) These concerns led to the inclusion, for the first time, of specific affordability requirements in the 1996 amendments to the Safe Drinking Water Act. (3)

U.S. EPA recently published a comprehensive guide on the development of affordability criteria for drinking water and a related paper. (4), (5) That work provides a thorough review of the various affordability standards that are in use throughout the United States. However, the literature lacks a discussion of empirical data concerning the cost of water as a percentage of household income or any other measures of the actual affordability of water in the United States.

The author's earlier study provided a first attempt to examine empirical data concerning the actual cost of water as a percentage of household income. (2) That study, however, was limited in its scope (focusing primarily on a sample of water systems in Pennsylvania) and did not examine several factors, including the fact that many people do not pay water costs directly. That work also used samples that may not be representative of any particular water service area, let alone a state or the United States as a whole. In addition, that work focuses primarily on the lowest-income households rather than households with more representative levels of income, such as the median household income.

This paper attempts to correct some of those earlier shortcomings and provide an analysis of the cost, and affordability, of water throughout the United States. Included will be data for each state, the District of Columbia, and the United States as a whole. (In the remainder of this paper, the term "state" will include the District of Columbia.)

Data Sources and Methodology

As part of the 1990 census, the U.S. Census Bureau conducted a survey of 5% of the households in each state. In 1995, the Census Bureau published the raw data from this survey on CD-ROM in a publicly accessible form (that is, it does not include any information that could be used to identify specific respondents to the survey). (6)

This data set is enormous, totaling in excess of 4.5 million records with more than 100 fields per record. The data are divided into separate files for each state. Included within these data are information about the source of water for each household, the annual cost of water, the number of people living in the household, and the household's income, to name but a few. The data set also includes weightings that enable the analyst to automatically scale results from the survey to the entire population of the state being examined.

The survey was conducted during 1990, meaning that the data about the household's income and expenses are from calendar year 1989.

The Census Bureau publishes a public-domain computer program, IMPS, which includes a data dictionary for the 5% survey as well as a cross-tabulation module. To conduct this analysis, the author customized the data dictionary to develop a cross-tabulation report that summarizes survey data from each state about the annual household cost of water (in ranges of \$50 from \$0 to \$499, then a general category of \$500 or more) and annual household income (in ranges of \$5,000 from \$0 to \$29,999, then a general category of \$30,000 or more). These categories should provide an accurate depiction of water bills for both low-income households and those households with median income (median household income in the United States in 1989 was \$30,056). (7), (8). Separate reports were prepared by household size (ranging from 1 through 5 persons, as well as a report for all households).

The cross-tabulation reports, which the IMPS program outputs to ASCII files, were then converted into a data base using a program developed in dBASE IV (Borland). Analysis of the resulting data base was conducted using Microsoft Excel version 7.0.

Other data about households in each state (for example, the number of households and median household income) were extracted from the Census Bureau's Summary Tape File 3C, using tools that are available through its Internet site. (7)

Understanding Changes Since 1989

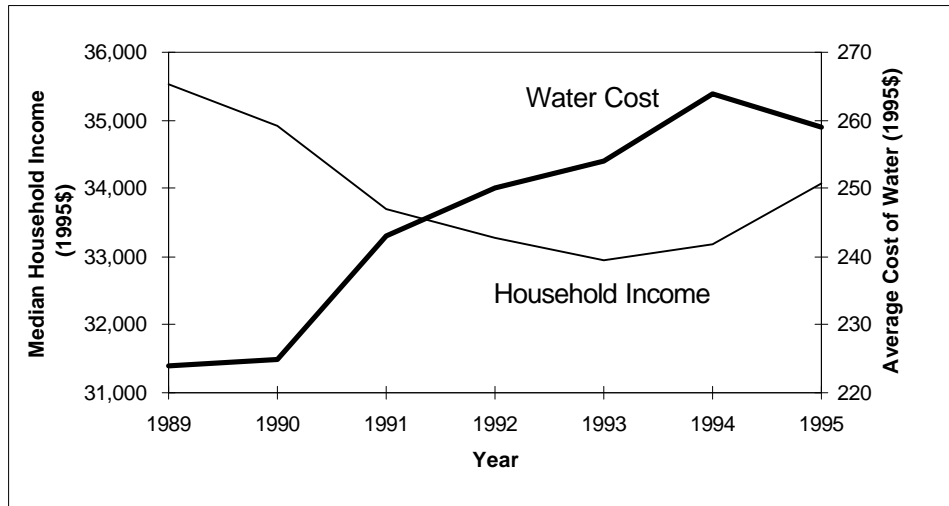
Before discussing the specific results of this analysis, it is important to note some changes that have occurred since these data were collected. The results that will be shown below examine household income and water costs for calendar year 1989. Since that time, on a nationwide basis, the median household income, in real (that is, inflation-adjusted) terms has declined, while the real cost of water has increased, as shown in Figure 1. (8), (9), (10). Similarly, incomes for the lowest-income wage earners declined by approximately 5% on a real basis during this time period. (11). In fact, as is apparent from the figure, from 1989 to 1995, median income declined by 4.1% in real terms, while the average cost of water increased by 15.6% in real terms.

Further indications of the change in water costs since 1989 are apparent from a recent survey of water costs in Virginia, showing that average water costs for a residential consumer using 5000 gallons per month increased by 36% from

1990 through 1997. (12) In real terms, this would amount to an increase of 8.2% above the rate of inflation.

As a result, it is likely that any relationships that are found in the 1990 census data between income and the cost of water would be greater in 1995 than they were at the time of the 1990 census. That is, if the census data reveal that water bills were a certain percentage of median household income, that percentage can be expected to be higher in 1995 than it was in 1990.

Figure 1: Real Change in Income and Cost of Water 1989-1995



In particular, if the nationwide relationship were to hold in each instance (which, of course, it does not, as the Virginia data show), the ratio of water costs to household income would be 20% higher in 1995 than it was in 1989.¹ Thus, if water costs were 1% of median household income in 1989, they could be expected to be 1.2% of median household income by 1995.

It is also noteworthy that, since 1990, there appears to be an increasing trend away from having water costs included in rental costs for residential dwelling units. A complete analysis probably will need to await the results of the 2000 census, but anecdotal information indicates that this trend is occurring. For example, in Orange County, California, the largest landlords “are starting to make tenants pay for water, sewer and trash – a trend they hope will spread.” (13) As a result, it can be anticipated that a larger percentage of consumers will pay directly for public water today than paid for it in 1990.

