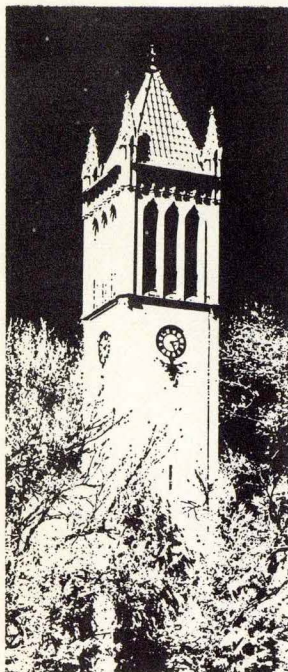# Characteristics of Demand for Meat by Consumers in Webster County, Iowa

by Richard E. Lund, Lawrence A. Duewer, Wilbur R. Maki and Norman V. Strand

Department of Statistics
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and
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CONTENTS

SUMMARY

To learn more about the consumer's wishes, his desires, as expressed by quantities purchased, and his evaluations, as expressed by opinions on quality and satisfaction, data were collected from 642 households in Webster County, Iowa, during an 8-week period in 1963. Each household supplied data for 4 weeks. The data for the first week were supplied from memory, and a diary was kept for the remaining 3 weeks. Such facts as price, quantity and quality were recorded for all meat items purchased. The respondents were queried weekly by interviewers to obtain opinions on various aspects of quality and satisfaction for each meat item. These data were related to the socioeconomic characteristics of the household and to data on marketing activities by retailers.

Quantity of meat purchased per person and price paid per pound generally were higher for the higher income families. In terms of proportional change when moving from low to high income families, a greater proportional increase occurred in quantity than in price. Price paid per pound also increased with the age of household head, but decreased with the size of household.

Quantity purchased per person was greater for families without children. However, quantity per person was also greater for smaller households after adjusting the data for the effect of household composition. A relationship between age of household and quantity purchased could not be established after adjusting the data for household size and composition.

The extent to which a household emphasized pork or beef in the aggregate, as a proportion of total meat consumption, was generally unrelated to household socioeconomic characteristics. Upon dividing the Webster County study panel into two groups of equal size according to household income, the data showed that households having an income below the median purchased 43 percent of all pork and 42 percent of all beef. An equal division of the panel by age of household head showed that the younger households purchased 60 percent of all meat and fish purchased by the study group, 60 percent of the beef and 58 percent of the pork. The only socioeconomic group that could be clearly separated from other groups by a general emphasis on pork items was the group consisting of extremely low-income, older persons. But this socioeconomic group accounted for an extremely small portion of all meat purchased by the panel.

Although consumption of aggregate kinds of meat could not be related generally to socioeconomic characteristics, rather clear relations could be established for individual items. For example, the lower-income half of the panel purchased only 26 percent of the t-bone and sirloin steak. Households containing children accounted for 83 percent of all wieners, but only 70 percent of all meat and fish. Wieners made up about 9 percent of all meat items purchased by households for which the head was under 35 years of age, but wieners contributed only 3 percent for households with the head 55 years or older. Younger households generally gave much more emphasis to ground beef and cold meats, while older families purchased more roasts. As may be anticipated, the higher-income groups purchased the higher-priced components of each general meat-item class.

Opinion data on the importance of four attributes of quality were collected. These were (1) amount of bone, (2) color, (3) freshness and (4) fat content. Freshness clearly stood out as being most important, while amount of bone was least important for all meat items. Color was second in importance for beef and poultry, and fat content was third. For pork, fat content was more important than color. All opinion data on quality were nearly homogenous for all socioeconomic groups. One exception was that fat content of pork was given more emphasis by higher-income households and by households having more education. Fat content was of more concern to persons in the middle age groups than to either of the extremes of young or old.

Opinions on satisfaction at time of preparation and eating were collected for the five attributes: (1) tenderness, (2) proportion fat to lean, (3) taste, (4) ease of preparation and (5) shrinkage. The results showed that taste was most important and that ease of preparation was least important. Shrinkage and fat content were more important to satisfaction in the case of pork than for either beef or poultry.

A model constructed to measure the response of households to changes in prices, advertising and in-store promotion on the part of the retailer, showed the lower-income households most responsive generally to these variables. The higher-income households and the households made up of aged, extremely low-income persons were much less flexible in their purchasing habits.

Charactertistics of Demand for Meat by Consumers
in Webster County, Iowa[1]

by Richard E. Lund, Lawrence A. Duewer,
Wilbur R. Maki and Norman V. Strand[2]

The marketing system for meat and livestock is nationwide. Livestock prices depend upon consumer tastes, preferences and buying power and, also, upon the supply of livestock and meat. Accordingly, the economic well-being of the livestock producer is as much determined by general economic conditions affecting the consumer of his product as by the events that transpire wholly within the boundaries of his farm, his county or his state.

This study was undertaken because of the concern expressed by Iowa farm leaders for the market prospects facing the livestock and meat industry of Iowa. Inasmuch as the desires of the consumer, and particularly of the housewife, are one of the primary factors affecting meat prices, this study is concerned particularly with the purchasing patterns of households in a prototype consumer market, that of Webster County, Iowa.

OBJECTIVES AND PROCEDURES

The orientation of this study was descriptive. The objective was not to test predetermined hypotheses, but instead, to uncover consumer demand patterns and to relate these to the socioeconomic characteristics of the consumer. One goal was to determine the effect on the consumer of various marketing activities on the part of the retailer. Another goal was to relate consumer opinions, expressed after purchasing or using specific items, to general demand. Particular emphasis was to be given to selected variables that may be subject to some degree of control by the meat industry.

Household data required for the completion of this study were obtained by a weekly interview survey conducted during an 8-week period in June and July 1963. Although the study lasted 8 weeks, a rotational scheme of household replacement enabled the retention of each household in the survey panel for only 4 weeks. A self-weighting stratified sample was drawn. Stratification was on an area basis.

The interviewing was conducted by the Iowa State

University Statistical Laboratory. The initial sample contained 779 housing units. As the survey progressed, 126 predetermined substitutions were made to replace refusals, families on vacation and households eliminated for various other reasons. Completed interview schedules for the full 4 weeks were obtained from 642 households.

Webster County was selected as the study area because it provided a desired combination of both rural and urban households. Although it includes only one urban place (Fort Dodge, a city of 30,000 population in 1963), the county's 50,000 people come from households having a wide variety of socioeconomic characteristics. Descriptions of consumer activities in this report are related to many of these socioeconomic variables. Since the socio-characteristics of Webster County in the aggregate are not too much different from those of the nation, conclusions reached in this report can have implications beyond those for the Webster County population. But in a strict sense, the conclusions reached in the report are valid statistically only for Webster County during the summer of 1963. Such a limitation is confronted in all studies conducted in a limited locality.

Appendix A contains many additional details on the socioeconomic structure of Webster County; comparisons with the nation are included. Additional details on survey and analytical procedures are given in various subject-matter sections of the report. Appendix C provides technical information on the survey design and data collection procedures.

WEEKLY PURCHASES OF MEAT

Webster County survey respondents obtained meat, poultry and fish from all sources at the rate of 7.95 pounds (retail-equivalent basis) per week per household during June and July 1963. The comparable rate per person was 2.30 pounds per week. These rates, when adjusted to an annual basis, amount to 413 pounds per household and 119 pounds per person. Approximately 38 percent of this was beef and 25 percent was pork. Cold meats amounted to 14 percent, poultry 19 percent and fish 4 percent.

Discussion to follow shows how these rates varied among households with different socioeconomic characteristics. But before taking up this topic, a brief

comparison of the survey data to national data may be meaningful. Understanding also may be improved by summarizing various definitional and procedural aspects of the survey.

Comments on Survey Data

The Webster County survey covered an 8-week period in June and July 1963. Data were collected from 642 respondents for 4 weeks. The 8-week coverage was produced by dividing the respondents into eight rotating panels. Appendix C provides additional details on the survey design.

Data for the first week were obtained by a simple query concerning what meats were obtained from all sources during the preceding week. The respondent provided estimates of pounds, value and cut description from memory. A diary was supplied to the respondent for recording such data at time of purchase for the following 3 interview weeks.

Table 1 shows the quantity of meat obtained per week per household from all sources on a per-interview-week basis. Data for the first week of interview were about 40 percent greater for most kinds of meat than were the data for the following 3 weeks. Some decrease in meat consumption as interviewing progressed was anticipated as a result of an expected tendency for people to eat less meat during the hot summer months. However, the size of the decrease between the first and second weeks for all meats could not be assigned to this reason.

Since the data collection methods used for weeks two through four were superior, we concluded that the data for the first week of interview contained a rather significant upward bias. One plausible explanation is that the respondents tended to include both meats consumed and meats purchased for later consumption. The size of the individual purchases was not significantly greater for the first week; instead, a greater number of purchases was indicated.

As a result, all data were omitted on quantity or value for the first week of interview. The data concerning consumer opinions in a later section does contain first-week data because the obvious quantity bias was considered to affect these opinions very little.

Table 2 shows that 14,274 pounds of all kinds of meat, poultry and fish were purchased during the second, third and fourth interview weeks by the 642 respondents. To this may be added 886 pounds received by gift, home-grown, caught, or other means. After a slight adjustment for an element of subsampling, the result of 7.95 pounds acquired per week per household is obtained.

It is not desirable to use all the data aggregated in table 2 in the major part of the analysis in this report. For example, the large-lot purchases of beef and pork involved only two purchases; an inclusion of such a purchase in a breakdown of acquisition by

Table 1. Meat obtained from all sources[a], Webster County survey, June-July 1963 (Pounds weekly per household).

Week of interview[b]	Beef	Pork	Cold meats	Poultry	Fish
First	4.50	2.29	1.36	2.16	0.62
Second	3.23	1.81	1.07	1.64	0.47
Third	3.17	1.92	1.05	1.37	0.29
Fourth.	2.71	2.25	1.09	1.53	0.30

[a]Purchases, gifts, homegrown, etc.

[b]The first-week data depended on memory of respondent. A diary was supplied for other weeks. All subsequent quantity and price data in this report are taken from the second, third and fourth weeks.

Table 2. Summary data on meat acquisition, Webster County survey, June-July 1963.

Item	Pounds
Survey aggregates[a]:	
Small lot purchases of beef, pork, cold meat, poultry and fish	13,931
Purchases of veal and lamb	30
Large lot purchases of beef and pork (quarters, etc.) . . .	313
Meat and fish received as gifts, home-grown, caught, etc. .	886
Adjustment to account for an element of subsampling in survey procedures (20 households were subsampled). . .	554
Total meat, poultry and fish considered in survey	15,714
Weekly acquisition rate for all meat and fish:	
Per household	7.95
Per person	2.30

[a]Aggregates are for second, third and fourth interview weeks for 642 households. Interviewing was conducted in June-July 1963 in Webster County, Iowa. See Appendix C for additional discussion on data-collection procedures.

socioeconomic classifications would cause some rather grotesque results. Gifts and home-grown items distorted prices. Thus, for all figures and tables to follow, with the exception of table 3, only small-lot purchases of beef, pork, cold meat, poultry and fish have been included. Table 2 shows that small-lot purchases totaled 13,931 pounds, which gave a mean weekly purchasing rate of 7.23 pounds per household.

Figure 1 shows the national time series context in which the Webster County survey was located. National prices for beef, pork and poultry in 1963 approached closely the mean prices in recent years. There was a small decline from 1962 prices for all three. National per-capita consumption of pork in 1963 was quite typical of that over the past 10 years, while per-capita consumption of both beef and poultry approached a value appropriate to their upward trend in recent years. There was a slight increase in per-capita consumption in 1963 over that of 1962 for all three meats.

A cross-sectional comparison between Webster County and the nation has some value. Such a comparison is provided in table 3, by elevating the June-July acquisition data for Webster County to an annual

Table 3. Comparison of Webster County annual per-capita meat acquisition data to a national source.

Item	USDA time series (1963) Total meat consumption in all forms[a] (Pounds)	Webster County survey Acquisitions only[b] (Pounds)
Beef	69.7	44.9
Pork (including cured)	60.7	29.1
Cold meat	-- [c]	15.9
Lamb, veal and other[d]	20.3	0.2
Poultry	37.9	23.0
Fish and shell fish	13.6	5.4

[a]Retail-equivalent pounds taken from U. S. Food Consumption, Sources of Data and Trends, 1909-63, Statistical Bulletin No. 364, U.S.D.A., and supplements.

[b]Webster County survey data on purchases, gifts, home-grown, etc., for second, third and fourth interview weeks.

[c]Included in other classes.

[d]Includes game and edible organs for the U.S.D.A. Time Series and 1955 Food Consumption Survey data; in the Webster County survey data, purchases of edible organs were distributed among the other classes.

basis. There are, however, considerable difficulties in establishing the validity of such a comparison.

First, the U.S. Department of Agriculture time-series data include consumption of meat in the form of meat mixture products and consumption away from home, such as in cafes. Cold-meat products, although handled as a separate class in Webster County, were included in the basic source meat classes in the time-series data. In addition, the Webster County data pertained only to acquisitions, but the other source represents an estimate of consumption; consequently, withdrawal from storage during the summer was not included in the Webster County data. [3]

Before concluding the brief comparison with the national situation, it may be meaningful to compare Webster County prices. Table 4 provides Webster County prices as well as quantity data by individual cut of meat. The price per pound of all pork was $0.57 in 1963 for the nation (fig. 1); the Webster County price was $0.60. The national price was $0.39 for poultry as compared with $0.38 in the survey. A close

[3] An earlier survey of 91 households in Marshalltown, Iowa, during April-May 1960 showed that purchases amounted to about 80 percent of actual consumption. Nonpurchase acquisitions were extremely small for this study since no rural households were included. The 20 percent difference was attributed largely to withdrawals from inventory in the spring. The survey was conducted by procedures similar to those used in Webster County. However, data on actual consumption were also collected by an interviewer taking beginning and ending home-storage inventory. The purchasing rate of 128 pounds per person annually for this study compared closely to the 119-pound acquisition rate for Webster County.

In attempting to reconcile the 119-pound acquisition figure for Webster County to the total of 202 pounds given in the time-series data, rough estimates can assign most of the difference to consumption away from home or in the form of meat mixtures and to seasonality factors pertaining both to a lower summer consumption rate and to a net removal from storage. A sizable proportion of total meat consumption is known to occur away from home. And consumers buy a significant amount of meat in the form of prepared meat mixtures.

Some sampling variation (see Appendix C), of course, also enters into the Webster County data, and the mechanical aspects of the interviewing situation may be responsible for some of the difference. An inclusion of the first-week interview data would greatly reduce the difference.

Table 4. Average weekly purchases and prices for all households by meat items, Webster County survey, June-July 1963.

Item	Weekly purchases Per household (Pounds)	Weekly purchases Per person (Pounds)	Price per pound (Dollars)
Beef			
Ground:			
Hamburger	1.07	0.31	0.45
Ground round, chuck, lean beef	0.18	0.05	0.65
Roast:			
Chuck	0.43	0.12	0.59
All other roasts	0.20	0.06	0.80
Steak:			
Round, Swiss, chuck	0.28	0.08	0.78
Cube, minute, steakettes	0.09	0.03	0.82
Sirloin	0.19	0.05	0.91
T-bone	0.20	0.06	1.03
Other:			
Chipped, dried, corned	0.04	0.01	1.38
Boiling	0.08	0.03	0.47
All other beef	0.05	0.01	0.46
Total beef (large lots excluded)	2.78	0.81	0.64
Pork			
Fresh:			
Sausage	0.10	0.03	0.46
Roast	0.14	0.04	0.54
Chops	0.44	0.13	0.65
Steak	0.07	0.02	0.55
Spare ribs	0.05	0.02	0.61
Cured:			
Bacon	0.49	0.14	0.52
Ham and picnic	0.49	0.14	0.70
All other pork	0.04	0.01	0.25
Total pork (large lots excluded)	1.82	0.53	0.60
Cold meats (including canned):			
Wieners	0.42	0.12	0.51
Bologna	0.24	0.07	0.56
Other cold meat	0.40	0.12	0.72
Total cold meat	1.06	0.31	0.60
Poultry:			
Broilers-fryers, whole	0.31	0.09	0.32
Broilers-fryers, cut-up	0.88	0.26	0.39
All other poultry	0.16	0.04	0.49
Total poultry	1.35	0.39	0.38
Fish and shell fish	0.22	0.06	0.75

comparison cannot be made for beef since the national data are on the basis of U. S. Choice grade, and a significant amount of ungraded and U. S. Good grade beef was sold in Webster County. Nevertheless, the Webster County beef prices seem reasonably close to those of the nation after taking this factor into account.

Table 4 also provides details on the general scheme used throughout the report for classifying individual meat cuts.

