The Relationship of Selected Variables to Consumer Knowledge of Beef in Selected Areas of Mississippi.

Duane H. Tucker

Louisiana State University and Agricultural & Mechanical College

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Submitted to the Graduate Faculty of the
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in partial fulfillment of the
requirements for the degree of
Doctor of Education

in
The Department of Extension Education

by
Duane H. Tucker
B.S., Mississippi State University, 1954
M.S., Mississippi State University, 1965
May, 1974
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ABSTRACT

The purpose of this study was to determine selected consumers' knowledge of concepts related to beef quality, nutritive value of beef and preparation and identification by the use of a multiple-choice type test, administered in the home of the respondent. Specific objectives were to:

1. Establish a benchmark concerning the level of consumer knowledge in regards to:
   a. Selected concepts related to beef quality.
   b. Selected concepts related to the nutritive value of beef.
   c. Selected concepts concerned with the identification and preparation of three retail cuts of beef (T-bone steak, round steak and chuck roast).

2. Determine, if any, the relationship of selected socio-economic and demographic variables to consumer knowledge of beef quality, nutritive value of beef, and identification and preparation.

3. Suggest a predictive equation which might predict consumer knowledge of certain selected concepts related to beef quality, nutritive value of beef, preparation and identification and composite score.

4. Indicate educational needs of certain socio-economic consumer groups in regards to factors relating to selection and preparation of beef.
The data were obtained from 500 consumers in three different geographical locations in Mississippi. Of these responses, 429 were usable. The numerical scores made by the respondents on each of the sections and composite score formed the dependent variables. Five independent variables were considered as treatments (discrete variables). They were geographical location, place of residence, level of education, race and children or no children. Three independent variables, age, income per household, and pounds of beef purchased were treated as covariables (continuous variables).

Analysis of variance was used to determine the effects of the traits considered as treatments.

Simple correlation and partial regression coefficients were used to determine the relationship between the dependent variables and covariables.

It appears that race, place of residence, and amount of education had a significant bearing on the scores made by the respondents on all sections of the test.

Location was significant only when considering the scores made on the section concerned with preparation and identification. There was a positive correlation between the scores made on one section and the scores made on the remaining sections.

Age and income were positively correlated with scores made on the four sections of the test, whereas, pounds of beef was not significantly correlated.
The partial regression coefficients obtained were very small and were not statistically significant. It was concluded from the study that the consumers' knowledge of the concepts presented was rather low. Also, the use of socio-economic and demographic traits, utilized in this study, would not yield a satisfactory predictive model.
CHAPTER I

INTRODUCTION

Situation

For many families, food buying is the largest single expenditure of the family budget, with red meat purchases accounting for 27 percent of the food dollar. The per capita consumption of red meat in 1972 was 188.1 pounds per year. Per capita consumption of beef in 1972 was 116 pounds (1:11). This means that approximately 64 percent of all red meat eaten is beef. An item that consumes such a large share of the grocery dollar and is so vital from a nutritional standpoint, should be purchased on the basis of factual knowledge rather than on hearsay.

Beef consumption over the past twenty years has been increasing at a tremendous rate. Table I shows that in 1952, consumption per person was 62.2 pounds of beef per year. In 1972, it was 116 pounds per year. This represents an 86.50 percent increase in per capita consumption since 1952.

TABLE I


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<td>Beef</td>
<td>62.2</td>
<td>84.6</td>
<td>88.9</td>
<td>106.5</td>
<td>116.0</td>
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* American Meat Institute
Some of the more important reasons for this increase are: increase in disposable income, improved methods of refrigeration and freezing which make it easier to store beef, weight consciousness and protein diets, and increased status of beef as a prestige food.

From a nutritive standpoint, beef is very important in the diet of the American consumer. Protein of an animal source supplies the consumer with two-thirds of his total protein intake. Of the total calories consumed, two-fifths comes from animals. (28:330).

Due to the increased competition, each store prepares its meat in a different manner. Therefore, the shopper must have a basic knowledge of the characteristics of quality meat and methods of preparation so that the best buys, both nutritional and monetary, may be obtained. With proper selection and preparation, some of the less expensive cuts of beef can be as nutritious and appealing as the more expensive cuts.

The satisfaction that a consumer receives from a beef purchase is very important. The importance of consumer opinion and its influence or impact on beef consumption is vital to the beef industry.

In order to do a good job of buying, preparing and serving beef, the consumer should be well-informed. Only then can he make the wisest possible choices within the limits of his budget. Research reveals that an informed consumer can make a more valid decision when supplied with accurate information. Carlton E. Wright (37:7) states, "Decision making on the part of the consumer requires information. Informed consumers are in a better position to make rational and wise
choices than those less informed. The more the consumer knows of the foods he buys, the better he is able to evaluate his food purchases. Knowledge of individual foods — quality, price, season, food value and use — is essential to good buymanship. Informed consumers can eat better at reasonable cost, can improve their diets by selecting foods and food nutritents to meet their needs, can stretch their food dollars and get maximum satisfaction out of their food purchase."

Not only is it important that the American consumer know the dietary advantages that are supplied by meats, but it is also very vital to the meat industry that the consumer know: what he is purchasing, why the purchase is necessary to good health and how to properly prepare the purchase to achieve maximum benefit and satisfaction. To meet these challenges, an educational program should be developed that will familiarize the consumer with meat quality, nutritive value and proper preparation.

Lloyd Davis, former Administrator of the Federal Extension Service, (5:197) states that, "One of the first requirements for conducting educational programs concerned with helping people to recognize and solve their problem, is for the Extension worker, himself, to identify and understand their needs." By establishing a benchmark concerning consumer knowledge of beef, this study could establish a reference point for future studies to evaluate educational programs and efforts in the field of beef consumer education. In addition, this study could give guidelines so that educational programs may be developed and planned to meet the needs of a specific socio-economic audience.
Statement of the Problem

The rapidly expanding population and the increasing per capita consumption of beef and increased expenditure for beef, points out a need for the consumer to be more knowledgeable about selection and preparation so that optimum eating satisfaction may be obtained.

Consumer knowledge of the nutritive value of beef is also very important. Besides joy and satisfaction derived from meat, Americans (on per capita basis) receive over one-third of their protein, nearly one-third of their iron and up to 50 percent of Vitamin B intake from meat (23).

In the past four decades, the U. S. Department of Agriculture (29:3) has conducted five nationwide surveys of food consumption. These were made in 1936, 1942, 1948, 1955 and 1965-66. Their objective was "to obtain information on the Nation's dietary situation." The survey indicated that expenditures for meat, poultry, and fish increased from $13.78 to 15.08 per week over a 10 year period of time beginning in 1955 (29:3).

A survey of household expenditures of urban families made in 1955 disclosed that families with incomes of more than $10,000.00 spent an average of 29 percent of their income for food, compared with expenditures amounting to 48 percent of total income for those who earned less than $2,000.00.

In addition to spending a greater percent of their income for food, the low income group had less beef and less expensive cuts of beef than did other income groups (28:616).

---

1 The statistical data available on nutritive value of meat is not broken down into specific categories.
The need for an educational program prepared for various income and social groups is pointed out in the study, Homemakers Opinion About Selected Meats (30:16). They reported four out of ten homemakers indicated no interest in learning more about cooking meat. The report further stated that older women, women from small families, and those with low education and income were least likely to express interest. It is this group that spends a high percentage of their total income for meat. Further, Caplozity (4:XIX) states that supermarket chain stores often use their low-income outlets for produce and meats that have begun to spoil.

For these reasons it seems essential that an educational program be designed to meet the needs of low income audiences.

This study was an attempt to determine what, if any, factors influenced the consumer's knowledge of selection and preparation of beef. It was felt that if certain economic and social factors were identified as having an influence on the consumer's knowledge, then educational programs could be developed that would be tailored to meet the needs of certain economic and social groups.

**Purpose and Objectives of the Study**

This study was undertaken in order to identify more precisely the needs of the beef consumer in Mississippi.

The research findings from this study will be used to assist the Mississippi Cooperative Extension Service in developing educational programs to meet the needs of its clientele - in this case, consumers of retail beef.
Specific objectives may be described as follows:

1. To establish a benchmark concerning the level of consumer knowledge in regard to:
   a. Certain concepts related to beef quality.
   b. Selected concepts related to the nutritional value of beef.
   c. Concepts concerned with identification and preparation of beef.

2. To determine, if any, the relationship between selected socio-economic and demographic variables and consumer knowledge of beef identification and preparation, and nutritional value.

3. To suggest a formula which might predict consumer behavior in regards to selection and preparation of beef.

4. To indicate educational needs of certain socio-economic consumer groups in regard to meat selection and preparation.

(References cited in Chapter I are listed following Chapter III.)
CHAPTER II

REVIEW OF LITERATURE AND RELATED RESEARCH

This investigation was concerned with measuring consumer knowledge of certain concepts related to beef quality, nutritive value of beef, and preparation and identification of selected retail cuts of beef.

