

Session 3 Energy Scenarios

Initial and Subsequent Consumer Response to Gasoline Shortages

David T. Hartgen, Joanna M. Brunso, and Alfred J. Neveu

When a rapid change occurs in the supply of gasoline government has traditionally responded in two ways. Initially it seeks to control the fuel distribution by regulation to ensure that available supplies are allocated equitably. Secondly, it acts to reduce the dislocation and financial impacts on various economic and geographic sections of the population. These programs are based on the assumption that hardship and radical changes will be felt within the economy as consumers are required to spend larger proportions of their household income on gasoline, but that consumers will continue to respond in their customary manner, except as regulation changes it.

The gasoline supply shortage of 1979 and the subsequent sharply rising prices of gasoline did not take Americans entirely by surprise. Experience in dealing with this type of situation had been gained only 5 years earlier. Americans responded by conserving gasoline and curtailing travel substantially, but, in recent years, although gasoline sales have continued to fall, vehicle miles of travel (VMT) have increased. The interaction between the savings made possible by fuel-efficient cars and the return to habitual gasoline-consuming behavior appear to be likely causes. If governments are to regulate wisely and ensure equitable treatment in the event of future energy crises, it is important to understand how the consumer responds. In this paper U.S. consumer responses to gasoline shortages are reviewed and the probable response to future crises is assessed.

OVERVIEW OF CONSUMER RESPONSE TO GASOLINE SHORTAGES

The literature on consumer response to gasoline shortages can be divided into (a) aggregate studies of trends in traffic counts, transit use, gasoline consumption, and similar statistics and (b) studies of household and consumer response.

Aggregate studies abound in the literature and will not be extensively reviewed here; the reader is referred to references (1-5,28). This section will focus on consumer studies, because it is from this detailed disaggregate assessment that differential responses can be most easily seen. A number of extensive reviews (6-10) summarize this literature.

Background

The data in Figure 1 and Table 1 show overall trends

in travel and energy use in New York during the last decade. The two energy crises are readily apparent. In each case, gasoline reduction was about 5 percent, of which about 4 percent showed up as reduced travel. Note the similarity between the two crises in terms of shortfall and consumer responses (11). U.S. trends were similar. Of particular interest is the divergence of the gasoline use (gal) and travel (VMT) lines in Figure 1 after 1976. These trends suggest that the link between travel and energy use is changing.

This change began in 1975 after the 1973 energy crisis (when consumers began rapid purchasing of fuel-efficient cars) and accelerated by the 1979 crisis. Coupled with the recent (1982) data given in Table 2, the data suggest that the cause of this change appears to be the rapidly increased efficiency of new cars. As more efficient vehicles are purchased and older vehicles are replaced, the average efficiency of cars operating on the road has risen rapidly since 1975. Consumers appear to be using the increased efficiency gained to power both a gain in travel (i.e., increased personal mobility) and reduction in fuel use (i.e., reduced out-of-pocket costs for gasoline). As will be shown in the following discussion, ironically, increased transit use and slower driving, both fuel savings actions, appear to be losers in this strategy; consumers appear to be replacing these actions by other more cost-effective actions.

The 1973-1974 Crisis

To place these recent trends in perspective, the 1973-1974 and 1979 energy crises must be reviewed. Consumer studies of the 1973-1974 energy shortages are surprisingly few. Seven separate studies are summarized in Table 3. Of the seven, only Stearns (12) takes a nationwide perspective but is beset with time-series problems. The other studies focus on urban-area suburbs or small cities and usually small atypical groups.

It is impossible to draw from these studies conclusions concerning the changes in consumer travel behavior during the 1973-1974 energy crisis. One of the most significant findings is that the supply or availability of automotive fuel, much more than price, was an important factor in determining short-term changes in travel demand. However, in several

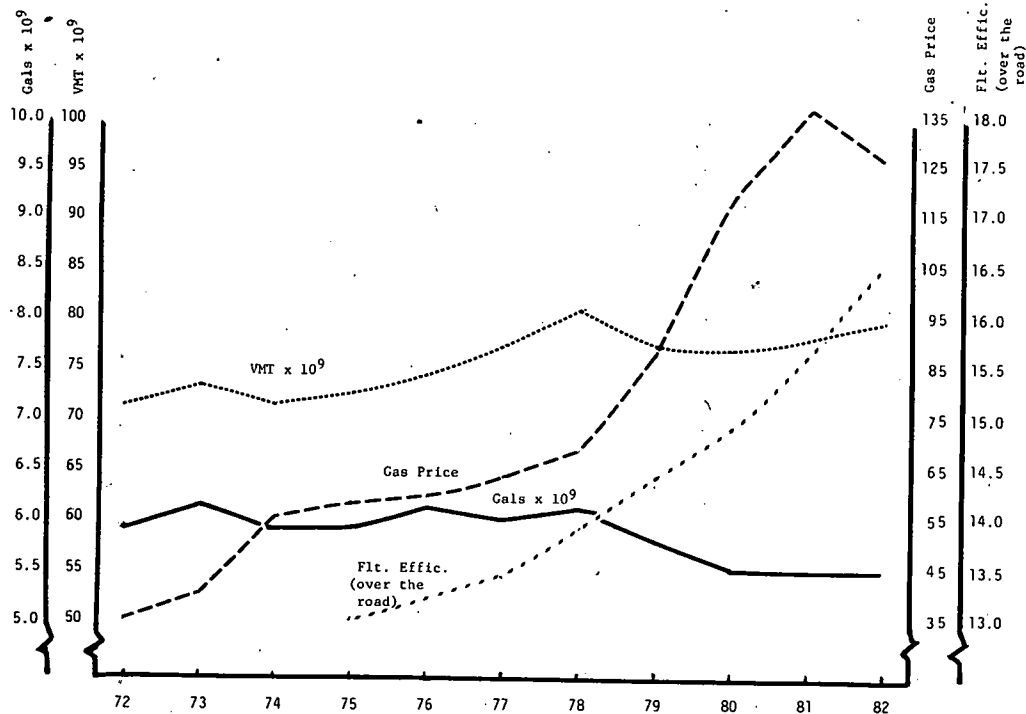


Figure 1. New York State travel, energy use, gasoline price, fleet efficiency.

Table 1. Impact of the 1973-1974 and 1979 energy crises in New York State (% change over previous year).

Category	1973-1974	1979
Maximum quarterly gasoline shortfall	-13	-11
Annual gasoline use	-5.1	-5.3
Annual travel (VMT)	-3.4	-4.5
Nominal gasoline price	+30	+35

of those studies, the high income of consumers in the sample may have overshadowed the effect of the rise in gasoline price. What is not clear from these studies is the effect of a sudden large increase in gasoline price. At the prices then in effect (55¢/gal) the demand for gasoline was observed to be extremely inelastic (e.g., $e = -0.10$).

Another finding is that only those consumers with some flexibility in travel options conserve fuel initially and they generally have high levels of automobile ownership and income. They also engage in large amounts of discretionary travel, and thus have a greater opportunity to conserve fuel. The lower-income traveler, and those with low levels of automobile ownership, do not have the ability to change their travel patterns without severely altering their lifestyle. The studies revealed that travelers with high incomes were more likely to change their travel patterns, but lower-income travelers were more likely to retain their changes when they altered their travel behavior.

Contrary to popular belief at the time, use of public transit was not found to be an important option in combating the gasoline shortage, even in areas with good transit service. In a study by Saaco and Hajj (15), attitudes toward public transit were found to be favorable, but poor service and high fares worked against its use.

Table 2. Travel and energy statistics for 1982 (numbers and percent change over 1981) (28).

Category	United States		New York	
	Number	%Δ	Number	%Δ
Gasoline use (billion gal)	64.617 ^a	-1.7	5.58	+0.4
Travel (billion VMT)	1,576.06	+1.4	80.48	+1.7
Transit ridership				
New York City				-2.9
Upstate New York				-4.9
Gasoline price (\$)			1.28	-6.3
New car			28.2 ^b	+3.7
Fuel efficiency (mpg)				
Speeds (median)			55.0	+0.4
Business index				+0.4

^aTen months.
^bEleven months.

The 1979 Crisis

Another fuel shortage occurred in 1979 during the spring and summer months and at various times throughout the nation. The West Coast was hit hardest in May and April, whereas the East Coast was affected the greatest in June and July. Because of the lagged occurrences of the fuel shortage in different locations there was time to begin studies soon after the crisis ended. Nevertheless, fewer studies were conducted and reported on the 1979 crisis than on the 1973-1974 crisis. The seven known studies are summarized in Table 3. From these studies, it can be seen that the public's response was extensive and varied, covering all aspects of their travel patterns.

Consumer reactions to the 1979 crisis were generally similar to those observed in the 1973-1974 crisis: small, unobtrusive actions were most frequently taken, generally focusing on nonwork travel, in which the household has the most flexibility in

Table 3. Studies of consumer responses to gasoline shortages.