Factors Affecting Meat Purchases

The level and composition of meat consumption by a household is affected by many factors. Size of household and family income are extremely important. But the stage of family maturation and age of children are also significant. Occupation and education, or
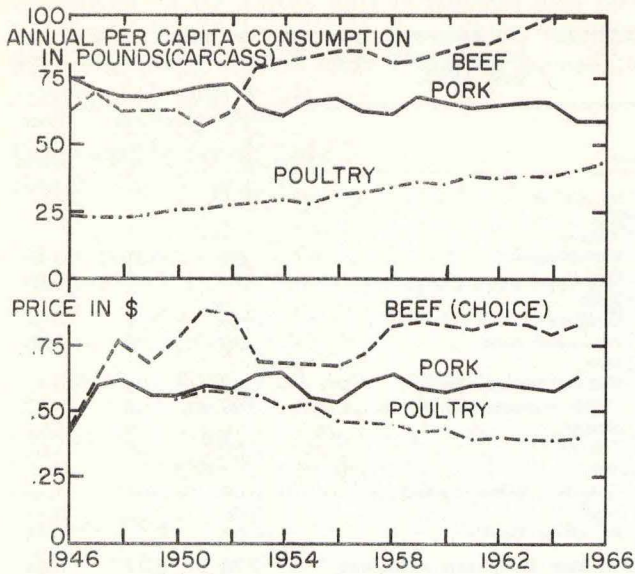
Fig. 1. Retail price and per-capita consumption of beef, pork and poultry, United States, 1946-66.
Source: U. S. Food Consumption, Sources of Data and Trends, 1909-63. U. S. Dept. Agr. Stat. Bul. 364, and supplements.

Fig. 2. Distribution of households by mean (mean of 3 weeks' purchases) weekly beef and pork purchases, Webster County survey, June-July 1963.

what may be called a social-status factor, have considerable influence.

These factors are the subject of the current section. But before taking up individual factors, it may be valuable simply to examine the distribution of Webster County households by size of weekly purchases. Such distributions for all beef and pork are given in fig. 2.

These distributions were based on mean purchasing rates derived from data for only 3 interview weeks. Nevertheless, they provide some indication of the distribution of weekly means that would result if the mean were taken over a longer period. That is, some of the dispersion in fig. 2 is caused by the fluctuations in an individual family's purchasing habits as well as by the effect of differences between families in consuming rates.

Fig. 2 shows skewed distributions, as may be expected. A rather sizable portion of the households tended to purchase at a rate of only half the mean rate. However, less than one-fifth of the households exceeded twice the mean rate for both beef and pork. The lack of a more extensive skewness seems to indicate that the purchasing habits of the households surveyed in Webster County were quite homogeneous. And, indeed, further examination will show that the socioeconomic characteristics of households usually were not associated with wide variations in purchasing behavior.

The close similarity of the distributions for pork and beef is indeed a curious phenomenon after examining the national trends for which beef consumption per capita nearly doubled in the past 20 years, while pork consumption declined significantly (fig.

1). A person who recognizes the extent to which people are creatures of habit would probably first hypothesize that the pork consumer is gradually being replaced with beef consumers by perhaps the birth-death process or possibly by an education or income effect. But Fig. 2 indicates at least a possibility of the opposite. That is, for both pork and beef, about two-thirds of the households made purchases at a rate of at least half the mean rate indicating quite wide-scale purchasing of both meats. The major difference between pork and beef is that most households merely purchased a smaller quantity of pork.

HOUSEHOLD SIZE AND COMPOSITION

Household size seems a major factor influencing volume of purchases per person as well as purchases per household. Fig. 3 shows that, as size increased from 2 persons to 7 or more persons per household, purchases of all meat, poultry and fish per person dropped from 2.9 pounds per week to 1.6 pounds. This lower purchasing rate can be related to the lower consumption by children in the larger families. Families with children (fig. 4) purchased at the rate of 1.9 pounds per person as compared with a rate of 2.8 pounds for households without children.

Fig. 3 shows that purchases per household amounted to 12.1 pounds per week for households containing seven or more members. The amount paid for all meat increased less rapidly than did quantity since the larger households paid nearly 10 cents less per pound than did smaller ones.

The larger households' purchases emphasized gen-

Fig. 3. Percentage distribution of pounds of meat purchased by size of household, Webster County survey, June-July 1963.
Source: Table B-1, Appendix B.

Fig. 4. Percentage distribution of pounds of meat purchased by whether family contains children, Webster County survey, June-July 1963.
Source: Table B-2, Appendix B.

erally the lower-cost meats. And again, within any general kind of cut, the lower-cost portions were bought. Proportionally more hamburger and less beef steak and roast were purchased by larger households. Cold meat was purchased by the larger households at a percentage rate nearly twice that of the one- or two-person households.

Little evidence was obtained for a family-size effect on general categories of meat. A rather marginal decrease in the proportion of pork, beef and chicken is indicated. These are offset by an increase in consumption of cold meat.

Much of the effect of household size on the pattern of purchases can possibly be explained more clearly by classifying the respondents into families with and families without children. The proportion of ground beef purchased was 50 percent greater for families with children. The purchase of beef roast and steak showed the opposite situation. Children liked wieners and other cold meats, and their families' purchases were also 50 percent higher than for families without children. Households without children purchased bacon more often, while families with children preferred ham.

However, the over-all proportions of pork, beef and chicken purchased seem influenced only slightly by the children factor. For families with children, the increase in the proportion of cold meats purchased was offset by small decreases in the proportion of all pork, beef and chicken.

HOUSEHOLD INCOME

Pounds of meat purchased per person changed only marginally as income increased through the major part of its range (fig. 5). Households with incomes above $10,000 annually purchased only 0.3 pounds more per person (14 percent greater) than did households earning from $1,000 to $4,999. One exception to this extremely mild income effect was that households with incomes under $1,000 purchased at a rate of only three-fourths the per capita mean.

An examination of fig. 5 indicates, nevertheless, that a rather strong income effect was present in pounds purchased per household. But the real situation is that size of household was strongly correlated with income up to the midpoint; purchases per household climbed also as the households became larger. Most of the households with low income consisted of older persons. The average age of the household head for the households with under $1,000 income was 75
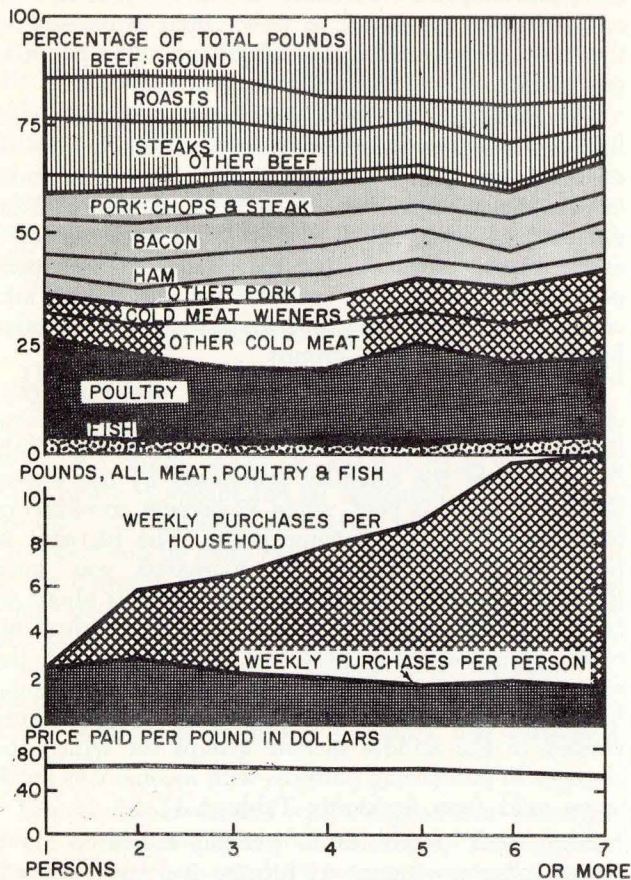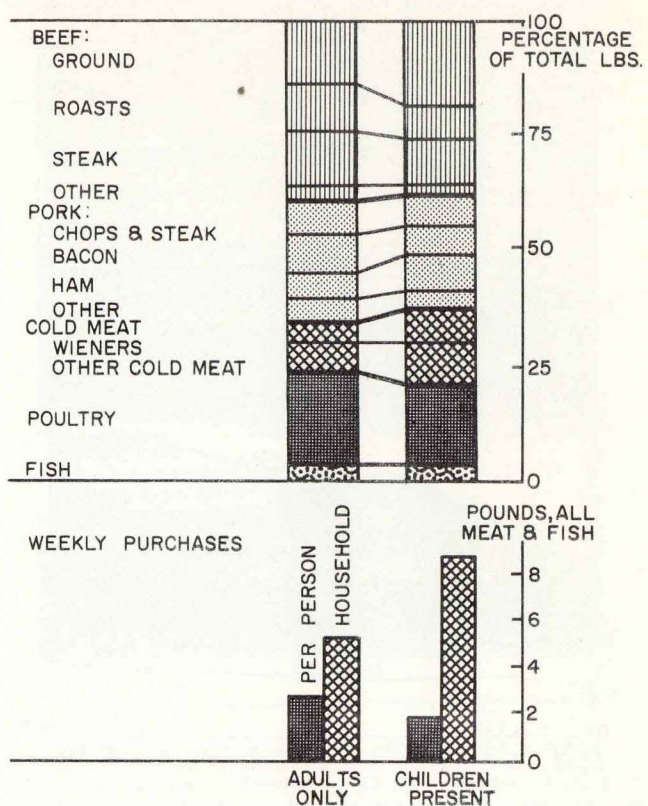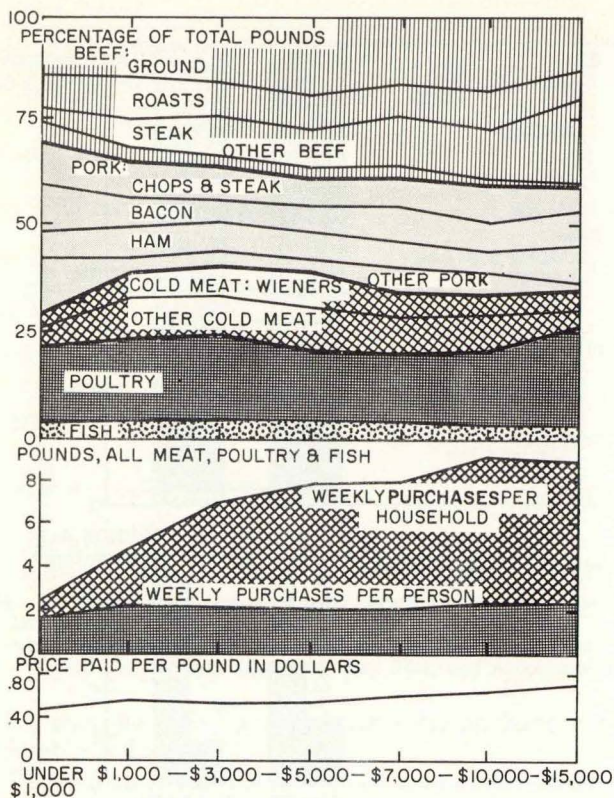
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Fig. 5. Percentage distribution of pounds of meat purchased by income of household, Webster County survey, June-July 1963.
Source: Table B-3, Appendix B.

years, and the average age of the $1,000 to $2,999 income group was 64 years.

As may be expected, dollars spent per household also made a rather sharp climb as income increased. The price paid per pound increased from $0.49 to $0.71 across the entire income range. But if the extreme groups at each end of the income range are disregarded, there is an increase from $0.56 to $0.63. This latter change again indicates that income as a factor in meat consumption was not especially pronounced except in the extremely high- or low-income groups.

Fig. 5 also provides information on the composition of meat purchased by different income groups. The concentration on pork purchases by the extremely low income, aged consumer clearly stands out. But such emphasis on pork cannot be regarded entirely as an effect of income since, in contrast, 24 percent of the meat purchased by households with incomes from $3,000 to $6,999 was pork as compared with 26 percent for households with incomes of $7,000 and above. The age of the household head was greater by only a small margin for the higher income group.

Despite the initial appearance of fig. 5, age and income can hardly be evaluated as important factors in over-all pork consumption in Webster County. Total

meat consumption by households in the first two income groups amounted to only about 9 percent of the meat consumption by all income groups. The percentage of total dollars spent was even less.

The mixture of the individual cuts of pork changed little with income. If the first two extremely low-income groups are disregarded, bacon showed some increase in quantity with income. Ham followed an uncertain pattern, which can probably be interpreted as no income effect on quantity. But if dollars spent per person rather than percentages are taken into account, both ham and bacon showed sizable increases for the higher-income groups.

Beef purchases as a proportion of total meat purchases can probably be related more closely to income than to any other socioeconomic characteristic. Only 30 percent of the quantity purchased by the lowest income group was beef, while 42 percent consisted of beef for the highest income group. The increase in beef purchasing as income increased was even stronger when dollars spent are considered; about 48 percent of the expenditures made by the highest income group was for beef. An examination of the extremes in income may be somewhat misleading, however, because most of the respondents were classed in the middle income groups for which the changes in purchasing patterns with income was much more mild (see Appendix Table A-1).

Beef steak purchases in general increased by a rather extreme amount as income increased. In addition, households with high incomes concentrated on t-bone and sirloin, while lower-income households purchased mostly round and chuck steaks. Households with an income of below $7,000 purchased only 0.06 pound of t-bone or sirloin steak per person a week, while households with an income of $7,000 or more purchased at the rate of 0.21 pound per person. In contrast, the lower-income group purchased more round and chuck steak per person than did the higher-income group.

AGE OF HOUSEHOLD HEAD

Maturation or stage in life of the household can be indicated reasonably well by age of household head. Fig. 6 provides information on meat purchases according to this household characteristic.

Purchases per person increased from about 1.8 pounds per week for households with the head under 45 years of age to 2.5 pounds for households with the head having an age of 45 years or more. Age made very little difference within these two divisions. Thus, it is suggested that age by itself was not causing the difference in mean purchases per person, but instead, the difference was caused largely by whether or not children were members of the household.

The effect of children in the household also shows up strongly in the mixture of meats purchased. Younger households gave more emphasis to ground

beef and cold meats, especially wieners, and less emphasis to roasts. Nearly 9 percent of the meat purchased by households with the head under 35 consisted of wieners, while the comparable figure was only 3 percent for households with the head being 55 years or older. But in this case, the emphasis placed on wieners cannot be attributed entirely to children because young couples without children purchased wieners at very nearly the same rate as did those with children.

EDUCATION OF HOUSEHOLD HEAD

The educational level of the household, as measured by the education of the household head, seems negligible in the meat-purchasing patterns of households in Webster County. Mean weekly purchases per person were nearly constant for all education groups. Price paid per pound increased slightly with education, but this effect can be more logically explained as the result of the higher incomes of more-educated persons. The group defined by the household head having 8 years or less of education emphasized pork a little more. However, this group's pattern was strongly influenced by elderly low-income households for whom it has already been noted that pork was especially important.

Households associated with a higher level of education gave less emphasis to cold meats. It is suggested that this may be a result of less preparation of away-from-home lunches. Education was related to greater purchases of the higher priced cuts such as t-bone and sirloin steak and roasts other than chuck.

OCCUPATION

The occupation of the household head was related to only minor changes in purchases. Mean per-capita purchases were nearly identical for all occupations. An exception was that farmers purchased at only about three-fourths the mean rate, but when home grown meat was considered, the difference became insignificant. Households in the "white-collar" class purchased pork at a rate of about 3 percent below the mean rate for all households of 25 percent. The income effect already noted was present, of course, when occupations were separated according to income.

STRENGTH OF EFFECTS

The discussion up to this point may appear to suggest that the socioeconomic factors considered have a rather strong effect on purchasing habits. This appearance, however, is strongly influenced by the extreme groups included in the preceding distributions. In addition, a classification by a particular factor also displays the aggregated effect of several factors by reason of the correlation of factors (for
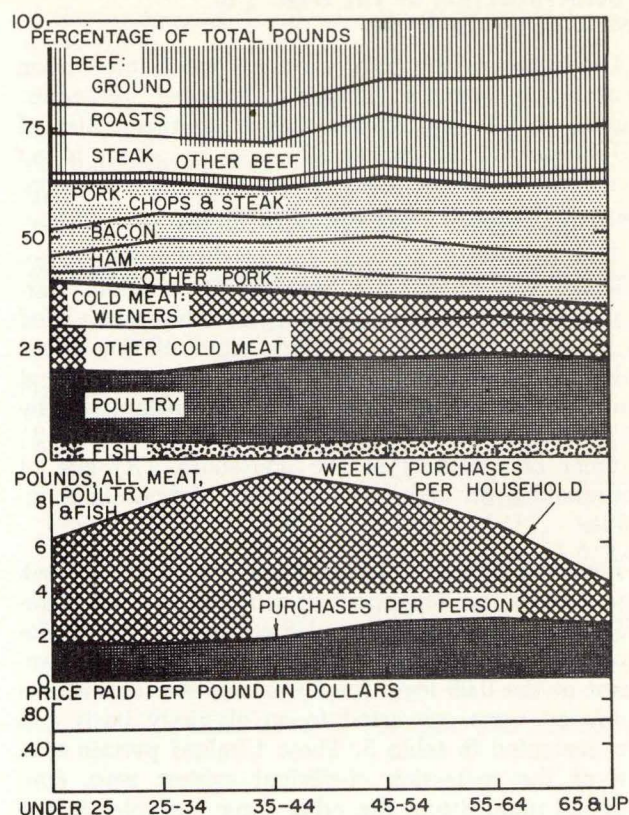
Fig. 6.   Percentage distribution of pounds of meat purchased by age of household head, Webster County survey, June-July 1963.
Source: Table B-4, Appendix B.

example, household size and income). Some indication of the mildness of these socioeconomic effects can be obtained by dichotomizing the survey data according to the factor of interest.

