HUSBANDS' AND WIVES' KNOWLEDGE ABOUT HOUSEHOLD ENERGY CONSUMPTION AS RELATED TO INFORMATION SOURCES AND SOCIOECONOMIC FACTORS

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ABSTRACT

HUSBANDS' AND WIVES' KNOWLEDGE ABOUT HOUSEHOLD ENERGY CONSUMPTION AS RELATED TO INFORMATION SOURCES AND SOCIOECONOMIC FACTORS

By

Brenda Rasch Long

The purpose of this study was to examine the relationship of information sources on energy-related issues with the present energy knowledge of husbands and wives. In addition, it attempted to identify socioeconomic subgroups in the population which varied as to their amount of energy awareness and in their use of sources of energy information. The socioeconomic variables used were educational attainment, family income, age, place of residence, and occupational status.

Survey data collected during May-June 1976 in a multi-stage probability sample of the Lansing Standard Metropolitan Statistical Area were used. The larger study was entitled "Functioning of the Family Ecosystem in a World of Changing Energy Availability," funded by the Michigan Agricultural Experiment Station. It contained a sample of 264 families, including 237 husbands and 262 wives. Data on knowledge and information sources regarding energy concerns were obtained using self-administered questionnaires. Demographic data were obtained through personal interviews.

The hypothesis and research questions were analyzed using nonparametric tests of association: Kendall (tau) Rank-Order Correlation Coefficient and Chi-square.

Results indicated that husbands and wives with higher educational attainment, family incomes, and occupational status reported reading more books and magazines to gain information on energy-related issues. As the occupational status increased, so did readership of newspapers, books and magazines. Respondents with lower family incomes and less education reported paying more attention to energy messages from commercials, television specials, and utility companies.

Husbands' sources of information to the knowledge items were nonpersonal (news broadcasts, newspapers, books or magazine articles, television specials, utility companies and schools or colleges). Wives' associations included these nonpersonal sources and interpersonal sources: their husband, friends or relatives, and people at work. Wives reported receiving information on some concepts from their husbands but husbands did not report receiving conceptual knowledge about energy from their wives. Both correct and incorrect information was associated with some sources: commercials, newspapers, television specials, and news broadcasts. No clusters of knowledge items were found.

The hypothesis predicted a positive association between knowledge about energy and educational attainment. It was not supported by a majority of the ten energy concepts.

No consistent patterns were found in three-way tests of association between knowledge and information source while controlling for a socioeconomic variable. Several specific relationships were found which have implications for future research and educational programs.

Proposals for hypotheses for future testing, revision of the questionnaire items measuring sources of useful energy information, and needs for content and audience analysis regarding energy messages were presented.

A crucial need exists to raise the knowledge level of families on energy-related concepts. Educators can assist families to understand the imbalance between energy demands and resource supplies. They can also counsel families through necessary lifestyle adjustments while enhancing the quality of life.

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Brenda Rasch Long

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

We are living in a time which has placed unprecedented demands on the world's limited fossil fuel resources, particularly natural gas and petroleum (Hubbert, 1971). These demands come from several sources: a growing population, technologies which are energy rather than labor intensive, shortages and unequal distribution of fossil fuels, and a worldwide revolution in expectations. With only 6 percent of the world's population, the United States consumes 30 percent of the world's annual energy budget (Freeman, et al., 1974:5). Unless United States citizens understand and fully realize the nature and extent of the energy problem and its implications for individuals and society as a whole, we are as a nation going to be in a position of precipitating a social catastrophe. We are beginning to question the capacity of the natural environment to provide the fossil fuels we depend on in our present socioeconomic system and accompanying lifestyles, and also to absorb wastes (Cottrell, 1955; Freeman, et al., 1974; Morrison, 1974; Paolucci and Hogan, 1973; Odum, 1971; Scientific American, 1971).

The "energy crises" during the winters of 1973-74 and 1977 radically decreased available supplies of certain fossil fuels. The energy shortages and increased prices caused some changes in both energy consumption and life styles, with increased awareness of the imbalance

between people and resources. However, there have been only minor reductions in individual and aggregate energy consumption. With adequate energy supplies, the general public is still not convinced it must personally make major changes in its fossil fuel consumption.

Present consumption patterns in the household sector of the economy use directly two-thirds of all U. S. energy consumed (Hannon, 1975). Most families directly consume energy for a central heating system, water heater, range, refrigerator, washing machine, lighting, and automobile. Indirect energy is required for the manufacturing and distribution processes of household goods and services. The combined direct and indirect consumption data reveal that the major portion of energy is ultimately consumed by the family unit. Thus, any significant shift toward decreased energy supplies nationally will necessitate shifts in family consumption patterns.

Need for Educational Programs

Present consumption patterns indicate the need for U. S. families to strike a new balance between their demand and the supply of limited energy resources. An ecologically sound perspective, this shift can allow Americans to adjust their life styles while maintaining both a quality of life and the quality of the surrounding environment. The change suggested here necessitates a transition to ecologically based values, beliefs, attitudes, and consequent behaviors. In the past, United States economic institutions and general societal values have centered around the belief in a limitless supply of natural resources and the expectation of an ever expanding economic universe.

Now there is a need to work toward the emergence of new values--interdependence, social concern, tolerance of complexity, conservation of scarce resources and a sense of living in harmony with nature. A reorientation of values and priorities away from the level of use of material goods will be necessary if the United States is to find a better balance between its energy needs and the energy resources of the environment. The development and implementation of such conversion is the task of educational programs.

Morrison, Keith, and Zuiches concluded that the overall level of awareness could be raised on energy-related topics. On ten questions designed to measure a variety of energy dimensions, the mean score was 4.7 out of ten with less than one out of five answering seven or more questions accurately. No question was answered correctly by more than 72 percent of the total sample (B. Morrison, et al., 1976:6).

This finding suggests the crucial need for educational programs. The function of such programs would be to inform and persuade U. S. Families about the energy problem and to suggest alternatives by which they can reduce their energy consumption. The foundation for educational programs can be widely divergent depending on the particular needs of identified target audiences, i.e., some programs may be targeted by sex, age, educational level, income, occupation, place of residence and prior knowledge.

Educational programs utilize communication. The reference mechanism employed in this study was that messages are sent through channels from source to receiver. Each component of the communication process--source, message, channel, and receiver--is complicated by a

number of variables (Berlo, 1960:72). Achieving effective communication results depend on understanding the interaction of these components.

Long (1977) illustrates this communication problem regarding the energy situation. She found that even though respondents perceived receiving "a great deal" of useful information about energy from mass media sources, the amount of knowledge exhibited by these respondents was low. Neither the mass media nor interpersonal sources of communication yielded a significant association with knowledge about energy. This suggests a breakdown between the messages conveyed by the sources and the decoded messages as interpreted by the receiver.

Another potential problem in the communication of energy information is that of misinformation. The messages sent by a source may contain subjective information. After hearing or reading the message, the receiver may make false conclusions regarding the "facts" of the situation.

This discussion suggests there is room for improvement in the whole communication process of energy information: the sources sending the messages and their relative credibility, the content of the messages, and the communication channels transmitting the messages, all of which effect how the receiver responds to the messages. The development and implementation of educational programs must cope with the complexities of the communication process.

Variation in Receivers of Messages

Different persons may accept messages in diversified ways, depending on their information level, attitudes, communication skills, and the cultural context. For example, some may know more or less about effective energy conservation practices; or variation may occur in feelings as to who is to blame for the energy crisis. It is important to know if these characteristics of the receivers of communication are distinguishable, since this would make a difference in how messages are directed to particular audiences.

If subgroups in the population can be identified that have (1) different levels of knowledge about energy and (2) utilize different kinds of information sources to learn about energy, it would be possible to develop targeted educational programs and efficiently deliver them through the appropriate communication channels. If subgroups cannot be identified, then messages can be developed for the public at large.

Professionals working to educate and change family energy consumption patterns need more information on which to base their programs. The outcome of this study will help answer the following questions: What energy-related concepts do the public know or not know? Are there areas of misinformation? What sources supply energy information most accurately? Are there subgroups in the population which know more or less than others? Are there subgroups which receive information from certain sources? How effective have past education programs been, or is a new approach needed? The results should also indicate some clues for structuring targeted educational messages and strategies for energy consumption.

Purpose of the Study

The purpose of this research was to examine the sources of information and levels of knowledge regarding household consumption of fossil fuel energy. It attempted to discover the information sources on energy-related issues and the present knowledge level within a sample of households. The intent was to supply a research base for structuring educational programs on the reduction of fossil fuel use in the household.

Further, this study attempted to ascertain whether or not there were distinguishable subgroups in the population which varied in the amount of energy awareness or in their sources of energy information. Attention was also paid to the problem of misinformation as well as types of information indicating energy knowledge. The responses of husbands and wives were examined separately according to income, education, age, place of residence and occupational status.

The general objective was to determine the strength of the relationship between husbands' and wives' knowledge and sources of information while controlling for critical contextual variables: income, education, age, place of residence and occupational status. Specific objectives were as follows:

Objective 1: To determine if there is any relationship between knowledge and sources of energy information.

Objective 2: To determine if there is any relationship among knowledge, sources of energy information, and family income levels.

Objective 3: To determine if there is any relationship among knowledge, sources of energy information, and age.

Objective 4: To determine if there is any relationship among knowledge, sources of energy information, and rural or urban residence.

Objective 5: To determine if there is any relationship among knowledge, sources of energy information, and occupational status.

Hypothesis

The review of literature, contained in Chapter II, produced only one testable hypothesis. It was:

Hypothesis: Knowledge about energy-related concepts will be positively associated with educational attainment.

Further hypotheses are anticipated upon the completion of this study. Suggested hypotheses for future testing are presented in Chapter V.

Operational Definitions

Knowledge about Energy: Awareness of correct response to questions covering energy-related concepts on a variety of dimensions.

Information Source: An individual or an institution that originates a message (Rogers, 1971). The source can be interpersonal, one of the mass media, or institutional. The source selects and transmits the message(s).

Household Energy Consumption: Mechanical energy that is used directly in the operation of the household. This type of energy is derived from a fossil fuel source. It does not include human or solar energy.

Socioeconomic Factors: Defined as educational attainment, family income, age, place of residence, and occupational status. Specifically, these variables were:

a. Educational Attainment: Total number of years of formal education, including vocational and technical school.

b. Family Income: Total gross income of all family members in 1975.

c. Age: Total number of years since birth.

d. Place of Residence: Location of household in either urban or rural portion of the tri-county area. Urban households lived within census tract areas. Rural households were drawn from townships containing no incorporated city or village.

e. Occupational Status: Occupations were classified according to three digit U. S. Census occupational classifications and each was recoded into prestige scores. The research methodology for the prestige scores was developed by Duncan and Reiss and implemented and reported by Siegel (1975). It is a measure of the social status associated with occupations.

The "Description of Variables" in Chapter III contains further discussion of the variables and the categories used in the analysis.

Assumptions

1. The survey research design, using a combination of the interview schedule and self-administered questionnaire, was an appropriate method for collection information on sources of information and knowledge about energy and socioeconomic background variables.

2. Respondents were able to accurately record sources of information and knowledge about energy.

3. Respondents were able to accurately answer questions about socioeconomic and demographic characteristics.

4. The ten knowledge questions adequately measured levels of awareness on energy-related topics.

5. The sources of information studied included the communication channels used by respondents to receive messages about energy.

6. The husband's and wife's answer to the knowledge and information source questions were valid and sufficiently representative to reflect a "good" approximation of the household's response.

CHAPTER II

REVIEW OF THE LITERATURE

The published research literature on information sources and knowledge about energy is limited, as evidenced by the small number of studies in these areas (D. Morrison, et al., 1976; Frankena, et al., 1976). Warren (1974) did the most comprehensive study to date on this topic when he studied responses to the winter of 1973-74 energy crisis. Most studies were done around the time or immediately following the 1973-74 energy crisis events. Since then, attitudinal polls have been conducted periodically, but few on-going, in-depth studies have been done on awareness levels and resulting behavioral adjustments.

Research and related literature will be reviewed in four major sections--sources of energy information, sources of related information, knowledge of energy information, and socioeconomic or contextual variables related to knowledge of energy issues and conservation practices.

Sources of Energy Information

Many sources of information about energy concerns are available to the public. People may receive information from mass media, i.e., newspapers, television, radio, books, and magazines; through personal contact with family, friends, acquaintances, relatives, neighbors,

people at work, and/or members of the same organization or club; from activist organizations, consumer groups, corporations and government agencies interested in the topic of energy.

This discussion will focus on the following points:

1. Most Important Sources
2. Most Trustworthy Sources
3. Content of Messages Sent
4. Impact on Receiver of Mixed Messages

Most Important Sources

There are seemingly two approaches to studying information sources. One way is to ask where respondents gain most of their information. The other approach is to elicit the most trusted or believable sources. There is a distinction. It is possible that the sources sending the majority of useful messages may not be the most trusted or believable sources in the eyes of the respondents.

Several studies have found mass media (television, radio, newspapers, books, and magazines) to be important sources. Warren (1974) found various forms of mass media were major sources of information about what is really behind the energy situation. Television ranked first (83 percent) and newspapers second (79 percent) according to where respondents said they received information on the energy situation. Magazine articles and radio also ranked high. Less than half mentioned interpersonal sources, such as friends, relatives, co-workers, a union, or people in an organization to which they belonged (Warren, 1974:14). In conclusion, he said mass media appear to be substantially more

significant sources of information and conservation ideas than formal and informal communication networks at work, in organizations, and in the neighborhood. Milstein also found television (42 percent) and newspapers (45 percent) were sources where consumers get most of their information about the energy problem (Milstein, 1976:8). B. Morrison, et al., reported news broadcasts, newspapers, television specials, commercials, books, and magazines were the most important sources for their respondents; one variation was that the well educated reported books and magazines ranked higher in importance than that for the general sample. They also found information from personal sources ranked lowest (B. Morrison, et al., 1976:7).

Michigan State University students also reported mass media as their chief source. A study of 1200 students conducted by Bugge and Rye in May, 1974, showed newspapers, books, magazines, television, and radio were their primary sources of information concerning the energy crisis (Bugge and Rye, 1974).

Most Trustworthy Sources

Another approach to finding out sources of energy information is to elicit responses regarding the most believable or trustworthy sources on this issue.

Gottlieb and Matre (1975) found forms of mass media were seen as information sources regarding the energy situation which were accurate and honest most of the time. Most people trusted television (58 percent). Local newspapers, radio, news magazines, and national newspapers were considered less accurate and honest by respondents

(one-quarter to one-third). They found only about one in ten persons considered government or energy company (oil, natural gas, and electric) sources accurate and honest most of the time.