Reference	Survey Location/Date	Number Surveyed	Focus	Primary Results	Threats to Extended Validity
1973-1974 crisis Peskin, 1975 (13)	July 1974 Households in northern Chicago suburbs	157	Retrospective behavior during crisis	Gasoline shortage did not affect work travel but non-work travel declined 13 percent (trip chaining) Gasoline supply is more important than price in determining travel Transit use did not increase substantially	Respondents tended to be high-income Memory lapses in retrospective response Past-crisis interview
Skinner, 1975 (14)	April to August 1974 FHWA employees in Washington, D.C.	103	Gasoline purchase behavior using diary	Gasoline demand is inelastic to price (household budgets adjusted)	Generally high-income respondents Gasoline purchase only, not travel Few transit alternatives Suburban focus
Sacco and Hajj, 1976 (15)	April 1974 Before and after Households in a suburb of Columbia, S.C.	318	Travel behavior Retrospective look	Moderate changes made by 60 percent, primarily in shopping, social, and recreational activities (least changes in work) Supply, not price, had impact on travel Attitudes favorable, but low-transit response (not available)	
Stearns, 1975 (12)	November 1973, February 1974 Households nationwide (two surveys)	680	Consumer trip making compared at two points in time	Low-income households changed modes High-income households cut some discretionary travel Most changes by location and group were not significant	Post Christmas fall-off may explain drops in shop (social and recreational) travel
Corsi and Harvey, 1977 (16)	November 1975 Households in Milwaukee, Wis.	1,461	Retrospective recall on modal changes for work travel Intended reactions to future scenarios	Very small (< 10 percent) shifts, largely to carpooling (primarily by mid-income, long-distance, and young children commuters)	No nonwork travel
Becker et al., 1976 (17)	Summer 1974 Households in Portland, Ore. metro area	439	Retrospective focus on modal use frequency changes and reversion	Frequent changes made by 52 percent, 16 percent of these reverted after crisis Higher-income groups changed more, but lower-income groups retained behavior	Overall results were weak, changes were not clearly related to demographics
Keck et al., 1974 (18)	January to April 1974 Households in three small New York State cities (Oneonta, Johnstown-Gloversville, Hudson)	300	Actions taken to reduce fuel use	Some action taken by 80 percent, mostly work- and shop-related (drive slower) Secondary actions were shopping, linkage-oriented Generally little sacrifice made	Very small isolated cities
1979 crisis San Diego CPO, 1979 (19)	July to August 1979 Households in San Diego area	600	Changes in travel May to July 1979	Cutback in travel by 75 percent in some way Higher-income households cut back because of reduced supply, lower-income because of higher prices Work modes changed by < 20 percent (shifted to carpool) Large families reduced travel more than small families One-fourth of households were considering trading cars	Generally representative of San Diego area
Trent and Pollard, 1982 (20)	1975 (n = 305) 1976 (n = 221) 1980 (n = 195) Respondents from small Appalachian county were interviewed three times	195	Publics' reaction to rising prices, 1974-1979 (reported behavior to future scenario)	Increase in real price (not pump) causes changes in fuel use and travel Response patterns form a history that guides further responses Respondents favored reducing driving over fuel-efficiency changes	Intended actions not implemented Impact of supply drop is not accounted for
Hartgen and Neveu, 1980 (21)	October 1979 October 1980 January 1983	1,520 1,560 1,503	Retrospective actions taken to conserve energy	1979: frequency of actions highest for nonwork but most energy saved in work- and car-related actions, particularly fuel-efficient car purchases, little mode switching	Retrospective memory New York State representative of United States

Table 3. (continued)

Reference	Survey Location/Date	Number Surveyed	Focus	Primary Results	Threats to Extended Validity
1979 crisis Brunso, Kupferman, and Hartgen, 1982 (22) Neveu, 1981 (23)	Three separate surveys of 1,500 New York State households		Probable actions for higher-price or 20 per- cent shortfall scenarios	Supply, not price, caused short-term changes Speeds increased Reduced vacation travel (sum- mer crisis) New York City: transit focus; suburbs: carpool; upstate: reduce travel and purchase fuel-efficient car 1980: transit and carpool- ing were short-lived actions Consumers rebound by drop- ping small-payoff actions Most savings by high-income households 1983: conservation more persuasive, supporting travel growth Middle-lower class participating more, upper income less Speed increasing	
Diltz, 1982 (24)	June 4-10, 1979 Households nation- wide	1,000	Gasoline purchase be- havior and difficulty Effect on travel	Overall 28 percent reported difficulty High-income households re- ported most difficulties Small households reported most difficulties Station closings and long lines accounted for 55 percent of responses Impact on travel reported by 32 percent (primarily limited trips, changed vacation plans, diverted for gasoline) only 0.9 percent used transit, 1.7 percent carpooled	Very short time period (1 week)
Washington State DOT 1981 (25)	Summer 1980 Households statewide	2,500	Changes in the past 2 years and future plans in response to higher transportation costs	Greatest change is reduction of travel (47 percent) Some action taken by 46 per- cent to reduce travel costs Most (77 percent) did not change mode, and 70 percent say they do not intend to change in the future New vehicle acquired by 45 per- cent in the last 2 years, and two-thirds of those said the new vehicle was more fuel ef- ficient	Retrospective memory No detailed energy questions, just transportation costs

making travel decisions. Again, transit options were not important overall, although, where good transit service was available, mode switching to transit assumed somewhat greater importance.

One major difference between the 1979 crisis and the 1973-1974 crisis was the availability of more fuel-efficient vehicles as a conservation option. Before the 1973-1974 fuel crisis there was little concern about the fuel economy of the automotive fleet. However, in the interim period between crises, vehicle fuel efficiency became an important issue with the government, the auto industry, and consumers. When the 1979 crisis occurred, vehicles with improved fuel efficiency were readily available, and many households chose to incur the relatively large capital cost (compared with most of the other conservation actions) to buy such a vehicle rather than adopting many of the smaller, less costlier actions. In one study (21) vehicle fleet turnover was found to be the largest single energy-saving action taken during the 1979 crisis. Ironically, the adoption of this major action to some extent replaced the smaller actions initially being taken by the public, leading to the impression that the public was doing less to conserve than before the crisis. In several 1979 studies, for example, consumers reported a decline in the use of the driving slower action; it was replaced by other actions.

SHIFTS IN RESPONSE AFTER A CRISIS

Three surveys undertaken by the New York State Department of Transportation (NYSDOT) after the 1979 energy crisis (21,22) can be analyzed in series to determine how consumers responded initially to the crisis, how they modified behavior 1 year later, and how they are responding now. These surveys included representative samples of New York State residents (Table 4) and focused on actions taken by New York State consumers to save transportation energy.

The Crisis Period (1979)

In October 1979 NYSDOT conducted a statewide telephone survey of households in New York State to inquire about residents' choice of action to conserve transportation fuel during the last 9 months. Respondents were also asked to indicate their possible reactions to two future energy scenarios: gasoline priced at \$1.50/gal and 20 percent less fuel available.

The results of this study are given in Table 5. The data indicate that the consumers' actions were generally similar to those observed in 1973-1974: small, frequent options such as trip chaining, driving slower, and increased maintenance were emphasized. Reducing vacation travel was also an im-

Table 4. Representativeness of New York State Department of Transportation energy surveys (%).

Representative Sample	Crossley, Inc., October 1979 (n = 1,520)	Crossley, Inc., October 1980 (n = 1,560)	Census April 1980	Fact Finders, Inc., January 1983 (n = 1,503)
Men	49	47	47	43
Women	51	53	53	57
New York City	40	39	42	40
Long Island	13	15	13	15
Westchester and Rockland Counties	7	6	6	6
Upstate New York	40	40	39	39
Income level (\$000s)				
<10	16	17	30	21
10-15	17	15	15	14
15-20	28	25	25	23
>25	26	25	29	33
Refused to answer	14	18	-	9
Persons per household				
1 to 2	43	50	55	50
3 to 4	38	34	31	34
5+	18	14	13	15
Refused to answer	1	2	-	1

Table 5. October 1979 survey: actions taken since January 1979 (% mentioning).