Households having an income below the median level for the group accounted for 43 percent of all meat, poultry and fish (pounds) purchased. This group also purchased 43 percent of all pork and 42 percent of all beef. Only a minor change is made by looking at dollars since this group contributed 41 percent of all expenditures on meat and fish. But the lower income half of the group purchased only 26 percent of the t-bone and sirloin steak purchased!

In dividing the survey group into equal parts by age of household head, the lower age group purchased 60 percent of all meat, poultry and fish. This group also purchased 60 percent of the beef and 58 percent of the pork.

Households containing children accounted for 70 percent of all meat, poultry and fish. They purchased 69 percent of the beef and 69 percent of the pork. The greater emphasis given to wieners by the younger families shows up in that 83 percent of all wieners were purchased by households with children.

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A QUANTIFICATION OF THE EFFECTS OF SOCIOECONOMIC FACTORS

Discussion in the prior section concentrated upon uncovering possible relations between meat-purchasing habits and socioeconomic characteristics of the household. Attention will now be given to an analytical technique used to quantify these relationships in terms of elasticity coefficients.

The regression analysis for producing these coefficients was based on a linear additive model. Various combinations of explanatory variables were tried to represent the socioeconomic factors of the households. The final conclusion was that quantity of meat purchased could be explained most satisfactorily by (1) whether the household contained children, (2) number of members in the household, (3) age of household head and (4) logarithm of household income.

Pounds purchased of each meat per person a week was used as the dependent variable for one set of regressions. The variation explained by the four socioeconomic variables just given was statistically significant at the 0.05 level for all meats. The coefficients produced were converted to an elasticity basis and are presented in table 5. These t values pertain to a test of the regression coefficient against zero, conditioned upon fitting the other three variables in the model.

Regressions were also completed by using as dependent variables: (1) proportion of total meat accounted for by a particular kind of meat and (2) dollar value of meat purchases per person weekly. The results are shown in tables 6 and 7.

The nature of the relationship envisioned within the model used to construct these tables was that a shift in the value for any socioeconomic variable for a particular household would lead to a corresponding shift in quantity of meat demanded. But it was not possible to alter the characteristics of the survey household to measure the effect on demand. Rather, it was possible only to examine the differences in demand for households already having specific characteristics.

The empirical model can only suggest real-world relationships that may or may not be true. However, the relationships so suggested, when fitted into the results obtained by other research methods, can contribute to an understanding of real-world situations. In cases such as this one, in which humans are involved, the nonexperimental approach often represents the only choice available for collecting data on a complex activity in a realistic setting.

The explanatory variables used in the model were highly correlated. For example, households containing children were generally larger than those containing only adults. Income was higher for larger households. The regression model attempted to determine the

Table 5. Elasticities of quantity demanded for selected household characteristics, based on purchases per person, Webster County survey, June-July 1963.

| Item | Income | | Composition | | Size-household | | Age of head | | | |
	Elasticity[a]	t value[b]	Coefficient[c]	t value[b]	Elasticity	t value[b]	Elasticity	t value[b]	F	R^2
Beef:										
Ground	0.25	1.88	0.34	2.22	0.02	0.22	-0.35	-2.08	2.61	0.016
Roasts	0.55	2.82	0.34	1.50	-0.28	-1.86	0.54	2.17	8.59	0.051
Steak	1.20	6.12	0.29	1.27	-0.64	-4.15	0.19	0.73	15.33	0.088
Other beef	0.06	0.21	0.75	2.43	-0.20	-0.99	0.01	0.03	5.68	0.035
Total beef	0.58	5.08	0.35	2.64	-0.26	-2.86	0.04	0.28	12.86	0.075
Pork:										
Chops & steak . .	0.08	0.46	0.49	2.31	-0.14	-0.99	-0.47	-1.99	3.08	0.019
Bacon	0.40	2.53	0.40	2.14	-0.28	-2.27	0.20	0.97	9.07	0.054
Ham	0.63	2.51	0.15	0.38	-0.30	-1.53	0.54	1.68	3.70	0.023
Other pork	0.30	1.10	0.05	-0.16	-0.54	-2.59	-0.01	-0.04	2.43	0.015
Total pork	0.35	2.81	0.27	1.82	-0.29	-3.00	0.07	0.42	9.06	0.054
Cold meat:										
Wieners	-0.01	-0.08	0.21	1.08	0.14	1.06	-0.91	-4.23	6.86	0.042
Other	-0.02	-0.11	-0.06	-0.39	-0.33	-3.13	-0.20	-1.12	3.21	0.019
Total cold meat . . .	-0.01	-0.13	0.04	0.29	-0.16	-1.79	-0.46	-3.13	3.11	0.019
Poultry	0.41	2.33	0.38	1.85	-0.07	-0.51	0.45	1.98	5.85	0.035
Fish	0.35	1.46	0.25	0.91	-0.33	-1.75	0.01	0.05	2.65	0.016
All meat, poultry & fish . .	0.41	4.78	0.29	2.95	-0.22	-3.33	0.06	0.52	16.05	0.092

[a]Based on model using log (household income).

[b]t value for regression coefficient used in estimating elasticity tested against zero.

[c]Magnitude of coefficient represents the proportional adjustment for households containing only adults relative to households containing children.

effect on demand corresponding to altering one socio-economic variable while holding constant all other socioeconomic variables. That is, when measuring the effect on demand of household size, the model simultaneously adjusted the data for the income, household composition and age effects. But since these explanatory variables were all strongly correlated, some difference in results would have been achieved if the model used involved a lesser or larger number of explanatory variables.

One must interpret the results to follow within this context. They are conditioned somewhat upon the judgment of the researchers as to what constitutes the most satisfactory explanatory model. And the inability to use an experimental technique upon the

Table 6. Elasticities[a] describing the relation of selected household characteristics to distribution of quantity of meat purchased, Webster County survey, June-July 1963.

Item	Income		Composition		Age of head			
	Elasticity[b]	t value[c]	Coefficient[d]	t value[c]	Elasticity	t value[c]	F	R^2
Beef:								
Ground	-0.22	-1.93	-0.03	-0.26	-0.32	-1.98	2.57	0.012
Roasts	0.36	2.07	-0.04	-0.23	0.63	2.51	3.17	0.015
Steak	0.80	5.24	0.27	1.87	0.29	1.32	10.06	0.045
Other beef	-0.19	-0.63	0.64	2.29	0.25	0.56	4.74	0.022
Total beef	0.17	2.24	0.09	1.34	0.08	0.70	2.43	0.011
Cold meat:								
Wieners	-0.29	-1.73	-0.28	-1.78	-1.05	-4.29	15.41	0.068
Other	-0.29	-1.77	-0.22	-1.44	-0.18	-0.79	2.26	0.011
Total cold meat	-0.29	-2.41	-0.24	-2.14	-0.48	-2.79	9.49	0.043

[a]The elasticity describes the proportional change in the proportion of all meats accounted for by a particular meat item that can be associated with a proportional change in a socioeconomic variable.

[b]Based on a model using log (household income).

[c]t value for regression coefficient used in estimating elasticity.

[d]Magnitude of coefficient represents the proportional adjustment for households containing only adults relative to households containing children.

Table 7. Elasticities of value demanded for selected household characteristics, based on purchases per person, Webster County survey, June-July 1963.

Item	Income		Composition		Size-household		Age of head			
	Elasticity[a]	t value[b]	Coefficient[c]	t value[b]	Elasticity	t value[b]	Elasticity	t value[b]	F	R^2
Beef:										
Ground	0.37	2.76	0.37	2.35	-0.03	-0.24	-0.20	-1.16	3.05	0.018
Roasts	0.89	3.94	0.48	1.81	-0.36	-2.06	0.60	2.08	10.41	0.061
Steak	1.44	6.81	0.38	1.55	-0.65	-3.95	0.24	0.88	17.23	0.097
Other beef	0.47	1.84	0.55	1.85	-0.34	-1.74	-0.10	0.29	5.16	0.008
Total beef	0.91	6.91	0.41	2.68	-0.36	-3.54	0.17	1.01	19.88	0.111
Pork:										
Chops & steak	0.27	1.44	0.46	2.12	-0.21	-1.47	-0.42	-1.74	3.36	0.021
Bacon	0.63	3.95	0.46	2.51	-0.34	-2.72	0.38	1.86	14.73	0.086
Ham	0.92	3.76	0.18	0.64	-0.22	-1.14	0.78	2.48	6.02	0.037
Other pork	0.55	1.86	0.01	-0.02	-0.69	-3.01	0.04	-0.09	3.73	0.022
Total pork	0.60	4.50	0.30	1.96	-0.32	-3.09	0.20	1.19	12.42	0.072
Cold meat:										
Wieners	0.09	0.60	0.15	0.91	0.06	0.57	-0.75	-3.99	6.34	0.038
Other	0.10	0.75	0.03	0.19	-0.40	-3.76	-0.13	-0.72	5.67	0.034
Total cold meat	0.10	0.88	0.07	0.56	-0.24	-2.85	-0.34	-2.36	3.72	0.022
Poultry	0.52	2.89	0.39	1.83	-0.15	-1.08	0.33	1.40	5.78	0.035
Fish	0.52	2.08	0.19	0.66	-0.42	-2.16	0.13	0.41	3.42	0.021
All meat, poultry & fish	0.64	7.16	0.32	3.05	-0.31	-4.41	0.12	1.06	25.84	0.140

[a]Based on model using log (household income).

[b]t value for regression coefficient used in estimating elasticity tested against zero.

[c]Magnitude of coefficient represents the proportional adjustment for households containing only adults relative to households containing children.

consumers prevents one from drawing simple cause-and-effect conclusions.

Tables 5, 6 and 7 express the relationships established by coefficients of elasticity. Such coefficients pertain to the percentage change in one variable that can be associated with a percentage change in another. For example, the elasticity shown for ground beef in table 5 under the column labeled "age of head" is -0.35. This means that a 10-percent increase in age of head was related to a 3.5-percent decrease in ground beef purchasing on a per-person basis.

Several potential relationships between socioeconomic characteristics and demand were uncovered earlier. We will now interpret the relationships indicated by the regression model.

EMPIRICAL RESULTS

It was noted earlier that purchases per person decreased as the household size became larger. It was suggested that this situation may be a result of the larger families, containing a larger proportion of children, for whom meat consumption is lower. Table 5 shows a significant decrease in purchases of most meats per person for households containing children, but it also shows that purchases per person decreased significantly for most meats as household size increased even when household composition remained constant. Households containing children purchased 29 percent less meat, poultry and fish per person than did households containing only adults after taking into account the income, size and age factors. The elasticity coefficient of -0.22 for size for all meat, poultry and fish indicates that a doubling, or 100-percent increase in family size, was accompanied by a decrease of 22 percent in purchases per person. Again, this coefficient assumes that all other factors remained constant. The model suggests that the addition of children to a household containing only adults would lead to a drop in consumption per person from both the size and household composition standpoints.

An examination of fig. 6 earlier suggested that age of the household head by itself may not be associated with an increase in purchases per person. The conclusion was reached even though households having a head above 45 years in age purchased meat at a rate about one-third higher per person than did households having a younger household head. Table 5 validates this conclusion. It indicates that age of household head was not related to aggregate purchases of meat, poultry and fish but that age was related to individual kinds of meat. Older families purchased significantly less ground beef, pork chops, steaks and cold meats. But in contrast, they purchased more poultry, ham and beef roasts. The elasticity coefficients show that an age increase from 40 to 60 years was related to an increase of about one-fourth for each of these three meat items.

The regression shows that age alone is a much more significant factor to cold-meat consumption than income, size or household composition. A significant relation to education was also found for cold meats.

The use of proportions as the dependent variable showed that pork, poultry and fish as a proportion of aggregate meat purchases could not be related significantly to any of the socioeconomic variables considered. Table 6 shows results only for beef and cold meats. The proportion of cold meat declined with an increase in income and age. Also, households containing only adults gave less emphasis proportionately to cold meats. All the declines in cold meats tended to be offset by a corresponding increase in all beef classes except ground beef. Income was related very strongly to beef steak purchases.

Table 7 was produced by using value of purchases as the dependent variable. It provides the same information as Table 5 on pounds purchased, except that the effect of prices paid is also included in the coefficients. Since elasticity of value equals elasticity of price paid plus elasticity of quantity purchased,[4] the elasticity of prices with respect to each of the socioeconomic variables can be obtained by simply subtracting the entries in table 5 from those of table 7. Table 8 is the result.

No t-test values were determined for table 8. But to provide some measurement of reliability, a regression was completed by using the mean price paid by each household for all meat, poultry and fish.

Table 9 shows that the four independent socioeconomic variables explain a significant part of the variation in price. However, an examination of the t-test values shows that household composition had almost no explanatory power after the other three coefficients were determined.

The results of the special regression on prices for all meats (table 9) agree very closely with those obtained by subtraction (table 8). Thus, we concluded that the elasticity coefficients shown in table 8 are generally descriptive of the price elasticities for the survey group. Price paid per pound increased with income for all meat items (table 8). However, the income effect on price was less than the income effect on quantity for essentially all meat items but cold meats. Price paid per pound increased marginally with the age of the head while larger households paid less per pound.

HOUSEHOLD SHOPPING PATTERNS

Household shopping behavior is manifested in the quantity of different items purchased from week to week. The preceding discussion attempted to show the consequences of consumer decision-making in objective terms.

One reason for emphasizing the objective consequences of consumer attitudes and preferences is the

$$^{4} \frac{\partial (pq)}{\partial x} \cdot \frac{x}{pq} = \frac{\partial p}{\partial x} \cdot \frac{x}{p} + \frac{\partial q}{\partial x} \cdot \frac{x}{q}$$

complexity of the environment that conditions consumer choices. The objective at this time, therefore, is relatively modest; namely, to ascertain variations in the shopping patterns of households that may help explain variations in week-to-week purchases of different meat items.

General Considerations

A general consideration affecting consumer purchasing behavior was the absence of purchase and consumption of some meat items. In 79 percent of the households, lamb was never served, and turkey was never served in 17 percent of the households. Pork was not served in only 4 percent. Beef was served in all but one household of the the study group.[5]

Accessibility to food storage and preparation facilities also may have affected food-purchasing practices. For example, nearly all households (95 percent) reported the availability of refrigerator space for frozen food (table 10). Only 7 percent of the households rented lockers (typically at a nearby frozen food locker plant), while outdoor cooking facilities were reported for most households. Moreover, 9 percent of the households specifically cited changes in their meat preparation patterns as a result of outdoor cookery.

Besides these general considerations, two additional series of questions were included in the schedule for the initial interview: a series on general food-shopping patterns and a series on specific practices with regard to meat purchases. The responses to these questions show an additional dimension of the demand for meat that cannot be inferred entirely from the objective data.

Food Shopping Patterns

A series of five questions was asked regarding food shopping practices. The responses to these questions, summarized in table 11, show substantial planning of purchases, but with important departures from these plans. Although 89 percent of the respondents asserted that they at least occasionally planned *what* they were going to buy, a substantially smaller percentage had in mind the *amount* they were going to spend. More-

[5] If no meat was served, the household was not included in the sample.

over, of the respondents preparing grocery lists (85 percent of all households), only 57 percent listed the quantity of the item, and practically all households reported purchasing items not on the list.

Among the reasons given for purchasing items not on the list, the most frequently mentioned were an oversight in compiling the list or an unanticipated sale (table 12). Impulse buying is suggested, also, in the case of items that were "eye appealing" or were "new

Table 8. Elasticities of price[a] for selected household characteristics, Webster County survey, June–July 1963.