Somewhat in contrast, a Northern Illinois Gas Company study (1976) found mass media were not the most important source. This study measured the believability of several sources of information. Results showed activist organizations lead with 62 percent, followed by mass media (51 percent), gas and electric companies (46 percent), and oil companies lowest at 17 percent (Northern Illinois Gas Company, 1976:12). Milstein (1976) and Rappeport and Labaw (1974a) showed similar findings; in each of their studies, consumer groups were seen as the more trustworthy sources of information than business or government. By October, 1974, Rappaport and Labaw (1974b) noticed a small decline in the degree of trust in the federal government as a source on energy-related information.

Thompson and Mactavish found the family was a trustworthy source for general information for 13 percent of the respondents, but only 3 percent trusted the family for information on energy problems (Thompson and Mactavish, 1976:70-71).

Responsibility for the 1973-74 energy crisis could be a factor related to the perception of sources seen as credible in the eyes of the public. Studies have found the oil companies or the federal government or both were most frequently blamed for the oil crisis. Relatively few respondents believed the public or individual consumers were responsible (Murray, et al., 1974; Bartell, 1974; Talarzyk, 1975;

Bultena, 1976; Doering, 1974; Muchinsky, 1976; Gottlieb and Matre, 1976; Rappeport and Labaw, 1974a). It is logical to conclude that if respondents blame oil companies and/or the federal government for the energy crisis, they are not likely to believe conservation messages from these sources. B. Morrison, et al., (1976) found conflicting results; i.e., respondents believed individual consumers could change and perform more energy conserving practices.

Content of Messages Sent

It is not enough to look at possible sources; attention must also be paid to the amount and types of energy information transmitted by various sources. Barnaby and Reizenstein (1975) found that the energy conscious consumer has exposure to mass media.

The use of content analysis provides a methodology for identifying and assessing the information being conveyed for the following studies discussed. Dangerfield, McCartney, and Starches did a content analysis of oil company materials, Congressional records, and news magazines to look at the kinds of energy information and when they are included. The researchers concluded that news magazines collectively "performed more like a thermometer than a barometer regarding the energy crisis" (Dangerfield, et al., 1975:320). The amount of coverage fluctuates with crisis events, but the long-term need to conserve fossil fuel energy does not change. Rubin and Sachs agreed that the media have a responsibility for communication information, not merely to react to events when they occur. Further, they said the media should act as a watchdog for the public regarding

environmental practices being considered by government or business before they are adopted, and also as an "early warning system" of environmental hazards before they reach such an advanced state that repair is impractical (Rubin and Sachs, 1973:250). Mazur and Leahy (1976) also concluded that the mass media played a crucial role in the rise and fall of controversy in three movements against technological innovations. They found media coverage rises and falls with the activity of leaders.

Shriner did a content analysis from January to December, 1976, in three newspapers available to Lansing, Michigan, area residents: The Lansing State Journal, Detroit Free Press, and the Sunday edition of the New York Times. He found the following: (1) oil and nuclear energy received the most coverage and were at top-of-mind awareness levels; (2) the awareness of likely natural gas shortages more than other fuels; (3) the desirability and technological feasibility of solar energy; (4) cost is an important factor in electricity; and (5) the belief that science and technology will solve America's energy problems in the near future (Shriner, 1977:13-14). Shriner concluded that the press may be partially responsible for maintaining or strengthening existing attitudes regarding energy and that the results emphasize the lack of general understanding of energy problem causes and effects.

While content analyses are useful tools for measuring content, they cover very partial information during one time period on a few sources of information. Neither of the two studies mentioned included

non-print media, which have also been influential sources of information on energy, according to the studies reviewed above.

Impact on Receiver of Mixed Messages

There is also the problem of mixed messages. The information presented by one source may contradict that from another source. Beane and Ross provided an explanation for why the public is not aware of energy facts. In their study of nuclear power issues, they found the majority of citizens were not well informed. Further, they did not appear receptive to new information which was dissonant, regardless of its source or direction. Citizens appeared to selectively read information which reinforced current beliefs (Beane and Ross, 1974:58). Selective exposure and retention have been identified by psychological and communication researchers as part of the way humans choose to perceive the real world.

Thompson and Mactavish (1976) concluded their study with a statement about how the public accepts mixed messages:

> The majority of the public includes a broad range of cynics. They are sophisticated in their ability to assess the messages they receive and react to inconsistencies and double messages, of which there have been many, by refusing to believe what they are told. . . .
>
> They do believe in coming price increases, having already experienced them, and when presented with a clear-cut action they can take to protect themselves, will act accordingly. The "dial-down" message, for example, was accepted by a large majority. Simple, consistent, straightforward messages presented simultaneously by a broad range of information sources and media are apt to be most effective (1976, p. 49).

This statement points out the need to evaluate the messages carrying energy-related information for their content, complexity, and consistency with other messages sent from other sources.

Sources of Related Information

Given the narrowness of energy-related research, it seems advisable to examine the literature on related issues to see if useful parallels to the energy question can be developed. Two questions will be addressed: Are different sources used for various kinds of information? Do people rely on one source or several sources?

Rubin and Sachs indicate the public has essentially four sources from which to receive information on environmental deterioration (which includes the energy problem): (1) scientific and academic communities which provide a data base for decisions made by government and industry; this work is unintelligible to the public and is availalbe through professional journals; (2) citizens' groups which are becoming more important but do not produce "official" looking work, so news media are wary of printing it; (3) government which is supposed to freely supply information by law but does not always comply; and (4) the private business community, whose plans and decisions are usually unknown to the public, yet companies have enormous resources under their control (Rubin and Sachs, 1973:248-249).

Wade and Schramm found different sources were used for different kinds of information. In the case of a political campaign, television was more likely to be the major source of public affairs information for those with little education, females, nonwhites, and farm

and blue collar workers. Persons for which print media were more likely to be used to gain information on public affairs were highly educated, males, whites, professional, managerial and white collar workers, and high income groups. Television is the chief source for the majority on public affairs (Wade and Schramm, 1969:201).

This same pattern does not hold for seeking information about science, according to Wade and Schramm. Newspapers are dominant. This finding was based on a 1957 Pre-Sputnik survey in which newspapers ranked higher than magazines, radio, and television for every subgroup: sex, age, education, and income (Wade and Schramm, 1969:201). However, this study was based on twenty-year-old data. In 1957 the saturation levels of television ownership were 78.5 percent (Television Digest, 1957:25). In 1976 99 percent or nearly all households owned at least one television (Lyons and Tyll, 1976:52).

Wade and Schramm also reported persons who correctly answered four science questions identified newspapers or magazines, rather than radio or television, as their principal sources. This finding was the case at each educational level and for males as well as females. The greater the education, the greater likelihood of using print as the major source of news and information (Wade and Schramm, 1969:204).

Rogers, in his book Communication of Innovations: A Cross-Cultural Approach, made several generalizations based on a number of research studies conducted on different innovations. Two which are pertinent to the topic of sources of energy information are:

> Earlier knowers of an innovation have greater exposure to mass media channels of communication than later knowers.
> Earlier knowers of an innovation have greater exposure to interpersonal channels of communication than later knowers (Rogers, 1971, p. 108).

In conclusion, it appears different sources are used for different kinds of information. Further, different sources are used by subgroupings, i.e., sex, race, income, education, occupation, age, and relative knowledge of an innovation.

Knowledge of Energy Information

What does the general public know, or just as importantly, what do they not know, about energy matters? The information they could be expected to know may be available from a variety of sources, but it is not necessarily perceived and learned by individuals.

Several studies have found the general public not very knowledgeable about energy-related topics. Using an energy knowledge scale, Gottlieb and Matre (1976) found the majority of respondents were not knowledgeable about energy, a finding which had not changed since 1974. Milstein (1976:6) suggested that people are not saving energy because they lack the knowledge; they did not know energy consumption concepts in lighting, water heating, automobiles, and insulation. Chandler used "The National Environment Test" which was conducted in 1970 for a CBS news special. It contained 27 questions about various aspects of air, water, and land pollution. He found 18 percent which he considered "high scorers," and over half of the respondents answered over half of the questions incorrectly (Chandler, 1972:186).

The lack of knowledge about energy concerns is apparent in findings about the public's beliefs and attitudes regarding energy supply and demand. Doering, et al. (1974) and Morrison and Gladhart (1976), in Indiana and Lansing, Michigan, respectively, found that roughly half of the respondents believed in an energy crisis and the rest did not believe energy was a problem. Doner (1975) also found half of his respondents perceived there was an energy cirsis; this was up 9 percent from 1974. Doner attributed the major reason for the increase to media attention to this issue. Perlman and Warren (1975) said 62 percent of their respondents were non-believers in the energy shortage. Warren (1974) found 52 percent said the energy crisis was not real, and these respondents were cynical and skeptical of the information they had received.

Other studies have found a higher belief in the energy problem. After a nationwide telephone survey, Rappeport and Labaw said, "The public has come to believe that energy shortages are both a serious and a long-term problem" (Rappeport and Labaw, 1974b:2). This belief increased with those more educated. Bartell (1974) found 20 percent felt the energy shortage was severe, 48 percent thought it was mild, and 26 percent did not think there was a shortage. Similarily, Gottlieb and Matre (1975) found 28 percent believing there was definitely an energy shortage and 39 percent thought there seems to be one, while only 9 percent said there definitely is not an energy shortage.

An energy conservation ethic is beginning to emerge among some American households. Perlman and Warren (1975) found that people's

attitudes as to whether or not the shortage was real made little difference in their conserving behavior. In Doner's study (1975), only half believed there was an energy crisis but three-fourths of the sample had reported changes in their behavior. Lasting efforts to conserve appear to be quite limited and meager (Grier, 1976; Warren, 1974; Murray et al., 1974; Bultena, 1976). Yet many persons would feel hardships if they were forced to save even more energy (Curtin, 1975).

One of the reasons energy conservation measures have been taken is because of the rapid increase in energy-related prices. Saving energy means saving money. In a time of inflation and cost-of-living increases without corresponding rises in income, the price of energy is a very important factor in conservation of resources.

Grier discussed the attitudes of what respondents felt they and other Americans can do about energy:

> Few people like to believe that they are wasteful, or that they should or can pay higher prices, or that they should or can change to less convenient ways of doing things. Nevertheless, more than half of 1975 respondents said they definitely agreed that every family should be willing to voluntarily reduce its use of fuels to no more than the average amount needed by a family of the same size. And a sizeable proportion even believe that members of their own households could do more to save on use of energy (1976, pp. 18-19).

Curtin discussed the relationship of income and conservation efforts. He said those respondents who felt their income was inadequate to provide their family with a comfortable standard of living reported significantly greater difficulty if they had to further conserve energy (Curtin, 1975:17).

Contextual Variables Related to Knowledge of Energy Issues and Conservation Practices

It may be that the theory of a knowledge gap (Tichenor, et al., 1970) applies in the case of energy information. The hypothesis is that of the infusion of mass media information into a social system increases, segments of the population with higher socioeconomic status tend to acquire this information at a faster rate than lower status segments so that the gap in knowledge between these segments tends to increase rather than decrease (Tichenor, et al., 1970:160). Is there a gap in knowledge between persons of divergent incomes, educational levels, ages, places of residence, occupations, or sex?

Several studies have shown that as educational level increases, the amount of awareness about energy concerns increases (Kilkeary, 1975; Thompson and Mactivish, 1976; Long, 1977; B. Morrison, et al., 1976). Hornbeck (1974) and Chandler (1972) found greater interest in environmental concerns among people with more education. Rogers' work in the area of diffusion of innovations includes the generalization that earlier knowers of an innovation have more education than later knowers (Rogers, 1971:107). However, Beane and Ross found the opposite result, i.e., formal education was not highly associated with the knowledge level of respondents (Beane and Ross, 1974:106).

Age is another variable which may divide people into distinguishable subgroups regarding energy. Chandler (1972:187) found young people were more concerned about environmental hazards and pollution than older respondents. Thompson and Mactavish found differences between age groups. The younger the respondent, the more he believed

we have and will have energy problems. They believed in technological solutions to the energy problem and that there could be gasoline and natural gas shortages in the future. Respondents under 44 had bought and were planning to buy major household appliances, whereas older respondents had ceased to buy them (Thompson and Mactavish, 1976: 46-47). Morrison, Keith, and Zuiches found 88 percent of respondents under 40 and 91 percent of respondents 40 or over agreed that the natural environment should be preserved even if they had to change their way of living (Morrison, Keith, and Zuiches, 1975:23).

Thompson and Mactavish also found differences between males and females. Both sexes were approximately equal in their recognition of present and future problems and on the expectations of future shortages. However, men looked to technological solutions and believed in the possibility of exhausting oil and natural gas supplies more than women. Men supported government emphasis on technological development of alternative fuels; women did not know what the government should do. Men expected greater price increases in gasoline and utilities. On the other hand, women paid lower utility bills and owned fewer cars than men. When asked what they plan to do to conserve energy, men more frequently answered "drive less" and women said "use less electricity" (Thompson and Mactavish, 1976:47). Chandler (1972) and Long (1977) found males were more likely to get a higher proportion of correct answers on environmental or energy tests, respectively, than females. In summary, there have been findings of differences between males and females on attitudes toward solutions of the energy problem, expectations for future behavior changes, and levels of knowledge.

Several studies found more conservation behaviors by middle income groups. Grier (1976:16) found middle income persons were most likely to have reported making energy conserving improvements. Kilkeary (1975:18) found the strongest influence on knowledge and conservation of energy was income, especially middle income. Murray, et al., (1974:262) found those reporting a reduction in daytime temperatures varied positively with income.

As far as occupational groups, Thompson and Mactavish (1976) found the recognition of energy problems increased with occupational levels, as does the belief in the possibility of the exhaustion of oil and natural gas supplies and the belief in coming energy shortages.

Summary

In summary, the review of literature produced only one testable hypothesis. It predicts a positive relationship between educational level and knowledge about energy. The most conclusive studies found were done on this subject, including Rogers' diffusion theory.

No study was found which looked at the relationship between both particular sources of information and knowledge levels; studies were found on one or the other of these topics. Other studies which included contextual variables were too inconclusive in their evidence to support a hypothesis which could make accurate predictions. Thus an exploratory study of sources of information, knowledge, or lack of knowledge about energy and contextual variables seemed appropriate.