Action	Region					Age			Sex		Cars per Household			Household Size			Household Income (\$000s)		
	Entire Survey	New York City	Long Island	Westchester and Rockland Counties	Upstate New York	18-34	35-64	65+	Male	Female	0	1	2+	1-2	3-4	5+	<10	10-25	>25
Combined shopping with other trips	47	30	55	43	62	50	48	31	40	53	13	51	57	42	49	54	36	49	52
Drove slower	42	36	47	45	46	43	43	31	46	38	12	48	49	39	43	48	33	41	49
Shopped closer to home	41	31	45	46	49	43	41	36	37	45	20	45	46	38	43	44	38	43	41
Tuned car	37	24	46	41	47	39	40	19	39	36	4	41	47	30	40	49	22	37	46
Shopped less often	35	24	43	27	45	36	37	26	30	40	11	38	42	29	38	44	30	35	40
Shopped on way home from work	25	21	24	22	30	32	25	4	24	26	11	25	31	20	29	31	14	27	33
Vacationed closer to home	17	11	12	16	25	21	16	9	19	15	7	17	32	13	20	21	14	18	19
Used train, bus, or plane for vacation	16	18	15	14	14	21	14	7	16	16	13	15	18	17	16	12	12	15	23
Canceled vacation trip	16	14	13	8	19	19	15	7	14	17	6	20	15	14	17	18	11	18	14
Bought a more fuel-efficient car	15	9	18	5	22	20	14	9	16	15	5	14	21	13	17	19	10	17	17
Took bus or subway for nonwork trips	15	26	8	13	7	19	13	10	16	14	20	19	9	16	14	15	17	18	13
Carpooled to work	14	9	16	16	18	19	13	2	17	12	7	13	18	10	17	16	8	17	16
Took bus or subway to work	12	22	5	10	5	17	9	4	14	10	13	16	8	11	12	13	11	14	12
Eliminated recreational vehicle or boat	9	4	14	1	15	13	7	6	10	9	2	10	12	7	11	12	8	8	12
Sold a car	8	4	14	0	12	11	7	3	9	8	7	6	11	6	11	11	8	8	9
Walked or bicycled to work	8	6	9	3	11	13	6	1	8	9	10	8	8	7	9	11	9	9	8
Took job closer to home	5	3	6	5	7	9	3	1	5	6	4	5	7	3	6	7	6	6	4
Moved closer to work	3	2	1	0	4	4	2	0	2	3	1	3	3	2	3	2	2	3	3

portant response, given the timing of the shortage (summer 1979). As in 1973-1974 mode switching was not generally an important option. The responses to the future scenarios were similar, although more major actions assumed greater importance (21).

There was one major conservation option available to the public during the 1979 crisis that was not generally available in the 1973-1974 crisis: purchasing a more fuel-efficient vehicle. Before 1973 automobile manufacturers had little incentive to produce more fuel-efficient vehicles. This situation changed, however, with rising fuel prices and government mandates. Thus, during the 1979 crisis a much wider variety of fuel-efficient automobiles were available to the consumer, and a surprisingly large percentage of consumers purchased fuel-efficient automobiles to conserve fuel. They could

travel as much as before, but on less gasoline. If the fuel situation worsened, more households could drop their small, frequent conservation actions in favor of the one-time, large action of purchasing a more fuel-efficient vehicle.

In a further analysis of this study, NYSDOT estimated the potential energy savings that resulted from each households' response pattern (21). By using reported trip lengths, typical trip rates by purpose, and an average vehicle fuel efficiency of 15 mpg, the energy savings of each of the 18 actions was calculated. These values were then applied to the responses of the household and expanded to estimate statewide savings for the period of the 1979 crisis. The results from the two future energy scenarios were also examined by using the six demographic classifications given in Table 5.

Results (Table 5) show that overall New York State residents conserved an estimated 289.5 million gallons of gasoline in the first 39 weeks (9-1/2 months) of 1979, for a per household savings of 46 gallons per household (Table 6). By far the greatest component--44 percent of this savings--was due to car-related actions, primarily purchasing or selling. Work and nonwork savings were approximately equal, with vacation-related savings close behind. Savings through the use of transit accounted for 16 percent, and carpooling conserved 8 percent of the total.

The response pattern differed somewhat by region of the state. In the New York City area, transit actions were selected more often than in upstate New York. Conversely, auto-related actions (i.e., carpooling, tune-ups, purchasing a more fuel-efficient vehicle) were more important than the transit actions. This difference in response seemed to be related to the availability of transit.

When queried about their future actions, the savings picture changed. If the price of gasoline were to rise to \$1.50/gal (a definite possibility during the Summer of 1980), New York City residents said they would increase their savings to 320.9 million gallons of fuel. However, the breakdown of these savings shifted: the vehicle purchasing action assumed greater importance, as did certain vacation actions (primarily mode changing). These upward trends came at the expense of some work and nonwork

actions, especially the use of transit for the work trip, driving slower, and car tune-ups. Under the prospect of a 20 percent reduction in the supply of gasoline, a similar pattern was observed: work and nonwork actions discussed previously would decline as vacations and car purchasing increased.

Several general observations were discussed in the report (22). Energy savings is not primarily due to carpooling, transit, driving slower, or cuts in discretionary travel. Although these actions were mentioned with great frequency by households, the most important actions in terms of savings potential are those dealing with purchasing a more fuel-efficient vehicle or selling one of the household cars without replacement. In this way consumers are acting rationally by saving gasoline while maintaining most, if not all, of their pre-crisis mobility. The respondents appeared to view conservation actions as elements of sets that satisfy their conservation needs and not as individual actions. These bundles of actions are selected for maximum benefit at minimum pain. Thus, actions taken early in a crisis to conserve marginal amounts of fuel are likely to be dropped in favor of more major actions leading to greater fuel savings as the crisis worsens.

Most consumer actions appeared to be independent of government directives. The public reacted in a rational manner to conserve gasoline during the 1979 crisis by cutting back only where they had to. Gov-

Table 6. October 1979 survey: overall transportation energy savings for the state of New York.

Action	Average Household Savings/Week	January to October 1979		At \$1.50/Gallon		At 20 Percent Shortfall	
		Gallons (000 000s)	%	Gallons (000 000s)	%	Gallons (000 000s)	%
Work related							
Bus or subway to work	4.18	37.0	13	30.3	9	28.9	9
Carpool to work	2.22	22.9	8	24.5	8	26.4	8
Walk or bicycle to work	0.93	5.5	2	6.1	2	5.3	2
Total		65.4	23	60.9	19	60.6	19
Shopping							
Shop closer to home	0.43	13.1	5	12.3	4	11.4	4
Combine shopping with other trips	0.20	6.9	2	6.7	2	6.3	2
Shop less often	0.30	7.7	3	8.4	3	8.0	3
Bus or subway for non-work trips	0.74	8.2	3	9.3	3	9.9	3
Shop on way home from work	0.58	10.6	4	10.0	3	9.0	3
Total		46.5	17	46.7	15	44.6	15
Car							
Tune up car	0.65	17.6	6	13.1	4	11.7	4
Drive slower	0.19	5.9	2	3.8	1	3.6	1
Buy a more fuel-efficient car	5.23	57.8	20	71.3	22	69.3	22
Sell a car (do not replace)	8.02	47.3	16	62.2	19	61.4	19
Total		128.6	44	150.4	46	146.0	46
Vacation							
Cancel a vacation trip	0.87	10.3	4	11.0	3	13.4	4
Change mode for vacation	1.91	22.5	8	33.4	10	34.5	11
Vacation closer to home	0.33	4.1	1	5.3	2	5.2	2
Eliminate recreational vehicle or boat	0.18	1.2	- ^a	1.1	- ^a	1.1	- ^a
Total		38.1	13	50.8	15	54.2	17
Moves							
Move closer to work	1.54	3.4	1	3.1	1	3.6	1
Take job closer to home	2.04	7.5	3	9.0	3	6.6	2
Total		10.9	4	12.1	4	10.2	3
Total savings		289.5	100 ^b	320.9	100 ^b	315.6	100
Per household savings (gal)		46.0		50.9		50.1	

^aLess than 1 percent.

^bPercentages do not add to 100 due to rounding.

ernment emphasis on mode changing (transit and car-pool actions) appear not to be viewed by the public as necessary options to cope with a fuel shortage.

One Year Later (October 1980 Survey)

NYSDOT repeated its analysis of consumer responses in October 1980 about 1 year after the 1979 survey. The same basic design and sampling plan was used as in the earlier surveys (23). Respondents were asked what actions they had taken since January 1980 to save transportation energy. Data were analyzed in the same manner, that is, by frequency of response and by energy saved.

Results (Table 7) were largely parallel to the earlier survey. Shopping-related actions were mentioned most frequently. More expensive car-related actions were less frequently mentioned. Work-related mode shifting was mentioned by 14 percent of respondents. Upstate New York residents placed more emphasis on shopping actions; transit-related actions were given more focus in New York City. Elderly persons, many not working, adopted fewer actions than other persons, as did 0-car households and low-income households.

Detailed analysis of gasoline savings (Table 8) also showed that most savings (40 percent) were car related. On a gallons saved per household basis, savings was highest for 2+ car households (46.7 gal/household), high-income households (42.4 gal/household), upstate households (40.2 gal/household), and Long Island households (40.0 gal/household). It was lowest for 0-car households (14.9 gal/household), elderly persons (16.4 gal/household), and low-income households (20.1 gal/household). At this point it was clear that energy conservation had not yet percolated through all segments of society.