An understanding of consumer knowledge of beef is at the heart of the beef marketing concept. Without such insight, it is most difficult for the beef industry to design strategies to penetrate their market targets. Mendenhall and Harap (20:205) state that, "Consumers everywhere want to know what they should buy, exactly what quality and quantity they are getting when they buy, whether the product in each case will serve the particular need for which it is intended and whether, in consideration of all factors, the price is fair." Selected socio-economic and demographic traits were investigated to determine if there is any relationship between these traits and knowledge of beef.

Problems in Consumer Research

In reviewing consumer research findings, the researcher became aware of three major problems in this area: (1) reaching an appropriate group of people, and (2) securing reliable responses from these people once they are reached, and (3) establishing the reliability and consistency of consumer research. In reference to the third problem mentioned above, Kollot (17:754) states that replication is rarely
practiced in consumer research. Most findings are based on single studies by a single researcher. He points out that this lack of replication often leads to invalid conclusions. The conclusions are inaccurate because samples are often not representative of the total population. The failure to replicate research also makes it impossible to test experimental and methodological procedures to establish reliability and validity.

Compared to most disciplines, the study of the consumer is in its infancy, dating back less than 50 years. A significant percentage, probably the majority of this research, has occurred during the last decade. The majority of these efforts have been confined to selected concepts or aspects of consumer behavior such as brand loyalty (9:445-459), (10:340-369), (11:9-14), (12:43-56), (14:35-42), (8:347-363), diffusion of innovations (15:238-251), (16:665-684), and consumer preference of certain meats (32:13), (30:37), (34:13), and consumer expenditures for beef (33:59).

Use of Socio-Economic and Demographic Traits to Predict Consumer Behavior

Recently, several studies have attempted to use certain socio-economic and demographic traits to predict consumer behavior.

In 1965, Raunikar, Purcell and Elrod published the results of an investigation which attempted to estimate the relationship between consumption and expenditure for meat, meat products and eggs to household income, household size and race. Using least squares regression models, they found that the relationship of the quantities purchased and expenditure, to income, varied within and among the retail categories. Per capita expenditures for total meat were higher
for white households than for non-white households, but per capita quantities were higher for non-white households (25).

Previous studies concerning the use of regression analysis in attempting to predict consumer behavior toward brands and consumption of certain foods have not yielded satisfactory prediction models. However, there are no studies attempting to predict consumer knowledge of certain items whereby a testing instrument is used to produce quantitative data. If use of certain socio-economic and demographic traits could be successfully used to predict the level of knowledge of a selected group, then this would be of unlimited value to organizations whose responsibility is to meet the educational needs of a wide and diverse clientele.

In 1967, Frank, Massey and Boyd, (12:184-190) used regression analysis involving fourteen socio-economic and demographic variables to predict household consumption of fifty-seven grocery products. Evans (10:340-369) used selected socio-economic variables to predict whether an individual owned a Ford or a Chevrolet. He concluded that personal characteristics were doubtful predictors for automobile ownership.

Williams (38:59) used a multiple regression model to determine the individual effects of the different socio-economic characteristics of the household on beef and pork purchases and expenditures. He concluded that individual cross-sectional analysis will not yield a good predictive model.
Mueller (22:899—917) used income and attitude as independent variables to predict consumer purchase of durable and non-durable goods. She obtained $R^2$ values of 0.79 for non-durable goods and 0.76 for durable goods.

**Knowledge Defined**

In Bloom's (3:3-8, 11, 72-73) cognitive domain, he describes knowledge: "as the ability to recall or recognize in an appropriate context of material whether it be specific facts, universal principles, methods; process patterns, structures or setting." He further states that knowledge implies "The recall of specifics and universals ... methods and processes, or ... a pattern, structure or setting ... knowledge objectives emphasize most the psychological processes of remembering ..."

**Purpose and Definition of Measurement**

Thorndike (26:335-336) states that the purpose of measurement is to acquire information. The information is always relevant to the description of the phenomena measured. Interpretation of the measure allows some kind of prediction. He further states that for an attribute to be measurable, it must fit the specifications of a quantitative variable, and units of measure must be established.

Dyer (6:30) defines educational measurement as consisting of the ordering of individuals in accordance with their responses to certain test situations. In an analysis of educational measurement, he lists three elements in the process: (1) the test situation to which individuals are expected to respond, (2) the responses of
the individuals to these situations and (3) the ordering of the individuals according to their response.

Underlying much of the theory and practice of measurement in education is the concept of variation from person to person of physical and psychological characteristics. The principal reason for such variation among persons is that the extent to which an individual possesses a given characteristic is usually the result of a very large number of internal and external influences interacting within and upon the individual. When a test is used to serve as a prediction function, its worth or validity depends on the extent to which it is actually successful in estimating performance in some type of real-life situation.

Measurement of knowledge or educational measurements have advanced greatly since the early part of the century. The role of evaluation or testing has taken on new meaning and purpose. According to Guilford (13:415), modern tests are developed to measure some ability or other trait that is hypothesized as being a significant dimension of personality or it is developed to predict or to evaluate the performance of some kind of personnel in a particular situation. Through the use of testing instruments, decisions that have in the past been based on intuition or informal guesses, can now be based on empirical evidence which has been obtained through some form of educational measuring device.

Consumer Studies Relating to Knowledge of Beef and Nutrition

Previous studies reveal that consumer knowledge of beef is limited. Woods and Jenkins (35:5) reported that color of beef was
the indication of tenderness most often relied on by the consumer. Sixteen percent used marbling as an indicator of tenderness and 11 percent did not know any factors associated with tenderness. They also found that at least half of the respondents in their study replied that they had gained their knowledge of beef selection and preparation by trial and error.

In a study conducted by Woods and Nettles (34:17), it was found that 31 percent of the respondents would use some form of dry heat as the method for preparing some of the less tender cuts. They also reported that as education increased, there was an increase in those suggesting baking or roasting the less tender cuts. In addition, as education increased, there was an increase in those suggesting cooking the tender cuts without liquid.

Van de Mark (31:29), in a study of Alabama consumers, reported that respondents indicated a fairly good understanding of protein needs as supplied by beef. However, the respondents' understanding of grades was not clear. She reported almost half of the homemakers selected U. S. Good as the preferred grade (31:8).

In a nationwide survey of 3,099 homemakers, the U. S. Department of Agriculture (30:5-6) reported that beef was the meat most frequently eaten, with only 17 homemakers reporting that no beef was served in their home in the past year. Ninety percent reported that they served beef on the average of two or more times per week. This Opinion Study (30:19) further revealed that the majority of homemakers appeared confused about the USDA grade designations for beef. Eighty-six
percent of the respondents said beef was graded and six out of ten respondents selected the correct names for the various grades. However, the spurious grade, "USDA Grade A," was mentioned as frequently as USDA Prime. There was also apparent confusion over what agency is responsible for the grading service. Only 28 percent correctly identified the USDA as the agency responsible. Ninety-two percent said that the beef they bought was inspected but only about half of the homemakers correctly associated the concepts related to wholesomeness with inspection and grading to quality.

There are numerous studies concerned with consumer's knowledge of the concept nutrition. Young and her associates (39:218-222) conducted a study in two up-state New York urban communities to determine what the homemaker knew about food and nutrition. They reported that approximately 40 percent of the respondents could give adequate nutritional reasons for including any food group mentioned.

Monse, Clayton and Cosgrove (21:667-668) proposed, as a result of their study concerning mothers' knowledge of nutrition, that some supervised education in nutrition was needed for mothers to plan more nutritious meals.

In view of the research studies reviewed, the conclusion was drawn that many studies of the consumer have been made. Attempts have been made to determine why a consumer has loyalty to a certain brand. Studies have been made to find out the consumer consumption of various commodities. Researchers have scrutinized the consumer's
environment and its relationship to consumer behavior and sophisticated models have been developed in attempts to predict consumer behavior. However, this researcher could find no studies that used a test instrument to determine the quantitative level of knowledge of concepts relating to beef quality, nutritive value of beef, and preparation and identification of selected retail cuts of beef. (References cited in Chapter II are listed following Chapter III.)
CHAPTER III

PLAN AND PROCEDURE OF THE INVESTIGATION

In this chapter, the following will be discussed: the sample, the data collection instrument and data analysis procedure.

Sample

The sample consisted of 500 homemakers all of which were women. The population was drawn from three selected areas (counties) in Mississippi. The criteria for selecting an area were:

1. Geographical location.
2. Combination of urban and rural elements.

Using these two criteria, the counties of Lee, Hinds and Pike were selected as the locations to be sampled. Each contained an urban area, and each is in a different geographical location within the state.

Using the latest census, the number of homemakers from each county was prorated so that each county would yield a percentage of respondents based on the percentage of residents as compared with the total population. \( \frac{X \times 500}{TP} \) where \( X \) = population of one geographical location, and \( TP = \) total population of three selected geographical locations). Within each county, the number of rural and urban respondents in the sample was determined by using the above formula. Within urban areas, the number of white and black respondents were determined by the population ratio. The number of rural homemakers was completely random with no control on race.
Development of the Data Collection Instrument

In order to develop an instrument that would measure levels of knowledge, the researcher designed a questionnaire based on information gained from the literature, the specialist and the audience - in this case, the homemaker. No single source of information is adequate to provide a basis for wise and comprehensive decisions about the objectives of an educational program.