CHAPTER III

METHODOLOGY

This study focused on the examination of the relationship between knowledge about energy concepts, sources of energy-related information and socioeconomic contextual variables for husbands and wives. Data collected in the Michigan Agricultural Experiment Station Project 3152, "Functioning of a Family Ecosystem in a World of Changing Energy Availability," were used to answer research questions about the interrelationships. These data were collected from families in the greater metropolitan area of Lansing, Michigan, during the months of May and June, 1976.

Discussion in this chapter takes the following order:

1. The Sampled Community
2. Sample Design and Selection
3. Description of the Sample
4. Description of Variables
    a. Independent Variable
    b. Dependent Variable
    c. Contextual Variables
5. Analysis of Data
    a. Statistical Analysis
    b. Computer Programs

The Sampled Community

The sample, selected from the larger interdisciplinary study, was from the greater metropolitan area of Lansing, Michigan. The Lansing Standard Metropolitan Statistical Area (S.M.S.A.) is considered to be a well-defined community, containing a unique diversity of functions. The area is the seat of the state government, and contains light and heavy industry, primarily related to the auto industry, and a major university (Michigan State University). It can be defined as a centrally located area of commercial enterprise and activity, surrounded by a productive diversified agricultural sector.

The Lansing S.M.S.A. has a total population of 367,000 persons and 89,610 families (1970 Census). A multi-stage probability sample of urban, suburban, and rural families was drawn from the tri-county area of the S.M.S.A. Some portions of Clinton, Eaton, and Ingham counties fall within the S.M.S.A., which is considered to be a viable geographic area with a heterogeneous population. This type of sample offered the interdisciplinary research team the opportunity to study the impact of the "energy crisis" on a relatively contained geographical area with diversity in its socioeconomic characteristics.

Sample Design and Selection

The present study was drawn from the second wave of a longitudinal study. It was a multi-stage probability sample design of 264 households surveyed in the spring of 1976. The surveyed unit was the "family," defined as two or more individuals living together, one of whom was

18 years of age or older." See Zuiches, et al., (1976) and B. Morrison, et al., (1976) for more details of the sampling procedure.

For the urban portion of the sample, a random selection of ten census tracts was made with each tract having a probability proportionate to the number of households therein. It was determined that the selected tracts were a reasonable approximation of the urban area of the Lansing S.M.S.A. Households were randomly selected from addresses available in the 1973 Polk City Directory for Lansing and suburbs for the 34 blocks contained within the ten selected census tracts. Of the addresses, 20 percent were sampled.

In choosing the rural portion of the sample, the rural character of the respondents was maximized at the expense of geographical completeness of the sample coverage. Accordingly, two rural townships were drawn randomly from the 12 townships containing no incorporated city or village. The probabilities of selection were proportional to population size. The 36 sections in each township were used as the primary sampling frame with one section randomly chosen from each row of six. Every second residence was sampled. While the rural and urban portions do not constitute a complete self-weighting sample of the Lansing metropolitan area, the households did meet the criteria for independence.

Self-administered questionnaires were delivered by an interviewer for energy-related questions to be completed by all respondents; upon returning to collect the questionnaire, questions concerning background socioeconomic questions were administered.

Description of the Sample

In the analysis that follows, all wives giving valid responses to the items under consideration constituted the "wife" sample, and similarity for the husbands. When correlations between husbands and wives are reported, these were for those couples where both husband and wife gave valid responses.

Some basic demographic characteristics of the 264 sample families are presented in table format.

The types of families included in the sample appear in Table 1.

Table 1.--Family Type of Respondents

Family Type	Number of Families	Number of Individuals
Husband/wife respondents	235	470
Single parent family--male	2	2
Single parent family--female	27	27
Total	264	499

Husband/wife respondents were the majority, but there were representation from male and female single parent families. Of the sample, 35 percent were rural families and the balance urban families.

The range of family incomes for the sample are shown in Table 2. Fourteen families refused to answer this question.

The largest group of family income was $15,000 - $24,999, and the second largest was $10,000 - $14,999. This would indicate that

TABLE 2.--Family Income

Income	Number	Percent of Those Responding
Less than $4,999	20	8.0
$ 5,000 - $ 9,999	40	16.0
$10,000 - $14,999	63	25.3
$15,000 - $24,999	90	36.0
$25,000 and up	37	14.7
Refused	14	---
Total	250	100.0

61.3 percent of the sample have family incomes between $10,000 and $24,999. There are more families with incomes below $9,999 (24 percent) than there are families with incomes above $25,000 (14.7 percent). The median family income of the sample was $15,100 compared to approximately $16,600 for the tri-county area (U. S. Bureau of Census, 1977). This census figure was adjusted from 1970 median family income data (U. S. Bureau of Census, 1972, P- 31) based on per capita income percentage changes since 1970.

Responses for husbands and wives were coded separately. The sample includes slightly more wives than husbands, as is shown in Table 3.

TABLE 3.--Sex of Adult Respondents.

Sex	Number	Percentage
Husbands	237	47.5
Wives	262	52.5
Total	499	100.0

Socioeconomic Characteristics

The largest number of husbands were in the age group 30 - 39 years, whereas the largest number of wives were in the 18 - 29 years age group, as shown in Table 4. About half of the husbands (47.4 percent) and wives (53.3 percent) were under 40 years old.

TABLE 4.--Ages of Husbands and Wives

Age Group	Percentage of Husbands	Percentage of Wives
18-29 years	18.8	28.4
30-39 years	28.6	24.9
40-49 years	19.3	16.3
50-59 years	14.9	16.0
60 years and over	18.4	14.4
Total	100.0	100.0
Number	234	257

Educational attainments of husbands and wives are shown in Table 5. The largest group of both husbands and wives was those who had not had any further formal education beyond high school. One-fifth of the husbands (20.3 percent) and nearly one-fifth of the wives (18.3 percent) had not completed high school. Slightly over one-fifth of each had had some college education. More husbands had completed a bachelor's degree or had done post-graduate work (26.6 percent) than had wives (15.3 percent). Sample husbands and wives are compared to Lansing S.M.S.A. families in Table 5 (U. S. Bureau of the Census, 1972b:24-753).

TABLE 5.--Educational Attainment of Husbands and Wives

Years of School Completed	Lansing SMSA Families	Percentage of Husbands in Sample	Percentage of Wives in Sample
0-11 years, less than high school	36.1	20.3	18.3
12 years, high school completed	33.1	32.0	42.0
1-3 years, college or vocational school	13.5	21.1	24.4
4 or more years college, professional training	17.3	26.6	15.3
Total	100.0	100.0	100.0
Number	89,610	237	262

Occupational status scores tabulated by sex role are listed in Table 6. Duncan and Reiss developed occupational classifications based

TABLE 6.--Occupational Status Scores of Husbands and Wives

Classification	Percentage of Husbands	Percentage of Wives
Less than 34, low	32.8	29.3
35-45, middle	31.0	29.9
46 and over, high	36.2	40.8
Total	100.0	100.0
Number	235	191

on census categories and gave them prestige scores ranging from zero to 100. The research methodology employed for the prestige scores was implemented and reported by Siegel (1975). The National Opinion Research Center and the University of Chicago sponsored the studies to measure the social status associated with occupations. Following Siegel's methodology, a prestige ranking was assigned to each respondent's current or most recent occupation. Persons not having a score were excluded. The occupational status data were treated as a continuous variable for both husbands and wives and were recoded into approximately equal thirds. Data were missing for two husbands and 71 wives.

Description of Variables

Independent Variable

Sources of Energy-related Information.--Eleven items from the self-administered questionnaire were selected (see Appendix A). The "other" category of the questionnaire was not used because preliminary figures showed very few responses were given. The source categories utilized are not exclusive or exhaustive, but they do cover a broad range of sources of information about energy.

Dependent Variable

Knowledge about Energy.--Ten multiple choice items from the self-administered questionnaire were used (see Appendix A). There is one answer which is most correct for each item. These questions were employed in the 1976 survey because it was felt that they measured a

variety of energy dimensions for which there was widespread agreement as to the correct response.

In a previous study, Long (1977) performed a Pearson product-moment correlation test on the same ten knowledge items. She found no correspondence between any of the knowledge items when they were classified as correct and incorrect answers. It seemed possible that a ranking of these knowledge items would produce different correlation results. If respondents answered one question correctly and were close on another item, those items might have a higher correlation when the possible responses were ranked.

The responses to the ten knowledge items were recoded in two ways: (1) by correct and incorrect responses, and (2) ranked from the most correct to the least correct response. If there were little differences between the place any two of the items should be in the ranking, they were given the same rank. This was done on the assumption that respondents would not be able to distinguish slight differences in the correctness of any two items.

The way the knowledge questions were recoded into ranks is shown in Table 7. A rank of "4" meant the most correct response; a rank of "1" was given to the least correct response. For the dichotomous variable of correct and incorrect responses, the most correct answer was coded as "1" and the other three responses were coded as "0".

The references used to base the recoded statements for the ten knowledge questions were as follows: Items one and two, Stanford Research Institute (1972:33); Item 3, Hannon (1972:43); Item 4,

TABLE 7.--Ranking of Knowledge Items

Item	Concept	Relative Correctness	Ranking
1	Activity using the most household energy	automobile transportation	4
		heating and cooling	3
		cooking	2
		lighting	1
2	Equipment using most household energy	hot water heater	4
		refrigeration	3
		lighting	2
		color TV	1
3	Beverage container wastes most energy	throwaway aluminum cans	4
		throwaway glass bottles	3
		throwaway plastic bottles	2
		returnable bottles	1
4	Most heat lost through	ceiling	4
		walls	3
		floors	2
		all the same	1
5	Most energy intensive protein source	beef	4
		chicken	3
		soybeans	2
		all the same	1
6	Least cooking energy for small meal	microwave oven	4
		low heat on stove burner	3
		bake in oven at 325°	2
		all the same amount	1
7	Least energy per person for cross-country transportation	bus	4
		train	3
		automobile	2
		airplane	1
8	Least energy to heat with same size and insulation	apartment	4
		single family house	3
		mobile home	3
		all the same	1
9	Amount of oil U. S. imported 1976 compared to oil embargo	more than in '73-'74	4
		same amount as in '73-'74	3
		a little less than in '73-'74	2
		much less than in '73-'74	1
10	Fuel now in shortest supply	natural gas	4
		petroleum	3
		coal	2
		none are in short supply	1

National Bureau of Standards and Executive Office of Consumer Affairs (1971); Item 5, Fritsch, et al., (1975:62-63); Item 6, Consumer Reports (1976:316); Item 7, Hirst (1973:27); and Item 10, Hubbert (1971:65). Item 8 was based on the concept that apartments have adjacent walls with other dwellings and therefore have less exposure, since the factors of size and insulation were constants (Real Estate Research Corporation, 1974:18). The ranking for Item 9 was based on newspaper reports at the time of the study (May 1976).

Contextual Variables--Operational Definitions

The contextual variables included in the study were these socio-economic factors: educational attainment, occupational status, age, sex, family income, and urban-rural residency. For purposes of this study, it was necessary to reclassify the data from the original study. The original data were categorized in the following manner before performing the analysis:

Educational Attainment of Husband/Wife:

1 0-11 years, less than high school graduation
2 12 years, high school graduation
3 13-15 years, some college or vocational school
4 16 or more years, college degree and professional training

Family Income:

1 Less than $11,999, low
2 $12,000 - $17,999, middle
3 $18,000 and over, high

Age of Husband/Wife:

1 Under 36 years
2 36-59 years
3 60 years and over

Occupational Status Scores of Husband/Wife:

1 Less than 35, low
2 35-45, middle
3 46 and over, high

Place of Residence:

Urban--Family lives within a census tract of the Lansing metropolitan area.
Rural--Family lives in a rural township.

Sex of Respondent:

Male--Husband's response
Female--Wife's response

Analysis of Data

Statistical Methods

In order to determine if knowledge about energy, sources of information, and the contextual variables were related, several non-parametric statistical methods were selected: Kendall tau and Chi-square. Nonparametric statistics or distribution-free methods do not assume that the underlying distribution of the population approximates a normal curve (Averill, 1972:187). They depend on the use of the median rather than the mean (Bulmer, 1965:153).

Kendall's (tau) Rank-Order Correlation Coefficient, symbolized as τ, is a measurement of the agreement between ranked scores. The mutual association is expressed from a perfect positive association (+1) to a perfect negative correlation (-1). Tied ranks are taken into consideration. In general, the absolute value of tau tends to be smaller than that of Pearson's product-moment correlation coefficient (Nie, et al., 1975:289). This statistic was chosen over Spearman's

(rho) Rank-Order Correlation Coefficient because of the small number of rankings for each variable.

Kendall tau's were computed among the set of knowledge items and the set of energy information items, and for each knowledge item by each source. This statistic was also used to test the correspondence between husbands' and wives' responses on each knowledge item and source.

Chi-square (x^2) tests the extent to which the distribution of data in a contingency table departs from what is expected on the assumption of independence for nominal level information (Weiss, 1968:256). This statistic was used to determine the discrepencies in knowledge and information source regarding energy while controlling for contextual variables: place of residence, educational attainment, family income, age, and occupational status. It was also employed to measure the association between knowledge and sources of energy information for husbands and wives.

Gamma was obtained to tell the direction of the ordering in the contingency table; it does not take ties or table size into account, so it generally has higher numerical values than tau (Nie, et al., 1975: 228).

Because age, family income, educational attainment, and occupational status have ordinal intervals, Kendall rank-order correlation coefficients were obtained along with chi-square and gamma when appropriate for these socioeconomic factors. There are two Kendall rank-order correlation measures--tau_b and tau_c--which were applied. Tau_b was utilized with square tables, i.e., when the number of rows equalled the

number of columns in the tabulation. When a rectangular table (one with an unequal number of rows and columns) was produced, tau_c was obtained (Nie, 1975:228).

Computer Programs

Analysis was done by the Control Data Corporation 6500 model computer using the 6.5 version of the Statistical Package for the Social Sciences (Nie, et al., 1975). All of the computations were implemented at the Michigan State University Computer Laboratory.

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter contains the results of the analyses of the data. The results are presented under the following section headings:

1. Description of Information Sources
2. Association with Use of Sources
3. Relationship of Knowledge Items
4. Association between Knowledge and Sources
5. Knowledge and Source Correlations for Husbands and Wives
6. Testing of the Hypothesis
7. Association between Knowledge, Sources, and Contextual Variables
8. Summary of Findings

Description of Information Sources

The first topic of analysis was the sources of energy information utilized by respondents. The results indicate where respondents receive useful information about energy-related issues. The frequencies for each of the sources for husbands and wives are shown in Table 8.