¹ The ratio of water costs to household income would be increased by the ratio of the real change in water costs to the real change in household income, or $115.6 \div 0.959$, which is equal to 120.5. That is, the ratio of water costs to household income would be 20.5% higher in 1995 than it was when the 1989 data were collected in the 1990 census.

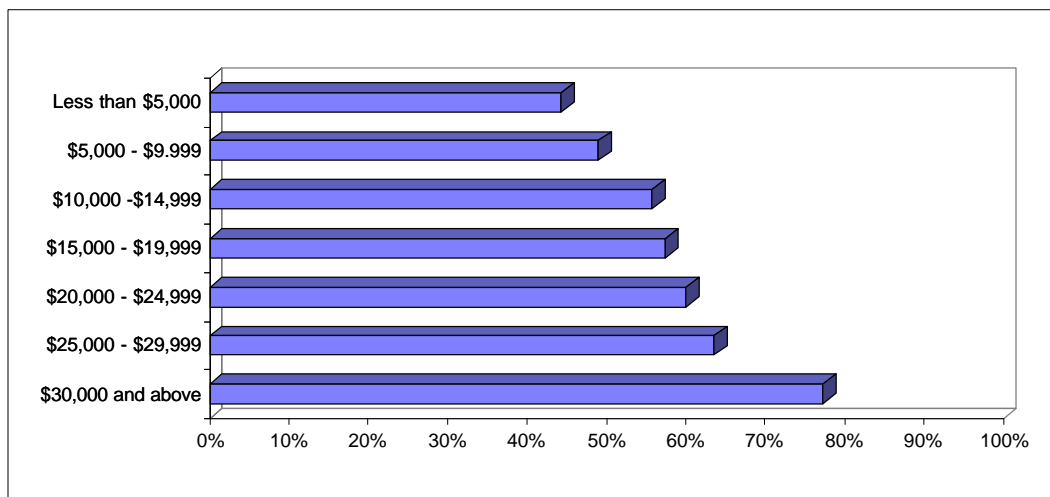
Results²

In 1990, there were approximately 92 million households in the United States. Of those, approximately 78 million households, or 85%, received water from a public water supply (that is, a publicly or privately owned water system that serves multiple buildings). This percentage varies dramatically among the states, ranging from less than 60% in Vermont and Maine to 100% in the District of Columbia. See Map 1.

Out of the 78 million households that receive water from a public water system, only two-thirds, or approximately 52 million households, pay directly for water. The remaining one-third of households report that their water costs are included in the rent or simply that they do not pay for water. There is also wide variation among the states in the proportion of households that pay directly for public water, ranging from 85% of households in West Virginia to only 38% of households in the District of Columbia, as shown in Map 2.

A further analysis of the data shows that households at the lower end of the income scale are far less likely to pay for water than are households with higher incomes. Presumably, this is related to the predominance of renters among lower-income households. Indeed, as shown in Figure 2, less than 50% of households with annual income under \$10,000 pay directly for water, while more than 75% of households with income above \$30,000 pay directly for water.

Figure 2: Percent of Households that Pay Directly for Water by Annual Household Income

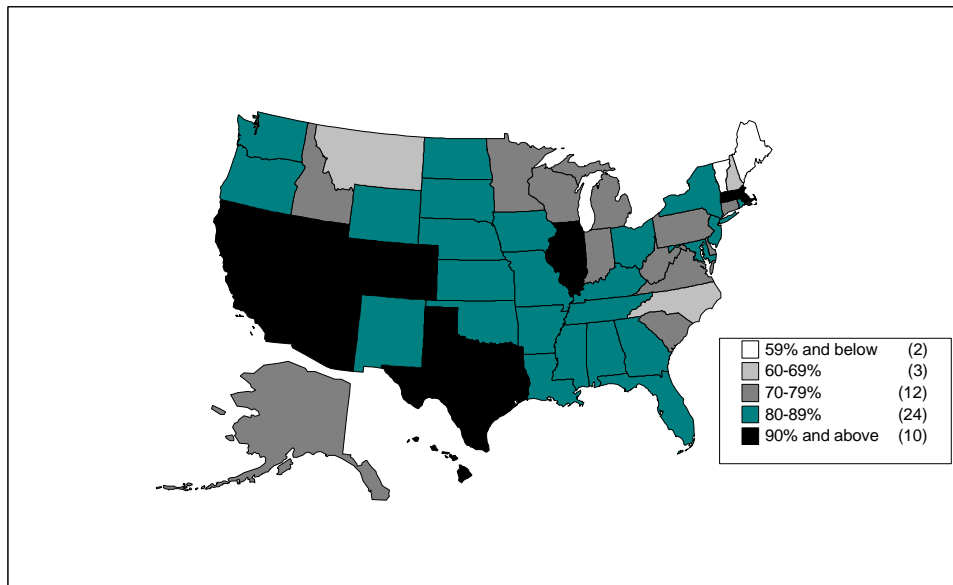


This nationwide summary, however, fails to capture the wide variation among the states. For example, in the District of Columbia and New York, fewer than 15% of households with income below \$5,000 per year pay directly for water, while in Arkansas and Mississippi, the figure is closer to 70%. These

² In this section, all data are based on the author's analysis of data from the 1990 census 5% sample (6) unless otherwise noted.

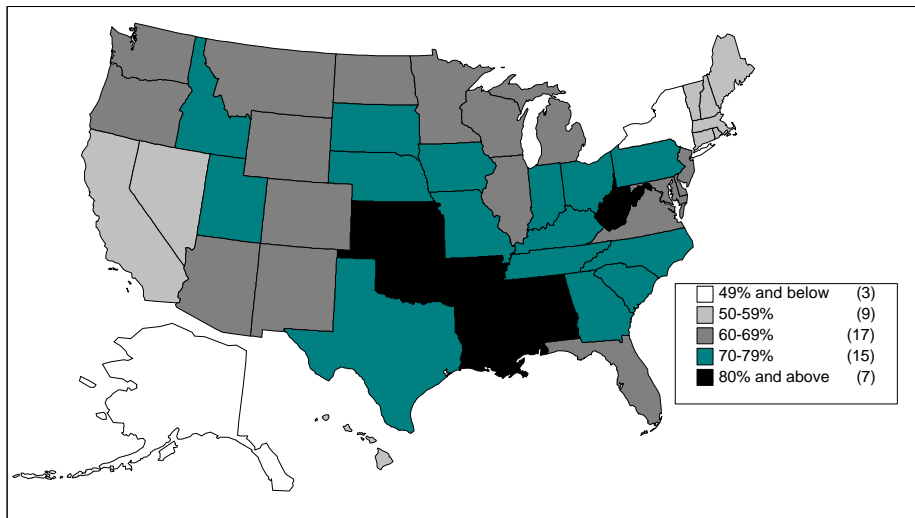
Map 1: Percent of Households on Public Water Supply