Tyler (27:4-16) states there are three sources of information available when determining the needs of a potential audience. They are:

1. The environment.
2. The specialists.
3. The audience itself.

A study of the audience would seek to identify needed changes in behavior patterns of the clientele. A study of the environment would serve to identify the needed changes in the clientele as indicated in the literature by researchers and writers in the subject field.

The third source would be subject matter specialists. This source is widely used. One criticism is that the objectives proposed by this group are often too technical and too specialized.

By using all three sources and being aware of the strengths and weaknesses of each, the instrument to determine levels of knowledge was developed.

The questionnaire was pretested on two groups. The first audience on which the instrument was pretested was a group of Extension Home Economists. Questions that had a high percentage of wrong answers
were eliminated and questions that were not clearly stated were restructured. The restructured questionnaire was pretested in two counties, using membership in homemakers' clubs. Questions with a high percentage of wrong answers were eliminated. Also, questions that had an extremely high percentage of correct answers were discarded. Questions not clearly stated were revised.

In this study concerning levels of knowledge, one of the limiting factors was the development of an instrument that would be effective in determining such levels. Wrightstone, Justman and Robbins (38:42) define the qualities of an evaluation technique as follows:

"A test on evaluative technique is judged for its adequacy, efficiency, and consistency or a measuring device on the basis of commonly accepted qualities. These qualities are validity, reliability, objectivity, norms and practicability. Validity is that quality which indicates the relationship of a message or diagnosis with meaningful criteria of learning or behavior ... Reliability is that quality which indicates the consistency, equivalence, or stability of a measure that is obtained. Objectivity is that quality which indicates the identity or similarity of scores or diagnoses obtained from the same data by equally competent scorers. A norm provides an average or typical value for a measure or diagnosis obtained by the administration of a measuring instrument to a specific population so that subsequent scores or measures for an individual or group may be compared with the typical values of a normative population. Practicability is that quality which indicates the feasibility for the general use of a test or evaluative technique on such bases as cost, time required for administration, ease of administration, ease of scoring and ease of interpretation of the results."

Lang (18:89) outlined guidelines for constructing a test by stating:

"Thought should be given to such matter as the nature of the subject matter to be tested, the mental abilities to be emphasized in the test, the principle of variety, the main function which the test is expected to perform, and the available testing facilities."
Either essay or objective tests may be used for determining levels of knowledge. Marshall and Hale (19:54) state that essay tests are most appropriate in assessing the quality of an examinee's higher-order mental processes: application, analysis, synthesis and evaluation.

Several factors limit the use of an essay type test. The amount of time required and the difficulty of scoring are two very important factors. Personal opinion and bias are additional disadvantages that can easily influence the final result. Objective tests, on the other hand, are quicker to complete, easier to score and reduce the possibility that bias may influence the final test score.

Five common types of objective tests are listed by Wood (36:24-30). They are true-false, multiple choice, matching, rank order, and completion. Most authors reviewed by the researcher rated the multiple choice as among the best testing methods. Wood (36:27), Ebel (7:196), and Nunnally (24:173) state multiple choice as one of the most popular instruments in current use. According to Marshall and Hale (19:93), the multiple choice test is the most flexible and versatile of all selection-type examinations. However, it cannot be used to measure an examinee's ability to organize materials or to clearly express his views according to acceptable language usage rules. To develop satisfactory multiple choice questions, the writer must have a thorough knowledge of the material, an awareness of the methodology of item writing and skill in the use of language.
Anastasi (2:33-45) states that a test is valid if it is a measure of and only what the examiner wishes to measure. A test score is valid to the extent that it is useful for a given purpose.

Guilford (13:415) justifies a test as a measure of some ability or other trait that is hypothesized as being a significant dimension of personality or if it is developed to predict or to evaluate the performance of some kind of personnel in a particular situation.

In determining the content of the instrument to measure the knowledge and understanding, the researcher posed this question --- "What are some of the concepts influencing beef quality, nutritive value of beef, and identification and preparation that a homemaker needs to understand to make a wise selection?"

Assumptions made were:

1. A person does need to remember certain facts and not just know where the information may be obtained.
2. The person needs to be able to apply and evaluate certain concepts pertaining to beef selection.
3. The person who has a command of these concepts is more apt to select the most appropriate cut for specific circumstances than the person who does not possess these understandings.

Based on these assumptions, test schedules were developed to ascertain the homemaker's knowledge of beef. Multiple choice questions were used. Each choice of answers contained the correct answer. Each question also contained a "don't know" which allowed the respondent an opportunity to respond to each question without being forced to
select an answer. This technique would allow respondents to avoid answering questions that they did not know, thereby eliminating much of the possibility of guessing.

The questionnaire was constructed around three major concepts relating to retail beef. Factors associated with beef quality were used as the basis for 14 questions. Nutrition characteristics of beef were used as the basis for constructing eight questions. Concepts relating to identification and preparation formed the basis for 12 questions. Total questions in the instrument were 34. Therefore, scores could range from 0-34 (A complete questionnaire is found in Appendix A).

Personal data gathered on each residence were age and education of homemaker, total income per household, race, place of residence, residents per household, pounds of beef purchased per week, and what species of meat would the homemaker serve if there were an important guest for a meal.

Collection of Data

Each Mississippi county is divided into five political subdivisions. The subdivisions are referred to as beats. In drawing the rural sample, each beat was assigned a number. One number was selected in a random fashion. The selected beat was then divided into segments using roads, rivers, railroads, farm to market roads, and main roads as boundaries. These divided areas were then numbered and one was selected in a random manner. The interviewer traveled to this area by the shortest and most logical route. Upon arriving in the specified area, he stopped at the first house on either side of the road. After
the initial interview, the next homemaker resided in the second house on the opposite side of the road from the first respondent. The interviewer continued alternating on sides of the road and interviewing every second house until he acquired the specified number or reached the boundary of this segment. If he had not acquired the desired number by this time, he returned to headquarters, drew another area and followed the same procedure as outlined above. If a selected house was vacant or no one at home, he went to the next house on the same side of the road. This house did not influence or change the original pattern.

Each urban area was divided into subdivisions, using natural boundaries such as highways, railroads, rivers and main thoroughfares. These areas were then designated as predominately black and white areas. To determine the number of urban homemakers of each race, the latest census was used to determine the ratio of white to black. This ratio was applied to the number of respondents selected from a particular urban area.

Due to living patterns that are present within cities which tend to segregate black in one area and whites in another, it was deemed necessary to exercise some control over the urban sample. With no control, it was possible that the entire urban sample would have been drawn from a white or black area.

In rural areas, these segregated living patterns are not as distinct as they are in urban areas; therefore, it was felt that a control on race was not necessary.
Each area was numbered and one subdivision from all the predominately white areas and one subdivision from all the predominately black areas were selected in a random manner. These selected areas were then further divided into more workable areas by using through streets and natural boundaries. These more workable areas were then numbered and one from each area was selected.

The interviewer traveled to the selected area by the shortest and most logical route. Immediately upon arriving in the selected area, he went to the first house on the left hand side of the street that had residents. The second interview was the third house on the same side of the street. He continued taking every third house in that block. If the appointed house was vacant or no homemakers were home, he crossed over to the opposite side of the street and took the first residence that was occupied by a homemaker. Upon entering another block, the interviewer moved to the right side of the street and interviewed the first household that had residents and continued this pattern of taking every third house that had occupants. He then moved back to the left hand side of the street in the next block and continued the pattern of interviewing every third house and alternating sides of the street when entering a new block until he secured the determined number or had reached the boundary of the selected area. If he reached the boundary without the specified number, he returned to headquarters, drew another area from the main area chosen and followed the same pattern as outlined.
If the house selected was a duplex, he took the one that was nearest the upper end of the street. If no homemaker was available, he took the adjoining duplex. If this was also vacant, he crossed over to the opposite side and took the first house that had a qualified respondent.

If a selected house was an apartment (more than two residents), he interviewed the homemaker that lived in apartment one or A. If no one was available, he continued in the apartment building, taking the next numbered (two or B) apartment until he had secured a homemaker. If he failed to secure a homemaker in the apartment, he crossed over the street and secured the interview from the first available homemaker, beginning at the upper end of the street.

This data was gathered by a team of interviewers, using a questionnaire. The questionnaire was self-contained in that the role of the interviewer was limited to asking the consumer to be a participant in the study. If the homemaker was illiterate, then the interviewer read the question and recorded the interviewee's reply. Interviewers were given instructions on how to approach and secure the cooperation of the selected respondent. After initial training, interviewers were supervised as they administered their initial questionnaire. Frequent checks were made in each area to determine if the interviews were in the right location and followed the prescribed plan.
Data Analysis

Structured questionnaires (Appendix A) were used to measure consumer knowledge of various concepts related to beef quality, nutritive value of beef and preparation and identification of three retail cuts of beef. The tests were scored with one point awarded for a correct response and a zero for an incorrect, no response or "don't know" reply. Possible scores on quality, nutrition and preparation ranged from 0-14, 0-8, 0-12, respectively.

