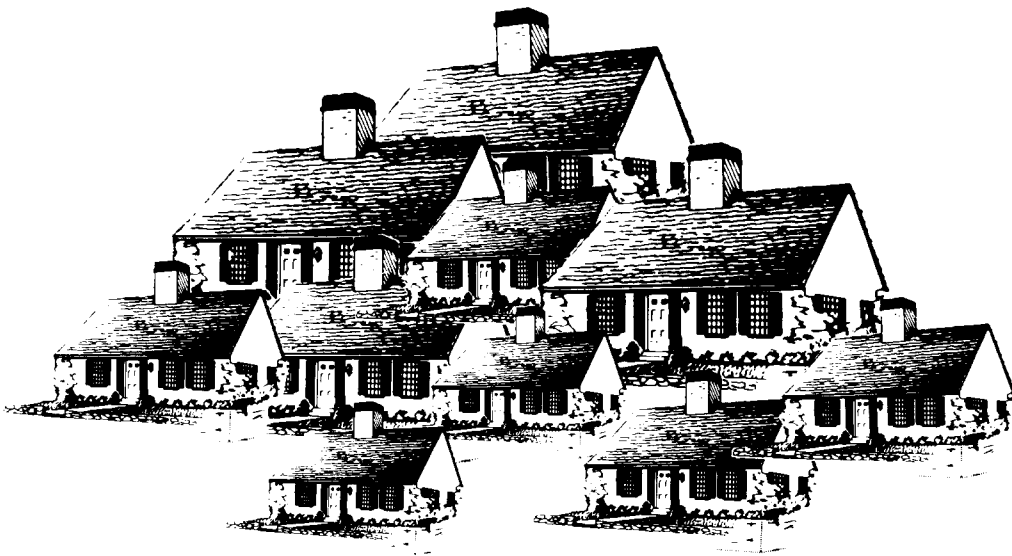


# **Single-Family Households: Fuel Oil Inventories and Expenditures**

**National Interim Energy Consumption Survey**

**December 1979**



**U.S. Department of Energy**  
Energy Information Administration  
Assistant Administrator for Program  
Development



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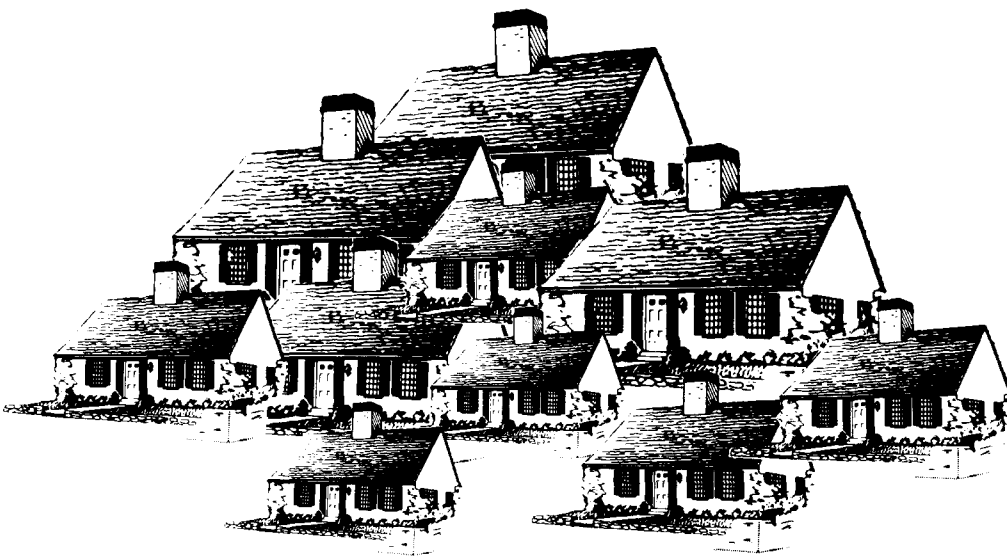
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# Single-Family Households: Fuel Oil Inventories and Expenditures

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Office of the Consumption Data System  
Washington, D.C. 20461



## PREFACE

This report of the Office of the Consumption Data System, Office of Program Development, Energy Information Administration, presents final data from the National Interim Energy Consumption Survey (NIECS) and a quick-response survey of fuel oil households. The focus of this report is the consumption, expenditures, and conservation activities of households which use fuel oil as their main space heating fuel.