Item	Income	Composition	Size of household[b]	Age of head
Beef:				
Ground	0.12	0.03	-0.05	0.15
Roasts	0.34	0.14	-0.08	0.06
Steak	0.24	0.09	-0.01	0.05
Other beef	0.41	-0.20	-0.14	0.09
Total beef	0.33	0.06	-0.10	0.13
Pork:				
Chops & steak	0.19	-0.03	-0.07	0.05
Bacon	0.23	0.06	-0.06	0.18
Ham	0.29	0.03	0.08	0.24
Other pork	0.25	-0.04	-0.15	0.05
Total pork	0.25	0.03	-0.03	0.13
Cold meat:				
Wieners	0.10	-0.06	-0.08	0.16
Other	0.12	0.09	-0.07	0.07
Total cold meat	0.11	0.03	-0.08	0.12
Poultry	0.11	0.01	-0.08	-0.12
Fish	0.17	-0.06	-0.09	0.12
All meat, poultry & fish .	0.23	0.03	-0.09	0.06

[a]Obtained by subtracting table 5 from table 7. The elasticity describes the proportional change in price paid that can be associated with a proportional change in a socioeconomic variable.

[b]Magnitude of coefficient represents the proportional adjustment for households containing only adults relative to households containing children.

Table 10. Selected food storage and preparation facilities, Webster County survey, June–July 1963.

Item	Percentage of all households
Refrigerator space for frozen foods	95
Separate home freezer	41
Locker at frozen food locker plant	7
Outdoor grill	54

Table 9. Elasticities of price for selected household characteristics for all meats, poultry and fish, Webster County survey, June–July 1963.

Item	Income		Composition		Size-household		Age of head			
	Elasticity[a]	t value[b]	Coefficient[c]	t value[b]	Elasticity	t value[b]	Elasticity	t value[b]	F	R[2]
All meat, poultry & fish .	0.23	7.73	-0.01	-0.15	-0.12	-5.29	0.06	1.48	21.30	0.118

[a]Based on model using log (household income).

[b]t value for regression coefficient used in estimating elasticity tested against zero.

[c]Magnitude of coefficient represents the proportional adjustment for households containing only adults relative to households containing children.

Table 11. Food shopping practices, Webster County survey, June-July 1963.

Questions	Usually	Sometimes	Never[a]	All households
		(percentage)		
1. Before starting on a shopping trip, do you plan what you are going to buy?	70	19	11	100
2. Do you have in mind the amount you are going to spend?	46	13	41	100
3. Do you prepare a grocery list before going to the grocery store?	60	25	15	100
4. If a grocery list was used, were any items purchased that were not on the list?	62	35	3	100[b]
5. If a grocery list was used, was the quantity of the item listed also?	35	22	43	100[b]

[a]Including nonrespondents.

[b]All households reporting use of a grocery list.

Table 12. Reasons given for purchasing items not on prepared grocery list, Webster County survey, June-July 1963.

Reason given	Percentage of total reasons
Forgot to put on list; see something I need . . .	30
On special; advertised,cheap; on sale	27
Eye appealing; tempting; attractive; seeing is suggesting; looks good	16
See something I want; see something we like . . .	12
Try new products; see something different; new ideas; a change	6
Pick up odds and ends; treats; splurge; children want	3
A good quality product at a good price; a good buy; want quality	3
Buy to have on hand or to stock up on good buys	3
Total	100

products." Price and quality clearly were two important considerations affecting point-of-sale choices.

Meat Buying

Respondents were questioned further regarding specific behavioral patterns associated with buying of meat items (table 13). About half acknowledged seasonal changes in purchasing. The kind of change indicated was most frequently that of buying additional cold meats during the summer, but many respondents said they also purchased additional frying meats such as chicken, hamburger, chops and steaks. Less roasts and boiling meats were said to be purchased during the summer.

Only 17 percent of the respondents said that they usually have in mind the amount of money they plan to spend each week. But these 17 percent were important consumers since their average weekly meat purchasing rate was about 1½ times the rate for all households. Only about 40 percent said that they tried

to stock up on meat items when they were on sale by buying larger amounts for storage.

Some emphasis was given to determining how people decide which meat items to buy. This phase of the interview was initiated with the "open-end" question: "When preparing your grocery shopping list or otherwise deciding which meats to buy, how do you go about selecting which meat items to buy?" After recording the response to the open-end question, a prepared list of eight possible responses (fig. 7) was then read, and the person was asked which of these applied to selecting meat items for her household. Next the person was asked which of her responses did she consider most important to her selection, second most important, and third most important.

Fig. 7 presents percentage data on how many respondents considered a certain factor in deciding which meats to buy. "Purchasing meats which were the favorite of the family" and "looking at ads in the newspaper" were the most frequent responses. Radio was cited least frequently. Both voluntary response data to the initial open-end question and the data on importance ranking of the factors mentioned by the respondent are consistent generally with the ordering of factors in fig. 7.

Fig. 7 provides an ordering of the factors that consumers considered important in deciding which meat items to buy. This particular ordering, however, need not reflect the importance of these various factors as a means to influence consumer demand. For example, a menu seen in a newspaper may be a significant influence to a consumer in selecting a new meat item that she previously did not use, even though

Table 13. Meat buying practices, Webster County survey, June-July 1963.

Item	Percentage of total households
Made changes in the type of meat bought during the summer from the type bought during the winter	51
Tried to stock up on meat items when they were on sale by buying larger amounts for storage .	40
Have in mind the amount of money to be spent on meat for a week	17
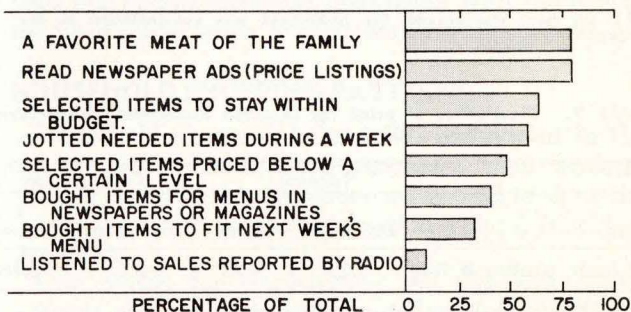
Fig. 7. Factors pertaining to how respondents determined which meat items to buy, Webster County survey, June-July 1963.

this consumer gives considerable attention to the price listings in the newspaper for determining most of her purchases. Most respondents said that they considered more than one factor when deciding to purchase a meat item.

Another approach used in the Webster County survey involved a hypothetical situation; namely, the availability of an additional $10 in the food budget. According to the responses, only 15 percent of the respondents would buy more meat or other foods for day-to-day consumption (table 14). Twenty-four percent would buy a better quality of food, expressed often times in terms of more beef or more steaks and roasts. An additional 17 percent would both increase quantity and buy a better quality. Generally, these results agree with findings of other studies that show a low income elasticity of demand for food but a higher income elasticity for selected meat items and for improved product quality.

Store Preferences

Store preferences of the respondents were examined since the merchandising factor may be a consideration in the quantity and quality of meat purchases.[6] A list of reasons for individual store preferences was prepared on the basis of a test sample of households, and these reasons were presented to each of the respondents. However, additional reasons were given by the respondents, some of which are included in table 15. Altogether, 5,600 reasons were cited by the group studied. These reasons are summarized into 15 categories (table 15).

Proximity, parking, personal rapport with the store manager and employees, and physical layout of the store were among the more frequently mentioned reasons given by the respondents. Stamps were cited in 6 percent of the reasons given, and low price was cited specifically in 7 percent.

Reasons given for selecting the food store where meat was bought again emphasized the quality of product or service (table 16). Variety of choice also was an important consideration.

Finally, each household was asked about the number of stores at which meat and food were purchased during the preceding month (table 17). Meat, generally, was purchased in fewer stores than food as a whole.

CONSUMER OPINIONS RELATING TO MEAT ITEMS PURCHASED OR EATEN

Three categories of consumer opinions were considered relevant to this study. These were opinions regarding (1) meat quality, (2) acceptability, in terms of both the individual product and the store, and (3)

[6] Food purchases were made at 81 different stores; however, 18 percent of the 15,900 purchases recorded were made at one large retail store. Moreover, more than half the purchases (55.2 percent) were made at four of the largest food stores.

eating satisfaction. Both meat quality and acceptability concepts referred to the opinions at time of purchase, but eating satisfaction opinions were collected only for meat items consumed while the survey was in progress.

All opinions, however, were based on recall of the attributes and events associated with each meat item for the two specific points in time. The procedure of

Table 14. Intended expenditure of an additional $10 in the food budget, Webster County survey, June 1963.

Intended expenditure	Percentage of total
Larger quantity of meat	8
Better quality of meat	16
Larger quantity of food	7
More food on hand	6
More luxury food items	8
Larger quantity and better quality of food	17
Eat out more	4
No change	25
Other	9
Total	100

Table 15. Reasons given for food store preferences, Webster County survey, June 1963.

Reasons selected	Percentage of total
Close to home	12
Like the manager and employees	9
Have plenty of parking space	9
The store is clean and nicely decorated	8
Consider store to be cheaper than other stores	7
Has better quality foods for the money	7
Give stamps that I save	6
Like the aisle width and organization of foods in the store	5
Sells products other than groceries	5
Size of the store	5
Provides services such as cashing pay checks, selling money orders, etc.	4
Less crowded, can get checked out faster	3
Convenient to other activities, happened to be near	3
Like the meat department and meat service; have butcher service	3
Other	14
Total	100

Table 16. Reasons given for preferring stores where meat was purchased, Webster County survey, June-July 1963.

Reasons selected	Percentage of total
Have better quality meats	13
Meat is fresher	12
Have butcher service	11
Can get desired package size	10
Have a variety of meat	10
Have self-service	9
I can complain if meat isn't good	7
They have the brands I prefer	7
Have frozen meat or poultry	4
Convenient to other activities, happened to be near	4
I do other shopping there	3
Other	10
Total	100

eliciting a response on an opinion from memory is traditional with the survey approach and is used extensively in providing basic data in many areas of consumer analysis. However, the extensiveness of the questioning and of the recall aids supplied for this survey is somewhat atypical. These procedures will now be explained.

Opinion data were collected on all fresh meat and poultry purchased and, in addition, selected smoked and processed meats. That is, the opinion data for the survey corresponded closely to the items included in table 4 except for the exclusion of opinions on cold meats and fish. Data from all 4 weeks of interview form the basis of the following section, although only the second through fourth weeks formed the basis of the prior section on quantity of purchases.

As mentioned earlier, the respondent was supplied a diary for recording data on meats received from all sources for the second, third and fourth weeks. The diary was filled out by the interviewer at the time of initial contact for the first week. For all 4 weeks, the interviewer based the questioning on opinions upon the individual entries in the diary. Opinions on quality and acceptability were solicited only on meats purchased where the interviewee was present at the time of purchase. That is, such opinions were not requested when another member of the household made the purchase but was unavailable for interview.

Opinions on eating satisfaction were obtained only on meats both purchased and eaten during the survey period. Again, such opinions were solicited only from an interviewee who was associated with the actual preparation and consumption.

Opinions of panel members were sought first on quality by use of questioning of the form:

"What was your opinion of the quality of (a specific purchase)?"

"Would you say that this meat was of:"

1	2	3	4	5
Very high quality	High quality	Medium quality	Low quality	Very low quality

"In deciding to buy this particular piece or package of ——————————— did you consider

    1. Amount of bone
    2. Color

                  ?"

    3. Freshness
    4. Fat content

"How important was

    1. Amount of bone
    2. Color
    3. Freshness

                  ?"

    4. Fat content

1	2	3	4	5
Extremely important	Very important	Moderately important	Slightly important	Not very important

Table 17. Percentage distribution of households reporting number of stores at which meat and food was purchased during the preceding month, Webster County survey, June 1963.

Number of stores	Meat	Food
1	31	15
2	31	26
3	25	29
4	9	15
5	2	9
6 or more	2	6
Total	100	100

A card was supplied the respondent containing the 5-point scale of quality and importance. After recording the initial response on importance of the various attributes, the interviewer asked the respondent to rank all attributes for which he gave an identical rating of importance.

It should perhaps be noted that the questions on quality were oriented to a specific purchase at the time of purchase. No referent was supplied for comparing quality.

After completing the questions on quality, a similar pattern of questioning on product acceptability was initiated with the question: "How well did these (this) (a specific purchase), in the form you bought it, fit your requirements?" Store acceptability was introduced with "Why did you buy this (these) —————————— at the store where you bought it?" Questioning then proceeded to the importance of various predetermined attributes of acceptability.

The data on satisfaction pertain to "After preparing and eating this (these) —————————— how well satisfied were you with the meat?" "Was it what you expected when you bought it?" Note that for satisfaction, a referent of satisfaction was supplied by the reference back to expectations at time of purchase.

The particular attributes selected for evaluation by the consumer for each of the four categories of opinions were determined by a pilot study in Marshalltown, Iowa, in 1960. In this study, the lists of pertinent attributes were longer. Many were eliminated as being superfluous in planning the Webster County study.

Attention first will be turned to the consumer opinions on quality, acceptability and satisfaction. Discussion concerning the attributes important to these categories follows later.

Measurement of Quality, Acceptability and Satisfaction

The responses on quality, acceptability and satisfaction were recorded and processed in the form of a 5-point hedonic scale. The number 1 was used to indicate "extremely high quality" or acceptability, or in the case of satisfaction, a degree of satisfaction "very much better than expected." The lower degrees of

quality, acceptability and satisfaction were given the appropriate higher integer.

Table B-7 in Appendix B shows the mean responses on quality, acceptability and satisfaction. The data confirm the *a priori* judgment that these variables are related to price. That is, for nearly all meats, a higher price was related to a better quality and acceptability rating and to increased consumer satisfaction.

The mean scores showed a somewhat higher quality and acceptability response than the 3.0 midpoint of the 5-point scale (table B-7). Again, this fits expectations since the data pertained only to meats actually purchased, which must have met some subjectively minimum level of quality and acceptability in the opinion of the purchaser. That is, unacceptable and inferior meats were simply not purchased, and this was reflected in eliciting few opinions in the low quality and acceptability ends of the scale. The average satisfaction index was also over the 3.0 midpoint.

The over-all scores for all beef, pork and poultry were nearly identical, which is noteworthy in itself. The similarity of poultry to beef and pork shows that these data are not just a reflection of price. The mean price of poultry (38c) was only about two thirds that of beef (64c) and pork (60c).

The mean score for quality and acceptability varied over a wider range than did satisfaction. Again, this was expected by reason of the respondent being given the definite referent of "expectations at time of purchase" for measurement of satisfaction. But despite this referent, the consumer was less satisfied generally by the lower-priced meats.

The mean scores on quality, acceptability and satisfaction for various socioeconomic groups were compared. Generally the mean scores for each group approached quite closely the mean for all groups. One exception, however, was that the households with a higher income gave their purchases a score denoting a somewhat higher quality. This again indicates consistency in the measuring process because the higher-income households also concentrated their purchases on higher-priced meats for which quality was better.

In summary, the scores obtained on quality, acceptability and satisfaction appear consistent with *a pri-*

Fig. 8. Opinions on importance of attributes in meat quality at time of purchase, Webster County survey, June-July 1963. Source: Table 18.

ori expectations, and such scores were generally unrelated to the socioeconomic characteristics of the household.

Interest can now be turned to the attributes or components making up these measurements. It was the collection of information on such components that served as the major impetus for conducting the consumer-opinion phase of the survey. The questioning on the aggregate concepts of quality, acceptability and satisfaction was included only as a means for obtaining the information on the components of these aggregates.

Attributes of Product Quality

As noted earlier, four components of product quality were identified; namely, amount of bone, color, freshness and fat content. The respondent was asked if he considered any of the four factors in the decision to buy a specified meat item. He was next asked how important was each factor he considered in terms of a 5-point scale. If two or more components were initially given the same importance rating, he was next asked to rank such components in importance. No attempt was made to describe or define these attributes for the interviewee.

For the analysis, a scale was constructed that took into account both the original 5-point measurement of importance and the secondary ranking system for components given an equal initial rating. The analysis was designed so that the data collected for different meat items, for which different components of quality would be applicable, could be aggregated to form means appropriate for major classes of meat. It also enabled valid comparisons between kinds of meats and between the attributes themselves.

In most scaling procedures for sociological data, a linearity and a zero-point problem are often confronted. That is, in terms of the current situation, is it true that "extremely important" is twice as important as "moderately important"? Or, does "very important" represent the midpoint on the importance scale between "moderately" and "extremely important"? Is "not very important" identical to zero importance? None of these questions can be answered in the affirmative with confidence. Nevertheless, the usual convention of linearity over the 5-point scale was followed in the analysis for reasons of simplicity.