<u>State</u>	<u>Percent</u>	<u>Rank</u>	<u>State</u>	<u>Percent</u>	<u>Rank</u>
AK	70%	46	MT	68%	47
AL	87%	18	NC	66%	48
AR	82%	28	ND	81%	33
AZ	95%	5	NE	84%	23
CA	95%	4	NH	63%	49
CO	92%	6	NJ	89%	11
CT	78%	36	NM	84%	24
DC	100%	1	NV	92%	7
DE	77%	38	NY	89%	15
FL	86%	19	OH	82%	27
GA	82%	30	OK	87%	17
HI	98%	2	OR	81%	32
IA	82%	29	PA	79%	35
ID	72%	44	RI	89%	14
IL	90%	10	SC	77%	37
IN	74%	41	SD	83%	25
KS	89%	12	TN	86%	21
KY	81%	31	TX	91%	9
LA	89%	13	UT	97%	3
MA	92%	8	VA	77%	40
MD	83%	26	VT	57%	51
ME	58%	50	WA	86%	20
MI	74%	42	WI	71%	45
MN	77%	39	WV	73%	43
MO	85%	22	WY	80%	34
MS	88%	16	US	85%	



Map 2: Percent of Households on Public Water that Pay Directly for Water

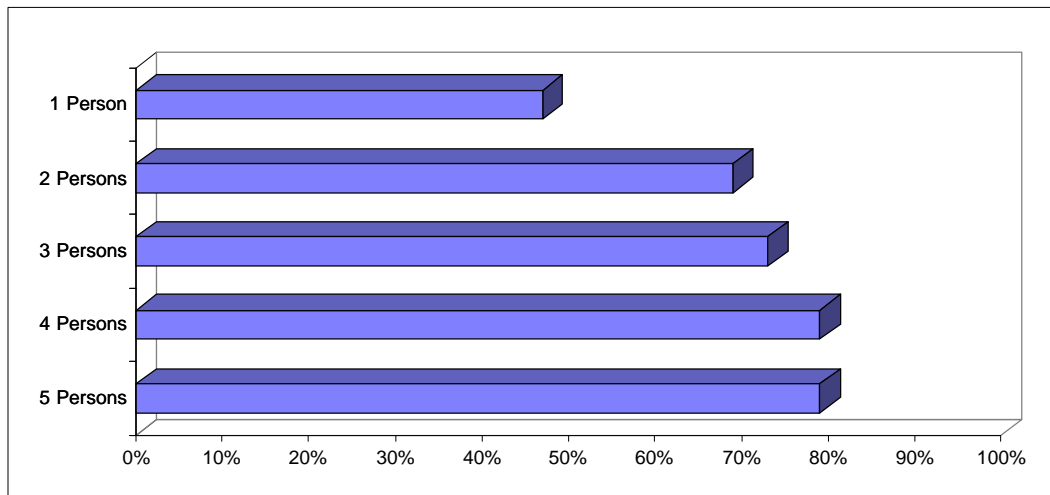
<u>State</u>	<u>Percent</u>	<u>Rank</u>	<u>State</u>	<u>Percent</u>	<u>Rank</u>
AK	47%	49	MT	69%	23
AL	83%	4	NC	75%	13
AR	84%	2	ND	63%	38
AZ	66%	29	NE	73%	14
CA	59%	40	NH	52%	47
CO	63%	38	NJ	64%	35
CT	57%	43	NM	69%	23
DC	38%	51	NV	55%	46
DE	65%	32	NY	43%	50
FL	64%	35	OH	70%	21
GA	73%	14	OK	81%	5
HI	52%	47	OR	67%	27
IA	79%	8	PA	73%	14
ID	73%	14	RI	58%	41
IL	65%	32	SC	78%	10
IN	72%	18	SD	72%	18
KS	80%	6	TN	79%	8
KY	78%	10	TX	72%	18
LA	80%	6	UT	70%	21
MA	56%	45	VA	69%	23
MD	65%	32	VT	57%	43
ME	58%	41	WA	64%	35
MI	67%	27	WI	66%	29
MN	66%	29	WV	85%	1
MO	76%	12	WY	69%	23
MS	84%	2	US	66%	



variations, which are shown for each income level in Table 1, could prove to be very important for policy makers on the state and local level and should lead to caution in trying to use these data on a national level.

A similar relationship is evident between the size of a household and the likelihood that it will pay directly for water. Figure 3 shows that smaller households (those with only one or two people) are less likely to pay directly for water than are larger households. As was the case with income, however, there is tremendous variation among the states, as shown in Table 2. For example, while less than one-half of the two-person households in Alaska, District of Columbia, Hawaii, and New York pay directly for water, more than 85% of similar-sized households do so in Alabama, Arkansas, Mississippi, Oklahoma, and West Virginia.

Figure 3: Percent of Households that Pay Directly for Water by Size of Household



There appears to be little relationship between a household's income and the household's water bill. Figures 4 and 5 show the distribution of water bills for one-person and three-person households, respectively, across the income spectrum. There is essentially no difference in the distribution of water bills among same-sized households with different levels of income. For example, Figure 4 shows that between 55% and 60% of the households with one person pay water bills that are less than \$200 per year. Similarly, Figure 5 shows that about one-half of three-person households spend less than \$250 per year for water, regardless of income level. The similarity of these curves indicates that the level of the household's water bill has little to do with the household's income.