In a follow-up comparison of the 1979 and 1980 data (22), NYSDOT traced the impacts on different groups of consumers. Work travel accounted for more savings in gasoline and mileage than nonwork travel.

The largest initial work-travel savings per household came from households with the highest income; however, after savings occurred, the higher income households were still relatively better off than low-income households. Household location (big city, big city suburbs, or other) was found to affect primarily the methods chosen to save gasoline, not the actual amount of gasoline or mobility conserved. The analysis suggests that consumers respond to energy constraints depending on their location, economic status, and previous response. They will rebound after a crisis by dropping actions that are expensive and limiting to mobility and by adopting actions that are cheaper and fit into the family's normal travel patterns. Based on these observations, a set of suggested government policies was developed (Table 9) that focused on assistance to consumers.

Three Years Later (1982)

Generally, 1982 was marked by continued increases in travel and declines in gasoline use (Figure 1 and Table 2). For the United States, preliminary statistics show that gasoline use continued to fall (down 1.7 percent from 1981), while travel continued to rise (up 1.4 percent from 1981); the numbers from the New York study are similar. In spite of a moderate recession travel continued to increase. In early 1983 NYSDOT repeated its survey of consumer response to energy constraints. Data were collected in the same fashion as in earlier surveys. Three nonwork travel actions were added to the list (Table 10). Energy savings have yet to be calculated, but the percent response to each action is given in Table 11. The possible actions are listed in rank order beginning with actions most frequently mentioned.

The most commonly mentioned actions are those relating to shopping and nonwork activities. These include (in order of mention):

Table 7. Actions taken January to October 1980 (% mentioning each action).

Action	Region					Age			Sex		Cars per Household			Household Size			Household Income (\$000s)		
	Entire Survey	New York City	Long Island	Westchester and Rockland Counties	Upstate New York	15-34	35-64	65+	Male	Female	0	1	2+	1-2	3-4	5+	<10	10-25	>25
	Combined shopping with other trips	54	37	54	52	70	54	58	42	53	55	16	59	67	50	57	59	38	59
Shopped less often	53	35	55	51	70	52	57	43	52	54	20	59	64	50	57	59	45	59	54
Shopped closer to home	47	37	47	46	57	48	48	43	47	47	19	56	51	45	48	51	42	51	45
Drove slower	43	29	48	37	55	39	49	34	47	40	6	49	55	41	46	44	29	46	49
Shopped on way home from work	30	25	27	20	37	36	33	9	30	31	14	32	36	29	31	33	16	34	36
Tuned car	26	18	29	17	33	27	28	17	28	24	3	27	36	23	27	29	17	29	30
Took train, bus, or plane for vacation	21	21	27	8	21	20	24	15	20	21	13	22	24	23	19	18	12	22	24
Vacationed closer to home	19	13	17	11	27	20	19	13	19	18	7	19	24	18	19	21	13	22	19
Bought a more fuel-efficient car	17	6	22	16	26	19	19	8	19	16	3	13	30	14	19	25	10	17	25
Took bus or subway for nonwork trips	15	25	8	9	10	17	15	12	15	15	18	19	9	17	13	15	19	15	13
Took bus or subway to work	14	22	8	8	9	17	14	4	15	12	15	15	11	13	13	15	9	13	17
Carpooled to work	13	7	18	12	18	14	16	3	14	12	4	11	21	10	16	21	6	15	17
Canceled vacation trip	12	8	14	5	16	12	13	8	11	12	4	13	15	10	12	16	8	14	11
Eliminated recreational vehicle or boat	12	6	12	4	18	12	13	7	13	11	2	13	15	10	13	15	8	13	12
Walked or bicycled to work	11	8	7	6	15	15	10	5	11	10	8	11	12	10	11	14	8	11	13
Sold a car	5	4	7	2	6	7	4	4	6	5	6	5	5	5	6	4	5	5	5
Took job closer to home	4	3	6	0	6	6	4	1	4	5	3	3	6	4	5	5	5	5	5
Moved closer to work	3	2	3	2	5	5	3	1	3	4	2	3	4	5	2	1	4	4	2
Sample size	1,560	601	230	99	630	565	709	265	731	829	304	649	604	785	535	214	269	626	388

Table 8. Energy savings January to October 1980 (%).

Action	Region					Age			Sex		Cars per Household			Household Size			Household Income (\$000s)		
	Entire Survey	New York City	Long Island	Westchester and Rockland Counties	Upstate New York	15-34	35-64	65+	Male	Female	0	1	2+	1-2	3-4	5+	<10	10-25	>25
	Work related																		
Bus or subway to work	11	26	7	21	3	11	13	2	13	10	27	12	9	11	12	7	8	11	13
Carpool to work	9	6	16	18	7	7	11	3	12	6	2	8	11	7	11	10	2	9	13
Walk or bicycle to work	<u>2</u>	<u>1</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>-^a</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>3</u>
Total	22	33	26	42	12	20	25	5	27	18	30	22	22	20	25	20	11	20	29
Shopping related																			
Shop closer to home	4	3	3	2	6	5	4	7	4	5	1	5	4	4	5	4	6	6	3
Combine shopping with other	3	3	2	3	3	3	3	5	3	3	2	4	3	3	3	3	3	3	3
Shop less often	4	2	2	2	6	4	4	6	4	5	2	4	5	4	5	4	6	5	3
Bus or subway for nonwork trips	2	3	1	4	2	3	1	2	1	3	4	2	1	2	3	1	3	2	1
Shop on way home from work	<u>4</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>5</u>	<u>4</u>	<u>5</u>	<u>4</u>	<u>5</u>	<u>4</u>
Total	17	16	13	14	22	20	17	23	16	21	14	20	17	18	20	17	22	21	14
Car related																			
Tune-up car	4	4	4	3	5	4	4	6	4	4	1	5	4	4	4	5	5	5	4
Drive slower	2	2	2	2	2	2	2	3	2	2	1	3	2	2	2	2	3	2	2
Buy a more fuel-efficient car	24	12	25	24	30	23	24	23	23	24	8	19	29	21	23	31	22	21	27
Sell a car (do not replace)	<u>10</u>	<u>12</u>	<u>11</u>	<u>5</u>	<u>10</u>	<u>13</u>	<u>8</u>	<u>17</u>	<u>10</u>	<u>10</u>	<u>26</u>	<u>10</u>	<u>8</u>	<u>11</u>	<u>10</u>	<u>8</u>	<u>18</u>	<u>10</u>	<u>8</u>
Total	40	30	42	34	47	42	38	49	39	40	36	37	43	38	39	46	48	38	41
Vacation related																			
Cancel a vacation trip	3	2	3	2	3	3	3	4	2	3	2	3	3	3	3	4	3	3	2
Change mode for vacation	11	14	11	5	9	9	11	16	9	12	15	12	9	13	8	9	10	11	10
Vacation closer to home	2	2	1	1	2	2	1	2	2	2	2	2	1	2	1	2	2	2	1
Eliminate recreational vehicle or boat	<u>1</u>	<u>-^a</u>	<u>1</u>	<u>-^a</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>-^a</u>
Total	17	18	16	8	15	15	16	23	14	18	20	18	14	19	13	16	16	17	13
Moves																			
Move closer to work	2	1	2	2	2	1	2	- ^a	2	1	- ^a	1	2	3	1	- ^a	1	1	2
Take job closer to home	<u>2</u>	<u>2</u>	<u>1</u>	<u>-^a</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>-^a</u>	<u>2</u>	<u>2</u>	<u>-^a</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>1</u>
Total	4	3	3	2	4	3	4	- ^a	4	3	- ^a	3	4	5	3	1	3	4	3
Total percent savings (10 ⁶ gal) Per household savings	217.1	61.5	38.0	13.0	104.6	87.8	106.8	18.0	112.2	104.9	18.0	82.5	116.6	97.8	83.5	32.1	22.4	92.0	68.0
	33.7	24.8	40.0	31.8	40.2	37.6	36.4	16.4	37.1	30.6	14.3	30.7	46.7	30.1	37.8	36.3	20.1	35.6	42.4

^aLess than 1 percent.

1. Combining shopping and other nonwork activities,
2. Shopping closer to home,
3. Sharing rides to nonwork activities,
4. Making fewer shopping trips,
5. Choosing social and recreation trips closer to home, and
6. Walking or bicycling to these activities.

This ranking occurs across most subsets. There were, however, some differences among the groups. Middle-income families are slightly more likely to have taken most of these actions as are families of 5+.

Because travel distances for the preceding actions tend to be short, the amount of gasoline saved is relatively small. As previously mentioned, travel has increased nationwide. Thus, it is probable that consumers are using vehicles more efficiently to increase mobility. This latter perception is strongest when the responses are divided according to income. Those respondents whose income is less than \$25,000 (the moderate and lower-income households)

gave the highest response to shopping, social, and recreation activities closer to home as well as shopping less often. Note also that this segment is more likely to walk, bicycle, or use transit for nonwork activities.