Data from the questionnaires were coded and then punched on cards for electronic computation. The quantitative scores on the three major concepts provided four dependent variables for this investigation, (1) knowledge of concepts affecting quality of beef, (2) knowledge of nutritive characteristics of beef, (3) knowledge relating to preparation and identification of three popular retail cuts of beef (T-bone steak, round steak, and chuck roast) and (4) combined total score.

There were eight socio-economic and demographic traits considered as independent variables. Five were considered as treatments (discrete variables) and three were considered as covariables (continuous variables). Variables considered as treatments were: (1) geographical location, (2) place of residence, (3) race, (4) level of education and (5) children or no children. Covariables were: (1) age of respondent, (2) income per household and (3) pounds of beef purchased per household. Dependent variables were the mean test scores the respondents made on (1) the quality section, (2) nutritive value, (3) preparation and identification, and (4) composite score.
The analysis of data consisted of using a least-square model with the five treatment effects and partial regression coefficients for the three covariables considered. Simple correlation coefficients among covariables and the test scores were also obtained with the statistical procedures. Analysis of variance statistical procedure (Appendix B, Tables I, II, III, and IV) was used to determine the effects, if any, of the various socio-economic and demographic traits used as treatments. Partial regression coefficients were calculated to determine the relationship of the covariables with the test scores. Coefficients of determination were calculated to determine the percent of variation accounted for by the statistical model. Simple correlation coefficients were also obtained between the independent variables, age, income, pounds of beef purchased and the four test scores.

**Comments on Data Collection**

The data were obtained in a very short period of time (September 15-November 1). This was planned so that any large scale advertising plans or shifts in the market would have a minimal effect.

However, during this time period, beef prices rose to an all time high, consumers were angry and many pickets across the nation occurred protesting high beef prices.

The opinions of the homemakers were reflected in the questionnaires by comments and the consumption of beef was affected during this period of high prices. The participants were requested to disregard the amount of beef purchased during this time and estimate their purchases during a more normal time. Therefore, the possibility of
incorrect estimates exists since the data regarding the quantity of meat consumed was based on the ability of the homemaker to recall this information.

The respondents also reported the total income of the selected residences. Therefore, incorrect or biased estimates could occur due to the homemaker's lack of knowledge of total income, their ability to recall this information, or their unwillingness to give such information.
REFERENCES CITED


CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The primary objective of this study was to determine the relationship, if any, between selected socio-economic and demographic traits and the consumers' understanding of certain concepts related to beef quality, nutritive value of beef and the preparation and identification of three selected cuts of retail beef (T-bone steak, round steak and chuck roast).

Five hundred homemakers in three different locations in Mississippi were selected through the use of a stratified random sampling plan. Each participant was given a self-contained questionnaire that had multiple choice questions concerned with various concepts of beef. These questionnaires were administered in the respondent's home by a trained interviewer during the time period September 15-November 1, 1973.

Of the 500 questionnaires received, there were 429 completed questionnaires. Only questionnaires that were complete in every detail were used for statistical analysis.

In collecting personal data, a certain amount of refusals was to be expected. Respondents may refuse to answer certain questions for a variety of reasons. The respondent may not be in a cooperative mood, the question may seem too personal, it may be offensive to him or he may not know. Clark (2:126) states that 15 percent refusals is about average for on-the-spot personal interviews. The percent
of questionnaires eliminated in this study due to non-response to certain questions fell within the 15 percent range. Eighty-six percent of the respondents completed the entire questionnaire.

The greatest percent non-response occurred with the question asking the respondent to indicate his income (9.4 percent).

General Description of Sample

Respondents in this study were predominately white (67.83 percent) and from urban areas (63.43 percent). Both of these percentages are greater than the percentages reported by the 1970 Census Report (6:39). It shows a percentage of 62.8 percent white and an urban percentage of only 44.5 percent (6:36). However, due to the manner in which the respondents were selected, it was predictable that the greater number of participants would be urban and Caucasians.

A general description of the homemakers' age, income per household and pounds of beef purchased per residence is presented in Table II.

TABLE II

MEANS, STANDARD DEVIATIONS AND COEFFICIENTS OF VARIATION FOR COVARIABLES, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Covariables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation, percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>40.18</td>
<td>13.21</td>
<td>32</td>
</tr>
<tr>
<td>Income per household</td>
<td>$12,788.00</td>
<td>$8,175.00</td>
<td>64</td>
</tr>
<tr>
<td>Pounds of beef purchased per household</td>
<td>351.50</td>
<td>191.69</td>
<td>55</td>
</tr>
</tbody>
</table>
The average age of the homemaker in this study was 40.18, the youngest, 17 and the oldest, 80.

Average income per household was $12,788.00. This is considerably higher than the mean income per Mississippi family of $7,292.00 as reported by the 1970 Census Report (7:539). Incomes ranged from below poverty level to $45,000.00

Average pounds of beef purchased was 351.50 pounds per household. Each household averaged 3.8 persons. Therefore, average per capita consumption of beef was 128 pounds.

The per capita consumption of beef in this study is 18 pounds higher than the 1973 per capita consumption of 110 pounds as reported by the American Meat Institute (1:3).

There is the possibility of error in this study's consumption figure as it is based on an estimate by the consumer; whereas national figures are based on pounds of beef sold through various outlets. Also, data relative to the amount of beef purchased was collected in the form of pounds of retail beef. Most per capita consumption figures are given in pounds of carcass beef. Therefore, it was necessary to convert the pounds of retail beef to carcass beef and this could cause the two figures to differ.

The size of the coefficients of variation shown in Table II indicates that there was a wide range within the covariables. This was particularly true in income per household and pounds of beef purchased per household.
The average number of residents per household in this study was higher than the state average of 3.4 as reported in the 1970 Census Report (6:39). This figure could partially explain some of the difference in income per family. However, the most probable reason for such a large income per family would be the educational level of the respondents in this study. Approximately 48 percent had either finished college or had the benefit of some college training. Forty-four percent of the respondents had either attended or finished high school. The remaining eight percent had eighth grade or less formal education.

Meat Selected for a Special Meal

When asked what meat they would serve to a special guest, beef was an overall favorite dish for prestige or "company" meal for both black and white (Table III). This is in agreement with Woods and Nettles (11:4) who reported that beef was used twice as much for a high status meal than any other meat, among both black and white. Williams (10) also reported that beef was most often selected for a guest meal where the host wanted to impress the guest.

In a study of Alabama consumers (8:7), Van DeMark reported that 43 percent of the homemakers selected beef as a first choice, 14 percent poultry and 10 percent pork. Among Negro homemakers, 38 percent selected poultry as first choice, 28 percent beef, and 20 percent pork.

In a 1961 Southern Cooperative Series (9:13) study, it was reported that beef was the meat most often preferred for the main
meal among white homemakers, with poultry second. Blacks, however, preferred poultry for the main meal with beef second in Alabama and pork second in Georgia.

TABLE III

PERCENTAGE OF RESPONDENTS SELECTING A MEAT FOR A HIGH STATUS MEAL, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Race</th>
<th>Beef</th>
<th>Pork</th>
<th>Poultry</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>83.63</td>
<td>6.85</td>
<td>7.14</td>
<td>2.38</td>
<td>100.00</td>
</tr>
<tr>
<td>Black</td>
<td>66.67</td>
<td>10.06</td>
<td>17.61</td>
<td>5.66</td>
<td>100.00</td>
</tr>
<tr>
<td>Average</td>
<td>77.56</td>
<td>7.82</td>
<td>10.02</td>
<td>3.41</td>
<td>100.00</td>
</tr>
</tbody>
</table>

As previously stated, beef was by far the most often selected meat for a high status or prestigious meal for both black and white. Poultry ranked second while pork was third.

This investigation indicates that within the past decade, more consumers are selecting beef as a prestigious meal and also as the meat most often preferred for the main meal.

Mean Scores for Dependent Variables

Data previously reported in this study has been limited to a general description of the population. It is now appropriate to describe the population from a standpoint of how they performed on the test schedule. Table IV shows the mean score, standard deviation and coefficient of variation for the entire population on each of the four dependent variables.
The data in Table IV reveal that the homemakers' knowledge of concepts presented in this study is rather low. It is interesting to note that there is very little difference in the scores made on one section and the scores made on another section. (Appendix C, Table I shows the percent of respondents correctly answering each question.)

TABLE IV

MEAN SCORE, STANDARD DEVIATION AND COEFFICIENT OF VARIATION (C.V.) FOR THE FOUR DEPENDENT VARIABLES, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Total Possible Score</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>C.V. (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>14</td>
<td>8.02</td>
<td>2.66</td>
<td>33</td>
</tr>
<tr>
<td>Nutritive Value</td>
<td>8</td>
<td>4.34</td>
<td>1.79</td>
<td>41</td>
</tr>
<tr>
<td>Preparation and Identification</td>
<td>12</td>
<td>6.94</td>
<td>3.01</td>
<td>43</td>
</tr>
<tr>
<td>Total Score</td>
<td>34</td>
<td>19.32</td>
<td>6.13</td>
<td>32</td>
</tr>
</tbody>
</table>

The large coefficients of variation indicate that differences could be difficult to detect with restricted sampling and small treatment differences.