Table 1: Percent of Households on Public Water that Pay Directly for Water
by Annual Household Income

State	All Households	Under \$5,000	\$5,000-\$9,999	\$10,000-\$14,999	\$15,000-\$19,999	\$20,000-\$24,999	\$25,000-\$29,999	\$30,000 and above
AK	47%	23%	22%	26%	23%	28%	33%	58%
AL	83%	65%	75%	80%	81%	83%	84%	91%
AR	84%	69%	75%	81%	83%	85%	87%	93%
AZ	66%	41%	46%	49%	53%	58%	65%	81%
CA	59%	37%	34%	41%	43%	46%	50%	71%
CO	63%	34%	38%	45%	48%	53%	61%	79%
CT	57%	25%	29%	41%	43%	43%	45%	69%
DC	38%	12%	23%	23%	24%	25%	27%	52%
DE	65%	37%	40%	46%	48%	51%	54%	78%
FL	64%	43%	49%	54%	56%	60%	64%	75%
GA	73%	54%	65%	65%	64%	66%	70%	83%
HI	52%	23%	35%	34%	37%	37%	40%	62%
IA	79%	52%	61%	68%	74%	78%	83%	90%
ID	73%	45%	53%	61%	67%	74%	77%	87%
IL	65%	34%	46%	54%	55%	58%	60%	77%
IN	72%	44%	54%	61%	65%	69%	73%	85%
KS	80%	57%	65%	70%	75%	78%	82%	90%
KY	78%	54%	66%	71%	75%	77%	80%	90%
LA	80%	65%	74%	75%	77%	79%	82%	90%
MA	56%	27%	27%	41%	42%	43%	46%	68%
MD	65%	34%	45%	47%	46%	48%	53%	76%
ME	58%	27%	34%	43%	49%	53%	56%	75%
MI	67%	39%	46%	54%	58%	61%	64%	80%
MN	66%	34%	38%	49%	53%	57%	63%	82%
MO	76%	50%	60%	66%	70%	74%	77%	87%
MS	84%	70%	77%	81%	81%	83%	87%	93%
MT	69%	41%	48%	59%	64%	67%	76%	87%
NC	75%	55%	65%	66%	68%	70%	73%	85%
ND	63%	37%	44%	49%	55%	60%	67%	82%
NE	73%	45%	55%	60%	65%	71%	75%	86%
NH	52%	24%	29%	36%	36%	41%	45%	65%
NJ	64%	31%	37%	49%	47%	49%	52%	74%
NM	69%	47%	55%	58%	61%	66%	72%	84%
NV	55%	30%	30%	32%	37%	40%	49%	71%
NY	43%	15%	22%	31%	34%	35%	38%	55%
OH	70%	37%	51%	58%	62%	66%	71%	84%
OK	81%	65%	71%	74%	77%	78%	83%	91%
OR	67%	36%	42%	53%	57%	63%	68%	82%
PA	73%	46%	55%	64%	66%	70%	73%	85%
RI	58%	30%	26%	40%	43%	46%	54%	74%
SC	78%	61%	71%	71%	72%	74%	78%	88%
SD	72%	42%	56%	63%	66%	74%	78%	88%
TN	79%	56%	69%	73%	75%	78%	81%	89%
TX	72%	54%	61%	61%	61%	64%	68%	84%
UT	70%	42%	48%	50%	57%	61%	70%	85%
VA	69%	41%	54%	54%	55%	57%	62%	80%
VT	57%	31%	29%	38%	45%	52%	55%	75%
WA	64%	34%	38%	46%	49%	55%	60%	79%
WI	66%	33%	40%	52%	55%	60%	67%	82%
WV	85%	61%	75%	84%	86%	89%	92%	95%
WY	69%	36%	47%	58%	62%	68%	73%	83%
US	66%	44%	49%	56%	57%	60%	64%	77%

Table 2: Percent of Households on Public Water that Pay Directly for Water
by Size of Household

State	All	1 Person	2 People	3 People	4 People	5 People
AK	47%	31%	46%	50%	56%	55%
AL	83%	71%	85%	87%	89%	88%
AR	84%	73%	87%	88%	90%	89%
AZ	66%	45%	68%	73%	79%	81%
CA	59%	40%	61%	64%	71%	70%
CO	63%	39%	67%	72%	80%	80%
CT	57%	37%	60%	64%	71%	70%
DC	38%	22%	43%	49%	54%	57%
DE	65%	46%	68%	69%	80%	79%
FL	64%	45%	64%	75%	81%	82%
GA	73%	57%	75%	78%	83%	83%
HI	52%	30%	49%	56%	60%	66%
IA	79%	61%	82%	85%	91%	93%
ID	73%	56%	75%	77%	84%	86%
IL	65%	44%	68%	73%	79%	78%
IN	72%	53%	75%	79%	86%	86%
KS	80%	64%	84%	86%	90%	91%
KY	78%	62%	81%	83%	87%	87%
LA	80%	67%	82%	83%	88%	88%
MA	56%	34%	57%	63%	71%	73%
MD	65%	44%	66%	71%	77%	80%
ME	58%	40%	62%	64%	72%	72%
MI	67%	45%	68%	74%	82%	85%
MN	66%	43%	69%	75%	85%	88%
MO	76%	56%	80%	83%	88%	89%
MS	84%	74%	86%	85%	89%	88%
MT	69%	52%	71%	75%	81%	85%
NC	75%	62%	77%	80%	83%	83%
ND	63%	43%	67%	69%	78%	85%
NE	73%	53%	76%	80%	86%	87%
NH	52%	33%	53%	57%	68%	71%
NJ	64%	43%	66%	69%	77%	76%
NM	69%	53%	74%	72%	76%	77%
NV	55%	34%	55%	62%	71%	71%
NY	43%	25%	46%	50%	57%	57%
OH	70%	50%	73%	77%	84%	86%
OK	81%	66%	85%	85%	88%	89%
OR	67%	45%	70%	75%	84%	84%
PA	73%	54%	76%	81%	86%	88%
RI	58%	37%	61%	65%	72%	70%
SC	78%	67%	80%	81%	85%	84%
SD	72%	53%	78%	77%	86%	85%
TN	79%	63%	82%	84%	88%	87%
TX	72%	51%	74%	77%	83%	83%
UT	70%	48%	69%	69%	76%	84%
VA	69%	50%	71%	76%	82%	81%
VT	57%	39%	62%	60%	72%	69%
WA	64%	41%	67%	71%	80%	80%
WI	66%	45%	70%	74%	82%	82%
WV	85%	73%	88%	89%	92%	93%
WY	69%	55%	74%	71%	75%	82%
US	66%	47%	69%	73%	79%	79%