Least frequently mentioned actions are those that have the greatest impact on lifestyle and travel--changing a job to one closer to home or moving closer to the job, or selling and not replacing a car. Geographic sectioning of the data shows only small differences except for those areas where transit is more widely available. The response is higher to using transit for both work and nonwork activities. New York City residents are more likely to walk or bicycle to all activities.

The greatest differences in responses between men and women are in car-related actions. Men are more likely to report having the car tuned more often and are more likely to have bought a fuel-efficient car. The effect of household size on the response is related to either efficient use of cars or budget constraints. Households of five or more are likely to share rides to work and nonwork activities, choose

Table 9. Suggested government policies for response to energy crisis.

Context	When the Crisis Hits		As the Crisis Subsides		If Prices Rise Rapidly	
	Consumer Action	Government Action	Consumer Action	Government Action	Consumer Action	Government Action
Big city Low income	Focus on work travel Bus to work	Transit capacity Transit promotion Transit schedules	Reduce transit use and carpool Increase car purchasing Increase discretionary actions	Transit promotion Fuel efficiency Car literature Trip planning	Sell cars Reduce bus use Increase discretionary actions	Transit promotion Fuel efficiency Trip planning
Medium income	Focus on work travel Bus to work (less than low income)	Transit capacity Transit promotion Transit schedules	Increase carpooling, retain work focus Reduce transit use	Transit promotion Carpooling Personal carpooling	Buy fuel-efficient cars Reduce bus to work and carpooling	Transit promotion Fuel efficiency Car literature
High income	Focus on work travel (bus to work) Also car purchasing	Transit capacity Transit promotion Car literature Fuel efficiency	Increase bus use and carpooling Retain work focus	Transit promotion Transit schedules Carpooling	Focus on work travel Increase bus to work	Transit promotion Transit schedules
Big city, suburbs Low income	Focus on reducing non-work travel Car purchasing and car selling	Fuel efficiency Car literature	Reduce discretionary actions Increase work actions Sell large cars and increase car purchasing Increase transit use	Trip planning Car literature Transit promotion Transit schedules	Increase work travel actions Increase car selling Increase transit use	Transit promotion Transit schedules
Medium income	Focus on work travel Car purchasing Also carpool	Car literature Fuel efficiency Carpool	Increase work actions Decrease car sales Maintain carpooling	Carpooling Personalized ride-sharing	Focus on work travel Maintain carpooling	Carpooling
High income	Focus on work travel Car purchasing Bus to work	Fuel efficiency Car literature Transit promotion Transit schedule	Increase work actions Increase car purchasing Increase carpooling	Car literature Fuel efficiency Carpooling	Focus on nonwork travel Maintain carpooling	Carpooling
Small cities and rural areas Low income	Focus on non-work travel Car purchasing	Car literature Fuel efficiency Car loans Trip planning	Focus on nonwork travel Strong car purchasing	Car literature Fuel efficiency Carpooling Trip planning	Focus on nonwork travel Strong car purchasing	Carpooling Fuel efficiency
Medium income	Focus on both work and nonwork travel reductions Car purchasing Sell old cars Some carpooling	Car literature Fuel efficiency Carpooling Trip planning	Focus on nonwork travel Strong car purchasing	Car literature Fuel efficiency Trip planning	Increase focus on work travel Strong car purchasing Slight increase bus to work Maintain carpooling	Transit promotion Transit schedules Car literature Fuel efficiency Carpooling
High income	Focus on work travel Strong car purchasing Sell old cars	Car literature Fuel efficiency Carpooling Trip planning	Focus on work travel Increase car purchasing Increase use of carpooling and transit	Car literature Fuel efficiency Transit promotion Transit schedules Carpooling Trip planning	Focus on work travel Strong car purchasing Increase carpooling Slight increase bus to work	Transit promotion Transit schedules Car literature Fuel efficiency Carpooling

nonwork activities closer to home, buy a fuel-efficient car and keep it tuned. Small households of one or two persons are less likely to mention any action except taking a bus, plane, or train for vacation.

Household income has the greatest effect on both the spread of the percent response and the change in the rank order of the response. Respondents in households with incomes less than \$10,000 are least likely to mention work-related actions but are most likely to have shopped less often and closer to home.

A comparison of the 1982 survey with the 1979 and 1980 surveys provides insights into changes in consumer behavior after the 1979 oil shortage and the subsequent sustained high prices of gasoline. Figures 2-5 show the response from 1979 to 1982.

A quick glance at these figures, as well as the first four columns of Table 11, reveals that conser-

vation behavior is far more prevalent today than 2 years ago; of 17 actions compared in Table 11, all but 1 has increased in frequency of response, and the increases are substantial. Clearly this behavior has permeated a much broader spectrum of society. The actions most frequently mentioned and having increased at the most rapid rate are those small frequent actions that make travel more efficient, save relatively little energy per trip, but constitute more than 60 percent of all travel. These actions include combining shopping and other trips and shopping closer to home and on the way home from work. Included among the top-ranked actions are those not included in the previous surveys: sharing rides to nonwork activities, choosing social and recreation trips closer to home, and walking and bicycling to nonwork activities. The greatest increase in these top-ranked actions occurs

Table 10. Fact Finders, Inc., New York State transportation survey.

NEXT, WE WOULD LIKE TO READ YOU A LIST OF THINGS YOU COULD DO AS A RESULT OF HIGHER GASOLINE PRICES.

3A) AT ANY TIME SINCE JANUARY 1982, DID YOU (read list) ?

3B) IF THE PRICE OF GASOLINE INCREASED TO \$2 A GALLON, WOULD YOU (read list)..... ?

(If respondent states they "don't work", skip * actions)

	Q.3A.	Q.3B		
A) Drive more slowly than before	_____ (A)	_____	44	45
B) Carpool to work	_____ (B)	_____	46	47
*C) Take a bus or subway to work	_____ (C)	_____	48	49
*D) Walk or bicycle to work	_____ (D)	_____	50	51
E) Have a car tuned more often	_____ (E)	_____	52	53
*F) Move closer to work	_____ (F)	_____	54	55
*G) Get a job closer to home	_____ (G)	_____	56	57
*H) Shop on the way home from work	_____ (H)	_____	58	59
I) Make fewer shopping trips	_____ (I)	_____	60	61
J) Combine shopping and other non-work trips	_____ (J)	_____	62	63
K) Shop closer to home	_____ (K)	_____		
	[REPEAT QUESTIONS]			
L) Choose social or recreational activities closer to home	_____ (L)	_____	64	65
M) Take a bus or subway more often for non-work activity	_____ (M)	_____	66	67
N) Share rides with neighbors or friends for non-work activities	_____ (N)	_____	68	69
O) Walk or bicycle to non-work activities	_____ (O)	_____	70	71
P) Take a vacation closer to home	_____ (P)	_____	72	73
Q) Cancel a vacation trip	_____ (Q)	_____	74	75
R) Use a train, bus, or airplane for vacation trips, rather than a auto	_____ (R)	_____	76	77
S) Replace a car with a more fuel efficient one	_____ (S)	_____	78	79
T) Sell a car(don't replace)	_____ (T)	_____	81	

Survey I.D.#:

Action T. (Q.3 B)

Table 11. Actions taken in 1982 (% mentioning).