The respondents apparently had a better understanding of the concepts relating to quality and preparation and identification than they did of factors relating to the nutritive value of beef. Also, there was more variation occurring on the tests relating to the nutritive value section and the section related to preparation and identification of beef than on the quality section. This would indicate that the respondents' quality
scores were more closely related or there was not quite the spread in quality test scores as there was on the other two sections. There was less variation on the total score and quality score than on the other two test scores.

The amount of variation occurring is greater than what one would expect in the field of a biological or physical science. Acceptable ranges in these disciplines would be 15–20 percent variation. However, these ranges shown in Table IV are not considered too large to be useful in researching human behavior as larger coefficients of variation are acceptable.

**Education**

The educational level of the homemaker was partitioned into three classifications. They were: (1) eighth grade or less, (2) 9–12, and (3) college.

Approximately 48 percent of the homemakers in this study had the benefit of at least some college training. Only 8.16 percent had an educational level of eighth grade or less.

Of the counties involved in the study, Hinds, according to the 1970 Census Report (6:278) shows the largest percent of its population as having an educational level above the high school level. That report shows 35.74 percent of the population in Hinds County, between the ages of 15–49 as having one year or more of college training. As previously stated, ages ranged in this study from 17–80. Even though there is a difference in age span occurring in this study and the age span given in the Census Report, it would seem reasonable to assume
that the educational level of the consumer involved in this study is higher than the average population.

Mean scores for each educational classification were obtained for each of the four dependent variables. The data are presented in Table V.

**TABLE V**

**MEAN SCORES FOR QUALITY, NUTRITIVE VALUE, PREPARATION AND IDENTIFICATION AND TOTAL BY EDUCATION, SELECTED MISSISSIPPI COUNTIES, 1973**

<table>
<thead>
<tr>
<th>Educational Classification</th>
<th>Mean Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quality**</td>
</tr>
<tr>
<td>8 or less</td>
<td>6.78</td>
</tr>
<tr>
<td>9-12 years completed</td>
<td>7.16</td>
</tr>
<tr>
<td>Some College</td>
<td>8.11</td>
</tr>
<tr>
<td>Total Possible Score</td>
<td>14</td>
</tr>
</tbody>
</table>

** = highly significant (P < .01)

Homemakers with college training consistently scored higher on all phases of the test than did those respondents with less education. Also, homemakers reporting an educational range of 9-12 scored higher on all sections than those respondents with an eighth grade or less education, except the nutritive value of beef section. The scores on this section were almost identical, 3.90 for those respondents with an eighth grade or less and 3.89 for those in the 9-12 range.
From a statistical standpoint, these differences were highly significant \((P < .01)\) (see Appendix B, Tables I, II, III, and IV). These findings would indicate that as an individual gains more formal education, his understanding of the concepts presented in this study increases and he becomes more knowledgeable about factors relating to quality, nutritive value, preparation and identification of beef.

Place of Residence

The urban areas involved in this study produced the greater percentage of respondents (63.64). Due to the sampling plan, this was expected. The data in Table VI show the mean scores of both rural and urban homemakers on the four dependent variables.

**TABLE VI**

MEAN SCORES FOR QUALITY, NUTRITIVE VALUE, PREPARATION AND IDENTIFICATION AND TOTAL BY PLACE OF RESIDENCE, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Place of Residence</th>
<th>Mean Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quality</td>
</tr>
<tr>
<td>Rural</td>
<td>6.75**</td>
</tr>
<tr>
<td>Urban</td>
<td>7.95**</td>
</tr>
<tr>
<td>Total Possible Score</td>
<td>14</td>
</tr>
</tbody>
</table>

* = statistically significant \((P < .05)\)

** = statistically significant \((P < .01)\)
It can be readily seen in Table VI that urban participants scored higher on all sections of the test with the exception of the section relating to the nutritive value of beef. These scores were almost identical with the rural homemaker scoring slightly higher. The differences observed in the scores made on the quality section were statistically significant \((P < .01)\) and composite scores were also statistically significant \((P < .05)\); whereas, the differences occurring on tests relating to the nutritive value and preparation and identification section could be due to chance since they were not statistically significant. Van de Mark's (8:18) study showed that urban consumers, both black and white, consumed more beef than their rural counterparts. This could account for some of the variation occurring in the scores between rural and urban respondents. The more opportunities an individual has, the more likely he is to learn more about the item. It is reasonable to assume that urban residents in this study are more knowledgeable of the concepts relating to quality and preparation and identification presented in this study than are their rural counterparts.

Race

Of the 429 homemakers, 67.83 percent were white and 32.17 percent were black. This ratio is closely associated with the ratio of black to white in Mississippi and is within the predicted response, according to the sampling procedure. The data in Table VII show the mean scores for the dependent variables, according to race.

In all cases, the scores made by the white respondents were higher than the black respondents.
TABLE VII
MEAN SCORES FOR QUALITY, NUTRITIVE VALUE, PREPARATION AND IDENTIFICATION AND TOTAL BY RACE, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Race</th>
<th>Mean Scores</th>
<th>Quality</th>
<th>Nutritive Value</th>
<th>Preparation &amp; Identification</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>6.55**</td>
<td>3.70**</td>
<td>5.10**</td>
<td>15.48**</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>8.15**</td>
<td>4.58**</td>
<td>6.64**</td>
<td>19.40**</td>
<td></td>
</tr>
<tr>
<td>Total Possible Score</td>
<td>14</td>
<td>8</td>
<td>12</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

** = statistically significant (P < .01)

Analysis of variance (Appendix B, Tables I, II, III, and IV) revealed that these differences were highly significant (P < .01) on all four dependent variables. This would indicate that the white homemakers in this study had a more comprehensive understanding of all the concepts relating to beef presented in this study.

G. Franklin Edwards (3:393) states that differences due to race do exist. He further reports that these differences are due to the Negro class structure and institutions and represent adjustments to the isolation under which Negroes have lived.

Location

Analysis of the data shows that Hinds County yielded the largest number of respondents, with Pike County having the fewest number of respondents. These data are presented in Table VIII.
TABLE VIII
NUMBER OF HOMEMAKERS ACCORDING TO LOCATION, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Location</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee</td>
<td>77</td>
<td>17.95</td>
</tr>
<tr>
<td>Hinds</td>
<td>300</td>
<td>69.93</td>
</tr>
<tr>
<td>Pike</td>
<td>52</td>
<td>12.12</td>
</tr>
<tr>
<td>Total</td>
<td>429</td>
<td>100.00</td>
</tr>
</tbody>
</table>

According to the sampling procedure, it was expected that the heavier populated areas would yield the greatest number of respondents, whereas, the less populated areas would yield the fewest number of respondents.

The mean scores for the dependent variables for each location are presented in Table IX.

Data in Table IX indicate that homemakers in Hinds County made the highest score on the sections concerned with quality, preparation and identification, and on the total. Homemakers in Lee County scored the highest on the nutritive section while the homemakers in Pike County made the lowest scores on all four sections.

Using the analysis of variance (Appendix B, Tables I, II, III and IV) it was determined that location was not statistically significant at the (P < .05) level concerning the scores on the quality, nutritive value and total sections of the testing instruments. This indicates that the differences observed in the three locations were probably due
to chance and not due to location effects. However, location was highly significant \((P < .01)\) when analyzing the scores concerned with the section on preparation and identification.

TABLE IX

MEAN SCORES FOR QUALITY, NUTRITIVE VALUE, PREPARATION AND IDENTIFICATION AND TOTAL BY LOCATION, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Location</th>
<th>Quality Mean</th>
<th>Nutritive Value Mean</th>
<th>Preparation &amp; Identification Mean</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=8</td>
<td>N=12</td>
<td>N=34</td>
<td></td>
</tr>
<tr>
<td>Lee</td>
<td>7.31</td>
<td>4.46</td>
<td>5.60</td>
<td>17.48</td>
</tr>
<tr>
<td>Hinds</td>
<td>7.64</td>
<td>4.04</td>
<td>6.58</td>
<td>18.36</td>
</tr>
<tr>
<td>Pike</td>
<td>7.09</td>
<td>3.92</td>
<td>5.43</td>
<td>16.48</td>
</tr>
<tr>
<td><strong>Total Possible Score</strong></td>
<td>14</td>
<td>8</td>
<td>12</td>
<td>34</td>
</tr>
</tbody>
</table>

\(** = \text{statistically significant (}P < .01\)\)

As previously stated, Hinds County has the highest educational level of any area in the state. Due to the relationship that exists between education and income, it is reasonable to assume that income per household in Hinds County is one of the highest in the state. Amount of income is related to the amount of beef purchased \((4:10)\). Therefore, it seems probable that an individual that is able to buy more beef has more opportunity to learn and identify traits associated with identification and preparation. In addition, the Hinds County area
has the greatest number of television and radio stations and a greater number of outlet stores selling beef than the other two locations. Therefore, more information relating to beef identification and preparation is probably available to residents in Hinds County. In addition, there are several colleges and universities located in the Hinds County area, which could have an influence on the educational level of the consumer, and the availability of informational material would probably be greater than in the other two locations.