Figure 4: Distribution of Water Bill by Income for One-Person Households

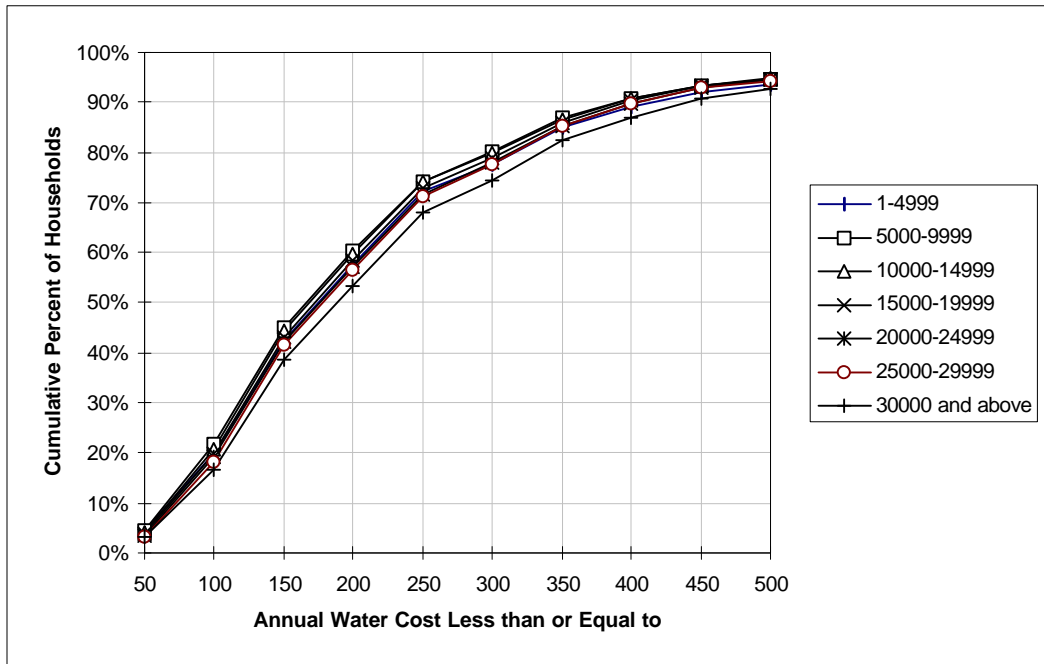
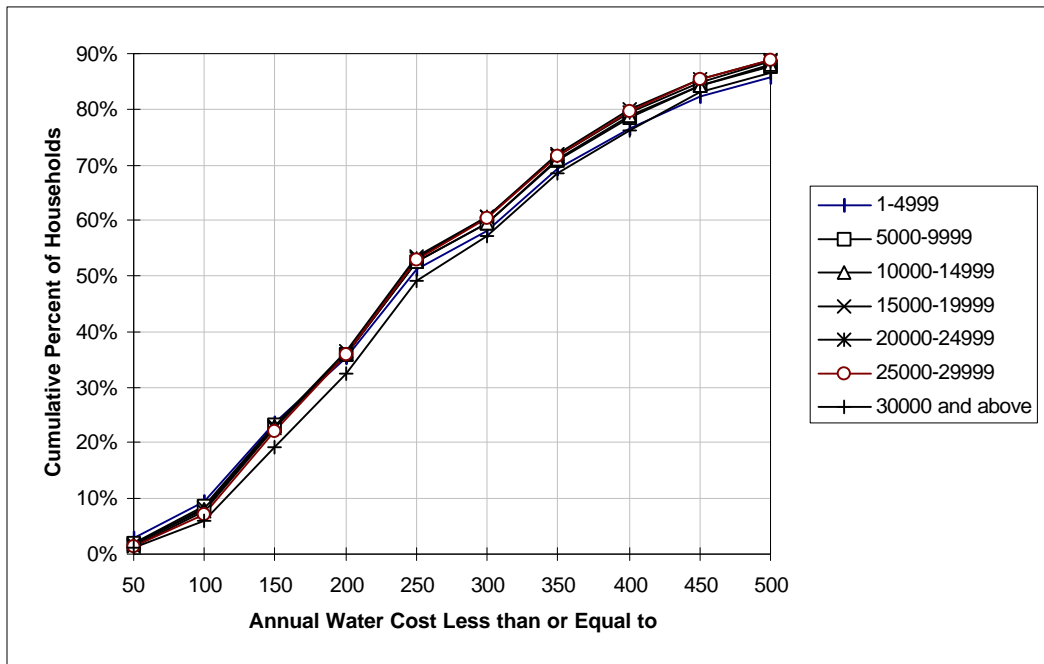
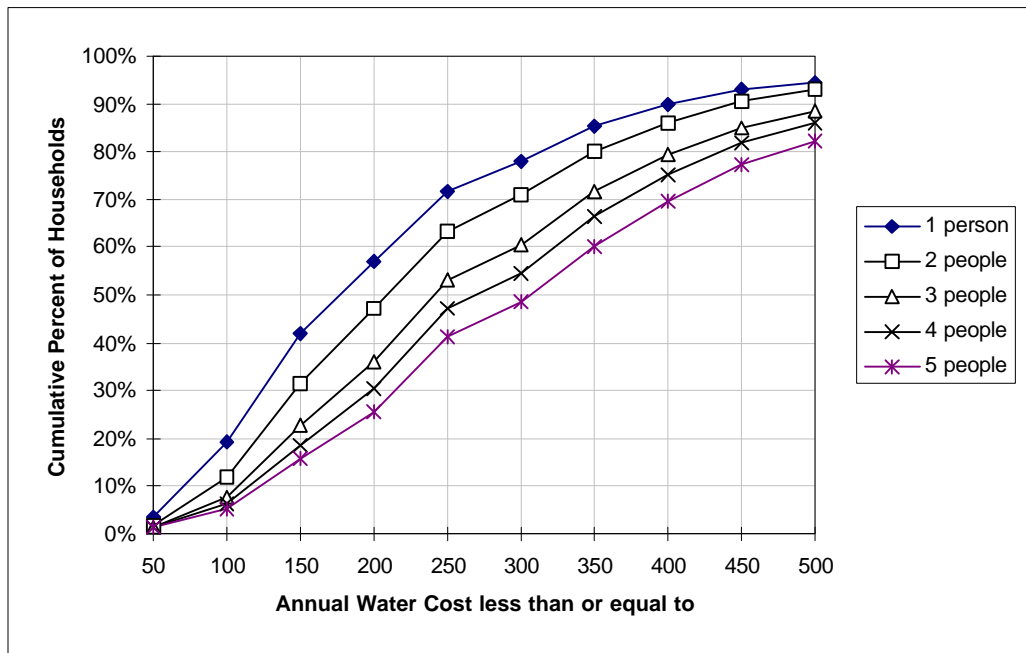


Figure 5: Distribution of Water Bill by Income for Three-Person Households



In contrast, Figure 6 shows the distribution of water bills for households with the same income level – \$20,000 to \$24,999 per year – but different number of household members. Here, there is a very clear relationship between the size of the household and the annual cost for water. Not surprisingly, the larger the household, the higher the annual cost for water, even though the level of income is the same. Thus, for example, while 70% of one-person households with this income have annual water bills that are less than \$250, only 40% of five-person households have water bills that are less than \$250.