Most frequently selected sources supplying "a great deal" of information were news broadcasts, newspapers, television specials, books or magazine articles, and commercials. Information from utility

TABLE 8.--Percent of Male and Female Respondents Reporting Where They Receive Useful Information about Energy Issues, May, 1976

	A Great Deal		Some		None	
	Percent Husbands	Percent Wives	Percent Husbands	Percent Wives	Percent Husbands	Percent Wives
News Broadcasts	50	51	48	48	2	.5
Newspapers	34	30	58	58	9	12
Books or Magazine Articles	18	20	59	59	23	22
Commercials	13	15	56	59	31	27
T.V. Specials	19	24	60	59	20	18
Husband or Wife	2	11	60	61	38	28
Children	1	3	27	34	71	63
Friends or Relatives	2	4	57	53	41	43
People at Work	8	5	60	36	32	59
Utility Companies	3	11	51	56	36	34
School or College	9	3	31	27	61	69

companies was also quite important. Interpersonal sources--husband or wife, children, friends and relatives, and people at work--were rated less important by respondents. Husbands gained less information from their wives than wives gained from their husbands.

Association with Use of Sources

The next exploratory question was what socioeconomic characteristics were associated with the use of particular sources of information. To gain the answer, each source was tabulated with the levels of each contextual variable for husbands and wives. Results for those reporting "a great deal" of information from the source are given in Tables 9 through 13.

There were no differences in the proportions responding across levels of the contextual variables for news broadcasts. While the differences do not satisfy the criterion chosen for statistical significance, $p < .05$, two interesting patterns occurred. A higher percentage of middle income husband respondents (57 percent) reported receiving information from news broadcasts than did lower (49 percent) and higher (45 percent) income groups for husbands. Also, a lower percentage of middle age respondents reported receiving information from news broadcasts than lower and higher age groups for both husbands and wives. Forty-four percent of the husbands and 43 percent of the wives received information from news broadcasts compared to 54 percent of the husbands and 56 percent of the wives under 35 years and 57 percent of the husbands and wives 60 years or older. It may be that news programs are broadcast at times when middle aged groups do not watch them.

TABLE 9.--Percentage of Husband and Wife Respondents Reporting "A Great Deal" of Information from Various Sources by Educational Attainment, May, 1976

Source			Educational Attainment				x^2* df=6	gamma*	τ_c*
			<High School	High School	Some College	College Plus			
	Husband Wife	(N=237) (N=262)	(N=48) (N=48)	(N= 76) (N=110)	(N=50) (N=64)	(N=63) (N=40)			
News Broadcasts	Husband	(N=234)	57	51	52	42	5.699	-.1339	-.0777
	Wife	(N=261)	56	51	50	42	1.698	-.1147	-.0814
Newspapers	Husband	(N=232)	24	26	51	35	20.094***	.2613	.1618***
	Wife	(N=256)	26	26	36	35	9.496	.2162	.1294**
Books or Magazines	Husband	(N=231)	11	8	19	37	29.801***	.4278	.2772***
	Wife	(N=254)	7	16	25	35	33.363***	.4526	.2819***
Commercials	Husband	(N=223)	21	21	7	3	19.825**	-.1983	-.1154**
	Wife	(N=249)	16	17	15	5	10.149	-.0366	-.0222
T.V. Specials	Husband	(N=229)	21	20	21	16	4.104	-.0895	-.0556
	Wife	(N=251)	22	27	22	20	3.749	.0059	.0036
Husband or Wife	Husband	(N=223)	5	1	2	2	6.869	.1962	.1094
	Wife	(N=248)	12	10	8	18	16.717**	.2628	.1542**
Utility Companies	Husband	(N=228)	14	15	17	6	18.109**	.1819	.1215**
	Wife	(N=249)	9	14	10	3	10.177	.0803	.0481

*Based on independent tabulations of husbands' and wives' responses for three categories of sources ("a great deal," "some," and "none") with educational attainment levels.

**p < .01

***p < .001

TABLE 10.--Percentage of Husband and Wife Respondents Reporting "A Great Deal" of Information from Various Sources by Family Income, May, 1976.

Source			Family Income			x^{2*} df=4	gamma*	τ_b*
			Low	Middle	High			
	Husband	(N=237)	(N=62)	(N=77)	(N=86)			
	Wife	(N=262)	(N=81)	(N=78)	(N=89)			
News Broadcasts	Husband	(N=222)	49	57	45	5.674	-.0910	-.0535
	Wife	(N=247)	59	44	49	3.741	-.1260	-.0732
Newspapers	Husband	(N=220)	25	37	38	7.741	.2152	.1305
	Wife	(N=242)	27	17	40	18.484****	.2980	.1842****
Books or Magazines	Husband	(N=219)	17	9	30	13.306***	.2656	.1649***
	Wife	(N=240)	17	16	27	7.335	.2195	.1364***
Commercials	Husband	(N=212)	21	12	7	7.903	-.1917	-.1189
	Wife	(N=239)	18	14	12	2.365	-.0540	-.0330
T.V. Specials	Husband	(N=217)	29	18	13	12.289***	-.0350	-.0217
	Wife	(N=239)	23	27	21	1.264	-.0230	-.0141
Husband or Wife	Husband	(N=211)	2	3	1	.574	-.0032	-.0018
	Wife	(N=238)	11	16	7	10.111**	.1260	.0769
Utility Companies	Husband	(N=216)	14	16	10	1.922	.0013	.0008
	Wife	(N=239)	13	15	4	13.012***	.0739	.0460

*Based on independent tabulations of husbands' and wives' responses for three categories of sources ("a great deal," "some," and "none") with family income levels.

**p < .05

***p < .01

****p < .001

TABLE 11.--Percentage of Husband and Wife Respondents Reporting "A Great Deal" of Information from Various Sources by Age, May, 1976

Source			Age 18-34 (N= 93) (N=110)	Age 35-59 (N= 98) (N=110)	Age 60 (N=43) (N=37)	x^{2*} df=4	gamma*	τ_b*
News Broadcasts	Husband	(N=231)	54	44	57	6.123	-.0475	-.0274
	Wife	(N=256)	56	43	57	4.538	-.0969	-.0542
Newspapers	Husband	(N=229)	31	37	32	5.699	.0421	.0247
	Wife	(N=251)	21	36	39	14.027**	.3402	.1997***
Books or Magazines	Husband	(N=228)	18	18	21	.504	-.0054	-.0032
	Wife	(N=249)	19	22	17	2.377	.0891	.0525
Commercials	Husband	(N=220)	15	11	14	5.702	-.2014	-.1225
	Wife	(N=244)	17	13	13	1.933	-.1274	-.0749
T.V. Specials	Husband	(N=226)	24	14	21	7.040	-.1512	-.0912
	Wife	(N=246)	26	22	21	1.486	-.0893	-.0526
Husband or Wife	Husband	(N=220)	2	2	0	6.581	-.2769	-.1563**
	Wife	(N=243)	13	9	7	1.684	-.0675	.0383
Utility Companies	Husband	(N=225)	12	17	5	3.647	-.0303	-.0184
	Wife	(N=244)	12	11	6	6.619	.0889	.0526

*Based on independent tabulations of husbands' and wives' responses for three categories of sources ("a great deal," "some," and "none") with age levels.

**$p < .01$

***$p < .001$

TABLE 12.--Percentage of Husband and Wife Respondents Reporting "A Great Deal" of Information from Various Sources by Occupational Status, May, 1976

Source			Occupational Status			x^{2*} df=4	gamma*	τ_b*
			Low	Middle	High			
	Husband Wife	(N=237) (N=262)	(N=77) (N=56)	(N=73) (N=57)	(N=85) (N=78)			
News Broadcasts	Husband	(N=234)	55	47	49	2.781	-.0684	-.0403
	Wife	(N=198)	49	46	54	.916	.0716	.0413
Newspapers	Husband	(N=232)	27	32	39	8.247	.2346	.1424***
	Wife	(N=196)	15	34	41	13.311***	.3640	.2239****
Books or Magazines	Husband	(N=231)	12	10	32	19.715****	.3674	.2296****
	Wife	(N=193)	10	20	29	10.942**	.3380	.2085****
Commercials	Husband	(N=223)	18	10	11	2.743	-.0394	-.0245
	Wife	(N=190)	20	14	8	4.952	-.0552	-.0336
T.V. Specials	Husband	(N=229)	23	21	14	2.758	-.0592	-.0363
	Wife	(N=191)	27	29	20	2.454	-.0538	-.0324
Husband or Wife	Husband	(N=223)	3	3	1	4.320	.1660	.0966
	Wife	(N=190)	12	13	5	4.546	.0149	.0089
Utility Companies	Husband	(N=228)	14	17	8	6.495	.0322	.0204
	Wife	(N=190)	16	9	8	4.640	-.0398	-.0244

*Based on independent tabulations of husbands' and wives' responses for three categories of sources ("a great deal," "some," and "none") with occupational status levels.

**p < .05

***p < .01

****p < .001

TABLE 13.--Percentage of Husband and Wife Respondents Reporting "A Great Deal" of Information from Various Sources by Place of Residence, May, 1976

			Place of Residence			
		Total	Urban	Rural	x^{2*} df=2	gamma*
	Husband	(N=237)	(N=150)	(N=87)		
	Wife	(N=262)	(N=169)	(N=93)		
News Broadcasts	Husband	(N=234)	51	48	1.299	-.0727
	Wife	(N=261)	49	54	.593	.1162
Newspapers	Husband	(N=232)	36	29	3.232	-.1954
	Wife	(N=256)	33	23	12.503**	-.3333
Books or Magazines	Husband	(N=231)	19	18	.322	-.0619
	Wife	(N-254)	23	14	3.708	-.2123
Commercials	Husband	(N=223)	12	15	.369	.0461
	Wife	(N=249)	12	20	4.061	.0392
T.V. Specials	Husband	(N=229)	18	22	.542	.0557
	Wife	(N=257)	20	30	3.142	.1434
Husband or Wife	Husband	(N=229)	3	1	1.405	-.1463
	Wife	(N=248)	9	15	4.045	-.0038
Utility Companies	Husband	(N=228)	12	15	3.997	-.1289
	Wife	(N=249)	12	7	5.247	-.2729

*Based on independent tabulations of husbands' and wives' responses for three categories of sources ("a great deal," "some," and "none") with place of residence.

**$p < .01$

Newspapers showed significant differences for several of the contextual variables. Newspapers had a positive association with wives' income, occupational status, and age. In other words, the higher the family income, the higher the wife's occupational status and the older the woman, the more she received information from newspapers.

Occupational status was also positively associated with the husbands' use of newspapers, as it was for the wives. Educational attainment and urban residency were also found to be related to the husbands' use of newspapers.

Books and magazine articles were positively associated with the schooling and occupational status of both husbands and wives. Family income was also related to the husbands' readership of books and magazine articles.

These findings are not totally surprising. Higher income families probably have the discretionary income to purchase newspapers. Those persons who have a high occupational status probably have more decision-making responsibilities. They may read more to keep informed and updated on current developments; such information may not be as critical to lower occupational status groups. Higher educational attainment probably correlates with a higher level of reading skills and a more positive attitude toward using print media. Newspapers may be more accessible to urban residents than to rural people. Older wives may have read more in their youths for entertainment as well as for information before television became so popular; thus, they may not use the broadcast media as much as younger people.

Commercials as information sources were negatively associated with husbands' educational attainment. Husbands with a high school degree or less used this source more than more highly educated husbands. Commericals were not related to any of the wives' socioeconomic characteristics.

The husbands' responses to television specials were negatively related to family income. The lower the family income, the more husbands used television specials as a source of energy information. Since television sets are owned in almost all homes and print media were found not to be used by husbands with lower family incomes, men with lower family incomes and educational levels may watch more television and thus almost inadvertently gain energy-related information.

Wives with lower family incomes and those with higher educations were significantly associated with receiving more information from their husbands. The only husbands' response associated with receiving information from their wives was age, i.e., men under 35 reported their wives as an information source on energy issues more than older husbands.

Utility companies were associated with different variables for husbands and wives. A negative relationship was found between energy-related information for husbands' educational attainment and for wives' family income. Lower educated husbands and wives whose family income was lower were differentiated as receiving less information from utility companies than did husbands with more education and wives from higher income families.

Relationship of Knowledge Items

To determine if there was any relationship between the ten knowledge items, they were correlated using the Kendall rank-order correlation coefficient for reasons discussed in Chapter III. Specific item clusters were sought. Where found, items within the clusters could be combined to reduce the number of knowledge items. Conceptually, the items seemed to be related to household energy use. Results for the husbands are shown in Table B-1 and for wives in Table B-2 in Appendix B.

These data show none of the knowledge items are significantly related to any other item. The highest correlations were .273 for the husbands' responses and .201 for the wives' responses. These correlations were less than .3, which was considered to be the size needed to discount the effects or random error. The data revealed no clusters of knowledge items. Therefore, each of the knowledge items was treated separately in subsequent analyses.

Even though there was no relationship between any of the knowledge items, those with $p < .01$ were ranked for the husbands and wives, as shown in Tables 14 and 15. This was done in the interest of discovering the relative position of related items for both the husbands and wives.