Rank	Action	Empire State Poll 1979	Empire State Poll 1980	Fact Finders, Inc., 1982	Δ 1982-1980	Region			Sex	Cars per Household	Household Size	Household Income (\$000s)								
						New York City	Long Island	Westchester and Rockland Counties				Upstate New York	Male	Female	0	1	2+	1-2	3-4	5+
1	Combine shopping and other trips	47	54	76	+22	71	76	76	80	73	78	63	77	81	73	78	79	66	82	78
2	Shop closer to home	41	47	65	+18	68	66	57	64	62	68	69	66	64	63	68	68	71	70	58
3	Share rides to non-work activities	-	-	59		53	60	67	63	57	61	45	60	64	53	64	68	51	63	60
4	Make fewer shopping trips	35	53	54	+1	48	53	46	61	53	54	43	54	58	50	56	56	59	58	47
5	Choose social and recreational activities closer to home	-	-	52		52	54	44	51	51	52	52	52	51	49	53	59	54	58	46
6	Walk or bicycle to nonwork activities	-	-	51		58	49	45	45	50	51	57	52	46	51	51	53	45	53	52
7	Shop on way home from work	24	30	50	+20	52	43	48	51	54	47	40	49	55	46	54	55	27	58	58
8	Use a train, bus, or airplane for vacation	16	21	45	+24	56	42	52	33	44	45	50	47	42	49	42	36	37	43	52
9	Drive slower	42	43	35	-10	28	36	29	41	39	31	9	38	42	33	37	34	26	38	38
10	Have car tuned more often	37	26	29	+3	29	11	26	34	35	24	5	29	39	23	35	35	17	34	33
11	Take bus or subway to work	15	14	28	+14	50	9	20	10	29	27	47	31	16	27	28	30	22	30	29
12	Take bus or subway more often for nonwork activities	15	15	25	+10	43	16	20	11	22	27	52	24	15	26	25	23	29	29	19
13	Buy fuel-efficient car	15	17	25	+8	19	31	25	30	31	21	5	24	36	21	28	34	14	26	33
14	Vacation closer to home	17	19	22	+3	21	21	15	26	26	20	18	22	24	20	25	24	16	28	21
15	Cancel a vacation trip	16	12	18	+6	18	18	12	18	17	18	17	18	18	16	18	22	20	19	15
16	Walk or bicycle to work	8	11	16	+5	18	7	17	16	20	13	17	19	13	15	18	17	10	20	17
17	Carpool to work	14	13	14	+1	10	7	16	18	17	12	7	15	16	11	16	18	8	16	16
18	Take job closer to home	5	4	11	+7	10	15	15	11	12	11	7	10	15	8	16	14	6	16	11
19	Sell car (do not replace)	8	5	7	+2	7	7	4	6	8	5	9	6	5	6	9	5	7	2	2
20	Move closer to work	2	3	7	+4	8	6	5	7	8	7	4	7	8	7	6	6	9	7	7
	Sample size	1,520	1,560	1,503		585	95	223	600	642	861	274	609	613	755	508	229	309	565	496

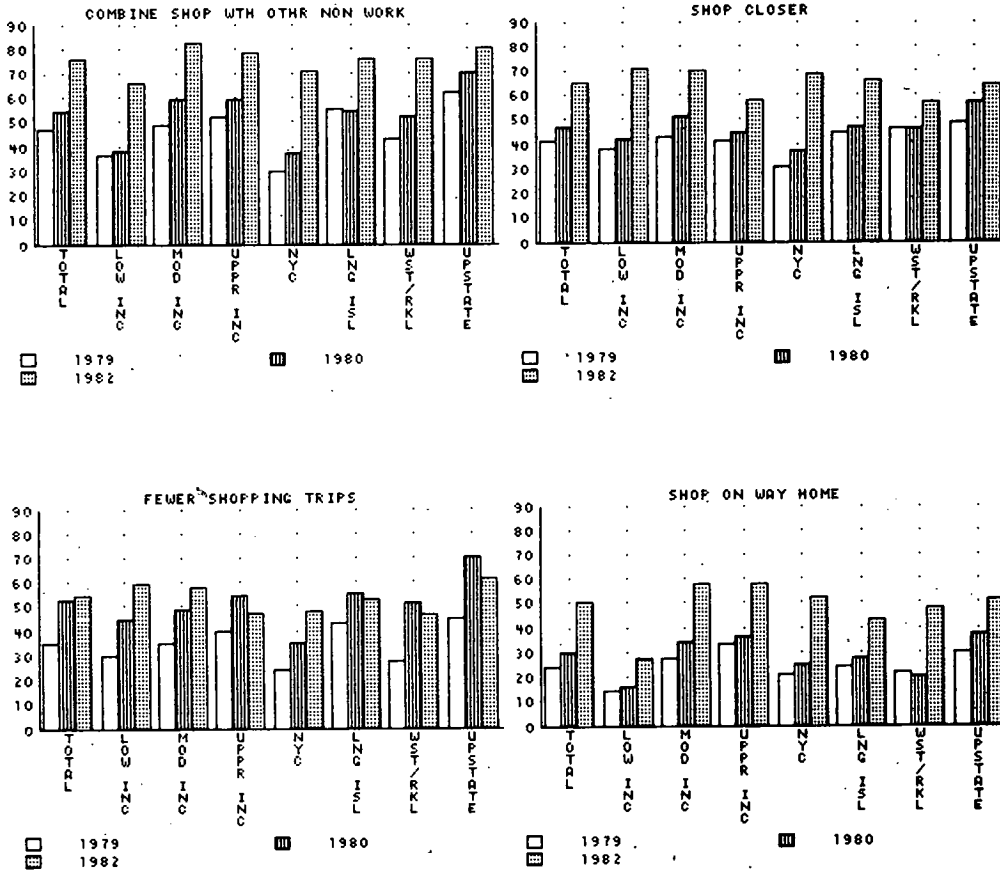


Figure 2. Comparison of surveys in shopping actions (bars represent % mentioning).

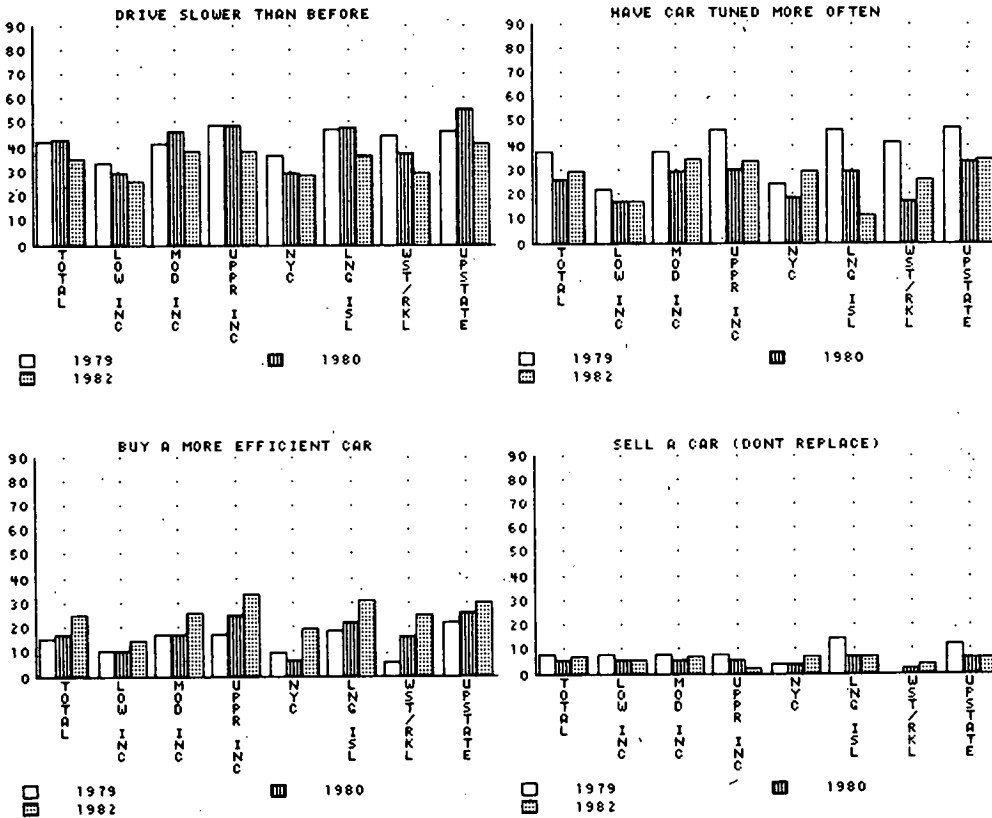


Figure 3. Comparison of surveys in car-related actions (bars represent % mentioning).