The results for all three major kinds of meat are shown in fig. 8. Here, the values from applying the scaling procedures have been transformed back into the original 5-point importance scale. The graphics of the figure show the zero value as "not very important." But such a convention is somewhat arbitrary. That is, the reader, in examining fig. 8, should not interpret it as indicating that freshness is only approximately 20 percent more important than fat content since this is how the length of the bars compare when they are drawn by starting at the "not very im-
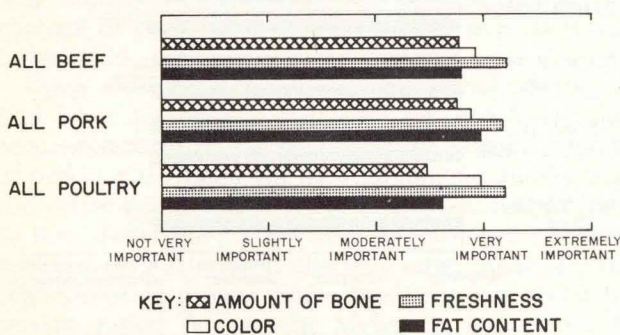
portant" or graphically obvious zero-point on the scale. The responses of "slightly important" and "not very important" were very seldom used by the respondent; instead the respondent simply considered either the attribute of greater importance than indicated by these values on the scale or considered it not applicable.

With the discussion of the conceptual basis now completed, attention can be returned to the actual information offered in fig. 8. Freshness was considered the most important component of quality for all meats, while amount of bone was considered least important. For beef and poultry, color was more important than fat content, but for pork the importance of these two attributes was reversed.

Fig. 8 also enables a comparison between meats on an attribute basis. That is, freshness was considered of nearly equal importance for all three major kinds of meat. Color was of only slightly less importance for pork than for beef and poultry. But in contrast, fat content is clearly most important for pork and least important for poultry. Amount of bone is most important for beef, a little less important for pork, and lowest in importance for poultry.

The data in fig. 8, of course, reflect the importance ratings given by persons who "considered" the particular attribute in judging quality at time of purchase. But often an attribute was not "considered"; also some attributes were simply not applicable, such as bone in a boneless roast or in ground beef. Interpretation can be expanded by considering such data.

Table 18 shows that bone was applicable in only 38 percent of the beef sold and for 42 percent of the pork. The other three attributes were nearly always applicable for beef and pork, while all four attributes were applicable to most poultry. Nevertheless, after taking into account the cases for which bone was not applicable, bone was "considered" in judging of pork and beef quality only about two thirds of the time. The bone rate for poultry was only 14 percent. Freshness was considered nearly 90 percent of the time for all meats.

Data on the importance ratings of attributes for individual cuts of pork and beef are given in figs. 9 and 10. Of course, these data reflect the values given by persons who "considered" the particular attribute.

The pattern just described for all beef portrays generally the situation for individual cuts of beef. One exception was that fat content was of greater importance for ground round and chuck than was fat content for beef in general; but such a difference clearly fits expectations because fat content is a major criterion in distinguishing such meat from ordinary hamburger.

The consistency with which individual cuts of beef followed the over-all beef pattern in terms of importance of attributes of quality did not hold true for pork. Fig. 10 shows much more variation for pork. Freshness was still most important for all cuts. Although fat content was usually given a higher rating

than color, the situation was reversed in the case of ham and picnic. The scale value for fat content exceeded the mean to a point where it compared closely to freshness in the case of bacon. Bone was of less importance for ham and picnic than for pork in general.

An examination of the importance rating given these attributes of quality by various socioeconomic groups showed a rather high degree of consistency. That is, respondents judged quality on about the same basis, regardless of their socioeconomic situation. The

Table 18. Opinions on importance of attributes in meat quality at time of purchase, Webster County survey, June-July 1963.

Meat	Total responses on quality	Attribute applicable[a] (percent)	Attribute "considered"[b] (percent)	Scaled value of[c] importance
Beef:	3,195			
Amount of bone		38	62	68
Color		100	81	73
Freshness		100	90	80
Fat content		97	74	70
Pork:	2,272			
Amount of bone		42	59	68
Color		100	67	72
Freshness		100	81	79
Fat content		100	78	74
Poultry:	936			
Amount of bone		98	14	62
Color		100	73	74
Freshness		100	90	81
Fat content		99	38	65

[a]Data are percentage of total responses on quality. An example of a case for which an attribute is not applicable is bone in ground meat.

[b]Data are percentage of times respondent "considered" attribute in judging quality when attribute was in fact applicable.

[c]Data are a mean of responses on importance of attribute scaled such that "not very important" is zero value and "very important" is 100.

KEY: AMOUNT OF BONE · FRESHNESS · COLOR · FAT CONTENT
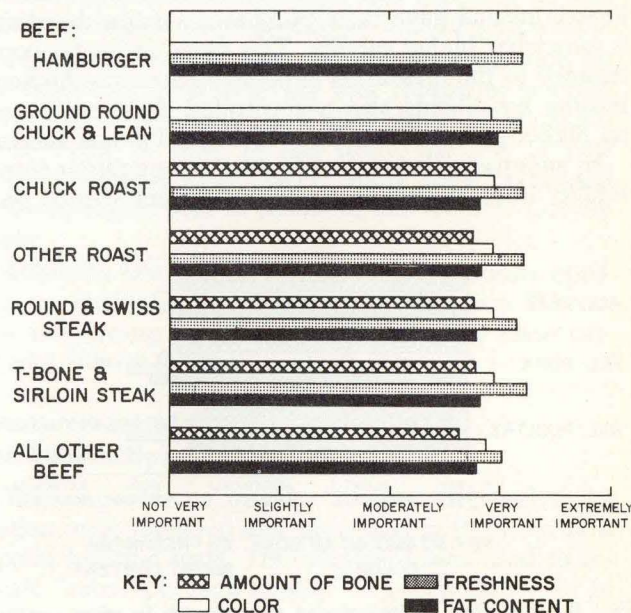
Fig. 9. Opinions on importance of attributes in beef quality at time of purchase, Webster County survey, June-July 1963.
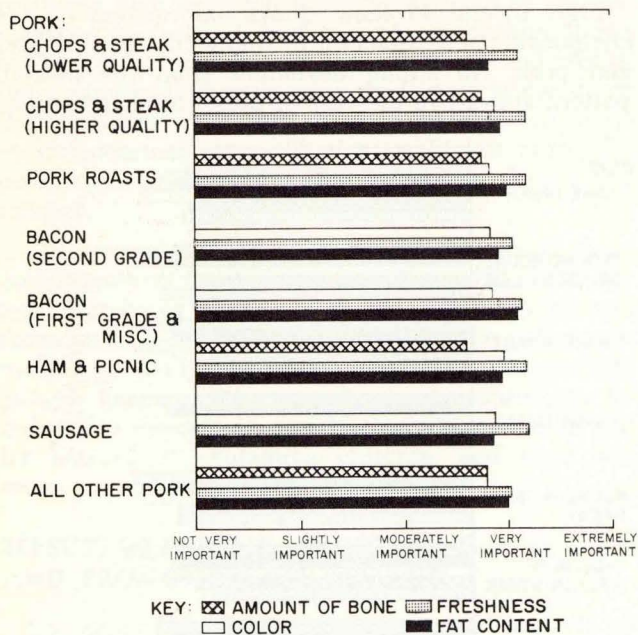
22

Fig. 10. Opinions on importance of attributes in pork quality at time of purchase, Webster County survey, June-July 1963.
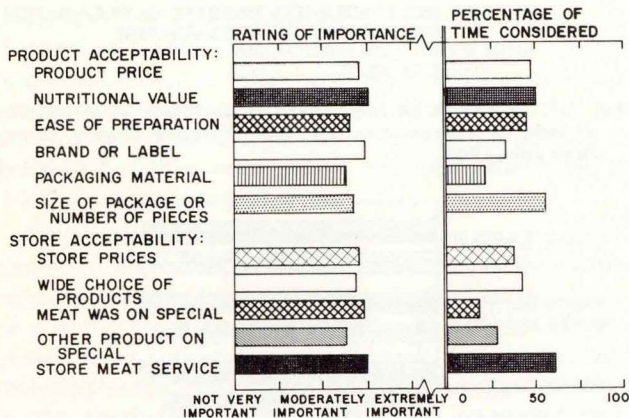

Fig. 11. Opinions on importance of attributes of acceptability for all beef, pork and poultry, Webster County survey, June-July 1963.

only significant exception was concerned with fat content in pork. And, the differences even here are rather mild.

Upon examining the scores for households classified by socioeconomic characteristics, we found that respondents with a higher education gave fat content of pork a more important place in judging quality than did respondents with a lower education. Respondents in the middle age groups were more concerned about fat content. Fat content also was rated higher by the higher-income groups. Some tendency was noted for groups rating fat content higher in importance to purchase a larger proportion of their pork purchases in the form of ham and picnic. However, this pattern was far from being clearcut.

In the scheme used to ascertain opinions, the importance rating given these attributes was not intended to reflect the quality rating given the meat item. For example, color could be rated as "extremely important" in judging the quality of a meat item to be low just as well as color could be rated as "extremely important" in judging the quality to be high. The question is now confronted as to whether certain attributes were considered more important for meat items given a low quality rating than for those given a high quality rating?

The relative importance of each of these four attributes was not influenced by the respondents' evaluation of quality. However, meat purchases given a lower quality rating were accompanied by a marginally lower mean importance rating for all four quality attributes considered in the survey. This may indicate that some other components of quality (for which no information was collected in the survey) became a more important factor as quality decreased.

Attributes of Product and Store Acceptability

Product acceptability was based on the question, "How well did these (this) (specific purchase), in the form you bought, fit your requirements?" Several attributes of product acceptability were identified before the study; namely, price, nutritional value, ease of preparation, brand or label, packaging material and size of package or number of pieces. After obtaining the respondent's opinion on acceptability, the interviewer first asked which of the attributes was "considered" in determining acceptability. Next, an importance rating was requested for each attribute considered.

Fig. 11 summarizes the results of these opinions for all beef, pork and poultry. Packaging material was "considered" only 20 percent of the time, and brand or label was considered only 34 percent of the time. All other attributes of product acceptability were "considered" about half the time.

An examination of the importance ratings given by respondents who considered the attribute shows nutritional value and brand or label to have been given the highest importance ratings. Brand or label exceeded nutritional value in the case of most cuts of pork, especially processed meats, but the opposite situation occurred for beef. Size of package was of relatively greater importance for ham and picnic than for other pork. Packaging material was rated of least importance, and ease of preparation and size of package or number of pieces were given relatively low ratings of importance.

Store acceptability opinions were found by asking, "Why did you buy this (these) ——————————— at the store where you bought it?" "Was it because of: store price level, wide choice of other products, meat

was on special, other products on special, or store meat service?" Fig. 11 shows both, which attributes were considered and a scaled value of importance.

Store meat service was most often considered (62 percent), but the meat item being on special was considered only 27 percent of the time. The other identified attributes were considered about one third to half the time. In turning to the scale values of importance, store meat service was rated most important; that another product was on special was rated lowest in importance.

Attributes of Consumer Satisfaction

The question, "After preparing and eating this (these) ———————————, how well satisfied were you with the meat?", was used in measuring consumer satisfaction. Five components of satisfaction were considered. These were tenderness, proportion of fat to lean, taste, ease of preparation and shrinkage. No attempt was made to describe these attributes for consumer.

These attributes were considered applicable to nearly all meat items, but the respondents "considered" each of these attributes in determining satisfaction roughly about two thirds of the time. Taste was nearly always considered, but shinkage was considered only about half the time. Fig. 12 shows the importance ratings attached to these components of satisfaction for the instances in which they were "considered."

Taste reigns supreme. Tenderness is second, and it is a more important criterion for beef and poultry than for pork. Proportion of fat to lean follows the pattern already noticed for fat content in judging meat quality by being most important for pork and least important for poultry. Shrinkage and ease of preparation, while being regarded generally as of lower importance than the other attributes of satisfaction, were nevertheless more important for pork than for either beef or poultry.

Figs. 13 and 14 show similar information on the components of satisfaction for individual cuts of beef and pork. No strong deviations from the over-all pattern appear. In the case of pork, shrinkage was of

Fig. 13. Opinions on importance of attributes of satisfaction at time of consumption for beef, Webster County survey, June-July 1963.

Fig. 14. Opinions on importance of attributes of satisfaction at time of consumption for pork, Webster County survey, June-July 1963.
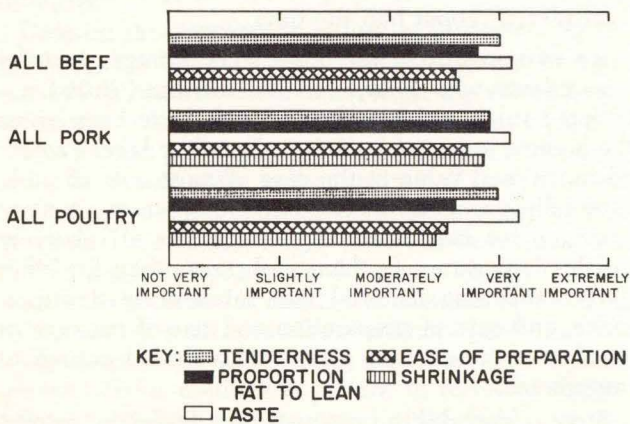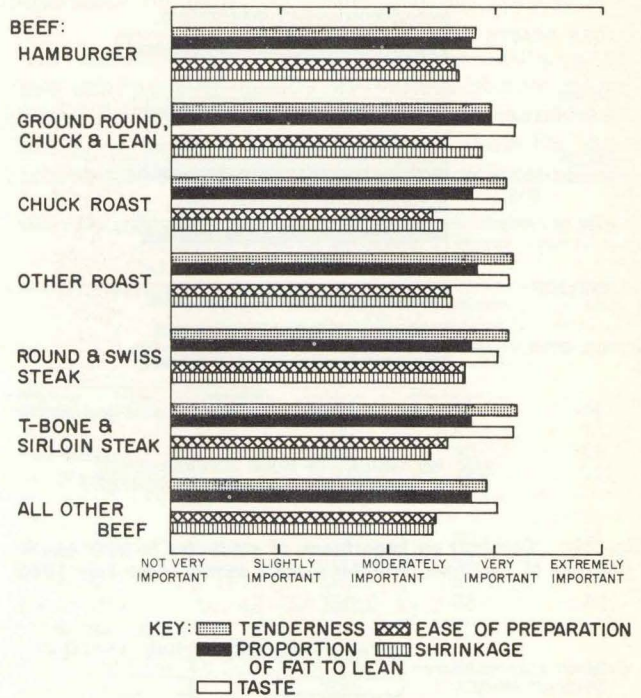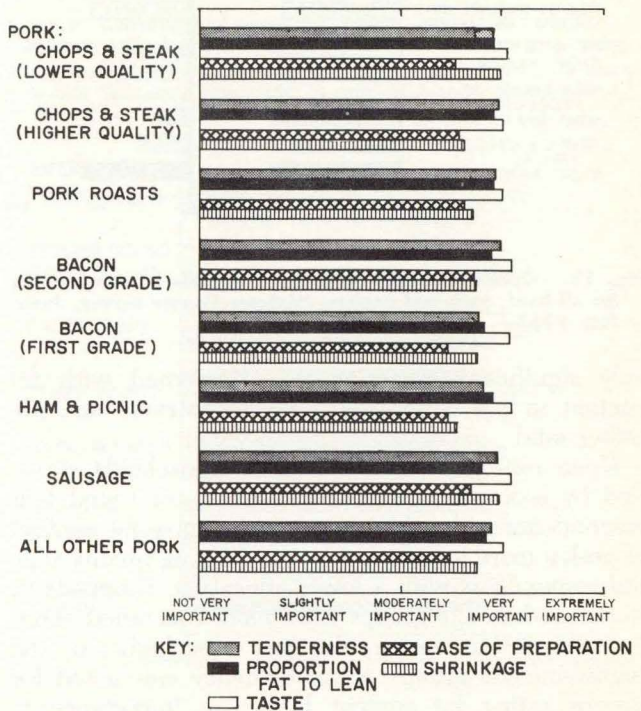

Fig. 12. Opinions on importance of attributes of satisfaction at time of consumption for all meats, Webster County survey, June-July 1963.

relatively high importance for sausage and of low importance for ham. A beef-to-pork comparison shows tenderness to predominate in beef roasts and steaks, but a similar high rating for tenderness is not given the equivalent pork cuts. As may be expected, however, tenderness was still given a higher rating for pork roasts and steaks or chops than for bacon and sausage.

The general pattern of importance for each of these components of satisfaction was the same, both for meat purchases given a high satisfaction rating and those given a low satisfaction rating. The pattern remained generally consistent also for all socioeconomic groups. One exception noted was that shrinkage increased in importance for the larger households and for households containing children, and taste was given a correspondingly lower rating.

EFFECTS OF PRICING, ADVERTISING, AND PROMOTION ON DEMAND

Consumer behavior in purchasing meat items is influenced by numerous factors. An earlier section concentrated on the effects of largely invariant socioeconomic characteristics of the household on mean demand. But persons engaged in marketing of meat items are especially concerned with the effects on demand of factors over which they have some degree of control. Possible influences of advertising and promotion media are especially pertinent. Marketers are the first to admit lack of strong control on pricing in general, but they nevertheless recognize their role in the price offer-acceptance process.