Figure 6: Distribution of Water Bill by Household Size for Households with Annual Income Between \$20,000 and \$24,999



Importantly, these distribution curves also can be used to readily identify the percentage of household income that is being spent on water. For example, if the midpoint of the income range (\$22,500, in this example) is used, 1% of household income would be \$225, while 2% would be \$450. From these curves, it can be seen that in 1989 approximately 50% of three-person households with this income were spending more than 1% of their income on water, while more than 10% of these households were spending more than 2% of their income on water. To put these figures in perspective, there were approximately 660,000 three-person households with annual incomes between \$20,000 and \$24,999 in 1989.

It must be noted that these data are for the entire United States. As might be expected, there is a wide variation in the cost of water among the states. For example, as Figure 5 shows, the median water cost for a three-person household is between \$200 and \$249 per year. Table 3 documents the wide variation among the states. In Alaska and Texas, the median water cost for a three-person household is between \$350 and \$399 per year, while in Rhode Island the median cost is between \$100 and \$149 per year.

Table 3: Median Cost of Water by Household Size

State	All	1 Person	2 People	3 People	4 People	5 People
AK	350-399	300-349	300-349	350-399	400-449	350-399
AL	150-199	100-149	150-199	200-249	200-249	250-299
AR	200-249	150-199	200-249	250-299	300-349	300-349
AZ	300-349	250-299	300-349	350-399	350-399	350-399
CA	250-299	200-249	200-249	250-299	300-349	300-349
CO	300-349	200-249	250-299	300-349	300-349	350-399
CT	200-249	150-199	200-249	200-249	250-299	250-299
DC	300-349	150-199	250-299	300-349	400-449	400-449
DE	150-199	100-149	150-199	200-249	200-249	200-249
FL	300-349	200-249	250-299	300-349	350-399	350-399
GA	200-249	150-199	200-249	200-249	250-299	300-349
HI	300-349	200-249	250-299	300-349	300-349	350-399
IA	200-249	150-199	200-249	250-299	250-299	300-349
ID	200-249	150-199	200-249	200-249	200-249	200-249
IL	200-249	150-199	200-249	200-249	250-299	300-349
IN	200-249	100-149	150-199	200-249	250-299	300-349
KS	200-249	150-199	200-249	250-299	300-349	300-349
KY	200-249	150-199	200-249	200-249	250-299	300-349
LA	200-249	150-199	200-249	200-249	200-249	250-299
MA	200-249	100-149	150-199	200-249	200-249	250-299
MD	150-199	100-149	150-199	200-249	200-249	300-349
ME	150-199	100-149	100-149	150-199	150-199	200-249
MI	200-249	150-199	200-249	200-249	250-299	300-349
MN	150-199	100-149	150-199	200-249	200-249	200-249
MO	150-199	100-149	150-199	150-199	200-249	200-249
MS	200-249	150-199	150-199	200-249	200-249	250-299
MT	200-249	150-199	200-249	200-249	250-299	250-299
NC	150-199	100-149	150-199	200-249	200-249	200-249
ND	250-299	150-199	200-249	250-299	300-349	300-349
NE	150-199	100-149	150-199	150-199	150-199	200-249
NH	150-199	100-149	150-199	200-249	200-249	200-249
NJ	200-249	150-199	150-199	200-249	250-299	300-349
NM	300-349	250-299	300-349	300-349	350-399	350-399
NV	300-349	200-249	250-299	300-349	300-349	300-349
NY	150-199	100-149	150-199	150-199	200-249	200-249
OH	200-249	150-199	200-249	250-299	300-349	300-349
OK	250-299	200-249	250-299	300-349	300-349	300-349
OR	200-249	150-199	150-199	200-249	200-249	200-249
PA	200-249	150-199	150-199	200-249	250-299	300-349
RI	100-149	100-149	100-149	100-149	150-199	150-199
SC	200-249	150-199	200-249	200-249	250-299	250-299
SD	200-249	150-199	200-249	250-299	250-299	300-349
TN	200-249	100-149	150-199	200-249	250-299	300-349
TX	350-399	250-299	300-349	350-399	400-449	400-449
UT	200-249	150-199	200-249	200-249	200-249	200-249
VA	250-299	150-199	200-249	250-299	300-349	350-399
VT	150-199	100-149	150-199	150-199	150-199	200-249
WA	200-249	150-199	200-249	200-249	250-299	250-299
WI	150-199	100-149	150-199	200-249	200-249	250-299
WV	200-249	150-199	200-249	250-299	300-349	350-399
WY	250-299	200-249	200-249	250-299	300-349	300-349
US	200-249	150-199	200-249	200-249	250-299	300-349

The typical household is usually defined as the 50th percentile, or median, household. For calendar year 1989 (as reported in 1990), median household income throughout the United States was \$30,056. (7) The median water bill for households with income of this amount was between \$250 and \$299. Using the midpoint of this range, it can be estimated that the median household paid approximately 0.9% of its income for water. It should be emphasized that this represents the 50th percentile of water bills for households at this income level.

Table 4 shows the wide variation in median household income and median water bills throughout the United States. In each instance, the table shows the median water bill for households whose income approximates the median household income. For example, the first entry in the table (Alaska) shows a median household income of \$41,408. This falls within the income range of \$30,000 and above. The median water bill for households in that income range was between \$350 and \$399 per year. Taking the midpoint of that range (\$375) and dividing by the median household income results in the median household paying approximately 0.9% of its income for water.

Throughout the United States, there is a wide range in the impact of water bills on the median household. In Maine and Rhode Island, the median household paid just 0.4% of its income for water, while in Texas the median household paid approximately 1.4% of its income for water.