The results of this ranking showed the first two items at the top of the wives' list appeared near the bottom of the husbands' list. The highest correlation for the wives were the concepts of beef being a highly energy intensive protein source and that multiunit housing

TABLE 14.--Ranking of Kendall Rank-Order Correlation Coefficients for Husbands' Responses to Knowledge Items, May, 1976

Rank	Knowledge Items	τ	Wives' Rank
1	(5) Protein requiring most energy to produce: beef and (9) Amount imported oil: more than '73-74	.2734	
2	(8) Housing type least energy: apartment and (10) Fuel shortest supply: natural gas	.1785	3
3	(5) Protein requiring most energy to produce: beef and (10) Fuel shortest supply: natural gas	.1634	
4	(9) Amount imported oil: more than '73-74 and (10) Fuel shortest supply: natural gas	.1625	9
5	(1) Requires most energy for families: transportation and (8) Housing type least energy: apartment	.1601	
6	(2) Uses most household energy: hot water heater and (6) Cooking method least energy: microwave	.1556	8
7	(4) Most heat lost: ceiling and (5) Protein requiring most energy to produce: beef	.1513	5
8	(4) Most heat lost: ceiling and (8) Housing type least energy: apartment	.1389	
9	(4) Most heat lost: ceiling and (9) Amount imported oil: more than '73-74	.1257	
10	(7) Cross country travel least energy: bus and (10) Fuel shortest supply: natural gas	.1195	
11	(2) Uses most household energy: hot water heater and (4) Most heat lost: ceiling	.1082	2
12	(5) Protein requiring most energy to produce: beef and (8) Housing type least energy: apartment	.1066	1
13	(4) Most heat lost: ceiling and (7) Cross country travel least energy: bus	.1022	

TABLE 15.--Ranking of Kendall Rank-Order Correlation Coefficients for Wives' Responses to Knowledge Items, May, 1976

Rank	Knowledge Items	τ	Husbands' Rank
1	(5) Protein requiring most energy to produce: beef and (8) Housing type least energy: apartment	.2005	12
2	(2) Uses most household energy: hot water heater and (4) Most heat lost: ceiling	.1711	11
3	(8) Housing type least energy: apartment and (10) Fuel shortest supply: natural gas	.1622	2
4	(4) Most heat lost: ceiling and (10) Fuel shortest supply: natural gas	.1416	
5	(4) Most heat lost: ceiling and (5) Protein requiring most energy to produce: beef	.1371	7
6	(8) Housing type least energy: apartment and (9) Amount imported oil: more than '73-74	.1277	
7	(4) Most heat lost: ceiling and (6) Cooking method least energy: microwave	.1238	
8	(2) Uses most household energy: hot water heater and (6) Cooking method least energy: microwave	.1236	6
9	(9) Amount imported oil: more than '73-74 and (10) Fuel shortest supply: natural gas	.1129	4
10	(1) Requires most energy for families: transportation and (10) Fuel shortest supply: natural gas	.1046	
11	(5) Protein requiring most energy to produce: beef and (6) Cooking method least energy: microwave	.1021	
12	(2) Uses most household energy: hot water heater and (5) Protein requiring most energy to produce: beef	.1005	
13	(7) Cross country travel least energy: bus and (8) Housing type least energy: apartment	.0995	

requires less energy (τ=.201). The wives' second highest correlation related to the hot water heater being a large energy user in the household and that the most heat is lost through the ceiling (τ=.171). On the husbands' scale, these concepts ranked twelfth and eleventh, respectively.

One correlation had a similar ranking for husbands and wives. The second highest association for the husbands' and the wives' third highest was between the concepts of multiunit housing requiring less energy and natural gas being the fuel in shortest supply.

It is also important to note those items which were not present or appeared less frequently in these rankings. No item was correlated with the concept in Item 3, that throwaway aluminum beverage containers waste more energy than other containers. For husbands and wives, Item 1 appears in each list once; the concept involved in Item 1 is that, in general, family transportation requires more direct energy than heating and cooling. Item 7 is the wives' ranking once and is in the husbands' ranking twice. Low levels of awareness were reported for these same three items, with less than 28 percent of the total sample answering them accurately (Morrison, et al., 1976).

Association Between Knowledge and Sources

To identify the association between the ten knowledge items and the eleven sources of energy information, two statistics were computed: a Kendall rank-order correlation coefficient and chi-square.

Results of the Kendall tau test are shown in Tables B-3 and B-4 in Appendix B. Positive and negative correlations were found for both husbands and wives. Positive correlations inferred a positive

association, or the more information received from the source, the more likely the knowledge item was answered correctly. Negative correlations were interpreted as the more information received from the source, the less the knowledge item was answered correctly. However, because these data were analyzed in an indirect manner, the possibility exists that a source does not supply the information negatively associated with it.

For the wives, the highest positive correlation was .190 and the highest negative correlation was -.161. The rank-order correlations for the husbands ranged from -.134 to .202. None of these correlations were above .3 or below -.3, which were considered the size necessary to discredit the influence of random error.

The Kendall rank-order correlation coefficients for knowledge items and sources with a $p < .01$ were ranked for husbands' and wives' responses. The intent was to examine any differences between sources of energy information for similar knowledge questions.

Results of the ranking for husbands are shown in Table 16. Husbands were positively associated with correct information from a variety of sources on energy-related topics. Books and magazine articles were associated with the most correct information about three concepts: more oil was being imported in 1976 than in 1973-74, natural gas is the fuel in shortest supply, and beef is the most energy intensive protein source. For husbands these same three concepts were also associated with receiving the most correct information from schools or colleges. Husbands were related to correct information from news broadcasts and commercials regarding the concept that throwaway

TABLE 16.--Ranking of Positive and Negative Kendall Rank-Order Coefficients for Knowledge Items and Sources of Energy Information by Husbands' Responses, May, 1976 ($p < .01$)

Source and Knowledge Item	τ
Newspapers and (8) Housing type least energy: apartment	.202
Books or magazine articles and (9) Amount imported oil: more than '73-'74	.194
School or college and (9) Amount imported oil: more than '73-'74	.192
Books or magazine articles and (10) Fuel shortest supply: natural gas	.152
News broadcasts and (3) Beverage container wastes most energy: throwaway aluminum cans	.137
Friends or relatives and (1) Requires most energy for families: transportation	.124
Commercials and (3) Beverage container wastes most energy: throwaway aluminum cans	.119
School or college and (5) Protein requiring most energy to produce: beef	.115
Wife and (9) Amount imported oil: more than '73-'74	.114
School or college and (10) Fuel shortest supply: natural gas	.112
T.V. specials and (6) Cooking method least energy: microwave	.105
Books or magazine articles and (5) Protein requiring most energy to produce: beef	.103
T.V. specials and (8) Housing type least energy: apartment	-.104
News broadcasts and (8) Housing type least energy: apartment	-.107
News broadcasts and (1) Requires most energy for families: transportation	-.123
Friends or relatives and (8) Housing type least energy: apartment	-.125
Commercials and (1) Requires most energy for families: transportation	-.134

aluminum cans are highly energy intensive beverage containers. For the husbands, relatives, wives, and television specials were associated with the most correct answers to different knowledge questions, as can be seen in Table 16.

Husbands were associated with incorrect information from several sources on two concepts. Television specials, news broadcasts, and friends or relatives were three sources associated with incorrect information husbands had on the fact that apartments require less energy than other housing types. Among the husbands, news broadcasts and commercials were associated with incorrect information on the concept that automobile transportation requires more energy for families than heating and cooling. This suggests that the emphasis on energy conservation in single-family dwellings disguises the facts that apartments consume less energy and automobile transportation uses more energy than space heating and cooling for most families.

Significant wives' Kendall rank-order correlation coefficients between knowledge items and sources are presented in Table 17. Among the wives, books and magazines were associated with correct information on five concepts: beef is the most energy intensive protein source, apartments require less energy than other housing types, more oil was being imported in 1976 than in 1973-74, natural gas is the fuel in shortest supply, and the most heat is lost through the ceiling. Newspapers were related with the wives' correct response to apartments requiring less energy than other housing types. Wives reporting they receive information from their husbands were associated with correctly answering that beef is the most energy intensive protein source.

TABLE 17.--Ranking of Positive and Negative Kendall Rank-Order Coefficients for Knowledge Items and Sources of Energy Information by Wives' Responses, May, 1976 ($p < .01$)

Source and Knowledge Item	τ
Newspapers and (8) Housing type least energy: apartment	.187
Husband and (5) Protein requiring most energy to produce: beef	.183
Books or magazine articles and (5) Protein requiring most energy to produce: beef	.139
Books or magazine articles and (8) Housing type least energy: apartment	.129
Books or magazine articles and (9) Amount imported oil: more than '73-'74	.123
Books or magazine articles and (10) Fuel shortest supply: natural gas	.110
Books or magazine articles and (4) Most heat lost: ceiling	.101
Commercials and (9) Amount imported oil: more than '73-'74	-.125
People at work and (5) Protein requiring most energy to produce: beef	
People at work and (8) Housing type least energy: apartment	-.129
Books or magazine articles and (3) Beverage container wastes most energy: throwaway aluminum cans	-.133
Newspapers and (1) Requires most energy for families: transportation	-.142
Husband and (3) Beverage container wastes most energy: throwaway aluminum cans	-.143
News broadcasts and (1) Requires most energy for families: transportation	-.154
Commercials and (5) Protein requiring most energy to produce: beef	-.161

Lack of accurate information was also found to be related to wives' responses as to their information source and the most correct answer on several knowledge items. Commercials were associated with incorrect information on the fact that more oil was being imported in 1976 than in 1973-74 and that beef is the most energy intensive protein source. People at work were related to incorrect messages on the concept that beef is more energy intensive than other protein sources and that apartments use more energy than other housing types. Newspapers and news broadcasts were associated with incorrect information for wives on the question regarding automobile transportation requiring more energy than heating and cooling. Books or magazine articles and her husband were two sources related to incorrect information for wives on the concept that throwaway aluminum cans are the most energy intensive beverage containers.

The possibility exists that some of these sources do not supply the information contained in a knowledge question. For instance, people at work are second-hand sources; if they have some information, they usually receive it from another source. Because of the indirect manner in which these data are being analyzed, there was no method to test for such an occurrence. If respondents had been directly asked to give their information source for each knowledge item, primary and secondary sources could have been determined.

Most associations between knowledge items and sources for husbands and wives were different. Those that were the same for both sexes were receiving information from newspapers and knowing that

apartments use less energy than other types of housing (positive association); receiving information from books and magazines and knowing that more oil was being imported in 1976 than in 1973-74 (positive association); and receiving information from news broadcasts and answering that automobile transportation requires the most energy for most families (negative association). In general, husbands and wives get their information from different sources.

In summary, both husbands and wives were positively associated with correct information from books and magazine articles and newspapers. Husbands were related to some accurate information from schools or colleges. The concept of beef being a highly energy intensive protein source was associated with the husband as a source of this concept for the wives, but none of the knowledge items were associated with the wives for the husbands. Other sources supplied some correct and incorrect information, depending on the concept involved.

The chi-square test was also performed between the sources of energy information and the knowledge questions. Results for these associations with a $p < .05$ are presented in Tables 18 and 19. The gamma statistics signify the direction of the relationship, positive or negative.

The results of the chi-square test are somewhat different than the Kendall rank-order correlation test. Five out of the eight wives' associations and three out of ten husbands' associations for the chi-square were also significant Kendall tau's.

The chi-square analysis produced an interesting difference between husbands and wives. Husbands' sources were all mass media:

TABLE 18.--Chi-Square and Gamma for Knowledge Items and Sources of Energy Information by Husbands' Responses, May, 1976

Source and Knowledge Item	N	x^2	df	p	gamma
Utility companies and (1) Requires most energy for families: transportation	228	7.735	2	.021	-.2149
News braodcasts and (3) Beverage container wastes most energy: throwaway aluminum	227	6.031	2	.049	.3499
Newspapers and (3) Beverage container wastes most energy: throwaway aluminum	225	9.357	2	.009	.4148
Utility Companies and (4) Most heat lost: ceiling	226	6.254	2	.044	-.0255
Newspapers and (5) Protein requiring most energy to produce: beef	230	8.632	2	.013	.1163
Newspapers and (7) Cross country travel least energy: bus	231	10.729	2	.005	.0225
T.V. specials and (7) Cross country travel least energy: bus	228	6.758	2	.034	.0860
Books or magazine articles and (9) Amount imported oil: more than '73-'74	226	13.132	2	.001	.3732
Books or magazine articles and (1) Fuel shortest supply: natural gas	231	6.618	2	.037	.3005
School or college and (9) Amount imported oil: more than '73-'74	216	7.243	2	.027	.3308

TABLE 19.--Chi-Square and Gamma for Knowledge Items and Sources of Energy Information by Wives' Responses, May, 1976

Source and Knowledge Item	N	x^2	df	p	gamma
Newspapers and (1) Requires most energy for families: transportation	250	7.002	2	.030	-.3778
Utility companies and (4) Most heat lost: ceiling	244	8.335	2	.015	-.0190
Commercials and (5) Protein requiring most energy to produce: beef	243	13.39	2	.001	.3750
Newspapers and (8) Housing type least energy: apartment	253	14.988	2	.001	.3758
Books or magazine articles and (9) Amount imported oil: more than '73-74	239	10.204	2	.006	.3392
Friends or Relatives and (3) Beverage container wastes most energy: throwaway aluminum	236	6.037	2	.049	-.3607
Husband and (5) Protein requiring most energy to produce: beef	243	8.988	2	.011	.3469
People at work and (6) Cooking method least energy: microwave	242	8.534	2	.014	.0329

news broadcasts, newspapers, books or magazine articles, television specials, and also utility companies and schools or colleges. Wives' associations with knowledge were from mass media sources--newspapers, books and magazine articles, commercials and utility companies; they also were related to some more personal sources: their husband, friends or relatives, and people at work. Interpersonal sources of energy information were more important to wives than to husbands.

Knowledge and Source Correlations for Husbands and Wives

Previous analyses have demonstrated no significant associations, i.e., greater than .3 or less than -.3, for either the husbands' or wives' responses to the knowledge items and sources of energy information. The next logical question was whether there was a relationship between husbands' and wives' on the same items. Kendall rank-order correlation coefficient tests were performed on the husbands to each knowledge item by the wives' and the same way for the sources of energy information. Results of both tests are shown in Appendix B, Tables B-5 and B-6.

Some significant associations (greater than .3) were found as a result of these Kendall rank-order correlation tests. The following three concepts showed significant associations between husbands and wives for the same item: microwave cooking is energy efficient for small amounts of food (τ=.357), natural gas is the fuel in shortest supply (τ=.356), and more oil was imported in 1976 than in 1973-74 (τ=.305). The Kendall rank-order correlation coefficients for the other seven knowledge items and their relative ranks are presented in Table 20.

TABLE 20.--Kendall Rank-Order Correlation Coefficients for Each Knowledge Item Between Husbands' and Wives' Responses, May 1976 ($p < .001$)

	Knowledge Item		Rank
(1)	Requires most energy for families: transportation	.238	6
(2)	Uses most household energy: hot water heater	.230	7
(3)	Beverage container wastes most energy: throwaway aluminum cans	.190	8
(4)	Most heat lost: ceiling	.175	9
(5)	Protein requiring most energy to produce: beef	.251	4
(6)	Cooking method least energy: microwave	.357	1
(7)	Cross country travel least energy: bus	.168	10
(8)	Housing type least energy: apartment	.239	5
(9)	Amount imported oil: more than '73-'74	.305	3
(10)	Fuel shortest supply: natural gas	.356	2

Three information sources were found to have associations between the husbands and wives for the same source: newspapers (τ=.335), chilren (τ=.333), and commercials (τ=.303). The Kendall rank-order correlation coefficients for the other eight sources and their relative ranks are shown in Table 21. People at work had a negative and insignificant association between the two spouses (τ=-.008).