A detailed description of how the survey was conducted and a glossary of terms is presented in a previous report, Preliminary Conservation Tables from the National Interim Energy Consumption Survey (EIA/DOE-0193/P).

This report was written by Lynda T. Carlson and Kenneth A. Vagts, statistical analysis was performed by Stuart Cohen, and Diane Good performed the secretarial and clerical functions.

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## INTRODUCTION

This report presents the results of the Energy Information Administration's (EIA) quick-response survey of fuel oil\* use by single-family households. Two surveys were conducted in August and September 1979 to determine if households were experiencing problems in obtaining fuel oil. The surveys also collected information on the households' expenditures for fuel oil and their conservation activities. The surveys involved contacting fuel oil households and dealers, respectively.

The quick-response surveys were preceded by the EIA survey of residential energy consumption\*\* conducted in the fall of 1978. Information was collected on housing unit characteristics, household characteristics, fuel consumption and end uses, and transportation characteristics from a sample of 3,843 households of which 2,675 resided in single-family units. In addition, waivers were collected from the households to obtain fuel consumption and expenditure data from their energy suppliers. These data were obtained from the dealers for the period April 1978 through March 1979. A detailed description of the survey design and sampling plan is provided in Preliminary Conservation Tables from the National Interim Energy Consumption Survey (NIECS)\*\*\*.

There were 575 single-family households in NIECS which used fuel oil as their main heat source during the 1978-1979 winter heating season. In August 1979, these households were contacted either by telephone or through personal interviews (in cases where the occupant had changed from NIECS or could not be contacted by telephone).\*\*\*\* In all, 498 or 87 percent of the original 575 were contacted. They were queried about changes to their heating systems, the status of their fuel inventories as of August 1978 and August 1979, storage tank capacities, and any conservation changes performed on their housing unit since fall 1978. Four-hundred and sixty of these indicated that they would be

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\*Data were collected from both fuel oil and kerosene households. There were 55 kerosene households in the sample and these data are included with the fuel oil.

\*\*The National Interim Energy Consumption Survey (NIECS).

\*\*\*National Interim Energy Consumption Survey, Office of the Consumption Data System, Office of Program Development, Energy Information Administration, August 1, 1979; DOE/EIA-0193/P; pp. 47-52.

\*\*\*\*Single-family housing structure types are either detached or attached. Mobile homes are not included in this category.

using fuel oil as their main heat source during the 1979-1980 winter heating season. New waivers for additional fuel oil expenditures and delivery information were requested. After the waivers were obtained, the companies servicing these households were recontacted and data on deliveries and expenditures from April through August 1979 were obtained for 288 or 63 percent of the 460 households. Information obtained included gallons delivered to the household, price per gallon, and expenditure per delivery.

The 63 percent response rate during this period may be attributed to several factors: First, the short time frame for this emergency survey precluded personal or multiple contacts in order to obtain waivers from households; second, insufficient time was available to make multiple contacts with fuel oil dealers; and third response fatigue may have occurred for both households and fuel oil dealers. Data from this part of the survey were used for only two purposes: First, the delivery data were used to verify the inventory information the households had provided; and second, the price data were used. These price data matched the price data obtained from the Bureau of Labor Statistics (see Table 3).

#### CAVEAT

The NIECS sample was based on a national probability sample of households. Fuel oil households had a probability of being selected proportional to their occurrence in the population. As the sample size for the quick-response survey is quite small, the data should be used to indicate trends rather than as providing definitive numbers. Standard errors are provided for several tables.\*

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\*The standard errors presented in the tables are estimates which allow the user to develop a confidence interval for the given estimate. A 95 percent confidence interval can be derived by taking twice the standard error and subtracting this value from the estimate to obtain the lower end of the interval. Adding twice the standard error to the estimate will give the upper end of the interval. For example, if 766 is the estimate of average gallons per household from September 1978 through March 1979 (Table 2) and 30 gallons is the standard error, then the 95 percent confidence interval is 706-826. A 95 percent confidence interval means that if we repeated the survey using all possible samples, 95 percent of all intervals calculated in this fashion would contain the true mean. (The error bounds quoted in the text are already at the 95 percent level and should not be doubled.)