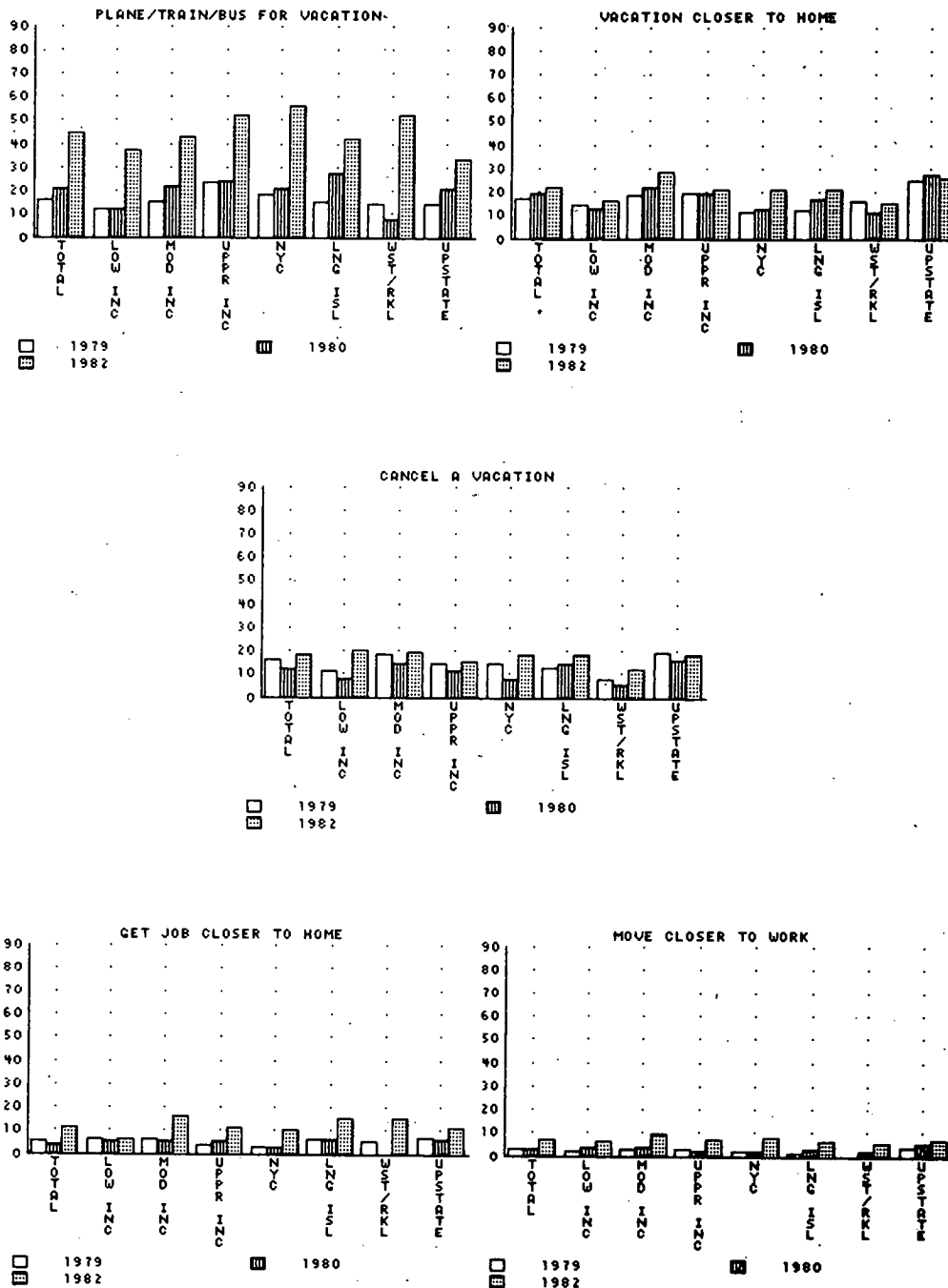


Figure 4. Comparison of surveys in vacation and move actions (bars represent % mentioning).

among the lower- and moderate-income groups and those in New York City, precisely those groups not formerly involved.

The purchase of fuel-efficient cars, a major expenditure in difficult economic times, has nevertheless increased in the same way. Lower- and moderate-income subsets, as well as the subset from New York City, have increased their purchasing the most; although the greatest initial response was from the upper-income groups, as the crisis progressed, automobile replacement by the upper-income group declined. This pattern suggests that those groups previously unable to participate in the most significant conservation strategy are now being included,

deriving the benefits of increased personal mobility at a lower expenditure of gasoline.

During the 1973-1974 oil embargo and the 1979 oil shortage driving slower (action 9) was widely publicized as a major conservation measure in which all Americans could participate to save gasoline. The nation adopted a 55 mph maximum speed limit, not without protests from some western states and truckers. The response to the survey over time confirms what highway observers already know--that there are fewer observers of the 55 mph speed limit than ever. Consumers appear to have concluded that the effort involved in driving slower takes more travel time and saves too little money in comparison

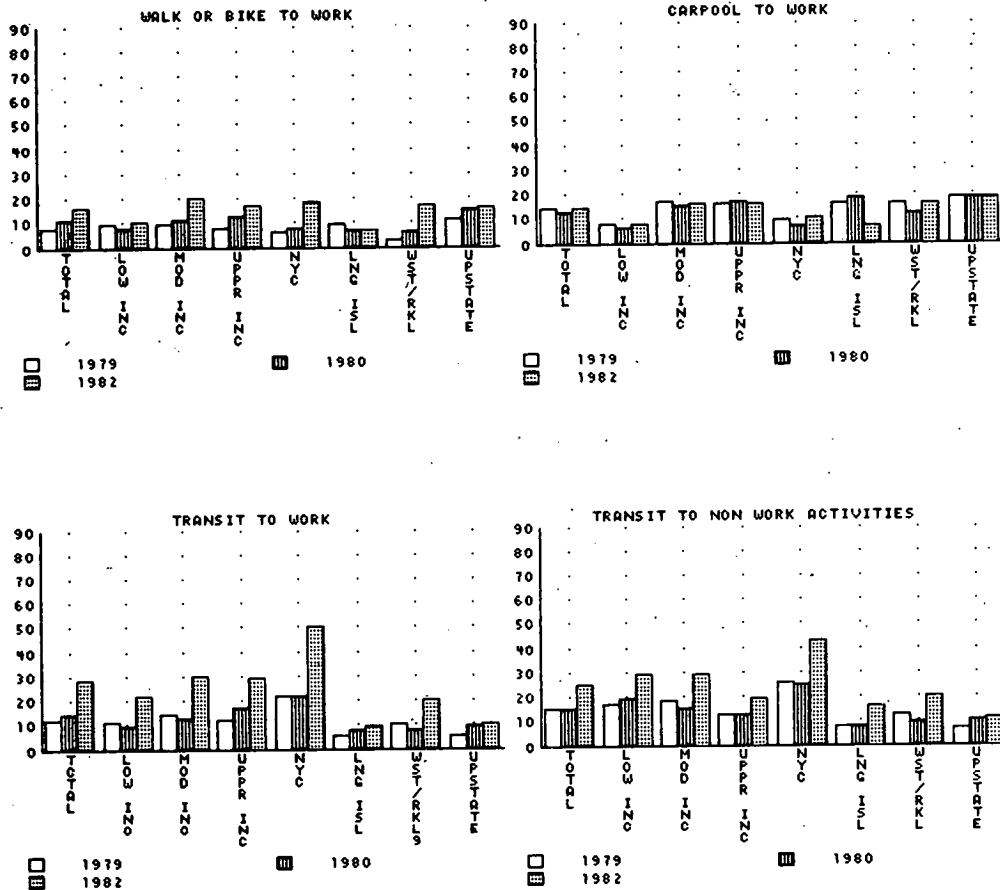


Figure 5. Comparison of surveys in work and transit actions (bars represent % mentioning).

with other actions. Figure 3 shows that this reduction in percent mentioned is greatest in the Long Island and upstate New York areas.

Vacation actions are difficult to evaluate. Vacationing closer to home and canceling a vacation are unpopular actions, although they have increased slightly among moderate-income households. The use of a bus, plane, or train for vacation has increased substantially, especially among upper-income residents and residents of Westchester and Rockland Counties. Such use has also increased in upper-income localities and among New York City residents, a group that owns fewer automobiles than average. Under stable gasoline prices and stable supply it is unlikely that this action was taken for energy conservation reasons.

It is interesting to note that carpooling to work has remained constant over time, even though the federal government has invested considerable time and effort in encouraging carpooling programs by employers and communities. This stability is consistent with the Census Bureau journey to work statistics (26). Recent research at NYS DOT (27) suggests carpool programs are most likely to be used in the face of an energy shortfall or by persons entering the workforce. This mode choice is often temporary.

Transit use both for work and nonwork purposes has increased. The increase is greatest among New York City residents, residents of Westchester and Rockland Counties, and moderate-income residents. Lower-income New York City residents increased their use of work transit substantially after its use declined in 1980. These findings conflict with actual transit ridership figures, which have declined

5.3 percent upstate and 6.4 percent downstate (28). One possible reconciliation of these findings is that more people are using transit some of the time, but not regularly.

The last action, moving closer to work or finding a job closer to home, has increased slightly. These are actions that cause major dislocation within households and are not easily or lightly taken.

Nonwork conservation actions remain highly popular as a conservation strategy. These actions are usually small and frequent but could save significant amounts of gasoline if practiced regularly. However, they also make travel more efficient by saving fuel and dollars as well as by saving time for discretionary travel. More importantly, this behavior has permeated all economic and geographic strata of consumers including New York City and low-income consumers who seem to have been affected more severely by the 1979 fuel shortage.

The purchase of fuel-efficient automobiles has increased, especially among those who either could not afford them or were not motivated to purchase them before. Driving slower, however, has largely been abandoned by upstate New York consumers, who apparently feel that fuel-efficient automobiles negate the need to conserve at the cost of increasing travel time. Carpooling to work has remained stable over time, but transit for work and nonwork is used irregularly by an increasing number of persons.

Overall, it appears that consumers are availing themselves of the whole range of conservation options, choosing strategies that suit their lifestyles and restrict their personal mobility the least.