TABLE 21.--Kendall Rank-Order Correlation Coefficients for Each Source of Energy Information Between Husbands' and Wives' Responses, May, 1976

Source		Rank
News broadcasts	.207**	8
Newspapers	.335**	1
Books or magazine articles	.262**	5
Commercials	.303**	3
T.V. Specials	.269**	4
Husband or wife	.137*	10
Children	.333**	2
Friends or relatives	.185**	9
People at work	-.008	11
Utility Companies	.218**	7
School or College	.240**	6

*p < .01

**p < .001

Testing of the Hypothesis

Hypothesis: Knowledge about energy will be positively associated with educational attainment.

Percentages, chi-square, gamma, and Kendall rank-order correlation coefficients were found by tabulating each knowledge item with educational attainment. Results are presented in Table 22.

The findings indicated four concepts were significantly and positvely associated with husbands' educational attainment. They were beef is a highly energy intensive protein source, multiunit housing uses less energy than other types, more oil was imported in 1976 than in 1973-74, and natural gas is the fuel in shortest supply.

The Kendall rank-order correlation coefficients for knowledge and sources (Table 16) showed these four items were highly associated with newspapers, books and magazine articles, and schools or colleges. Therefore, it can be interpreted that the higher their educational attainment, the more husbands receive correct information about energy-related issues from newspapers, books and magazine articles, and schools and colleges.

Wives' educational attainment was associated with knowledge about three concepts; beef is a highly energy intensive protein source, multiunit housing uses less energy than other types, and more oil was imported in 1976 than in 1973-74.

The Kendall rank-order coefficients for wives' knowledge and sources showed these knowledge items were associated with newspapers, her husband, and books and magazine articles.

TABLE 22.--Percentage of Husband and Wife Respondents Correctly Answering Ten Knowledge Items by Educational Attainment, May, 1976

Knowledge Item			Educational Attainment						
			≤High School	High School	Some College	College Plus	x^{2*}		
	Husband	(N=237)	(N=48)	(N= 76)	(N=50)	(N=63)	df=3	gamma*	c*
	Wife	(N=262)	(N=48)	(N=110)	(N=64)	(N=40)			
1. Requires most energy for families: transportation	Husband	(N=236)	31	29	32	30	.117	-.001	-.001
	Wife	(N=256)	15	17	20	19	.519	.081	.034
2. Uses most household energy: hot water heater	Husband	(N=234)	63	65	62	60	.290	-.039	-.027
	Wife	(N=256)	54	51	50	51	.242	-.029	-.021
3. Beverage container wastes most energy: throwaway aluminum	Husband	(N=230)	18	24	21	31	6.413	.239	.136
	Wife	(N=250)	29	22	17	21	2.282	-.139	-.067
4. Most heat lost: ceiling	Husband	(N=233)	75	71	82	84	4.078	.201	.104
	Wife	(N=257)	53	63	75	71	6.199	.234	-.150
5. Protein requiring most energy to produce: beef	Husband	(N=235)	66	62	72	95	21.729****	.430	.255****
	Wife	(N=256)	57	70	70	87	9.165**	.278	.165**
6. Cooking method least energy: microwave oven	Husband	(N=234)	71	68	74	56	4.924	-.150	-.099
	Wife	(N=259)	57	60	63	54	.915	0	0

TABLE 22.--Continued.

Knowledge Items			Educational Attainment: ≤High School	High School	Some College	College Plus	x^{2*} df=3	gamma*	c*
			(N=48)	(N= 76)	(N=50)	(N=63)			
	Husband	(N=237)	(N=48)	(N=110)	(N=64)	(N=40)			
	Wife	(N=262)							
7. Cross country travel least energy: bus	Husband	(N=237)	29	22	28	27	.900	.008	.004
	Wife	(N=256)	35	28	25	33	1.627	-.044	-.026
8. Housing type least energy: apartment	Husband	(N=236)	48	54	68	82	17.783****	.409	.290****
	Wife	(N=259)	38	53	67	82	20.025****	.428	.299****
9. Amount imported oil: more than '73-'74	Husband	(N=231)	40	30	47	65	16.527****	.317	.239****
	Wife	(N=245)	29	40	37	58	7.603**	.214	.148***
10. Fuel shortest supply: natural gas	Husband	(N=237)	29	34	36	70	25.655****	.418	.315****
	Wife	(N=247)	38	47	42	54	2.516	.099	.069

*Based on independent tabulation of husbands' and wives' responses for correct and incorrect answers to knowledge items with educational attainment levels.

**p < .05
***p < .01
****p < .001

In general, knowledge was not found to be associated with educational attainment for a majority of the concepts. Knowledge was associated with only certain concepts and educational attainment, however. The hypothesis was not supported.

Association Between Knowledge, Sources and Contextual Variables

Significant associations were found between some information sources and socioeconomic characteristics for husbands and wives (Table 9 through 13). Some significant associations were also found between the knowledge items and sources of energy information (Tables 16 and 17). Having observed an empirical relationship between two variables, a third variable can be introduced to understand the nature of the relationship (Babbie, 1973:286).

Results of significant associations between knowledge and sources controlling for a socioeconomic variable for the husbands are shown in Table 23. Rural husbands but not urban husbands exhibited a significant correlation between the husbands receiving information from newspapers and throwaway aluminum beverage containers being highly energy intensive. Books and magazines were positively associated with the information that the United States was importing more oil in 1976 than in 1973-74 for husbands with middle and high family incomes and low occupational status. Books and magazines were positively related to information that natural gas is the fuel in shortest supply for husbands with high family incomes.

Results for the wives' three-way test of association are shown in Table 24. Middle-aged wives who reported receiving useful

TABLE 23.--Chi-Square, Gamma, and Kendall Rank-Order Correlation Coefficient for Knowledge Items and Sources of Energy Information Controlling for Selected Characteristics by Husbands' Responses, May 1976 ($p < .05$)

Source and Knowledge Item	Controlling for	x^2	gamma	τ_c
Newspapers and (3) Beverage container wastes most energy: throwaway aluminum	Rural Residence	9.114	.729	.236
Books and magazine articles and (9) Amount imported oil: more than '73-'74	Middle Family Income	10.948	.768	.349
Books and magazine articles and (9) Amount imported oil: more than '73-'74	High Family Income	5.777	.429	.249
Books and magazine articles and (9) Amount imported oil: more than '73-'74	Low Occupational Status	6.813	.512	.291
Books and magazine articles and (10) Fuel shortest supply: natural gas	High Family Income	7.067	.487	.298

TABLE 24.--Chi-Square, Gamma, and Kendall Rank-Order Correlation Coefficient for Knowledge Items and Sources of Energy Information Controlling for Selected Characteristics by Wives' Responses, May, 1976 ($p < .05$)

Source and Knowledge Item	Controlling for	x^2	gamma	τ_c
Newspapers and (1) Requires most family energy: transportation	Middle Age	6.182	-.528	-.173
Newspapers and (8) Housing type least energy: apartment	Low Family Income	8.747	.549	.339
Newspapers and (8) Housing type least energy: apartment	Low Age	10.968	.537	.301
Newspapers and (8) Housing type least energy: apartment	Middle Age	5.904	.300	.171
Books or magazine articles and (9) Amount imported oil: more than '73-74	High Occupational Status	12.387	.679	.408
Husband and (5) Protein requiring most energy to produce: beef	Some College Education	10.222	.648	.319

energy information from newspapers were associated with the incorrect information that heating and cooling requires the most energy for most families. Young and middle-aged wives and wives with low family incomes were differentiated groups exhibiting a significant relationship between newspapers and the concept that apartments require less energy than other types of housing. For wives with high occupational status, books and magazines were related to the information that more oil was being imported in 1976 than in 1973-74. For wives having some college education, their husbands as an interpersonal source were associated with the knowledge the beef is an energy intensive source of protein.

Summary of Findings

There were no differences in the proportion responding to news broadcasts across the levels of the contextual variables--educational attainment, family income, age, place of residence, and occupational status. Husbands showed some positive associations between newspapers, books and magazine articles and some levels of each contextual variable. Commercials, television specials, and utility companies were associated with incorrect information and lower levels of family income and educational attainment groups.

The data revealed no clusters of knowledge items for husbands or wives. No highly significant rank-order correlations were found between knowledge items and sources. However, low positive associations were found for both husbands and wives with books and magazine articles and newspapers. Husbands were related to some accurate

information from schools or colleges. The concept of beef being a highly energy intensive protein source was associated with the husbands as a source of this concept for the wives, but none of the knowledge items were associated with the wives as a source for the husbands.

The chi-square analysis revealed differences between husbands and wives. Husbands' sources were all mass media: news broadcasts, newspapers, books or magazine articles, television specials, and also utility companies and schools or colleges. Wives' associations were from mass media sources as well as some interpersonal sources: their husband, friends or relatives, and people at work.

Several significant rank-order correlations between husbands' and wives' to the same items were found. The knowledge items found to be highly associated between sexes were microwave cooking is energy efficient for small amounts of food, natural gas is the fuel in shortest supply, and more oil was being imported in 1976 than in 1973-74. Three information sources were found to have associations between husbands and wives: newspapers, children, and commercials.

In general, knowledge was not found to be associated with educational attainment for a majority of the concepts. Knowledge was associated with only certain concepts and educational attainment. Husbands' and wives' educational attainment was associated with three concepts: beef is a highly energy intensive protein source, more oil was imported in 1976 than in 1973-74, and natural gas is the fuel in shortest supply. Husbands' educational attainment was also

associated with the idea that multiunit housing uses less energy than other types.

Some significant associations were found between knowledge and sources controlling for a socioeconomic factor. Rural husbands, but not urban husbands, exhibited a significant correlation between receiving energy information from newspapers and the concept that throwaway aluminum beverage containers are highly energy intensive. For husbands, books and magazines were positively associated with the information that the United States was importing more oil in 1976 than in 1973-74; when disaggregated, only those husbands with middle and high family incomes and low occupational status exhibited a positive correlation. For husbands with high family incomes, books and magazines were positively related to the information that natural gas is the fuel in shortest supply.

Results of the wives' three-way test of association showed some significant relationships. Middle-aged wives who reported receiving useful energy information from newspapers were associated with the incorrect information that heating and cooling require the most energy for families. For wives, newspapers were positively associated with the information that apartments require less energy than other types of housing; when controlling for the contextual variables, those differentiated were wives with low family incomes and younger and middle-ages wives. For wives with high occupational status, books and magazines were related to the information that more oil was being imported in 1976 than in 1973-74. For wives having

some college education, their husbands as an interpersonal source were associated with the knowledge that beef is an energy intensive source of protein.

CHAPTER V

CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS

Conclusions

This research has examined the relationship between information sources on energy-related issues and the present knowledge level of selected households. It has also tried to identify distinguishable subgroups in the population which varied as to the amount of energy awareness and in their use of sources of energy information.

Before proceeding to analyze the research questions, descriptive information about the independent and dependent variables was sought. Results indicated the following conclusions.

Variety of Sources Used: Different sources were found to be perceived by respondents as conveying useful information about energy. Most used were the broadcast media (news broadcasts, commercials, and television specials) and print media (newspapers, books and magazine articles). Utility companies were also quite important. Fewer used interpersonal sources--husband or wife, children, friends or relatives, and people at work. Husbands reported they gained less information from their wives than wives reported they gained from their husbands. This finding may be indicative of traditional sex role patterns.

No Knowledge Item Clusters: Knowledge item clusters were not found. Each knowledge item was independent of the rest for both

husbands and wives, even though some seemed to be conceptually related a priori. This finding agrees with that of Long (1977). One possible explanation is that energy information is a series of facts; it is not highly integrated to the conceptual level that would permit generalization in the thinking processes of respondents. Energy concepts are at the point where they are important only when their indirect usage more directly effects lifestyle activities.

The following conclusions have been drawn about the proposed research objectives and hypothesis based on resultant findings.

Objective 1: To determine if there is any relationship between knowledge and sources of energy information.

The importance of different sources of energy information varied with distinct kinds of knowledge concepts. The analysis revealed both positive and negative correlations between correct information and some sources: commercials, newspapers, television specials, and news broadcasts. While these sources may present many sides to the issues, some recipients are still misinformed. Books or magazine articles and schools or colleges were associated with accurate information on most concepts. These sources may present more factual, objective information.

Objective 2: To determine if there is any relationship among knowledge, sources of energy information, and family income levels.

Family income differentiated different sources and knowledge for husbands and wives. For husbands from middle and high income families, books and magazine articles were positively associated

with knowledge of the concept that more oil was being imported in 1976 than in 1973-74. Husbands from high income families also exhibited a strong relationship between information from books and magazines that natural gas is the fuel in shortest supply. On the other hand, wives from low income families exhibited a positive relationship between information from newspapers and the concept that apartments require less energy than other types of housing. These findings correspond with data presented in Table 10: as family income increased for husbands, their use of books and magazines increased. For wives, as family income increased, their use of newspapers increased significantly. Nevertheless, those wives from low income families that do read newspapers know that apartments require less energy than other types of housing.

Objective 3: To determine if there is any relationship among knowledge, sources of energy information, and age.

Age was a factor which explained some of the differentiation among wives, but not among husbands. Young and middle-aged wives were associated with reading newspapers and knowing the housing-related information that apartments require less energy than other types. Middle-aged wives who received information from newspapers were less likely than other age groups to know that automobile transportation requires the most energy for most families. The two-way association between newspapers and age showed a significant, positive association (Table 11). Young wives do not read newspapers as much as older wives: those that do know something about housing energy requirements.

Objective 4: To determine if there is any relationship among knowledge, sources of energy information, and rural or urban residence.

Place of residence discriminated one association among husbands and none among wives. Rural husbands who read newspapers were more likely to know that throwaway aluminum cans are energy intensive beverage containers. The percentage of rural husbands who read newspapers was lower than that of urban husbands (Table 13). For the rural husbands that do read newspapers, they know about the wastefulness of throwaway aluminum beverage containers.

Objective 5: To determine if there is any relationship among knowledge, sources of energy information, and occupational status.

Occupational status differentiated the same source and knowledge item for husbands and wives. Books and magazine articles were associated with the awareness that the amount of oil imported in 1976 was more than 1973-74. However, this source and knowledge item were associated with high occupational status for husbands and low occupational status for wives. Given the data in Table 12, husbands with high occupational status could be expected to show this association. However, wives with low occupational status do not read books and magazine articles as much as those with higher occupational status; those that do know something about the amount of oil the United States imports.