Children Status

An extremely large percent of the respondents (82.75) reported having or having had children. A further breakdown of the data revealed that the more Caucasians in this study reported having had children than did the Negroes. Also, it was found that the white households reported more persons per household than did the blacks.

Table X contains the mean scores for each test section made by the homemakers who reported having had children and the homemakers who reported never having children.

The scores made by the respondents who reported never having had children were higher on the quality, nutritive value, and total sections than those of the respondents reporting that they had or had had children. However, the difference between the scores was not statistically significant. Therefore, it seems reasonable to conclude that respondents with children do not have a better understanding of these concepts. These findings are rather interesting. It would seem that families with children would be more aware of the factors relating to quality,
nutritive value and preparation and identification that were presented in this study than those families without children.

**TABLE X**

**MEAN SCORES FOR QUALITY, NUTRITIVE VALUE, PREPARATION AND IDENTIFICATION, ACCORDING TO STATUS IN REGARD TO CHILDREN, SELECTED MISSISSIPPI COUNTIES, 1973**

<table>
<thead>
<tr>
<th>Children Status</th>
<th>Quality</th>
<th>Nutritive Value</th>
<th>Preparation &amp; Identification</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>7.08</td>
<td>4.12</td>
<td>6.09</td>
<td>17.38</td>
</tr>
<tr>
<td>No Children</td>
<td>7.63</td>
<td>4.16</td>
<td>5.65</td>
<td>17.51</td>
</tr>
<tr>
<td>Total Possible Score</td>
<td>14</td>
<td>8</td>
<td>12</td>
<td>34</td>
</tr>
</tbody>
</table>

**Correlation Coefficients for the Independent Variables**

In order to determine the association among the independent variables, correlation coefficients, using the method of Steel and Torrie (5) were obtained, and are presented in Table XI.

The correlations between age and income and age and pounds of beef purchased were negative. The correlation between age and income was not statistically significant; whereas, the correlation between age and pounds of beef purchased was highly significant at the (P < .01) level. This indicates that as the respondents grow older, they have a tendency to purchase less beef.
TABLE XI

CORRELATION COEFFICIENTS FOR AGE, INCOME AND POUNDS OF BEEF PURCHASED, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th></th>
<th>Income</th>
<th>Pounds of Beef Purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.04</td>
<td>-0.17**</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td>0.34**</td>
</tr>
</tbody>
</table>

** = statistically significant \( P < .01 \)

Income and pounds of beef purchased were positively correlated. The correlation between these two variables was highly significant. It seems reasonable that as the family income increases, so does the total amount of beef purchased. While other variables in this study might influence one's life style, income is a definite limiting factor in the amount of beef purchased by a household. Snell (4:10) reported that a relationship between income and quantity of beef purchased is such that a 10 percent change in income will result in approximately a 10 percent change in quantity of beef purchased.

Correlation Coefficients for Dependent Variables

In order to determine the relationship between the dependent variables, correlation coefficients were obtained. Table XII shows a positive correlation between the scores made on the quality section and the three remaining dependent variables, and they were statistically significant. As the individual scored higher on the quality section, his score on the nutritive value, preparation and identification sections also increased.
TABLE XII
CORRELATION COEFFICIENTS FOR DEPENDENT VARIABLES, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th></th>
<th>Nutritive Value</th>
<th>Preparation &amp; Identification</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>0.51**</td>
<td>0.52**</td>
<td>0.83**</td>
</tr>
<tr>
<td>Nutritive Value</td>
<td></td>
<td>0.49**</td>
<td>0.75**</td>
</tr>
<tr>
<td>Preparation &amp; Identification</td>
<td></td>
<td></td>
<td>0.86**</td>
</tr>
</tbody>
</table>

** = statistically significant (P < .01)

When comparing the scores on the nutritive value section and the three remaining dependent variables, it was found that all of the correlation coefficients were positively correlated and all were statistically significant. These findings were also repeated when comparing preparation and identification and total scores with the remaining variables. It is reasonable to assume that as an individual scores high on one section, then he is going to score slightly higher on the remaining sections. This would seem appropriate as an understanding of the concepts relating to one section should be of value in understanding the questions asked in the other sections.

Correlations Between the Independent and Dependent Variables

Correlation coefficients were obtained between age, income, pounds of beef purchased and the four test scores. These data are presented in Table XIII.
TABLE XIII
CORRELATION COEFFICIENTS FOR COVARIABLES AND DEPENDENT VARIABLES, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Covaribles</th>
<th>Age</th>
<th>Income</th>
<th>Pounds of Beef Purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td></td>
<td>0.103**</td>
<td>0.226**</td>
<td>0.100*</td>
</tr>
<tr>
<td>Nutritive Value</td>
<td></td>
<td>0.014</td>
<td>0.140**</td>
<td>-.009</td>
</tr>
<tr>
<td>Preparation &amp; Identification</td>
<td></td>
<td>0.306**</td>
<td>0.193**</td>
<td>0.059</td>
</tr>
<tr>
<td>Total Score</td>
<td></td>
<td>0.638**</td>
<td>0.238**</td>
<td>0.073</td>
</tr>
</tbody>
</table>

* = statistically significant (P < .05)
** = statistically significant (P < .01)

Inspection of the correlation coefficients presented in Table XIII reveals that there was a positive correlation between the age, income and the pounds of beef purchased by the respondents and the quality test scores. The age and income correlation was statistically significant at the .01 level; whereas, the pounds of beef correlation was significant at the .05 level.

These data indicate that as the respondent grows older and income increases along with increased purchases of beef, his scores on the quality section tend to increase. The covariable having the most influence was income per household.

The data concerning the nutritive value of beef portion of the test reveals some interesting findings. There was a slight positive
correlation between age and nutritive value scores, but it was not statistically significant. The correlation between income and nutritive value was also positively correlated and was highly significant \( (P < .01) \). The correlation between the amount of beef purchased and knowledge of the nutritive value of beef was correlated in a negative fashion. However, this correlation was not statistically significant.

The correlation between age and income of respondent was positive. Both of these correlations were highly significant \( (P < .01) \). This indicates that older respondents with higher incomes have a tendency to score higher on the preparation and identification section than those younger respondents with lower levels of income. The correlation between pounds of beef purchased and the dependent variable, preparation and identification, was positively correlated but the magnitude of the coefficient is very small and statistically non-significant.

Age and income were positively correlated with the composite test score and were highly significant \( (P < .01) \). Pounds of beef purchased was also correlated in a positive manner but was not statistically significant.

Age and income were positively correlated with the four dependent variables and the correlations were highly significant in all instances with the exception of age and the nutritive value score. It was positively correlated but not statistically significant.

Pounds of beef purchased per household was positively correlated with three dependent variables. Those variables were: (1) quality scores, (2) preparation and identification, and (3) total score.
However, the only statistically significant correlation obtained was with quality scores. This would seem reasonable since the more beef purchased, the more opportunity the respondents have to become aware of factors associated with quality beef.

The large number of statistically significant correlations between age and income and the dependent variables suggests that these factors are interrelated. These relationships generally indicate that as age and income increase, so does the respondent's score on the test. However, the coefficient of determination obtained with age and total score was 0.41 and income and total score was 0.05 which indicates that only 41 percent of the variation can be accounted for by age and only five percent by income.

**Partial Regression Coefficients**

As previously stated, one purpose of this study was to develop an equation to predict consumer knowledge of certain concepts related to beef by using selected socio-economic and demographic traits. Partial regression coefficients were obtained for the covariables and the dependent variables. These data are presented in Table XIV.

The data in Table XIV indicates that all of the partial regression coefficients were statistically non-significant at the 0.05 level.

A statistically non-significant coefficient says that the variables have relatively no influence on the score made by the homemaker on any of the four dependent variables.

There was a positive correlation between age and the four dependent variables. Income and test scores on the nutritive value showed a
positive relationship. Also, positive coefficients were found between quality scores and pounds of beef purchased. Negative relationships were found between income and quality, preparation and identification, and total scores. In addition, there were negative values obtained for pounds of beef purchased and scores for nutritive value, preparation and identification, and total score.