All analysis up to this point has been strictly cross-sectional. For example, data presented have shown the mean influence of invariant socio-factors on purchases of specific meat items. Since the data on meat purchases were collected over a 7-week period, the data included some information on the effects of changes in the marketing environment upon consumer purchasing behavior.

In addition to consumer data, considerable data were collected on all kinds of promotion and advertising, retailer and wholesaler inventory levels, and retailer pricing—all on a time-series basis. Many different kinds of data were available to use in describing environmental changes of the market. The smallness of the survey panel and the shortness of the time covered, however, suggested that the description of marketing environment be restricted to three variables: (a) retail-store prices, (b) newspaper advertising, and (c) in-store promotion. Although the other data collected could not be meaningfully related to purchases by the consumer panel, this does not mean that consumer purchasing is not influenced by these other variables.

Specifically, this section is concerned with the relation between quantity purchased by the consumer

panel and retailer price, advertising and in-store promotion. Discussion will first consider the technicalities of the data series involved. Interest next will be turned to the development of response or elasticity coefficients.

Data Series

Analysis was confined to 13 classes of meat items (fig. 15). Criteria for selection were high volume, widespread consumption and homogeneity in price and quality aspects. Attention was given to meat item classes for which both a high and low quality variant existed. The 13 classes accounted for about 87 percent of all beef purchases, 55 percent of all pork, 62 percent of all cold meat and 88 percent of all poultry. From an over-all standpoint, 75 percent of all meat and poultry were included.

The stores from which the panel purchased were divided into five groups. Two of the five store groups were individual stores; another consisted of a small and large member of a chain who cooperated on advertising and pricing. The fourth group consisted of four relatively small supermarkets. The fifth store group corresponded to purchases made from all other stores, both inside and outside Webster County. This latter store group largely constituted small neighborhood stores and locker plants. The over-all effect was to divide the purchases into five approximately equal groups for which pricing, advertising and promotion practices were reasonably similar within each group. From here on in this report, the word "store" will usually refer to one of these store groups.

Interviewers collected weekly price data on about 25 specific meat items directly from the retailer at the beginning of each week. However, it was subsequently
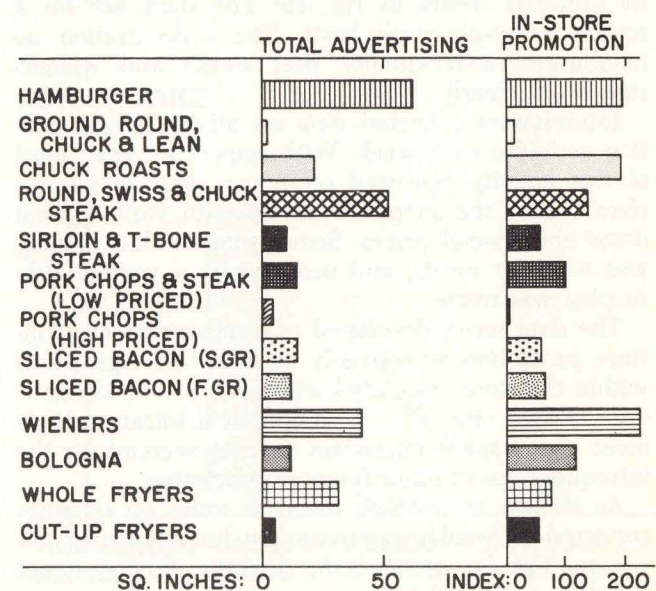

Fig. 15. Newspaper advertising per week and index of in-store promotion for selected meats, Webster County survey, June-July 1963.

decided to disregard these data and to use instead the mean prices paid reported by the consumers for each of the 13 meat item classes. These mean prices overcame the problem of midweek price changes by the retailer and automatically weighted the various individual cuts going into each of the 13 meat item classes. For example, the price data collected directly from the retailer on chuck roast pertained specifically to U. S. Choice, arm-cut chuck on Tuesday. But the consumers purchased several different kinds of chuck roasts, and the grade was sometimes U. S. Good.

All newspaper advertisements for the first four store groups were obtained for the study period. The fifth store group conducted practically no advertising; consequently, the exclusion of their advertising caused minimal distortion. Advertising in media other than newspapers was nearly nil for all stores.

Most of the newspaper advertising was oriented toward an announcement of prices. Variation occurred in format and amount of space given to each item listed, but the over-all ad size remained nearly constant from week to week. The predominant pattern was a major ad on Wednesday, giving prices effective through Saturday, and a smaller ad on Monday, giving prices effective through Wednesday. Shifts in the fixed pattern were associated usually with holidays. Some stores used small ads listing daily specials.

A variation in advertising is vital to any measurement of its effectiveness. In the case of an individual meat item, the major amount of variation was associated with whether the item was listed and the amount of space given to the listing. Consequently, the time-series variable developed to measure advertising was simply amount of space for each of the 13 meat item classes per week for each store group.

Total newspaper advertising by all stores is shown for selected meats in, fig. 15. The data are on a square-inches-per-week basis. The concentration on hamburger, lower-quality beef steaks and wieners stands out clearly.

Interviewers collected data on all in-store promotion activities each week. With respect to meat, most of this activity consisted of indoor signs of various sizes calling the shopper's attention to various meat items and special prices. Some front-window signing was used for meats, and occasionally a special aisle display was made.

The data series developed as a measurement of in-store promotion was largely an index of sign space within the store associated with each of the 13 meat-item classes (fig. 15). A somewhat arbitrary adjustment of the space index was used to account for the infrequent use of other forms of promotion.

As already mentioned, the data series on quantity consisted of weekly purchases by households in the survey. But for most of the analysis, the consumer panel was divided into seven socioeconomic groups. This grouping was based on an iritial division into three groups, according to household income, and a
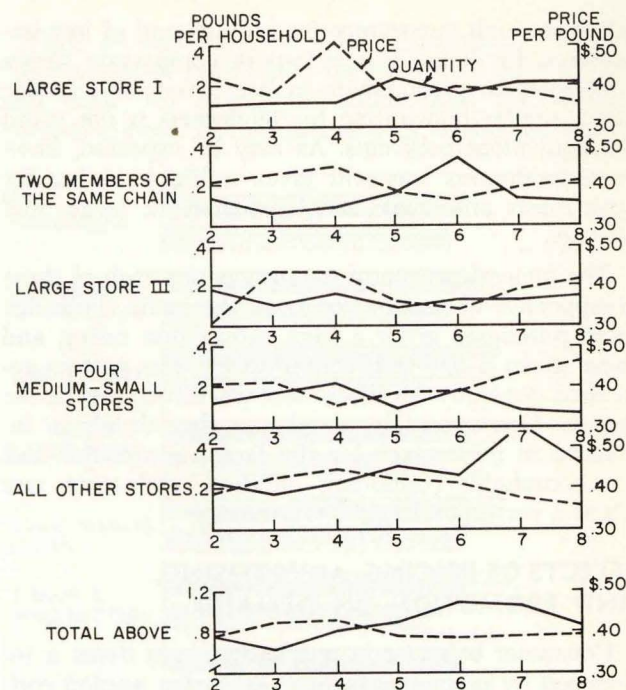
Fig. 16. Price and quantity data for cut-up fryers by store by week, Webster County survey, June-July 1963.

further separation by whether the household contained children under 13 years of age. Finally, the group consisting of adult households in the lowest of the three income groups was again divided on the basis of income.

The final result was a division into seven nearly equal groups. Although the separation strictly took into account only income and family composition, a strong separation also was made for education and age of household head.

Fig. 16, showing prices and quantity of cut-up frying chicken purchased per week, is submitted as an example of the data series used. Note the rather sizable amount of variation in both price and quantity from week to week. Yet despite that variation, the tendency for a low price to be associated with high quantity can be seen. The series for cut-up chicken was one of the better series. Other less-frequently purchased meat items posed the problem of even greater relative variation.

Store Elasticities

A store price elasticity of demand is a coefficient indicating the proportional change in quantity purchased by consumers relative to a proportional change in store price. All other variables affecting quantity of the product are assumed fixed. Examples of other variables are prices for other meats, total advertising and all promotion.

In the case of this analysis, a store price coefficient was associated with each of the 13 meat-item classes. Thus, the other variables to be held constant for a particular meat item were prices of the same meat item at

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all other stores as well as the price of competing meat items within the same store and other stores. The term "store" used here means one of the five store groups which may loosely be considered equivalent to a modern, moderately large, supermarket.

Store advertising and store promotion elasticities of demand can be defined similarly. They represent a proportional response in terms of quantity to a proportional change in advertising or promotion.

The elasticity coefficients estimated herein are oriented, of course, to the extreme short-run situation. Since the data used in their construction were weekly means of prices and quantities, they represent a purchasing period of 1 week.

Technicalities of constructing these coefficients and additional information on the data series used are presented in another report.[7] However, the mechanics can be summarized by stating that the 7-week data series on quantity purchased, prices, advertising and in-store promotion for each of the 13 meat-item classes were transformed to a percentage change basis. A linear regression analysis provided the coefficients. The regression was made on 3,185 "observations" pertaining to weekly purchases from each store group by each socioeconomic group for each of the 13 meat-item classes.

Store elasticities of quantity purchased for price, advertising and in-store promotion are shown in table 19. These elasticities are on a single-meat-item basis. For example, suppose a retailer dropped his price of hamburger by 10 percent, but no other changes in the marketing environment occurred. The model suggests that the quantity of hamburger purchased should increase by $(-0.10) \times (-1.305)$, or 13 percent.

The model accounted for combinations of price changes, advertising and in-store promotion additively. For example, it may be assumed that a retailer dropped the price of hamburger by 10 percent, and in addition, used a mean-sized advertisement and a mean-sized in-store promotion device. The 10 percent price change can be multiplied directly by the price elasticity coefficient to determine the response, but it is necessary to convert the use of the newspaper advertisement and the in-store promotion sign to a percentage change basis. Retailer data showed that newspaper advertisements were used 37 percent of the time, and in-store promotion devices 18 percent of the time by the eight store groups for the 13 classes of meat items. Consequently, the use of an advertisement corresponds to an increase in the advertising index of

$$1/0.37 - 1 = 1.70.$$

The use of a mean-sized in-store device corresponds to an increase of 4.56. Applying these proportional displacements to the model (table 19) suggests that

quantity purchased should increase by about
$$(-0.10) (-1.305) + (1.70) (0.042) + (4.56) (0.023)$$
$$= 0.31$$
or 31 percent.

The elasticities in table 19 are mean elasticities appropriate for all 13 classes of meat items considered. After examining fig. 15, which shows that some

Table 19. Store elasticities of quantity demanded for price, advertising, and in-store promotion, Webster County survey, June-July 1963.

Item	Elasticity	t value[a]
Single meat basis:		
Price	-1.305	-5.84
Advertising	0.042	2.61
In-store promotion	0.023	1.41

[a]Test of hypothesis that elasticity is zero. The F value for all coefficients in the model was 6.17 (13 degrees of freedom in the numerator and 3,185 in the denominator).
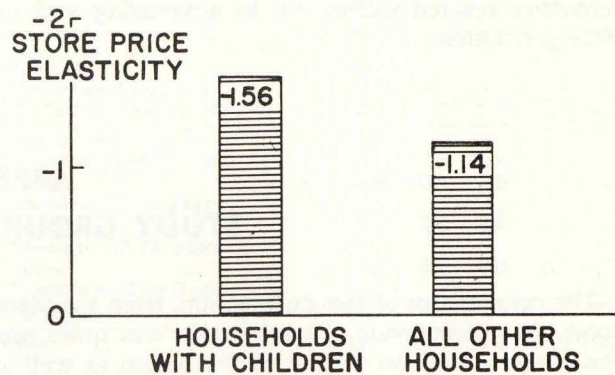
Fig. 17. Response to store price changes for households with and without children, Webster County survey, June-July 1963.
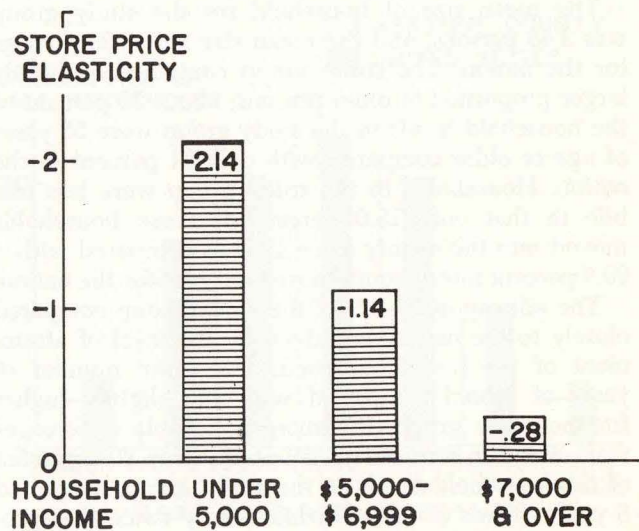
Fig. 18. Response to store price changes by households in different income groups, Webster County survey, June-July 1963.

[7] R. E. Lund. Factors affecting consumer demand for meat, Webster County, Iowa. Unpublished Ph.D. thesis. Iowa State University, 1967.

kinds of meat were advertised and promoted much more often than others, however, one may hypothesize that the elasticities for all meats are not the same. Such a possibility was considered in the model used to estimate these elasticities. Some evidence was obtained that suggested that lower-quality meat class variants were more elastic with respect to price than the higher-quality variants. But such a difference was not statistically significant. Clear patterns of variation were not obtained in the elasticities for advertising and in-store promotion by kind of meat.

In formulating the model to measure the elasticities, the possibility of some households reacting differently to changes in the marketing environment was also considered. The results indicated that households having children were more responsive to price changes than were households containing only persons aged 13 years or more (fig. 17). Price elasticity also dropped significantly as household income increased (fig. 18). No evidence was obtained that suggested that households possessing certain socioeconomic characteristics reacted differently to advertising and in-store promotion.

It has been stressed that all elasticities up to this point pertain to adjustments in price, advertising and promotion of a single meat-item class by a single retail store (store group). But, what happens when a retailer lowers the price of several meat items? Does quantity sold of each class of meat items remain about the same because the consumer now does not substitute the marked-down item for another item not marked down? Or, does quantity go up even higher than would be expected by looking at the individual meat item coefficients by reason of the "big sale" attracting more buyers to the store?

The model suggested the latter. An elasticity of -2.277 was obtained for lowering the price of all meats at an individual store.

But a single store does not operate in a vacuum. Competing stores are quick to counter price and advertising changes. Thus, the reader may now wonder what result is produced by all stores in a community altering their prices simultaneously. The Webster County data indicated that very little change in overall meat purchases will occur.

APPENDIX A:
STUDY GROUP CHARACTERISTICS

The composition of the study group, from the viewpoint of socioeconomic characteristics, was quite similar in many respects to that of the nation as well as to the economic area in which Webster County is located. Table A-1 provides a comparison on many important characteristics between 1960 U.S. Census data and study group data.

The mean size of household for the study group was 3.45 persons, and the mean size was 3.29 persons for the nation. The study group contained a slightly larger proportion of older persons; about 39 percent of the household heads in the study group were 55 years of age or older compared with only 34 percent in the nation. Households in the study group were less mobile in that only 13.6 percent of these households moved into the county since 1955 as compared with a 20.3 percent inter-county movement rate for the nation.

The educational level of the study group compared closely to the nation as judged by the level of attainment of the household head. The mean number of years of school completed was only slightly higher for the study group. But more noticeable differences were noted in terms of distribution. Only 20.7 percent of the household heads in the study group completed 8 years or less of school, while nearly twice that proportion, or 39.7 percent, of all persons 25 years of age or older in the nation were classed in this attainment group.

The general distribution and mean level of income for households in the study group compared closely to that of families for the nation. The more significant differences in occupation were a lesser emphasis on the professional, technical and kindred classes and a stronger emphasis on farmers, managers and proprietors. But the emphasis on farming was not nearly as strong in the study group as was the case for the economic area of Iowa in which Webster County is located. Table A-1 also contains comparative information on industry of work.

Figs. A-1, A-2 and A-3 show graphically the distribution of the study group households by size, age of head and income. These three characteristics of households were found quite determinant of meat purchasing patterns.

Mean household size and mean age and educational attainment of the household head are tabulated on the basis of household income in table A-2. The households with extremely low income consisted largely of older persons. Moreover, these households were much smaller and educational attainment was much lower. A large proportion of the household heads were retired.

A distribution of households by the two classifications of age of household head and family composition is provided in table A-3. The period in which children constitute an important influence on family consumption shows up clearly.