Distribution curves also can provide additional information about the impact of water costs on the median household. Figure 7 shows the distribution of water costs for the nationwide median household. From this figure, it can be seen that approximately 40% of households with median income are paying more than 1% of their income (\$300) for water, while fewer than 10% are paying 2% of their income (\$600) for water.

Figure 7: Cost of Water for Households with Median Income

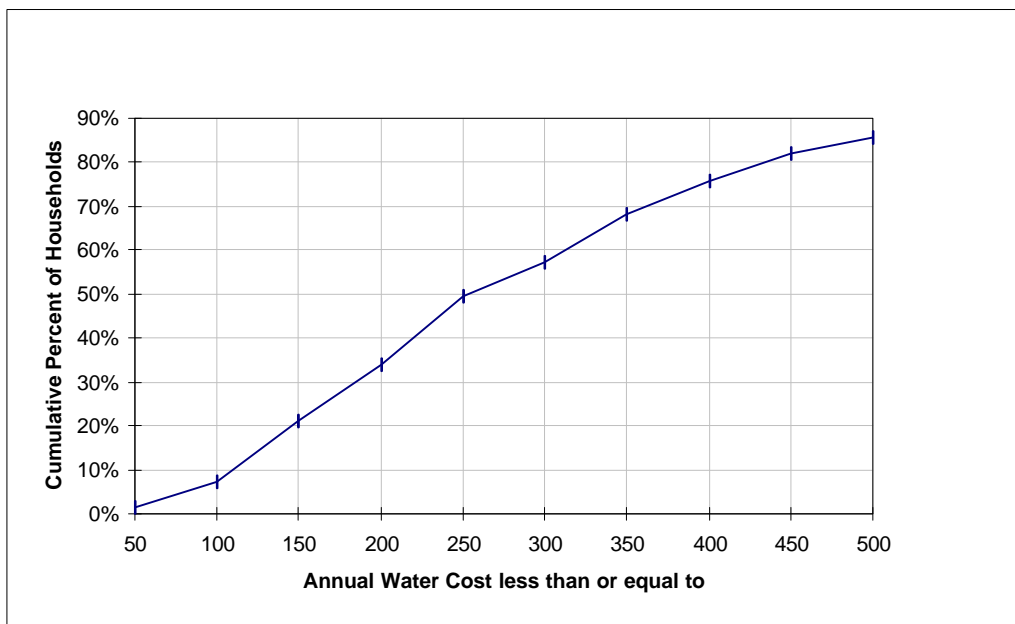


Table 4: Median Water Bill for Household with Median Income

State	Median Household Income	Income Range	Median Water Bill	% of Income for Median Household	Rank
AK	41,408	\$30,000 and above	350-399	0.9%	18
AL	23,597	\$20,000 - \$24,999	150-199	0.7%	31
AR	21,147	\$20,000 - \$24,999	200-249	1.1%	6
AZ	27,540	\$25,000 - \$29,999	300-349	1.2%	3
CA	35,798	\$30,000 and above	250-299	0.8%	22
CO	30,140	\$30,000 and above	300-349	1.1%	6
CT	41,721	\$30,000 and above	200-249	0.5%	46
DC	30,727	\$30,000 and above	300-349	1.1%	6
DE	34,875	\$30,000 and above	200-249	0.6%	40
FL	27,483	\$25,000 - \$29,999	300-349	1.2%	3
GA	29,021	\$25,000 - \$29,999	200-249	0.8%	22
HI	38,829	\$30,000 and above	300-349	0.8%	22
IA	26,229	\$25,000 - \$29,999	200-249	0.9%	18
ID	25,257	\$25,000 - \$29,999	200-249	0.9%	18
IL	32,252	\$30,000 and above	200-249	0.7%	31
IN	28,797	\$25,000 - \$29,999	200-249	0.8%	22
KS	27,291	\$25,000 - \$29,999	200-249	0.8%	22
KY	22,534	\$20,000 - \$24,999	200-249	1.0%	11
LA	21,949	\$20,000 - \$24,999	200-249	1.0%	11
MA	36,952	\$30,000 and above	200-249	0.6%	40
MD	39,386	\$30,000 and above	200-249	0.6%	40
ME	27,854	\$25,000 - \$29,999	100-149	0.4%	50
MI	31,020	\$30,000 and above	200-249	0.7%	31
MN	30,909	\$30,000 and above	200-249	0.7%	31
MO	26,362	\$25,000 - \$29,999	150-199	0.7%	31
MS	20,136	\$20,000 - \$24,999	200-249	1.1%	6
MT	22,988	\$20,000 - \$24,999	200-249	1.0%	11
NC	26,647	\$25,000 - \$29,999	150-199	0.7%	31
ND	23,213	\$20,000 - \$24,999	200-249	1.0%	11
NE	26,016	\$25,000 - \$29,999	150-199	0.7%	31
NH	36,329	\$30,000 and above	150-199	0.5%	46
NJ	40,927	\$30,000 and above	200-249	0.5%	46
NM	24,087	\$20,000 - \$24,999	300-349	1.3%	2
NV	31,011	\$30,000 and above	300-349	1.0%	11
NY	32,965	\$30,000 and above	150-199	0.5%	46
OH	28,706	\$25,000 - \$29,999	200-249	0.8%	22
OK	23,577	\$20,000 - \$24,999	250-299	1.2%	3
OR	27,250	\$25,000 - \$29,999	150-199	0.6%	40
PA	29,069	\$25,000 - \$29,999	200-249	0.8%	22
RI	32,181	\$30,000 and above	100-149	0.4%	50
SC	26,256	\$25,000 - \$29,999	200-249	0.9%	18
SD	22,503	\$20,000 - \$24,999	200-249	1.0%	11
TN	24,807	\$20,000 - \$24,999	150-199	0.7%	31
TX	27,016	\$25,000 - \$29,999	350-399	1.4%	1
UT	29,470	\$25,000 - \$29,999	200-249	0.8%	22
VA	33,328	\$30,000 and above	250-299	0.8%	22
VT	29,792	\$25,000 - \$29,999	150-199	0.6%	40
WA	31,183	\$30,000 and above	200-249	0.7%	31
WI	29,442	\$25,000 - \$29,999	150-199	0.6%	40
WV	20,795	\$20,000 - \$24,999	200-249	1.1%	6
WY	27,096	\$25,000 - \$29,999	250-299	1.0%	11
US	30,056	\$30,000 and above	250-299	0.9%	

Once again, however, it must be noted that the situation in each state will be different than this nationwide picture. For example, the 75th percentile of water costs for median-income households in the United States is approximately 1.2% of median income (that is, that 25% of the median-income households in the country pay more than 1.2% of their income for water). See Table 5. In New Mexico, Texas, and West Virginia, though, the 75th percentile is 1.8% of household income, while in Rhode Island the 75th percentile is just 0.7% of median household income.