No consistent patterns were found in these three-way tests of association. Generalizations cannot be stated, but specific relationships do have implications for future research and educational programs.

The following hypothesis was predicted:

Hypothesis: Knowledge about energy-related concepts will be positively associated with educational attainment.

Results indicated that knowledge about energy was not associated with educational attainment for a majority of the concepts. Educational attainment was associated with three out of ten concepts for the wives and four out of ten concepts for the husbands. This agrees with the conclusions by Morrison, Keith, and Zuiches (1976) and Beane and Ross (1974) that formal education did not substantially differentiate the knowledge level of respondents. It contradicts the findings by Chandler (1972), Rogers (1971), Kilkeary (1975), and Thompson and Mactavish (1976). In analyzing the same data, Morrison, Keith, and Zuiches (1976) counted the number of correct responses to the same ten knowledge items. This research showed that when these items were disaggregated, some differentiation was revealed, but not the majority needed to make a generalization which supported the hypothesis.

One significant three-way association was found among knowledge, sources of energy information, and educational attainment. The percentage of wives with some college education reporting that they received energy information from their husbands was not very high (Table 9). However, for those that did, they knew that beef is an energy intensive source of protein.

Other Conclusions

Association with Use of Sources

Different sources were associated more or less with particular socioeconomic subgroups. Similarly, Wade and Schramm (1969) found different sources were used to gain information on public affairs. The proportion responding to news broadcasts did not vary across the levels of the contextual variables--educational attainment, family income, age, occupational status, and place of residence. Positive associations were found between newspapers and wives' family income, occupational status and age, and between husbands' educational attainment, occupational status, and urban residency. Books and magazine articles were positively associated with the schooling and occupational status of both husbands and wives, as well as husbands' family income. The importance of commercials were negatively associated with husbands' educational attainment. Television specials were negatively related to husbands' family income. Wives with lower family incomes and those with higher educations received more information from their husbands than did others. Younger husbands received more information from their wives than did older ones. Wives from low income families and husbands with low educational attainment reported receiving less information from utility companies than did others.

In general, several patterns emerge. Husbands and wives with higher educational attainment, family incomes, and occupational status reported reading more books and magazines to gain information

on energy-related issues. As occupational status of husbands and wives increased, so did their readership of both newspapers and books and magazines. Husbands' attention to television specials and commercials increased as family income and educational attainment decreased, respectively. Other energy information sources were reported as useful, but they were not the same sources for husbands and wives of the same socioeconomic characteristics.

Husband and Wife Agreement

Significant rank-order correlations were found between husbands' and wives' responses to some of the same items. The knowledge items found to be highly associated between sexes were microwave cooking is energy efficient for small amounts of food, natural gas is the fuel in shortest supply, and more oil was being imported in 1976 than in 1973-74. Husbands and wives may share knowledge about microwave ovens because microwaves are a relatively new major appliance and therefore are receiving a great deal of marketing promotion by manufacturers and retailers. Also, microwave ovens are probably expensive enough that many spouses share in the decision making to purchase one. The other two shared concepts deal with the world's energy supply; perhaps this is an indication of the content covered in primary sources of energy information. Inversely, the lack of association between husbands and wives on the same items may point to the lack of shared knowledge about household energy concepts, which were the main theme of the other seven items. Another possible explanation is that shared knowledge between spouses

follows one or both of two scales: newsworthiness and technicality. Items found to be shared by husbands and wives have been widely reported in the mass media during the last few years. Conversely, some amounts of technical knowledge are needed to accurately respond to other items, which were in fact less frequently answered correctly by both sexes.

Three sources of energy information were found to have significant, positive associations between husbands and wives: newspapers, children, and commercials. It is entirely logical that these three sources could be held in common between husbands and wives. An unanswered question is why the other sources were not as highly associated.

Comment on Methodology

On a methodological note, the chi-square analysis and Kendall rank-order correlation coefficient test on the same items produced different results. The chi-square is a more general, nominal level statistic and the Kendall tau is more specific because of the ranked items. At times, the Kendall tau showed more significant associations than the chi-square. This may have been in part due to the sample size. Kendall tau may be used with small sample sizes. Because there were over 200 husbands and 200 wives, this may have influenced the Kendall tau calculations in such a way as to cause small correlation coefficients (under .3 and -.3) to meet the criterion of statistical significance.

Limitations

This study used socioeconomic factors as contextual variables. Few relationships were found between these factors and sources of energy information. Another group of conceptually-related variables might show more significant relationships.

The set of sources of energy-related information was neither mutually exclusive nor exhaustive. Commercials and news broadcasts could be transmitted by either television or radio; this was not clearly defined in the source. Utility companies and schools or colleges could utilize one of the mass media sources to convey their messages about energy. Information known by interpersonal sources--husband or wife, children, people at work, and friends or relatives --could have been received second-hand from one the other sources. Also, no consumer groups or government agencies were included as sources of energy information, as they were in studies by Milstein (1976), Rappeport and Labaw (1974a; 1974b) and Thompson and Mactavish (1976).

The ten knowledge items were not thoroughly pretested before they were incorporated into the original study. Problems arose in ranking several items because it was difficult to clearly distinguish the correct answer. On the other hand, common sense readily eliminated some of the choices on other questions. More pretesting of these items might yield stronger results.

Another limitation was the indirect approach used to relate knowledge, sources of information regarding energy, and the contextual

variables. This limited the analysis to discussion of the association between the variables. It would have been more meaningful to be able to directly determine the awareness level caused by attention to particular sources. This could be done by asking respondents to identify their source of information for each knowledge item.

Implications

Implications for Future Research

This study has produced several impications for future research endeavors. The association between knowledge and sources of energy information has been established to some extent from this research. It could be carried to the next theoretical step, i.e., that of the behavioral level. Possible research questions might include what influence does awareness of an energy-related concept have on attitudes toward energy issues? On actual fuel consumption? Such in-depth research would shed light on the complex interaction between attitudes, knowledge, and behavioral activities.

Another question raised by this research was why certain subgroups are associated with certain sources for energy knowledge? Why are these sources and that knowledge viewed as useful by respondents? Past research studies reviewed in Chapter II partially answer these questions. But none have attempted audience response analyses in order to establish the attitudinal linkages influencing the use of certain sources. Are there some human needs and emotions influencing the sources reported as useful? If so, what are these needs? What kinds of information are most effective at evoking desired responses?

What is the period of message retention, i.e., how long must the message be repeated before behavioral changes occur? Results of such research would indicate how messages could be coded in educational programs.

Furthermore, the need exists for some hard data measuring the content of energy-related messages. Are there conflicting messages sent from various sources? If found, efforts must be made to alleviate this problem. What is the content from broadcast media (news broadcasts, commercials, special programs) as well as from print and other sources? Do advertisements include objective or subjective information which may be misleading? This research could be tied to the previous research implication discussed by examining the conclusions audiences are drawing from information being diffused by various sources.

At the present time, energy-related information is not well known by a majority of respondents in this study. As the supply of finite fossil fuels becomes more scarce, the diffusion of energy-related information will inevitably increase. As the suggested change takes place, consequential results should include more awareness of energy-related concepts and more integration of these concepts. Future research should be undertaken to study and monitor changes in energy awareness to serve as a basis for the content of diffused messages on this subject.

Several future research hypotheses have resulted from this study:

1. Families with higher levels of knowledge about energy-related concepts will function more effectively in reducing their household energy consumption than families with lower levels of knowledge.

2. Knowledge of energy-related concepts is negatively related to the amount of technical information contained within the concept.

3. Knowledge of energy-related concepts will increase proportionally with the relative news source attention given to the concepts within the last three years.

4. Sources of energy information most frequently given attention by all family members will be associated between family members.

5. Sources of information most frequently evoking positive responses will be perceived as useful sources of information on energy.

6. Husbands exhibiting traditional role patterns will report their wives and children as a source of energy-related information less frequently than husbands not showing traditional role patterns.

Proposed revision of the questionnaire items measuring sources of useful energy information will be shown on the next page.

In future research, it will be important to directly establish the linkages between the knowledge of a particular energy concept and particular information source. Direct causal relationships would be measured which have essential implications for educational programs.

Implications for Educational Programs

A crucial need exists to raise the knowledge level on energy-related issues and concepts. The public must understand the limitations of the energy and resource base it depends on in its life

	A Great Deal	Some	None
Newspaper stories	____	____	____
Newspaper advertisements	____	____	____
Books	____	____	____
Magazine articles	____	____	____
Radio news broadcasts	____	____	____
Radio commercials	____	____	____
Television news broadcasts	____	____	____
T. V. Specials	____	____	____
Husband or Wife	____	____	____
Children	____	____	____
Friends or relatives	____	____	____
People at work	____	____	____
Schools (elementary or secondary)	____	____	____
Colleges	____	____	____
Utility Companies	____	____	____
Consumer Groups	____	____	____
Government agencies	____	____	____

support systems. Explanations should include both the direct and indirect costs of current manufacturing, distribution, and consumption processes. This research found a general lack of awareness on concepts which measured a variety of energy dimensions. Continued lack of concern and consequent action toward the imbalance between the supply and demand for limited fossil fuels will precipitate a social catastrophe. Educational programs must become involved in persuading families of the energy problem and suggesting alternatives whereby they can decrease their energy consumption. Raising awareness levels would be the suggested initial step toward achievement of the goal just discussed.

As described in the conclusions section, there are some specific socioeconomic subgroups which receive their information from a particular source and have significant knowledge of a particular concept. However, educational programs in general can focus on the entire public.

There should be a coordination of effort among educational programs to convey simple, consistent messages. Evidence of the reception of the same information from different sources was found in this research. Another discovery was misinformation, shown by positive and negative associations of knowledge and the same source. It will be important to establish credible, believable sources supplying energy information. Results would be more persuasive messages and more effective implementation of conservation practices.

United States families need to find a better balance between their energy demands and the earth's supply of energy resources.

This process will involve many lifestyle adjustments at the family level. Educators can assist families to bring about orderly change, counsel them through the process of change, help shape energy conservation practices and public policies. Programs should emphasize change that will satisfy energy needs and also assure that the home setting will be an optimum environment for human development and enhance the quality of life.

APPENDICES

APPENDIX A

EXAMPLE QUESTIONNAIRE FORMS FOR INFORMATION SOURCES AND ENERGY KNOWLEDGE VARIABLES

Of the following, where do you get information about energy issues? Check (✓) how much useful information you have received from these sources.

	A Great Deal	Some	None
1. News broadcasts			
2. Newspapers			
3. Books or magazine articles			
4. Commercials			
5. T.V. specials			
6. Husband or wife			
7. Children			
8. Friends or relatives			
9. People at work			
10. Utility companies			
11. School or College			

12. Other _____

_____

The following questions give you an opportunity to tell us your ideas about energy and how you think the AVERAGE MICHIGAN FAMILY in 1976 uses energy. Check (✓) the one answer you agree with most.

1. For most families which ONE of the following requires the MOST energy?

   ___1. heating and cooling the house
   ___2. lighting the house
   ___3. automobile transportation
   ___4. cooking

2. In most houses, which of the following uses the MOST energy?

   ___1. lights
   ___2. refrigerator-freezer
   ___3. color TV
   ___4. hot water heater

3. Which beverage container wastes the MOST energy?

   ___1. returnable bottles
   ___2. throw-away glass bottles
   ___3. throw-away aluminum cans
   ___4. throw-away plastic bottles

4. In a house the MOST heat is lost through the

   ___1. walls
   ___2. ceiling
   ___3. floors
   ___4. all the same

5. For the same amount of protein, which probably requires MORE energy to produce?

   ___1. beef
   ___2. soybeans
   ___3. chicken
   ___4. all the same

NOW THINK ABOUT THE LEAST ENERGY USED:

6. Suppose you prepare a small Swiss steak for dinner; which cooking method would require the LEAST energy?

   ___1. low heat on stove burner
   ___2. microwave oven
   ___3. bake in oven at 325°
   ___4. all the same amount

7. For cross-country or long distance trips, on the average, which of the following uses the LEAST energy per person?

___1. train
___2. automobile
___3. airplane
___4. bus

8. In general, which type of housing of the same size and insulation would probably require the LEAST energy to heat?

___1. apartment
___2. single family house
___3. mobile home
___4. all the same

NOW THINK ABOUT ENERGY IN GENERAL:

9. Consider the amount of oil the United States was importing at the time of the oil embargo (Winter 1973-74). We are now importing

___1. much less than in '73-'74
___2. a little less than in '73-'74
___3. same amount as in '73-'74
___4. more than in '73-'74

10. Which of the following fuels in in shortest supply now?

___1. coal
___2. petroleum
___3. natural gas
___4. none are in short supply

(Correct answers: 1. automobile transportation; 2. hot water heater; 3. throw-away aluminum cans; 4. ceiling; 5. beef; 6. microwave oven; 7. bus; 8. apartment; 9. more than in '73-'74; 10. natural gas)

APPENDIX B

SUPPLEMENTARY FINDINGS

TABLE B-1.--Kendall Rank-Order Correlation Coefficients of Ten Knowledge Items to Each Other by Husbands' Responses, May, 1976

Knowledge Items		1	2	3	4	5	6	7	8	9
2. Uses most household energy? hot water heater	τ =	.069								
	p =	.058								
3. Beverage container wastes most energy? throwaway aluminum	τ =	-.026	-.012							
	p =	.278	.393							
4. Most heat lost? ceiling	τ =	.050	.108*	-.043						
	p =	.125	.007	.162						
5. Protein requiring most energy to produce? beef	τ =	-.037	-.021	.097	.151*					
	p =	.200	.313	.016	.001					
6. Cooking method least energy? microwave oven	τ =	.028	.156*	.012	.095	.084				
	p =	.258	.001	.352	.016	.028				
7. Cross country travel least energy? bus	τ =	-.031	.008	.066	.102*	.085	.029			
	p =	.236	.429	.067	.010	.026	.262			
8. Housing type least energy? apartment	τ =	.160*	.052	-.007	.139*	.107*	-.003	-.008		
	p =	.001	.119	.436	.001	.008	.473	.427		
9. Amount imported oil? more than '73-'74	τ =	.045	-.060	.044	.16*	.273*	.019	.035	.087	
	p =	.151	.084	.158	.002	.001	.331	.213	.024	
10. Fuel shortest supply? natural gas	τ =	.026	-.073	-.028	.075	.163	-.043	.120*	.179*	.163*
	p =	.273	.047	.264	.043	.001	.165	.004	.001	.001