## GENERAL CHARACTERISTICS

There are approximately 11.5 million households living in single-family units who used fuel oil as their main heat source during the 1978-1979 winter heating season. Fuel oil was the second ranking home heating fuel and was used in 22 percent of the housing units. Natural gas was first with 57 percent; electricity was third with 13 percent; and LPG, wood, and other fuels accounted for the remaining 7 percent.\* Fuel oil-heated housing units are concentrated in the Northeast census region. Of the 22 percent of single-family housing units nationwide who heat with fuel oil, 9 percent are in the Northeast census region. The North Central census region has 6 percent, the South has 6 percent, and the West has 1 percent.

Fuel oil is used for water heating in six percent of the total number of single-family housing units. Virtually all housing units which use fuel oil for hot water heating also use fuel oil for their primary heating fuel. Looking at this the other way, only a little more than one-fourth of the housing units using fuel oil as the primary heating fuel also use fuel oil for water heating.

## CONSUMPTION AND EXPENDITURES

Single-family households using fuel oil as a main heating fuel (approximately 11.5 million households) consumed approximately 10.7 billion gallons in the period from April 1978 through March 1979. The total expenditures for fuel oil were approximately \$5.8 billion. The average consumption\*\* per household from April 1978 through March 1979 was 936 gallons, +106 at the 95 percent confidence level. The weather for this period was 11 percent colder than the 47-year average (see Table 1).

From September 1978 through March 1979, the average consumption per household was 766 gallons, +60 at the 95 percent confidence level. The average expenditure was \$420 per household, +38 at the 95 percent confidence level.

---

\*Numbers do not add due to rounding. See Table 10 in Characteristics of the Housing Stock and Households: Preliminary Findings from the National Interim Energy Consumption Survey, October 1, 1979, DOE/EIA-0191/P.

\*\*Fuel oil data are represented by gallons delivered. Unlike gas and electricity, the deliveries do not correspond directly to consumption.

Table 2 presents average expenditure and consumption estimates for households with incomes "less than \$15,000" and "\$15,000 or more".\* Estimates of consumption and expenditures for September 1979 through March 1980 are also presented based on the August 1979 fuel oil price and two weather conditions--last year's and the 47-year average.

#### PRICES

Prices have increased substantially in the last year. From April through August 1978, fuel oil prices remained steady at 50 cents per gallon. From August 1978 through August 1979, however, fuel oil households experienced a 60 percent increase in the price per gallon. From April through August 1979, there was a 29 percent price increase (see Table 3). Table 4 presents average prices for the April through August 1978 and April through August 1979 time periods.

Based on last year's weather and an 80 cents per gallon price, the average household will spend \$613 on fuel oil from September 1979 through March 1980. If this year's weather pattern is similar to the average of the previous 47 years, the average household will spend \$561 (see Table 2).

#### CONVERSIONS

Approximately seven percent of the single-family households that used fuel oil as their main heat source during the 1978-1979 winter heating season have converted to an alternative fuel source (see Table 5). Four percent have converted to utility gas and three percent to wood.

The meaning of the data on wood is unclear. It appears to indicate that households do have wood-burning stoves, but it is not known if the oil-heating equipment has been removed from them. Consequently, households may still be able to use their fuel oil furnaces.

#### SUPPLEMENTARY HEATING SYSTEMS

Approximately 60 percent of all single-family households using fuel oil for space heating do not plan to use a supplementary heating fuel in the coming winter (see Table 7).

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\*See p. 40 of Characteristics of the Housing Stock and Households: Preliminary Findings from the National Interim Energy Consumption Survey for a definition of the variable family income.

## CONSERVATION

Detailed information on energy conservation activities of households are to be found in Preliminary Conservation Tables from the National Interim Energy Consumption Survey.<sup>\*</sup> In this special fuel oil survey, households were reminded of the data on conservation changes which they had provided during the fall 1978 interview. They were then asked if any insulation, storm windows, or storm doors had been added to the unit since that point. Responses indicated a major trend in that approximately eight percent of the households have added attic insulation and seven percent have added insulation in the outside walls since November 1978 (see Table 6).

The data also indicate that since fall 1978, approximately 60 percent of the households had their furnaces cleaned. A number of households have also otherwise improved the efficiency of their heating system (see Table 8 for details).

## INVENTORY

An estimated 80 percent of single-family fuel oil households reported that their fuel oil tanks were at least half full in August 1979. They were also asked to estimate what their inventory was as of August 1978. Although these data are subject to respondent recall error, 83 percent indicated that their tanks were at least half full in August 1978 (see Table 9).