Table A-1. Percentage distributions of socioeconomic characteristics of study group compared with that of United States and Area II in Iowa.

| Characteristic | 1960 Census | | Webster County study group |
	United States	Area II Iowa[a]	
Mean persons per household	3.29	3.18	3.45
Age of head of household:			
Under 25 years	5.1	—	5.2
25 to 34 years	18.4	—	15.9
35 to 44 years	22.1	—	22.0
45 to 54 years	20.4	—	18.1
55 to 64 years	16.5	—	17.8
65 and over	17.5	—	21.0
Residency; moved into county since 1955:	20.3	18.5	13.6
Years of school completed by adults[b]:			
8 years or less	39.7	36.6	20.7
9 to 11 years	19.2	14.0	18.1
12 years	24.6	31.7	40.4
13 to 15 years	8.8	11.0	14.9
16 years or more	7.7	6.7	5.9
Income[c]:			
Under $1,000	5.6	7.1	3.9
$ 1,000 to $ 2,999	15.8	21.1	12.3
$ 3,000 to $ 4,999	20.4	27.1	23.4
$ 5,000 to $ 6,999	23.0	21.2	26.5
$ 7,000 to $ 9,999	20.1	14.0	21.0
$10,000 to $14,999	10.5	5.5	9.3
$15,000 and over	4.6	4.0	3.6
Occupation[d]:			
Professional, technical and kindred .	10.3	8.1	6.2
Farmers and farm laborers	8.3	35.8	14.0
Managers, officials and proprietors . .	10.7	9.5	14.1
Clerical and kindred workers	6.9	3.5	5.9
Sales workers	6.8	6.1	8.8
Craftsmen, foremen and kindred . .	19.5	13.2	15.8
Operatives	19.9	12.8	18.2
Service workers	6.1	4.0	4.7
Laborers	6.9	5.1	3.0
Homemaker, not working or occupation not reported	4.6	1.9	9.3
Industry[d]:			
Agriculture, forestry, fisheries and mining	10.5	28.4	14.4
Construction	8.4	5.9	4.6
Manufacturing	30.2	11.3	26.8
Transportation, communication and other public utilities	8.5	5.7	7.4
Wholesale and retail trade	17.0	19.2	18.5
Finance, insurance and real estate . .	3.4	2.7	2.7
Business and repair services	2.9	2.0	3.0
Personal, entertainment and recreational services	3.3	5.8	2.0
Professional and related services . . .	6.9	13.9	7.1
Public administration	5.3	3.1	3.3
Industry not reported	3.6	2.0	10.2

[a]Economic Area II of Iowa includes Boone, Calhoun, Clay, Dallas, Dickinson, Emmet, Franklin, Greene, Hamilton, Hancock, Hardin, Humboldt, Kossuth, Osceola, Palo Alto, Pocahontas, Story, Webster and Wright counties.

[b]Data from U. S. Census are education of all persons over 25 years while study group data apply to household heads and homemakers only.

[c]Family income was used from U. S. Census to compare with household income in study group.

[d]Employment data on all males over 14 years in U. S. Census are compared with employment data of household head in study group.

Table A-2. Mean age and education of household head and size of household by annual household income, Webster County survey, June-July 1963.

Household income	Number of households	Household head Age (Years)	Household head Education (Years)	Household size (Persons)
Under $1,000	25	75	8.1	1.56
$ 1,000 to $ 2,999 . .	79	64	9.2	2.13
$ 3,000 to $ 4,999 . .	150	48	10.8	3.44
$ 5,000 to $ 6,999 . .	170	44	11.1	4.01
$ 7,000 to $ 9,999 . .	135	46	11.5	3.72
$10,000 to $14,999 . .	60	45	13.0	3.77
$15,000 and up	23	54	13.8	3.65

Table A-3. Percentage distribution of households by household composition and age of head.

| Household composition | Age of household head (in years) | | | | | | |
	Under 25	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	Total
One-person households .	---	---	0.3	0.4	2.1	7.1	9.9
Adults only:							
Homemaker under 40 .	1.5	1.2	0.3	---	0.1	---	3.1
Homemaker 40 or over.	0.1	---	0.9	6.1	9.3	12.5	28.9
Adult(s) and children:							
Children pre-school only	3.3	5.8	0.6	0.1	0.3	---	10.1
Children 6-12 years only	---	2.3	2.9	2.0	0.6	0.6	8.4
Children 13-20 years only	---	0.1	1.8	5.5	4.0	0.8	12.2
Children in 2 or 3 age groups	0.3	6.5	15.2	4.0	1.4	---	27.4
Total	5.2	15.9	22.0	18.1	17.8	21.0	100.0
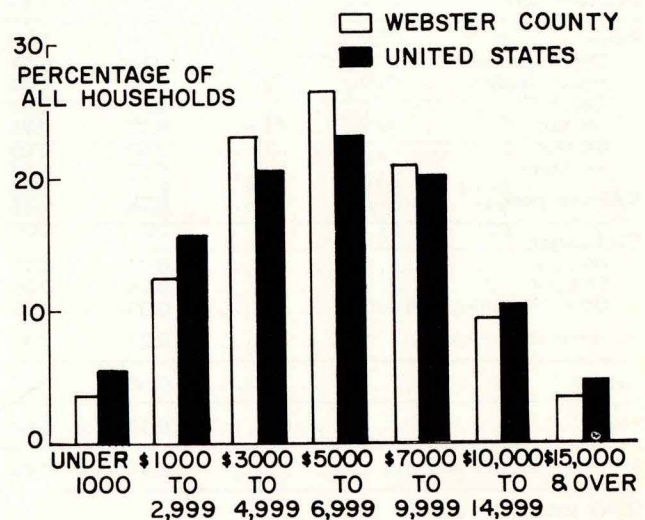
Fig. A-1. Percentage distribution of households by number of persons in household, Webster County survey, June-July 1963.
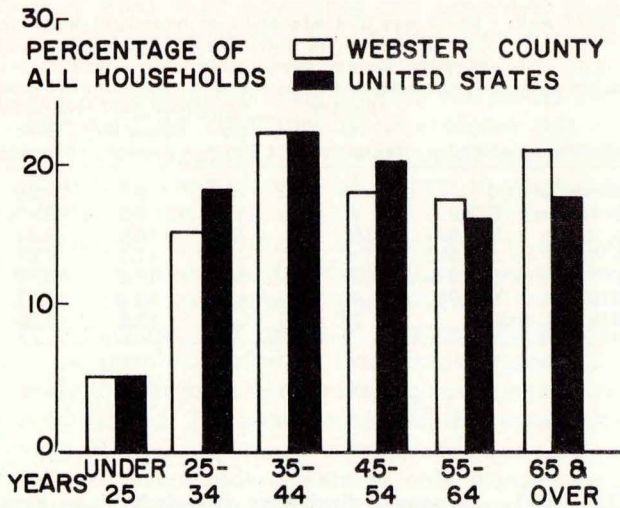
Fig. A-2. Percentage distribution of households by age of household head of study groups compared with that in the United States.
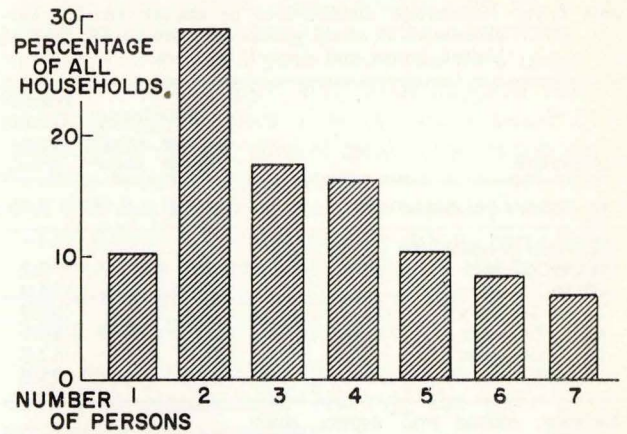
Fig. A-3. Percentage distribution of households by annual household income of study group compared with that in the United States.

APPENDIX B: BASIC DATA TABLES

Table B-1.   Mean weekly purchases per person in pounds by size of household, Webster County survey, June-July 1963.

Meat	1	2	3	4	5	6	7 or more	Total
				Number of persons				
Beef:								
All ground beef	0.34	0.40	0.33	0.36	0.33	0.42	0.32	0.36
Chuck roast	0.12	0.21	0.12	0.12	0.09	0.11	0.08	0.12
Other roast	0.11	0.11	0.09	0.06	0.02	0.04	0.02	0.06
Round, Swiss, cube, etc., steak	0.20	0.16	0.14	0.08	0.09	0.09	0.06	0.11
T-bone and sirloin	0.11	0.22	0.12	0.09	0.09	0.09	0.04	0.11
Chip, dried, corn	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
All other	0.10	0.08	0.03	0.03	0.02	0.02	0.03	0.04
Sub-total beef	0.99	1.19	0.84	0.75	0.65	0.78	0.56	0.81
Pork:								
Chops and steak	0.14	0.21	0.15	0.15	0.14	0.11	0.13	0.15
Roast (fresh)	0.08	0.04	0.05	0.05	0.04	0.03	0.03	0.04
Bacon	0.21	0.23	0.17	0.13	0.08	0.14	0.10	0.14
All ham	0.10	0.21	0.15	0.14	0.12	0.11	0.12	0.14
Sausage	0.02	0.05	0.04	0.03	0.02	0.02	0.01	0.03
All other	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.03
Sub-total pork	0.58	0.77	0.58	0.53	0.42	0.43	0.41	0.53
Cold meats:								
Wieners	0.07	0.11	0.09	0.12	0.12	0.16	0.14	0.12
Bologna	0.05	0.09	0.08	0.08	0.06	0.05	0.06	0.07
Other (including canned)	0.09	0.13	0.16	0.12	0.09	0.10	0.08	0.12
Sub-total cold meats	0.21	0.33	0.33	0.32	0.27	0.31	0.28	0.31
Poultry	0.56	0.56	0.36	0.30	0.40	0.36	0.33	0.39
Fish	0.10	0.08	0.06	0.07	0.05	0.05	0.06	0.06
All meat, poultry and fish	2.44	2.93	2.17	1.97	1.79	1.93	1.64	2.10
Other data:								
Mean purchases per household	2.44	5.86	6.51	7.90	8.94	11.61	12.15	7.23
Mean price per pound	0.60	0.61	0.60	0.58	0.59	0.55	0.51	0.58
Number of households	66	186	114	105	72	55	44	642

Table B-2.   Mean weekly purchases per person in pounds by household composition, Webster County survey, June-July 1963.

| Meat | Single persons | Adults only | | Adults with children | | | | |
		Under 40	Over 40	Preschool	6-12 years	13-21 years	Several ages	Total
Beef:								
All ground beef	0.34	0.56	0.35	0.33	0.31	0.36	0.37	0.36
Chuck roast	0.12	0.24	0.20	0.10	0.13	0.13	0.09	0.12
Other roast	0.11	0.02	0.12	0.03	0.02	0.10	0.04	0.06
Round, Swiss, cube, etc., steak	0.20	0.22	0.15	0.09	0.12	0.10	0.08	0.11
T-bone and sirloin	0.11	0.20	0.21	0.07	0.14	0.09	0.08	0.11
Chip, dried, corn	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01
All other	0.10	0.03	0.08	0.03	0.04	0.02	0.03	0.04
Sub-total beef	0.99	1.28	1.12	0.66	0.78	0.81	0.70	0.81
Pork:								
Chops and steak	0.14	0.24	0.21	0.16	0.11	0.13	0.13	0.15
Roast (fresh)	0.08	0.03	0.05	0.04	0.08	0.04	0.03	0.04
Bacon	0.21	0.24	0.22	0.13	0.13	0.15	0.11	0.14
All ham	0.10	0.03	0.21	0.09	0.17	0.19	0.12	0.14
Sausage	0.02	0.02	0.06	0.03	0.03	0.03	0.02	0.03
All other	0.03	0.03	0.03	0.02	0.04	0.02	0.02	0.03
Sub-total pork	0.58	0.59	0.78	0.47	0.56	0.56	0.43	0.53
Cold meats:								
Wieners	0.08	0.20	0.09	0.14	0.14	0.10	0.13	0.12
Bologna	0.05	0.08	0.09	0.09	0.05	0.07	0.06	0.07
Other (includes canned)	0.09	0.16	0.13	0.10	0.13	0.17	0.09	0.12
Sub-total cold meats	0.22	0.44	0.31	0.33	0.32	0.34	0.28	0.31
Poultry	0.56	0.39	0.58	0.27	0.44	0.29	0.36	0.39
Fish	0.10	0.06	0.09	0.06	0.09	0.05	0.05	0.06
All meat, poultry and fish	2.45	2.76	2.88	1.79	2.19	2.05	1.82	2.10
Other data:								
Mean purchases per household	2.44	5.52	6.07	6.99	8.30	7.06	10.19	7.23
Mean price per pound	0.60	0.61	0.61	0.56	0.57	0.60	0.56	0.58
Number of households	66	21	179	67	49	80	180	642

Table B-3. Mean weekly purchases per person in pounds by income of household, Webster County survey, June–July 1963.

Meat	Under $1,000	$1,000 to $2,999	$3,000 to $4,999	$5,000 to $6,999	$7,000 to $9,999	$10,000 to $14,999	$15,000 and over	Total
Beef:								
All ground beef	0.23	0.34	0.34	0.37	0.35	0.44	0.31	0.36
Chuck roast	0.08	0.14	0.14	0.13	0.12	0.12	0.04	0.12
Other roast	0.05	0.08	0.02	0.05	0.05	0.11	0.15	0.06
Round, Swiss, cube, etc., steak	0.02	0.13	0.11	0.11	0.11	0.08	0.09	0.11
T-bone and sirloin	0.02	0.04	0.08	0.06	0.15	0.21	0.40	0.11
Chip, dried, corn	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.01
All other	0.08	0.06	0.04	0.04	0.03	0.04	0.02	0.04
Sub-total beef	0.48	0.79	0.74	0.77	0.83	1.01	1.02	0.81
Pork:								
Chops and steak	0.16	0.18	0.16	0.13	0.15	0.18	0.11	0.15
Roast (fresh)	0.14	0.03	0.02	0.05	0.04	0.05	0.03	0.04
Bacon	0.17	0.15	0.12	0.13	0.16	0.17	0.20	0.14
All ham	0.09	0.14	0.14	0.13	0.16	0.13	0.22	0.14
Sausage	0.05	0.04	0.03	0.02	0.03	0.03	0.00	0.03
All other	0.04	0.03	0.02	0.02	0.04	0.03	0.01	0.03
Sub-total pork	0.65	0.57	0.49	0.48	0.58	0.59	0.57	0.53
Cold meats:								
Wieners	0.04	0.11	0.13	0.13	0.12	0.12	0.09	0.12
Bologna	0.03	0.07	0.08	0.08	0.06	0.07	0.03	0.07
Other (includes canned)	0.05	0.13	0.11	0.11	0.12	0.11	0.08	0.12
Sub-total cold meats	0.12	0.31	0.32	0.32	0.30	0.30	0.20	0.31
Poultry	0.28	0.46	0.42	0.35	0.35	0.45	0.57	0.39
Fish	0.04	0.06	0.07	0.06	0.06	0.06	0.06	0.06
All meat, poultry and fish	1.57	2.19	2.04	1.98	2.12	2.41	2.42	2.10
Other data:								
Mean purchases per household	2.44	4.66	7.05	7.88	7.89	9.08	8.85	7.23
Mean price per pound	0.49	0.56	0.54	0.56	0.61	0.63	0.71	0.58
Number of households	25	79	150	170	135	60	23	642

Table B-4.   Mean weekly purchases per person in pounds by age of household head, Webster County survey, June-July 1963.

Meat	Age in years						
	Under 25	25-34	35-44	45-54	55-64	65 and up	Total
Beef:							
All ground beef	0.35	0.35	0.38	0.36	0.39	0.28	0.36
Chuck roast	0.11	0.08	0.11	0.13	0.19	0.18	0.12
Other roast	0.01	0.03	0.04	0.06	0.10	0.12	0.06
Round, Swiss, cube, etc., steak	0.14	0.08	0.08	0.12	0.17	0.12	0.11
T-bone and sirloin	0.05	0.07	0.10	0.17	0.14	0.12	0.11
Chip, dried, corn	0.01	0.01	0.01	0.02	0.01	0.01	0.01
All other	0.02	0.03	0.03	0.04	0.04	0.07	0.04
Sub-total beef	0.69	0.65	0.75	0.90	1.04	0.90	0.81
Pork:							
Chops and steak	0.18	0.13	0.12	0.19	0.17	0.17	0.15
Roast (fresh)	0.03	0.04	0.04	0.05	0.03	0.06	0.04
Bacon	0.12	0.11	0.11	0.17	0.20	0.18	0.14
All ham	0.07	0.11	0.11	0.20	0.20	0.17	0.14
Sausage	0.03	0.02	0.02	0.04	0.04	0.04	0.03
All other	0.00	0.02	0.03	0.03	0.04	0.02	0.03
Sub-total pork	0.43	0.43	0.43	0.68	0.68	0.64	0.53
Cold meats:							
Wieners	0.16	0.15	0.12	0.13	0.09	0.07	0.12
Bologna	0.06	0.08	0.06	0.07	0.08	0.07	0.07
Other (includes canned)	0.13	0.10	0.10	0.14	0.14	0.11	0.12
Sub-total cold meats	0.35	0.33	0.28	0.34	0.31	0.25	0.31
Poultry	0.29	0.27	0.38	0.47	0.52	0.42	0.39
Fish	0.08	0.05	0.05	0.08	0.09	0.08	0.06
All meat, poultry and fish	1.84	1.73	1.89	2.47	2.64	2.29	2.10
Other data:							
Mean purchases per household	6.19	7.96	9.41	8.31	6.75	4.17	7.23
Mean price per pound	0.57	0.57	0.56	0.59	0.59	0.61	0.58
Number of households	35	99	145	113	112	138	642

Table B-5. Mean weekly purchases per person in pounds by education of household head, Webster County survey, June-July 1963.