TABLE B-2.--Kendall Rank-Order Correlation Coefficients of Ten Knowledge Items to Each Other by Wives' Responses, May, 1976

Knowledge Items		1	2	3	4	5	6	7	8	9
2. Uses most household energy? hot water heater	τ =	.009								
	N =	253								
	p =	.413								
3. Beverage container wastes most energy? throwaway aluminum	τ =	-.024	.038							
	N =	247	247							
	p =	.287	.186							
4. Most heat lost? ceiling	τ =	.079	.171*	-.046						
	N =	254	253	247						
	p =	.030	.001	.140						
5. Protein requiring most energy to produce? beef	τ =	.021	.101*	-.012	.137*					
	N =	253	253	247	254					
	p =	.321	.009	.388	.001					
6. Cooking method least energy? microwave oven	τ =	.031	.124*	.038	.124*	.102*				
	N =	255	255	250	256	256				
	p =	.227	.002	.189	.002	.008				
7. Cross country travel least energy? bus	τ =	.057	-.017	.068	.053	.066	-.078			
	N =	252	252	248	253	253	256			
	p =	.091	.341	.056	.107	.059	.042			
8. Housing type least energy? apartment	τ =	.057	.009	.035	.072	.201*	.015	.100*		
	N =	255	255	249	256	255	258	255		
	p =	.088	.420	.208	.004	.001	.358	.009		
9. Amount imported oil? more than '73-'74	τ =	-.014	-.067	.011	.065	.081	-.009	.097	.127*	
	N =	242	242	240	242	243	245	243	244	
	p =	.370	.060	.398	.006	.030	.414	.013	.002	
10. Fuel shortest supply? natural gas	τ =	.105*	.028	-.049	.142*	.084	.067	.043	.162*	.113*
	N	244	243	240	244	244	247	245	246	238
	p	.008	.261	.130	.001	.026	.058	.161	.001	.005

TABLE B-3.--Kendall Rank-Order Correlation Coefficients for Knowledge Items and Sources of Energy Information for Husbands' Responses, May, 1976

Sources		Knowledge Items									
		1	2	3	4	5	6	7	8	9	10
1. News Broadcasts (N=234)	τ =	-.123*	-.031	-.137*	-.052	.017	.038	-.018	-.107*	-.052	-.002
	p =	.003	.241	.001	.120	.350	.196	.344	.008	.120	.480
2. Newspapers (N=232)	τ =	.063	-.036	-.066	-.027	.064	.074	.021	.202*	.095	.090
	p =	.076	.209	.067	.267	.074	.047	.322	.001	.017	.021
3. Books or Magazines (N=231)	τ =	.016	.035	.054	.008	.103*	-.009	.015	.076	.194*	.152*
	p =	.363	.215	.112	.432	.010	.421	.367	.044	.001	.001
4. Commercials (N=223)	τ =	-.134*	-.040	.119*	-.050	-.099	.062	.021	-.101*	-.104*	-.010
	p =	.002	.187	.005	.133	.014	.084	.325	.013	.011	.413
5. T.V. Specials (N=229)	τ =	-.108*	-.039	-.006	-.097	-.003	.105*	.019	-.104*	.083	-.020
	p =	.008	.191	.449	.015	.474	.010	.334	.010	.032	.326
6. Wife (N=223)	τ =	.040	.089	.093	-.080	.089	.037	.028	-.021	.114	.040
	p =	.118	.024	.019	.038	.025	.209	.265	.322	.006	.190

TABLE B-3.--Continued.

Sources		Knowledge Items									
		1	2	3	4	5	6	7	8	9	10
7. Children (N=222)	τ =	-.018	-.000	-.005	-.089	.020	.099	.046	-.027	.009	.031
	p =	.345	.498	.458	.024	.332	.015	.156	.275	.425	.245
8. Friends or Relatives (N=224)	τ =	.124*	-.032	-.069	.013	.062	-.050	.037	-.125*	.021	.068
	p =	.003	.237	.063	.383	.084	.132	.207	.003	.322	.064
9. People at Work (N=227)	τ =	.011	-.081	-.039	.049	.056	.032	-.015	-.101	.046	.046
	p =	.404	.036	.189	.136	.110	.236	.370	.012	.149	.153
10. Utility Companies (N=228)	τ =	-.101	-.059	.025	.019	.051	.082	.005	-.004	-.039	.066
	p =	.012	.092	.291	.337	.126	.034	.459	.467	.194	.074
11. School or College (N=221)	τ =	.013	-.029	-.003	.043	.115*	-.001	.073	-.002	.192*	.112*
	p =	.387	.262	.476	.173	.007	.496	.054	.485	.001	.007

*Included in Table 16.

TABLE B-4.--Kendall Rank-Order Correlation Coefficients for Knowledge Items and Sources of Energy Information for Wives' Responses, May, 1976

Sources		Knowledge Items									
		1	2	3	4	5	6	7	8	9	10
News Broadcasts	τ =	-.142*	.020	-.031	-.060	-.062	-.061	-.037	-.055	-.059	-.020
	N =	255	255	249	256	255	258	255	258	244	246
	p =	.001	.316	.237	.077	.070	.072	.189	.095	.085	.324
Newspapers	τ =	-.154*	-.090	-.088	-.031	-.057	-.008	.084	.187*	.076	.051
	N =	250	250	245	251	251	254	251	253	241	242
	p =	.001	.018	.020	.230	.117	.421	.024	.001	.041	.118
Books or Magazines	τ =	-.032	-.016	-.133*	.101*	.139*	.097	.011	.129*	.123*	.110*
	N =	248	248	244	249	249	252	250	251	239	241
	p =	.225	.353	.002	.009	.001	.012	.399	.002	.003	.006
Commercials	τ =	-.076	-.073	-.089	-.081	-.161*	-.050	-.024	-.042	-.125*	.055
	N =	244	245	239	244	243	246	244	246	235	236
	p =	.039	.045	.021	.030	.001	.124	.293	.164	.003	.106
T.V. Specials	τ =	-.033	-.062	.031	-.097	-.064	.036	.035	-.083	-.086	.021
	N =	245	246	240	246	245	248	245	248	236	237
	p =	.219	.075	.236	.012	.068	.203	.210	.027	.026	.317
Husband	τ =	-.050	.076	-.143*	.038	.183*	.084	.051	.036	.058	.039
	N =	242	242	239	243	243	246	244	245	235	236
	p =	.123	.040	.001	.191	.001	.025	.117	.202	.094	.188

TABLE B-4.--Continued.

Sources		Knowledge Items									
		1	2	3	4	5	6	7	8	9	10
Friends or Relatives	τ =	.018	.046	-.084	-.030	.014	.056	-.056	-.074	-.037	-.029
	N =	239	239	236	240	240	243	241	242	233	233
	p =	.240	.145	.028	.244	.372	.099	.100	.045	.203	.257
People at Work	=	-.024	.016	-.034	-.020	-.127*	-.012	-.098	-.129*	.036	-.009
	N =	238	238	234	239	239	242	240	241	232	232
	p =	.293	.358	.222	.328	.002	.395	.012	.002	.210	.416
Utility Companies	=	.050	.019	-.027	.007	-.023	.067	-.031	-.087	-.047	.064
	N =	244	244	239	244	244	247	245	246	237	237
	p =	.124	.329	.271	.439	.294	.058	.237	.022	.143	.070
School or College	=	.024	.010	.023	-.034	-.013	.017	.026	.015	.058	.052
	N =	230	229	226	231	231	233	231	232	223	223
	p =	.292	.408	.305	.222	.383	.347	.278	.368	.101	.126

*Included in Table 17.

TABLE B-5.--Kendall Rank-Order Correlation Coefficient Between Husbands' and Wives' Responses by Ten Knowledge Items, May, 1976

Knowledge Items		1	2	3	4	5	6	7	8
1. Requires most energy for families: transportation (N=229)	τ =	.238	.059	.014	.040	.006	.006	.015	-.007
	p =	.001	.094	.376	.183	.450	.451	.369	.440
2. Uses most household energy: hot water heater (N=230)	τ =	-.026	.230	-.042	.082	.015	.167	.037	-.033
	p =	.283	.001	.174	.033	.036	.001	.204	.228
3. Beverage container wastes most energy: throwaway aluminum (N=225)	τ =	-.124	-.039	.190	-.099	-.003	.075	.040	-.152
	p =	.003	.191	.001	.014	.478	.048	.185	.001
4. Most heat lost: ceiling (N=225)	τ =	.001	.089	-.004	.175	.170	.016	-.019	.084
	p =	.498	.023	.463	.001	.001	.356	.336	.030
5. Protein requiring most energy to produce: beef (N=231)	τ =	.012	-.003	-.001	.058	.251	-.016	.036	-.006
	p =	.393	.177	.493	.095	.001	.356	.209	.451
6. Cooking method least energy: microwave oven (N=233)	τ =	-.079	.135	.074	.020	.116	.357	.008	-.006
	p =	.038	.002	.046	.329	.005	.001	.433	.450
7. Cross country travel least energy: bus (N=230)	τ =	-.084	-.028	.068	.034	.074	.006	.168	.119
	p =	.030	.262	.063	.225	.048	.443	.001	.004
8. Housing type least energy: apartment (N=233)	τ =	-.004	-.021	-.039	.095	.119	.083	.112	.239
	p =	.462	.321	.187	.016	.004	.031	.006	.001
9. Amount imported oil: more than '73-'74 (N=221)	τ =	.098	.074	.001	.009	.018	-.089	-.066	.100
	p =	.016	.051	.493	.005	.343	.025	.072	.014
10. Fuel shortestsupply: natural gas (N=222)	τ =	-.007	-.026	-.043	-.004	.097	.020	.218	.104
	p =	.437	.281	.171	.466	.016	.326	.344	.011

TABLE B-5.--Continued.

Knowledge Items	9	10
1. Requires most energy for families: transportation (N=229)	τ = -.079 p = .039	.048 .139
2. Uses most household energy: hot water heater (N=230)	τ = .046 p = .149	-.009 .419
3. Beverage container wastes most energy: throwaway aluminum (N=225)	τ = .058 p = .098	-.025 .260
4. Most heat lost: ceiling (N=230)	τ = .118 p = .004	.027 .274
5. Protein requiring most energy to produce: beef (N=231)	τ = .253 p = .001	.130 .002
6. Cooking method least energy: microwave (N=223)	τ = .108 p = .007	.081 .032
7. Cross country travel least energy: bus (N=230)	τ = .025 p = .285	.109 .007
8. Housing type least energy: apartment (N=233)	τ = .164 p = .001	.158 .001
9. Amount imported oil: more than '73-'74 (N=221)	τ = .305 p = .001	.153 .001
10. Fuel shortest supply: natural gas (N=222)	τ = .149 p = .001	.356 .001

TABLE B-6.--Kendall Rank-Order Correlation Coefficient Between Husbands' and Wives' Responses by Eleven Sources of Information, May, 1976

Source		1	2	3	4	5	6	7
1. News broadcasts	τ =	.207	.096	-.053	.097	.128	.128	.063
	p =	.001	.016	-.118	.017	.003	.003	.082
	N =	231	229	228	220	226	220	219
2. Newspapers	τ =	.099	.335	.150	.052	.057	.125	.151
	p =	.013	.001	.001	.128	.102	.004	.001
	N =	227	226	225	217	223	217	216
3. Books or magazines	τ =	.019	.193	.262	-.043	-.030	.176	.102
	p =	.340	.001	.001	.174	.252	.001	.013
	N =	225	225	225	218	223	218	217
4. Commercials	τ =	.039	-.034	-.004	.303	.054	.005	.121
	p =	.197	.230	.459	.001	.119	.458	.005
	N =	221	220	220	213	218	212	211
5. T.V. Specials	τ =	.305	.105	.099	.177	.269	.206	.247
	p =	.001	.010	.014	.001	.001	.001	.001
	N =	224	224	224	216	222	216	215
6. Husband or Wife	τ =	.056	.063	.229	-.016	-.037	.137	-.032
	p =	.106	.082	.001	.363	.208	.002	.241
	N =	222	222	222	214	220	214	214
7. Children	τ =	-.066	-.059	.017	.067	.071	.064	.323
	p =	.073	.097	.352	.073	.061	.085	.001
	N =	219	219	219	212	217	212	212
8. Friends or Relatives	τ =	-.058	-.074	.113	.138	.021	.121	.058
	p =	.101	.052	.007	.002	.320	.005	.104
	N =	220	220	220	213	218	213	213
9. People at Work	τ =	.053	-.068	.009	.047	.034	.050	.063
	p =	.123	.068	.423	.158	.227	.143	.088
	N =	217	217	217	209	215	209	209
10. Utility Companies	τ =	-.038	-.096	-.144	.072	-.054	.022	.088
	p =	.201	.017	.001	.060	.121	.318	.029
	N =	223	220	219	213	217	212	211
11. School or College	τ =	.014	.115	.149	-.010	.120	.144	.115
	p =	.385	.007	.001	.418	.006	.002	.008
	N =	209	209	209	201	207	202	200

TABLE B-6.--Continued.

Source		8	9	10	11
1. News broadcasts	τ =	-.033	-.040	-.054	0
	p =	.232	.188	.133	.50
	N =	221	224	225	218
2. Newspapers	τ =	-.118	-.093	-.004	.022
	p =	.005	.021	.466	.313
	N =	218	221	221	215
3. Books or magazines	τ =	.052	.015	.016	.120
	p =	.126	.368	.358	.005
	N =	219	221	222	216
4. Commercials	τ =	-.055	.043	.146	.082
	p =	.116	.173	.001	.039
	N =	213	216	216	210
5. T.V. Specials	τ =	.141	.013	.157	.106
	p =	.001	.388	.001	.011
	N =	217	219	221	214
6. Husband or Wife	τ =	.012	.074	-.007	.127
	p =	.394	.053	.444	.005
	N =	215	217	218	212
7. Children	τ =	.042	.028	.096	.109
	p =	.180	.274	.018	.010
	N =	.213	.215	.216	.210
8. Friends or Relatives	τ =	.185	.036	.098	.112
	p =	.001	.218	.016	.008
	N =	214	216	217	211
9. People at work	τ =	.085	-.008	.090	.056
	p =	.033	.428	.026	.115
	N =	211	213	214	208
10. Utility Companies	τ =	-.091	.021	.218	.073
	p =	.023	.321	.001	.058
	N =	213	216	217	210
11. School or College	τ =	.124	.108	.095	.240
	p =	.005	.011	.022	.001
	N =	202	204	205	199

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