Conclusion and Next Steps

Water bills appear to be directly related to the number of people in the household, but unrelated to the household's income. That is, low-income households do not have water bills that are appreciably different from households of the same size with the median, or even higher, incomes. This implies that the ability of low-income households to lower their water bills may be extremely limited.

Both the level of water bills and the percentage of a household's income that is used to pay that bill vary dramatically from state to state. The water bill for households with median statewide income range from 0.4% to 1.4% of household income – a difference of more than 300%.

The survey of 5% of the households in each state that was conducted in conjunction with the 1990 census provides a wealth of information about household income, expenditures, size, and numerous other demographic factors. This paper has just scratched the surface in terms of analyzing the enormous amount of data that are available from this survey. Analysts and policy makers attempting to determine the affordability of water service, and spending patterns for households with different characteristics, to name but a few, should become familiar with this data set and perform additional analyses of these data.

Any attempt to determine the level of median household income that can be spent on water should begin with a consideration of the percentage of income that is currently being expended. For example, 25% of the median-income households in three states already spend (as of 1989) more than 1.8% of their income for water. An affordability standard that sets a lower figure as being “affordable” might not be credible unless it can be demonstrated that 25% of the median-income households in those states are financially distressed.

On the other hand, it should be recognized that in several states most median-income households spend less than 1% of their income for water. Setting an affordability benchmark too high could result in severe rate shock in several states, which could lead to a public backlash against new regulations and other initiatives to improve the quality of water service.

This paper has not attempted to develop an answer to the affordability question. Rather, it has attempted to present some actual data for the United States on the level of water bills, both as related to income and to the size of households. These data should be analyzed in much greater detail, and in

Table 5: Highest 25% of Water Bills for Households with Median Income

State	Median Household Income (1990)	Income Range	Highest 25% of Water Costs	% of Income for Median Household	Rank
AK	41,408	\$30,000 and above	500-999	1.3%	19
AL	23,597	\$20,000 - \$24,999	250-299	1.2%	22
AR	21,147	\$20,000 - \$24,999	300-349	1.5%	8
AZ	27,540	\$25,000 - \$29,999	400-449	1.5%	8
CA	35,798	\$30,000 and above	400-449	1.2%	22
CO	30,140	\$30,000 and above	400-449	1.4%	13
CT	41,721	\$30,000 and above	300-349	0.8%	48
DC	30,727	\$30,000 and above	500-999	1.7%	4
DE	34,875	\$30,000 and above	500-999	1.5%	8
FL	27,483	\$25,000 - \$29,999	400-449	1.5%	8
GA	29,021	\$25,000 - \$29,999	300-349	1.1%	31
HI	38,829	\$30,000 and above	450-499	1.2%	22
IA	26,229	\$25,000 - \$29,999	300-349	1.2%	22
ID	25,257	\$25,000 - \$29,999	300-349	1.3%	19
IL	32,252	\$30,000 and above	350-399	1.2%	22
IN	28,797	\$25,000 - \$29,999	300-349	1.1%	31
KS	27,291	\$25,000 - \$29,999	300-349	1.2%	22
KY	22,534	\$20,000 - \$24,999	300-349	1.4%	13
LA	21,949	\$20,000 - \$24,999	300-349	1.5%	8
MA	36,952	\$30,000 and above	300-349	0.9%	43
MD	39,386	\$30,000 and above	350-399	1.0%	38
ME	27,854	\$25,000 - \$29,999	200-249	0.8%	48
MI	31,020	\$30,000 and above	350-399	1.2%	22
MN	30,909	\$30,000 and above	300-349	1.1%	31
MO	26,362	\$25,000 - \$29,999	250-299	1.0%	38
MS	20,136	\$20,000 - \$24,999	300-349	1.6%	5
MT	22,988	\$20,000 - \$24,999	300-349	1.4%	13
NC	26,647	\$25,000 - \$29,999	250-299	1.0%	38
ND	23,213	\$20,000 - \$24,999	350-399	1.6%	5
NE	26,016	\$25,000 - \$29,999	200-249	0.9%	43
NH	36,329	\$30,000 and above	300-349	0.9%	43
NJ	40,927	\$30,000 and above	350-399	0.9%	43
NM	24,087	\$20,000 - \$24,999	400-449	1.8%	1
NV	31,011	\$30,000 and above	400-449	1.4%	13
NY	32,965	\$30,000 and above	300-349	1.0%	38
OH	28,706	\$25,000 - \$29,999	300-349	1.1%	31
OK	23,577	\$20,000 - \$24,999	350-399	1.6%	5
OR	27,250	\$25,000 - \$29,999	250-299	1.0%	38
PA	29,069	\$25,000 - \$29,999	300-349	1.1%	31
RI	32,181	\$30,000 and above	200-249	0.7%	51
SC	26,256	\$25,000 - \$29,999	300-349	1.2%	22
SD	22,503	\$20,000 - \$24,999	300-349	1.4%	13
TN	24,807	\$20,000 - \$24,999	300-349	1.3%	19
TX	27,016	\$25,000 - \$29,999	450-499	1.8%	1
UT	29,470	\$25,000 - \$29,999	300-349	1.1%	31
VA	33,328	\$30,000 and above	350-399	1.1%	31
VT	29,792	\$25,000 - \$29,999	200-249	0.8%	48
WA	31,183	\$30,000 and above	350-399	1.2%	22
WI	29,442	\$25,000 - \$29,999	250-299	0.9%	43
WV	20,795	\$20,000 - \$24,999	350-399	1.8%	1
WY	27,096	\$25,000 - \$29,999	350-399	1.4%	13
US	30,056	\$30,000 and above	350-399	1.2%	

conjunction with other data concerning expenditures on essential goods and services, to determine the impact that affordability policies and benchmarks may have on households of various sizes and income levels. In this way, both state and national affordability policies and programs can be tailored to the specific needs of households in the affected location.

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