Meat	8 years or less	9 to 11 years	12 years	13 to 15 years	16 years or more	Total
Beef:						
All ground beef	0.36	0.36	0.35	0.38	0.34	0.36
Chuck roast	0.16	0.12	0.12	0.11	0.10	0.12
Other roast	0.06	0.06	0.04	0.10	0.09	0.06
Round, Swiss, cube, etc., steak	0.13	0.12	0.09	0.12	0.08	0.11
T-bone and sirloin	0.06	0.12	0.12	0.09	0.18	0.11
Chip, dried, corn	0.01	0.01	0.01	0.01	0.01	0.01
All other	0.05	0.04	0.04	0.03	0.02	0.04
Sub-total beef	0.83	0.83	0.77	0.84	0.82	0.81
Pork:						
Chops and steak	0.17	0.16	0.14	0.11	0.14	0.15
Roast (fresh)	0.03	0.05	0.04	0.04	0.04	0.04
Bacon	0.16	0.15	0.14	0.15	0.12	0.14
All ham	0.16	0.12	0.14	0.13	0.16	0.14
Sausage	0.04	0.03	0.02	0.03	0.02	0.03
All other	0.04	0.02	0.02	0.02	0.03	0.03
Sub-total pork	0.60	0.53	0.50	0.48	0.51	0.53
Cold meats:						
Wieners	0.12	0.13	0.13	0.10	0.10	0.12
Bologna	0.09	0.08	0.07	0.06	0.04	0.07
Other (includes canned)	0.11	0.13	0.12	0.10	0.08	0.12
Sub-total cold meats	0.32	0.34	0.32	0.26	0.22	0.31
Poultry	0.40	0.39	0.35	0.40	0.57	0.39
Fish	0.07	0.06	0.06	0.06	0.07	0.06
All meat, poultry and fish	2.22	2.15	2.00	2.04	2.19	2.10
Other data:						
Mean purchases per household	6.24	7.27	8.02	6.55	8.41	7.23
Mean price per pound	0.55	0.58	0.58	0.60	0.64	0.58
Number of households	182	97	226	89	48	642

Table B-6. Mean weekly purchases per person in pounds by occupation of household head, Webster County survey, June-July 1963.

Meat	Professional and technical	Farmers	Managers and proprietors	Clerical	Sales workers	Craftsmen and foremen	Operatives	Service workers	Laborers	Homemaker and not working	Total
Beef:											
All ground beef	0.36	0.28	0.34	0.34	0.34	0.44	0.39	0.34	0.32	0.36	0.36
Chuck roast	0.15	0.09	0.11	0.10	0.14	0.16	0.09	0.17	0.20	0.16	0.12
Other roast	0.07	0.02	0.12	0.04	0.06	0.04	0.05	0.05	0.00	0.15	0.06
Round, Swiss, cube, etc., steak . . .	0.11	0.05	0.12	0.08	0.12	0.14	0.12	0.08	0.12	0.09	0.11
T-bone and sirloin	0.12	0.04	0.19	0.08	0.20	0.12	0.09	0.06	0.10	0.08	0.11
Chip, dried, corn	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.02	0.00	0.01	0.01
All other	0.03	0.01	0.04	0.03	0.04	0.04	0.03	0.07	0.08	0.05	0.04
Sub-total beef	0.85	0.49	0.93	0.68	0.91	0.94	0.78	0.79	0.82	0.90	0.81
Pork:											
Chops and steak	0.15	0.11	0.11	0.14	0.11	0.19	0.17	0.14	0.17	0.20	0.15
Roast (fresh)	0.08	0.01	0.06	0.01	0.03	0.04	0.04	0.06	0.09	0.07	0.04
Bacon	0.11	0.12	0.15	0.11	0.14	0.16	0.15	0.18	0.13	0.15	0.14
All ham	0.14	0.18	0.11	0.12	0.13	0.15	0.15	0.16	0.06	0.12	0.14
Sausage	0.02	0.02	0.03	0.03	0.02	0.04	0 04	0.00	0.02	0.03	0.03
All other	0.03	0.02	0.01	0.01	0.03	0.04	0.03	0.01	0.02	0.03	0.03
Sub-total pork	0.53	0.46	0.47	0.42	0.46	0.62	0.58	0.55	0.49	0.60	0.53
Cold meats:											
Wieners	0.14	0.12	0.10	0.12	0.14	0.13	0.12	0.14	0.18	0.09	0.12
Bologna	0.08	0.08	0.06	0.07	0.05	0.08	0.08	0.07	0.12	0.05	0.07
Other (includes canned)	0.13	0.16	0.07	0.08	0.09	0.13	0.11	0.10	0.09	0.11	0.12
Sub-total cold meats	0.35	0.36	0.23	0.27	0.28	0.34	0.31	0.31	0.39	0.25	0.31
Poultry	0.28	0.30	0.52	0.33	0.39	0.45	0.35	0.43	0.39	0.40	0.39
Fish	0.07	0.06	0.05	0.10	0.05	0.06	0.07	0.08	0.05	0.07	0.06
All meat, poultry and fish	2.08	1.67	2.20	1.80	2.09	2.41	2.09	2.16	2.14	2.22	2.10
Other data:											
Mean purchases per household . .	6.66	5.81	8.04	6.61	7.46	9.42	7.92	5.65	8.12	4.37	7.23
Mean price per pound	0.62	0.55	0.62	0.57	0.59	0.55	0.58	0.56	0.56	0.60	0.58
Number of households	41	92	93	39	52	98	115	31	20	61	642

Table B-7 Consumer opinions[a] **on meat quality acceptability and satisfaction by kind of meat, Webster County survey, June-July 1963.**

Item	Quality	Accept-ability	Satis-faction
Beef			
Ground:			
Hamburger	2.36	2.13	2.70
Ground round, chuck, lean beef . . .	1.85	2.07	2.57
Roast:			
Chuck	2.15	2.09	2.55
All other roasts	1.85	1.92	2.46
Steak:			
Round, Swiss, chuck	2.12	2.12	2.63
Cube, minute, steakettes	2.05	2.14	2.48
Sirloin	1.95	2.03	2.56
T-bone	1.75	1.81	2.41
All other beef	2.22	2.13	2.63
Total beef	2.15	2.08	2.61
Pork			
Fresh:			
Sausage	2.21	2.14	2.67
Roast	2.22	2.13	2.58
Chops and steak (lower quality) . . .	2.51	2.27	2.79
Chops and steak (higher quality) . . .	2.12	2.11	2.61
Spare ribs			
Cured:			
Bacon (second grade)	2.41	2.17	2.76
Bacon (first grade and miscellaneous) .	2.15	2.15	2.64
Ham and picnic	2.07	2.05	2.55
All other pork.	2.25	2.13	2.60
Total pork	2.20	2.14	2.65
Poultry:			
Broilers, fryers-whole	2.20	2.15	2.47
Broilers, fryers-cut-up	2.09	2.06	2.57
All other poultry	2.15	2.03	2.57
Total poultry	2.12	2.08	2.55
All meat and poultry	2.16	2.10	2.61

[a]A low score represents a high degree of quality, acceptability, or satisfaction.

APPENDIX C:

SURVEY DESIGN, ESTIMATION AND MEASUREMENT OF RANDOM VARIATION

SURVEY DESIGN

Data for the household phase of the survey were collected with a stratified, single-stage, area sample in which the areas, or sampling units, consisted of approximately four contiguous housing units drawn at random. Webster County was divided into 24 strata containing nearly an equal number of housing units. Open country made up four strata, and another four strata consisted of small towns. The remaining 16 strata were located in the City of Fort Dodge.

All occupied housing units in Webster County constituted the universe for the survey. An occupied housing unit was defined as a room or group of rooms shared by a family or a group of persons or by a person living alone. Group quarters containing more than four lodgers were not included in the universe. Thus, large rooming houses, hotels, etc., were excluded.

The sampling frame was formed by using various maps and supporting information on dwelling-unit counts. The city directory was used in Fort Dodge. Observation from a moving automobile supplied the required housing counts in the small towns. A map prepared by the Iowa State Highway Commission for Webster County provided a rough indication of the number and location of housing units in the open

country, making it possible to form block-like units.

The goal was to select eight sampling units containing four occupied housing units from each stratum with equal probability. The procedure used was to select eight blocks from each stratum, with probability proportional to estimated housing-unit count. Next, the selected blocks were examined by a field crew to obtain a more accurate occupied housing-unit count. A sampling unit of contiguous housing units and two potential substitutes were then drawn at random from the block. The size of the sampling unit was determined by multiplying by 4 the ratio of the count obtained by the field crew with respect to the initial estimated count. This produced a sample of 779 occupied housing units.

An initial interview was obtained at 624 of the 779 housing units. Of the 155 nonresponses, 63 were refusals and 61 families were on vacation. Various reasons accounted for the remainder of the difference. Preplanned substitutions were made for 126 of these nonresponses, giving a total of 750 completed first-week interviews. Attrition in the survey panel following the first week brought the total down to 642 usable schedules completed for the full 4 weeks.

A rotational scheme was developed to collect data over an 8-week period and yet retain each household in the survey panel for only 4 weeks. Table C-1 illustrates the procedure. Each of the 8 sampling units in a stratum was assigned to a specific one of the 8 replacement patterns so as to attain balance with respect to strata and time periods. The scheme involved dropping one fourth and adding a new one fourth of the total households each week. Thus, every pair of contiguous weeks and the first and eighth week contained the same number of common housing units. Half of the sample of households was scheduled for interviewing each week.

ESTIMATION

As noted previously, the sample was generally selected so that the sample means and proportions were unbiased estimates of the corresponding population means and proportions. However, one exception of the self-weighting aspects of the sample was made. An apartment house containing 20 households was subsampled by selecting only 3 households. A minor adjustment to compensate for this subsampling was made in all sections but two of the report. The data tables and associated discussion pertaining to the quantity of meat purchased per week by socioeconomic classes and the information on the effects of pricing, advertising and promotion on purchases, are simple means of the sample without the adjustment for this one instance of subsampling. Thus, the data supplied in these two sections are slightly biased as estimators of the Webster County population.

ESTIMATES OF VARIATION

Most of the information in this report has been comparative or analytical. That is, the major emphasis has been given to comparing meat-purchasing behavior by households having different socioeconomic characteristics. Such a viewpoint of emphasis can be contrasted to that of surveys oriented primarily to providing estimates of population totals and means. Of course, the comparative information in this report (for example, the difference between two socio-group purchasing rates) constitutes an unbiased estimate of the corresponding difference for the population.

Table C-2 provides estimates of variation appropriate for testing differences between mean purchasing rates for various socioeconomic groups. The level of measurement used is that of weekly purchases of a particular meat in pounds per person. Variation due to the socioeconomic characteristics of the household has been eliminated.

The technique for obtaining these measurements was to divide the sample into seven nearly equal socioeconomic groups according to household income and composition. These were the groups used in the section on relating pricing, advertising and promotion to quantity. Next, each of the seven groups was divided into two groups at random. The difference between sample means for any pair then provided a 1-degree of freedom estimate of "error." These 1-degree of freedom estimates were pooled over all seven sociogroups and transformed to the proper basis to provide the estimates of *standard* deviation in the first column of table C-2.

The second column of table C-2 contains a *coefficient of variation* appropriate to a mean for a sociogroup containing about one-seventh of the total sample or 92 households. For example, table B-4 shows mean purchases of ground beef per person weekly by households having a head aged 55 to 64 years to have been 0.388 pounds. The bottom of table B-4 shows that this group contained 112 households. Thus, the *coefficient of variation* given in table C-2 for ground beef amounting to 0.13 is appropriate. The value 0.13

Table C-1. Pattern[a] of rotation used for panel members, Webster County survey, June-July 1963.

Panel segment	Period covered in diary							
	May 29 to June 4	June 5 to June 11	June 12 to June 18	June 19 to June 25	June 26 to July 2	July 3 to July 9	July 10 to July 16	July 17 to July 23
1	X					X	X	X
2	X	X					X	X
3	X	X	X					X
4	X	X	X	X				
5		X	X	X	X			
6		X	X	X	X			
7			X	X	X	X		
8				X	X	X	X

[a]An X shows the weeks for which the panel segment provided purchasing data.

Meat item	Standard deviation[a] (Household basis)	Coefficient of variation[b]	Least significant difference[c]
Beef:			
All ground	0.44	0.13	0.121
Chuck roasts	0.28	0.24	0.079
Other roasts	0.17	0.30	0.047
Round, Swiss and chuck roasts	0.15	0.14	0.041
Sirloin and T-bone steaks	0.21	0.20	0.058
Chipped, dried and corned beef	0.04	0.41	0.011
All other beef	0.08	0.23	0.023
Sub-total beef	0.62	0.08	0.173
Pork:			
Chops and steak	0.25	0.18	0.070
Roasts (fresh)	0.11	0.28	0.031
Bacon	0.15	0.11	0.042
All ham and picnic	0.22	0.16	0.062
Sausage	0.08	0.28	0.021
All other pork	0.06	0.23	0.016
Sub-total pork	0.42	0.08	0.119
Cold meats (including canned):			
Wieners	0.11	0.09	0.030
Bologna	0.10	0.15	0.028
Other cold meats	0.13	0.12	0.037
Sub-total cold meats	0.21	0.07	0.059
Poultry	0.42	0.11	0.119
Fish	0.09	0.14	0.024
All meats	1.31	0.06	0.367

[a]These are 7-degree of freedom estimates of the variation between households of mean pounds purchased per week. Variation due to socioeconomic differences of households has been removed.

[b]These values refer to a typical socioeconomic group mean made of one seventh of the total households in the survey.

$$(\text{Coefficient of Variation}) = \frac{(7/642)^{1/2} \ (\text{Standard Deviation})}{(\text{Socio-group Mean})}$$

[c]The probability of a difference between two socio-group means for a particular meat exceeding this value is 0.10 when no true difference exists.

$$(\text{Least Significant Difference}) = 1.895 \ [2(7/642)]^{1/2} \ (\text{Standard Deviation})$$

indicates that the *standard error* for the mean was estimated to be 0.13 or 13 percent of the value 0.388.

A reader may question whether households having a head aged 45 to 54 actually purchased less ground beef per person than did households with heads aged 55 to 64 years. The means for the two groups are 0.388 and 0.355, respectively, which gives a difference of 0.033 pounds. The final column of table C-2, under the heading *least significant difference*, provides the value 0.121 to which the actual difference can be compared. Since 0.033 is less than 0.121 it can be concluded that the sample data do *not* provide evidence that households in Webster County in the two groups purchased ground beef at a different rate.

The *least significant difference* values in table C-2 constitute a test with an error rate of 10 percent. That is, in a technical sense, the selection of random samples from Webster County during the particular time period of this study may be considered a random process. This random process generates the particular random variable that estimates the difference between the corresponding population means. Now, if, in fact, no difference exists between the population means, an estimate of that difference produced by sampling will exceed the value 12.1 only 10 percent of the time, or, say, with a probability of only 0.10.

These *least significant differences* are computed on the basis of each mean containing about one-seventh of the study group or 92 households. If the two means to be compared pertain to a group containing greater than one-seventh, the appropriate value is less than that shown in the table. The values of table C-2 are inserted only as a rough guide to variation. A test of a linear effect such as the increase in purchasing of t-bone steaks when moving from a low to a high household income group involves statistics similar to that of the *least significant difference*, but a different critical value is required. Most elementary statistics books will provide formulas for setting up appropriate tests.

The *standard error* for the opinion index on the importance of freshness to meat quality was estimated to be 1.0 for a mean taken over all households for any particular kind of meat. For example, the scale value for freshness of ground beef in fig. 9 was 80.7 when a zero value is taken to be "not very important" and a 100.0 value is defined for "very important." The *standard error* for the particular estimate 80.7 is estimated to be 1.0; this gives a coefficient of variation value of about 0.01. Although measurements of variation for other attributes on which opinions were collected were not calculated, evidence indicated a level similar to that just given. The particular value of 1.0 was computed from the interaction between meat and socio-group.