The total single-family fuel inventory as of August 1979 is estimated to be 59 million barrels,  $\pm 8$  at the 95 percent confidence level. The total single-family fuel oil inventory as of August 1978 is estimated to be 58 million barrels,  $\pm 8$  at the 95 percent confidence level.

The data on the households' estimates of their inventory for August 1978 and August 1979 appear to be verified by delivery data from suppliers. Table 10 indicates that single-family fuel oil households purchased approximately the same amount of fuel oil from April through August 1979 as was purchased from April through August 1978. Table 11 presents the average gallons delivered during this period.

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<sup>\*</sup>Published, October 1, 1979; DOE/EIA-0193/P.

## CAPACITY

The total storage capacity for single-family fuel oil households is estimated at 86 million barrels, +10 at the 95 percent confidence level. Table 12 presents more detail on storage capacity.

Table 1. Heating Degree Days

Month	1931-1978	1978-1979
	Average Heating Degree Days*	Heating Degree Days*
April	361	373
May	159	167
June	34	31
July	6	8
August	11	11
September	71	66
October	267	308
November	564	545
December	861	888
January	957	1,134
February	802	1,016
March	664	613
TOTAL	4,757	5,278

\*Population weighted numbers for the United States provided by the National Oceanographic and Atmospheric Administration.

Table 2. Average Gallons Per Single-Family Household Used From September 1978 through March 1979, and Estimated Ranges of Expenditures and Consumption for September 1979 through March 1980

Distribution	September 1978 Through March 1979				September 1979 Through March 1980					
	Average Gallons	Standard Error	Average Expenditures	Standard Error	Estimated Expenditures*	Standard Error	Estimated Gallons**	Standard Error	Estimated Expenditures***	Standard Error
All Households	766	30	\$420	19	\$613	28	702	27	\$561	25
Income Under \$15,000	654	44	\$360	28	\$523	41	599	40	\$479	37
Income Of \$15,000 and Over	783	41	\$429	26	\$626	38	717	38	\$574	35

\*Based on 80¢ per gallon, and 1978-1979 consumption and degree days. These numbers are calculated by multiplying the average gallons column by .80.

\*\*Based on average degree days for 1931-1978. The estimate is based on the ratio of the 47 year average of heating degree days for the period of September 1 through March 31 to the number of heating degree days from September 1, 1978, through March 31, 1979.

\*\*\*Based on 80¢ per gallon and average degree days for 1931-1978. These numbers are calculated by multiplying the estimated number of gallons in the previous gallons column by .80.

Table 3. Average Price in Cents Per Gallon Paid by Single-Family Fuel Oil Households

Year	April	Standard Error	May	Standard Error	June	Standard Error	July	Standard Error	August	Standard Error
1978	50.	2.	50.	2.	49.	2.	50.	1.	50.	1.
1979	62.	3.	66.	3.	71.	2.	75.	2.	80.	2.
1979 (BLS)*	62.7		65.6		70.9		75.2		80.0	

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\*These price data are from the Bureau of Labor Statistics news release, Consumer Prices: Energy.

Table 4. Average Price in Cents Per Gallon Paid by Single-Family Fuel Oil Households\*, April 1978 to August 1979

Fuel Oil Households	April 1978 through August 1978	Standard Error	April 1979 through August 1979	Standard Error
All Single-Family	50.	3.	68.	4.
Household Income				
--Under \$15,000	49.	5.	67.	7.
--\$15,000 and Over	50.	4.	68.	5.
Heating Degree Days				
--5,500 or More	49.	5.	69.	6.
--4,000 to 5,500	51.	5.	67.	6.
--Less than 4,000	50.	7.	66.	8.

\*Represents single-family fuel oil households who plan to use fuel oil as their main heating fuel in the winter of 1979-1980.



Table 5. Fuel Plans for the Winter of 1979-1980\*

Fuel Plans	Percent of Households	Standard Error
Will Continue to Use Fuel Oil	92	2
Have Converted or Plan to Convert** from Fuel Oil to:	***7	2
Utility Gas	4	2
Wood	3	2
Other	1	1
Plans Unknown	1	1
TOTAL	***100	

\*All single-family households who used fuel oil as the main heating fuel in the winter of 1978-1979.

\*\*The survey was conducted with NIECS households who, in the fall of 1978, indicated that they used fuel oil for space heating. Therefore, our August 1979 sample does not include any household that has converted to fuel oil. In addition, the sample does not include any units constructed since September 1978.

\*\*\*May not add due to rounding.