TABLE XIV

PARTIAL REGRESSION COEFFICIENTS FOR AGE, INCOME, POUNDS OF BEEF PURCHASED AND TEST SCORES FOR QUALITY, NUTRITIVE VALUE, PREPARATION AND IDENTIFICATION AND TOTAL TEST SCORE, SELECTED MISSISSIPPI COUNTIES, 1973

<table>
<thead>
<tr>
<th>Covariable</th>
<th>Quality</th>
<th>Nutritive Value</th>
<th>Preparation &amp; Identification</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.031</td>
<td>0.001</td>
<td>0.016</td>
<td>0.047</td>
</tr>
<tr>
<td>Income</td>
<td>-.001</td>
<td>0.001</td>
<td>-.001</td>
<td>-.001</td>
</tr>
<tr>
<td>Pounds of Beef Purchased</td>
<td>0.001</td>
<td>-.001</td>
<td>-.000</td>
<td>-.000</td>
</tr>
</tbody>
</table>

Predictability of Test Scores

In order to determine the amount of variation being accounted for when all of the independent variables were being considered, coefficients of determination ($R^2$) were calculated for each of the four dependent variables. The largest coefficient of determination (0.23) was for the composite score, whereas, the smallest coefficient (0.14) was for the nutritive value of beef test score. The $R^2$ value for quality
was 0.22 and 0.19 for the quality test scores. These statistics indicate that only a very small percentage of the variation occurring was accounted for when considering all of the socio-economic and demographic traits used in this study.

These small coefficients of determination suggest that a major portion of the variation is unexplained. This indicates that the relative importance of other variables in explaining the variation in the test scores assumes significant proportions.

In view of the findings in Table XIII and Table XIV, it did not seem feasible to develop prediction equations using the independent variables included in this study. The data indicated that the variables used in this study would not yield a predictive model that would produce satisfactory results.

These findings are in agreement with other studies that have used various socio-economic and demographic traits in attempts to predict consumer behavior.
REFERENCES CITED


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CHAPTER V

SUMMARY AND CONCLUSIONS

Purpose of Study

The major purpose of this study was to determine the level of knowledge of the beef consumer in three selected areas of Mississippi.

Objectives

The specific objectives of this investigation were:

1. To establish a benchmark concerning the level of consumer knowledge in regards to:
   a. Certain concepts related to beef quality.
   b. Selected concepts related to the nutritional value of beef.
   c. Concepts concerned with identification and preparation of beef.

2. To determine, if any, the relationship that selected socio-economic and demographic variables have to consumer knowledge of beef quality, nutritive value of beef and preparation and identification.

3. To suggest a formula which might predict consumer behavior in regards to quality, nutritive value, preparation and identification of retail beef.

4. To indicate educational needs of certain socio-economic consumer groups in regards to meat selection, preparation and nutritive value of beef.

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Methodology

Five hundred homemakers selected from three geographical locations in Mississippi comprised the population in this study. The data were gathered by the use of a questionnaire administered in the home of the participant. There were 429 usable questionnaires gathered.

The instrument consisted of two parts. Part I was a multiple choice test, used to determine the homemaker's knowledge of certain concepts related to beef quality, nutritive value of beef, preparation and identification. Scores made on these three sections were compiled to form a composite score. Test scores were determined in the following manner. A correct response received a score of one, while an incorrect, don't know, or no response received a score of 0. Quality scores could range from 0-14, nutritive value scores could range from 0-8, and scores on preparation and identification could range from 0-12. Total scores could range from 0-34.

Analysis of variance of F-value was computed for the five treatment effects which were considered as independent variables. They were geographical location, place of residence, race, education and children or no children. Partial regression coefficients were determined for covariables, age, income and pounds of beef purchased.

Findings and Conclusions

The conclusions presented are the results of the researcher's interpretation of the findings in this study.

Analysis of variance revealed that education and race were statistically significant when considering the four test scores.
Inference can be drawn from these findings that as education increases the consumers knowledge of the concepts presented in this study also increases. This would be expected as people with more formal education tend to be more familiar with their total environment than those with less formal education. Also, it was likely that the white homemaker would score higher than the black homemaker. Generally speaking, the white people of Mississippi tend to have more formal education and are not as restricted in their opportunities to be involved in various learning experiences. Urban residences scored higher on the quality section and total score than did those homemakers who lived in rural areas. A possible explanation for this happening could be that the urban areas have more outlet stores selling beef thereby allowing the consumer to be exposed to more advertising from mass media sources. Also, it is probable that the urban residence can secure informational material more readily.

Analysis of mean scores in relation to location revealed that the only significant differences obtained were with the scores made on the preparation and identification section. This finding is interesting in that only the one section was significant. The researcher is unable to draw any logical conclusion as to why the differences in this section were significant and the other three were not.

The data revealed that there were no statistical differences between the scores made by the homemakers who had children and those who did not. This is a rather suprising finding. A large percent of the homemakers reported having children, therefore, those who
reported no children were a small minority. It is possible that the sample was not large enough to reveal the difference, if there were differences. The researcher felt that those homemakers having children should have been more aware of the factors presented in this study, thereby should have scored higher.

The correlation between age and income was negatively correlated but not statistically significant. Also, a negative correlation was obtained between age of the respondent and pounds of beef purchased. This correlation was highly significant. From this finding, it could be concluded that as a person grows older, he eats less beef. Diets and health problems, which are associated with aging offer some reasoning for this finding. The relationship between income of household and pounds of beef purchased was positively correlated and highly significant. This would indicate that as one's income went up so does the amount of beef purchased. This is logical in that as disposable income increases the respondent will have more money available to buy more beef which has risen to a very prestigious status symbol within the last decade. In addition, beef is the favorite meat of the majority of consumers.

Correlation coefficients between the four dependent variables were positive and highly significant. This indicates that as scores on one section increased so did scores on the other sections. This is a logical relationship in that the concepts are very much interrelated and if a consumer is knowledgeable about one section then he is more than likely to be knowledgeable about other sections.
There was a positive correlation between age and the four dependent variables. This relationship was found to be highly significant. As age increases so do the scores on the four sections. This would normally be expected because as a homemaker grows older she will have had more experiences and will have been exposed to more opportunities to become familiar with concepts relating to beef.

Income was positively correlated with the scores made on the four dependent variables. This correlation was highly significant. It can be concluded that as income increases so do scores on all four sections. Income and education are closely related. Therefore, it is plausible to conclude that the increase in score due to income is partially due to higher levels of education. It is also plausible to conclude that because of the higher level of income the respondent is able to purchase more beef, therefore, she has more opportunity for exposure to the concepts relating to beef that were presented in this study. Of the dependent variables, only the quality scores showed a significant correlation with pounds of beef purchased.

There were no significant partial regression coefficients for the variables tested. Very small coefficients of determination ($R^2$) values were obtained. The largest was for the composite score (0.22) and the smallest was nutritive value (0.14).

Based on the scores made on the dependent variables it is apparent that the respondent's knowledge of the concepts relating to beef quality, nutritive value of beef, and preparation and identification was relatively low. The highest score (58 percent correct answers)
was the total or composite score and the lowest score (54 percent correct answers) was obtained on the section relating to the nutritive value of beef.

From the analysis of data in this study, it can be concluded that the consumer needs to be exposed to additional learning experiences relative to the concepts presented. Generally speaking, the respondents need educational programs developed around all three areas as there is very little difference in scores in the different areas.

It is apparent that consumers are a very heterogeneous lot. Similar or identical behavior patterns may be exhibited by many people, however, the reasons for these patterns may be as many as the number of people involved. Therefore, various educational programs with varying levels of technical material would need to be developed to meet the needs of this diverse and pluralistic audience.

A final conclusion drawn from analysis of the data is that the socio-economic and demographic traits used in this study will not yield a satisfactory predictive model due to the small amount of variation that is being accounted for; therefore, one must look elsewhere if prediction of consumer behavior (knowledge) is the goal.
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GOVERNMENT PUBLICATIONS


APPENDIX A

THE QUESTIONNAIRE
Hello:

We are conducting a study concerning the consumer's knowledge of meat. This study is being conducted by Louisiana State University College of Agriculture. Through a systematic process, you have been selected as a participant. The information given by you will be treated with strict confidence and will be seen only by the research staff which will prepare the statistical reports.

We would appreciate your taking 15 minutes of your time and fill out the following questionnaire.

The results of this study will serve as the basis for which an educational program concerning meat selection, preparation and other important factors will be developed.

Thank you for your cooperation.
THE FOLLOWING QUESTIONS DEAL WITH DIFFERENT IDEAS CONCERNING BEEF.

WOULD YOU PLEASE ANSWER EACH QUESTION BY CHECKING THE ONE THAT
BEST ANSWERS THE QUESTION?

1. The most desirable color of beef before cooking is
   1. bright cherry red .....................
   2. pale pink ..............................
   3. deep dark red ..........................
   4. don't know .............................

2. The term marbling refers to
   1. small flecks of lean in the fat .........
   2. small flecks of fat in the lean .........
   3. the strips of fat on the outside of the meat ... .
   4. don't know .............................

3. The most desirable texture of beef fat is
   1. firm, brittle ...........................
   2. soft-oily ..............................
   3. firm-oily ..............................
   4. don't know .............................