IMPLICATIONS

The foregoing review of 1979 consumer responses and more recent adaptive behavior suggests the following:

1. Immediate consumer response to an energy crisis, and adaptive behavior following the crisis, is likely to vary widely according to available options, status, ability to respond, severity of crisis, and previous investment in actions. Generally, response will be pain-relieving rather than energy-saving; that is, consumers will focus on actions that facilitate coping and maintaining mobility, not necessarily saving gasoline. Government policies must be sensitive to these purposes and differences.

2. Consumers consider actions as holistic sets, not as individual items. Hence, as conditions change, some actions may be dropped in favor of others. This is particularly true of driving slower which has declined in importance as a conservation action, as consumers have the opportunity to institute other behaviors and react to the perception of less enforcement in the belief that it does not really save gasoline.

3. Over time major actions will tend to be undertaken by an expanding circle of consumers: those most capable will undertake them first, followed by those with less initial capability. Over time, such actions tend to penetrate through society, eventually reaching all or most consumers.

For example, the effects of the 1979 energy crisis are still being felt as low- and middle-income consumers finally undertake certain major actions such as buying a fuel efficient car, vacationing closer to home, or changing jobs.

4. In the current climate, consumers appear willing to trade some of the gasoline savings potential of many actions for greater mobility. In the last year, conservation behavior as an ethic has penetrated through society, as is manifested in the high frequency of response associated with many behaviors. But the background statistics on rising travel and stable gasoline use (Figure 1 and Table 2) indicate that conservation per se is not the goal: consumers are reinvesting some of the energy saved in more travel--they are regaining the mobility lost in the 1979 crisis and its economic after-shocks.

The current price softening is not likely to encourage consumers to revert to wasteful ways. New vehicles are much more fuel-efficient than 5 years ago, and as a result fuel use is likely to continue to decline even as travel increases. In this context, consumers will reinvest dollar savings from lower gasoline prices in other sectors of the economy rather than in simply more gasoline. In short, look for continued declines in gasoline use, moderately rising travel, and continued fleet turnover to more fuel-efficient vehicles. Transit use and carpooling are not likely to increase more than travel.

If a third crisis occurs, the sequence of actions described previously probably will be repeated, but certain groups will be affected more than in the past. Assuming a crisis similar in magnitude and duration to the previous crises occurs within the next 5 years, expect the greatest proportional reductions in mobility to come from the lower- and middle-income groups and one-car households. These will be the families capable of rapid action to save energy by purchasing new cars. If the crisis occurs later than 5 years from now, expect high-income, two-plus car households to act again by buying a second generation of even more fuel-efficient cars as their principal coping mechanisms. In either

event, transit and carpooling will increase in the short term but the gains will be short-lived: their growth may continue but will be slower than that of overall travel.

City spread and diffusion will continue--even accelerate--in the event of another crisis. This is because long-distance travel will be discouraged and linkages to downtown will become more strained. Look for closer-to-home shopping, continued growth of suburban areas, and generally more polynucleated and fragmented city structure.

In essence the lessons of the 1973-1974 oil crisis were relearned and reinforced in 1979. Consumers behaved rationally, adopting immediate conservation actions that were within their capabilities and which preserved as much of their personal mobility and usual household patterns as possible. Over time major investments of time or money were made to improve household mobility and these patterns of investment-savings gradually involve every strata of society, even those who were unable to participate initially. With the exception of legislation to improve efficiency of American automobiles, government actions generally did little to bring about conservation of energy; consumers independently responded to market forces.

This is not to say that government has no role to play in the event of major energy crises. Most of the research and demonstration programs funded by the federal government have yielded valuable information on the short- and long-term impacts on specific groups of both consumers and providers. Plans and manuals have been developed by the government but they must be given to providers. The severe impact on low-income, rural, and elderly households can be ameliorated through information and subsidy. By and large the role of the government is to provide information to the appropriate groups at the local level. Specific action plans and delegation of authority at the local, state, and federal levels in a time of stability of price and supply can save time and hardship in future crises.

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REFERENCES

1. Highway Travel Trends During the 1970s. FHWA, Office of Highway Planning, U.S. Department of Transportation, July 1980.
2. Monthly Motor Gasoline Reported by States. FHWA, U.S. Department of Transportation, Dec. 1976-1982.
3. Traffic Volume Trends. FHWA, U.S. Department of Transportation, Dec. 1982.
4. Regional Plan Association. The Last Gas Crises: How It Affected Travel. New York State Power Authority, Albany, Nov. 1979.
5. D.K. Boyle. Transit Use and Energy Crises: Experience and Possibilities. In Energy Issues in Transportation. TRB, Transportation Research Record 870, 1982, pp. 16-20.
6. SYDEC, Inc. New York State Transportation Energy Contingency Planning. New York State Department of Transportation, Albany, Jan. 1981.

7. A.J. Neveu. Effects of Fuel Constraints and Price Rises on Travel Demand. Draft Rept., UMTA, U.S. Department of Transportation, Oct. 1982.
8. C. Carlson. The 1979 Gasoline Crisis: Impacts on Passenger Travel. Draft Rept. U.S. Department of Energy, June 1980.
9. D.T. Hartgen (ed.). Changes in Travel in Response to the 1979 Energy Crisis. Prelim. Res. Rept. 170. New York State Department of Transportation, Albany, Dec. 1979.
10. R.L. Peskin. Policy Implications of Urban Traveler Response to Recent Gasoline Shortages. In Considerations in Transportation Energy Contingency Planning, TRB, Special Rept. 191, 1980, pp. 86-90.
11. D.T. Hartgen. What Will Happen to Travel in the Next 20 Years. In Travel Demand Forecasting and Data Considerations, TRB, Transportation Research Record 807, 1981, pp. 21-27.
12. M.D. Stearns. The Behavioral Impacts of the Energy Shortage: Shifts in Trip-Making Characteristics. In Perception and Values in Travel Demand, TRB, Transportation Research Record 592, 1976.
13. R.L. Peskin, J.L. Schofer, and P.R. Stopher. The Immediate Impact of Gasoline Shortages on Urban Travel Behavior. Final Rept. Northwestern University, Evanston, Ill., April 1975.
14. L.E. Skinner. The Effect of Energy Constraints on Travel Patterns. Gasoline Purchase Study. Final Rept. FHWA, U.S. Department of Transportation, July 1975.
15. J.F. Saaco and H.M. Hajj. Impact of the Energy Shortages on Travel Patterns and Attitudes. In Transportation Energy Conservation and Demand, TRB, Transportation Research Record 561, 1976, pp. 1-11.
16. T.M. Corsie and M.E. Harvey. Travel Behavior Under Increases in Gasoline Price. Traffic Quarterly, Vol. 31, 1977, pp. 605-624.
17. B.W. Becker, D.J. Brown, and P.B. Schary. Behavior of Car Owners During the Gasoline Shortage. Traffic Quarterly, Vol. 30, No. 3, July 1976.
18. C. Keck, N. Erlbaum, P. Milic, and M.S. Trentacoste. Changes in Individual Travel Behavior During the Energy Crisis 1973-74. Prelim. Res. Rept. 67. Planning Division, New York State Department of Transportation, Albany, Aug. 1974.
19. Comprehensive Planning Organization of the San Diego Region. Transportation Energy Opinion Survey. San Diego, Calif., Sept. 1979.
20. R.B. Trent and C.R. Pollard. Individual Responses to Rising Gasoline Prices: A Panel Approach. Presented at 61st Annual Meeting, TRB, 1982.
21. D.T. Hartgen and A.J. Neveu. The 1979 Energy Crisis: Who Conserved How Much? In Considerations in Transportation Energy Contingency Planning, TRB, Special Rept. 191, 1980, pp. 157-165.
22. J.M. Brunso, D.T. Hartgen, and S.L. Kupferman. Equity Impacts of Gasoline Shortages and Price Rises. Presented at 62nd Annual Meeting, TRB, Jan. 1983.
23. A.J. Neveu. The Sensitivity of Work and Non-Work Travel to Energy Shortages or Price Rises. Prelim. Res. Rept. 201. New York State Department of Transportation, Albany, July 1981.
24. J.D. Diltz. Reported Household Gasoline Purchasing Experience: June 1979. Transportation, Vol. 11, No. 3, Sept. 1982.
25. E.E. Iverson, R. Jacobson, and B. Limotti. Response of Washington State Residents to Higher Transportation Costs and Energy Shortages. Department of Transportation, Washington State Transportation Commission, Olympia, Aug. 1981.
26. The Journey to Work in the United States: 1979. Current Population Reports, Series P-23, No. 374. Bureau of the Census, 1982.
27. D.T. Hartgen and J.M. Brunso. Neighborhood Ridesharing Demonstration Study. Final Rept. Transportation Analysis Rept. 6. Planning Division, New York State Department of Transportation, Albany, May 1982.
28. Transportation Statistics Report. Planning Division, New York State Department of Transportation, Albany, March 1983.