Table 6. Energy Conservation Changes Made by Fuel Oil Households\*, January 1978 to November 1978 and December 1978 to August 1979 (In percent of households)

Type of Change	January 1978 to November 1978 (11 months)	December 1978 to August 1979 (9 months)
Weather Stripping and/or Caulking	**19	14
Types of Insulation		
Roof or Attic	4	8
Outside Walls	3	7
Hot Water Pipes or Heating Ducts	1	3
Basement or Crawl Space	1	2
Other	***	2
Storm Windows and/or Insulating Glass	4	5
Storm Doors and/or Insulating Glass	3	5
Automatic or Clock Thermostat	1	***

\*All households living in single-family homes and planning to use fuel oil as their main heating fuel in the winter of 1979-1980.

\*\*Caulking only.

\*\*\*Less than one percent.

Table 7. Plans for Supplementary Fuel Use in the Winter of 1979-1980

Supplementary Fuel	Percent of Households*
No Plan to Use Supplementary Fuel	63
Supplementary Fuel Use Planned	37
Wood	22
--Fireplace	14
--Stove	9
Electricity	6
Utility Gas	2
Other/Unknown	6
TOTAL	**100

\*All single-family households planning to use fuel oil for space heating in the winter of 1979-1980.  
 \*\*May not add due to rounding.

Table 8. Furnace Cleaning and Heating System Changes Made  
By Single-Family Households\* Between September  
1978 and August 1979

Type of Change	Percent of Households
Furnace Cleaned	61
Nozzle Replaced	21
New Furnace Installed	2
Flame-Retention Head Burner Installed	2
Thermostat Recalibrated	2
Home Heating System Zoned	1
Automatic Flue Door Added	**

\*All households living in single-family homes and planning to use fuel oil as their main heating fuel in the winter of 1979-1980.

\*\*Less than one percent.

Table 9. Gallons in Storage as a Percent of Tank Capacity, August 1979 and August 1978

Proportion of Tank Filled	Percent of Households*			
	August 1979	Standard Error	August 1978	Standard Error
Single-Family				
Less Than 25 Percent	7	2	6	2
25 to 49 Percent	13	3	10	3
50 to 74 Percent	29	4	40	5
75 to 99 Percent	23	4	18	3
100 Percent (Full)	28	4	25	4
TOTAL	**100		**100	

\*All single-family households planning to use fuel oil for space heating in the winter of 1979-1980.

\*\*May not add due to rounding.

Table 10. Total Gallons Delivered to Single-Family Fuel Oil Households\*

Fuel Oil Households	In Millions of Gallons			
	April 1978 through August 1978	Standard Error	April 1979 through August 1979	Standard Error
All Single-Family	1,739	218	1,739	184
Household Income**				
--Under \$15,000	553	117	528	109
--\$15,000 and Over	930	154	953	132
Heating Degree Days				
--5,500 or More	845	144	867	126
--4,000 to 5,500	719	145	641	110
--Less Than 4,000	174	70	230	82

\*Represents single-family fuel oil households who plan to use fuel oil as their main heating fuel in the winter of 1979-1980.

\*\*These numbers will not add to the total for "All Single-Family" because all households did not report their income.

Table 11. Average Gallons Delivered Per Single-Family Fuel Oil Household\*

Fuel Oil Households	In Millions of Gallons			
	April 1978 through August 1978	Standard Error	April 1979 through August 1979	Standard Error
All Single-Family	219	19	209	16
Household Income				
--Under \$15,000	175	27	179	25
--\$15,000 and Over	235	27	220	23
Heating Degree Days				
--5,500 or More	227	31	218	27
--4,000 to 5,500	236	33	201	25
--Less than 4,000	152	29	198	34

\*Represents single-family fuel oil households who plan to use fuel oil as their main heating fuel in the winter of 1979-1980.

Table 12. Estimated Storage Tank Capacity for Single-Family Households, August 1979\*

Tank Capacity**	Percent of Households	
	Total U.S.	Standard Error
All Single-Family Households		
Less Than 200 Gallons	7	1
200 to 399 Gallons	73	2
400 to 699 Gallons	18	2
700 and Over	3	2
TOTAL	100	
Average Tank Capacity	333	21

\*Represents single-family fuel oil households who plan to use fuel oil as their main heating fuel in the winter of 1979-1980.

\*\*The standard tank sizes for single-family units are 275 and 500 gallons.



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