4. The term "aged beef" refers to
   1. old animals - over 2 years old ..........
   2. animals 10-12 months old .............
   3. beef left in the cooler for short period
      of time ..............................
   4. don't know .............................
5. Of the factors listed, which affects tenderness most?
   1. amount of fat covering
   2. age
   3. color
   4. don't know

6. The color of beef from old animals is
   1. lighter than young animals
   2. darker than young animals
   3. about the same
   4. don't know

7. The color of beef that has been cut and in display case for long periods of time is
   1. lighter than fresh cut meat
   2. darker than fresh cut meat
   3. about the same as fresh cut meat
   4. don't know

8. The stamp "U. S. Inspected" means
   1. that the meat is high quality
   2. that the meat has been slaughtered under sanitary conditions and is free of any disease
   3. don't know
9. Juiciness in cooked beef is an impression of wetness during the first few chews. Continued juiciness is due to

1. protein content
2. muscle content
3. fat content
4. don't know

10. As animals grow older, the bones become

1. harder
2. softer
3. remain the same
4. don't know

11. What department of the U. S. Government inspects meat and meat packing plants for health standards?

1. Health, Education and Welfare
2. United States Department of Agriculture
3. Farm and Home Administration
4. don't know

12. Tenderness of beef is highly desirable but varies greatly. What influences tenderness most?

1. kind and amount of connective tissue
2. kind and amount of fat
3. kind and amount of marbling
4. don't know
13. Which of the following indicates a Quality Grade of beef?
   1. USDA #1 ....................................
   2. USDA AA ....................................
   3. USDA Choice ................................
   4. don't know ..............................

14. The recommended length of time beef (not ground) can be frozen and maintain basic quality is
   1. 13-15 months ..............................
   2. 6-12 months ................................
   3. 16-18 months ..............................
   4. don't know ..............................

15. Some beef cuts are higher in iron content than others. Please check the meat that has the highest iron content.
   1. liver ....................................
   2. hamburger meat ............................
   3. round steak ................................
   4. don't know ..............................

16. In comparing fat and lean meat, would you say that fat meat
   1. gives more energy ...........................
   2. gives less energy ..........................
   3. they give the same amount of energy .....
17. Proteins are considered very important in the diet of man. What is their major function?
   1. supplies energy
   2. muscle builders
   3. fat content
   4. don't know

18. The government has set maximum levels for the amount of fat that can be in hamburger meat. Check the maximum level.
   1. 10% 
   2. 30% 
   3. 20% 
   4. don't know

19. Much has been written about saturated and unsaturated fats. Animal fats are mostly
   1. saturated 
   2. unsaturated 
   3. don't know 

20. Vitamins are necessary in the diets of humans. Beef is an excellent source of (check one).
   1. B vitamins 
   2. Vitamin A 
   3. Vitamin D 
   4. don't know
21. Beef is generally divided into expensive cuts and inexpensive cuts. Example of expensive cuts would include cuts from the loin area, while inexpensive cuts would come from the shoulder. From the standpoint of food value:

1. inexpensive cuts are just as good for you as expensive cuts ..................................................

2. expensive cuts are better for you than inexpensive cuts ..................................................

3. don't know ................................................................

22. Nutritionists say that everyone should have a serving of meat each day. An average serving of meat would weigh:

1. 3 1/2 - 4 oz. ............................................

2. 8 oz. ......................................................

3. 10 oz. .....................................................

4. don't know ...................................................
Described below are six ways to cook beef. Please read these before answering questions.

To answer questions 23-34, please refer back to this sheet as often as you like.

**ROASTING**
1. Place meat fat side up on rack in open roasting pan.
2. Do not add water. Do not cover. Do not baste.
3. Roast in slow oven — 300°F-350°F.

**PANBROILING**
1. Place meat in heavy frying-pan.
2. Do not add fat or water. Do not cover.
3. Cook slowly, turning occasionally.
4. Pour fat from pan as it accumulates.
5. Brown meat on both sides.

**PANFRYING**
1. Brown meat on both sides in small amount of fat.
2. Do not cover.
3. Cook at moderate temperature until done, turning occasionally.

**BROILING**
1. Set oven regulator for broiling.
2. Place meat 2 to 5 inches from heat.
3. Broil until top of meat is brown.
4. Turn meat and cook until done.

**BRAISING**
1. Brown meat on all sides in fat in heavy utensil.
2. Add small amount of liquid, if necessary.
3. Cover tightly.
4. Cook at low temperature until tender.

**COOKING IN LIQUID**
1. Brown meat on all sides in own fat or lard, where desirable.
2. Cover with liquid, cover kettle, cook below boiling point until tender.
PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT THE ABOVE RETAIL CUT OF BEEF

23. Identify the section of the animal from which the cut comes

   1. loin ........................................
   2. shoulder ...................................
   3. rump .....................................
   4. don't know ...............................

24. The best way to cook the above cut of beef is by

   1. broiling ...................................
   2. panfrying ................................
   3. cooking in liquid .....................
   4. don't know ...............................

25. The best way to identify the above cut is by

   1. shape of bone ............................
   2. color of meat ...........................
   3. size of cut ................................
   4. don't know ...............................

26. The cut of beef is considered

   1. expensive and highly desirable ........
   2. an economical cut of beef ...........
   3. a less tender cut .....................
   4. don't know .............................
PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT THE ABOVE PICTURED RETAIL CUT OF BEEF

27. Identify the section of the animal from which the cut comes
   1. round ........................................
   2. sirloin .....................................
   3. rib .........................................
   4. don't know ................................

28. The best way to cook the above cut of beef is by
   1. panfrying .................................
   2. broiling ..................................
   3. use moist heat ............................
   4. don't know ...............................

29. The best way to identify the above cut of beef is by the
   1. shape of the cut and size of bone structure .
   2. color meat .................................
   3. amount of outside fat ...................
   4. don't know ...............................

30. The above cut of beef is considered
   1. expensive and highly desirable ........
   2. an economical cut of beef .............
   3. a tender cut .............................
   4. don't know .............................
PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT THE ABOVE CUT OF BEEF

31. Identify the section of the animal from which the cut comes
   1. shoulder ........................................
   2. rump ...........................................
   3. loin ...........................................
   4. don't know ....................................

32. The best way to cook the above cut of beef is by
   1. panbroiling ...................................
   2. roasting ......................................
   3. cooking in liquid ............................
   4. don't know ....................................

33. The above cut is generally considered to be a
   1. very tender cut of beef ........................
   2. less tender cut of beef ......................
   3. don't know ....................................

34. The above cut is generally thought of as
   1. an inexpensive cut of beef ..................
   2. an expensive cut of beef ...................
   3. don't know .................................
IN ORDER FOR US TO HAVE THE MOST EFFECTIVE STUDY, WE NEED TO KNOW THE FOLLOWING PERSONAL INFORMATION. WOULD YOU PLEASE CHECK THE ONE THAT MOST NEARLY DESCRIBES YOU AND YOUR FAMILY.

Please indicate your age

Please indicate whether you have children

1. yes
2. no

Please indicate the number of people living in this household.

Adults
Ages 13 through 18
Ages 12 and under

Would you please indicate the total income of your family.
Please include all income of the wage earners in your family.

$ 

Indicate the highest grade in school or college you completed.


If you have an important guest for supper, which type of meat would you serve?

1. beef
2. pork
3. poultry
4. other
Approximately how much beef do you purchase per week for this household _______________ lbs./week.
APPENDIX B

ANALYSIS OF VARIANCE TABLES

FOR THE FOUR

DEPENDENT VARIABLES
## APPENDIX B

### TABLE I

**ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE QUALITY**

<table>
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<tr>
<th>Source</th>
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<tr>
<td>Mu</td>
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<td>Location</td>
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<tr>
<td>Residence</td>
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<tr>
<td>Race</td>
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* = statistically significant (P < .05)  
** = highly significant (P < .01)
APPENDIX B

TABLE II

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE NUTRITIVE VALUE

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* = statistically significant (P < .05)
** = statistically significant (P < .01)
**APPENDIX B**

**TABLE III**

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE
PREPARATION AND IDENTIFICATION

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* = statistically significant ($P < .05$)

** = statistically significant ($P < .01$)
APPENDIX B

TABLE IV

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE TOTAL SCORE

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* = statistically significant ($P \leq .05$)
** = statistically significant ($P \leq .01$)
APPENDIX C

PERCENT OF RESPONDENTS CORRECTLY ANSWERING EACH QUESTION ON THE QUESTIONNAIRE
APPENDIX C

TABLE I

PERCENT OF RESPONDENTS CORRECTLY ANSWERING EACH QUESTION IN THE QUESTIONNAIRE

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VITA

Duane H. Tucker was born on October 4, 1932, in Louisiville, Mississippi. He spent most of his life on the farm.

He graduated from Bobo High School, Clarksdale, Mississippi in 1950. He entered Mississippi State University that fall and was graduated from that institution in May, 1954, with a Bachelor of Science Degree in Animal Science. He earned a Master of Science in Extension Education from Mississippi State University in 1965.

He managed a beef cattle operation in Bolivar County for five and one-half years. In September, 1960, he was employed by the Mississippi Cooperative Extension Service as Assistant County Agent in Holmes County. He has since held the following positions with that organization: Associate County Agent and Extension Livestock Specialist.

The author married the former Elizabeth Ann Brown of Clarksdale, Mississippi, in July, 1954. They have two sons, Shane and Neely.