Analysis of the Utilization of Outdoor Recreation in Tennessee

Edward Wayne McCoy

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To the Graduate Council:

I am submitting herewith a dissertation written by Edward Wayne McCoy entitled "Analysis of the Utilization of Outdoor Recreation in Tennessee." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Agricultural Economics.

Joe Martin, Major Professor

We have read this dissertation and recommend its acceptance:

Stanton Perry, W. P. Ranney, David Chambers, Hans Jensen

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)
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We have read this dissertation and recommend its acceptance:

[Signatures]

[Signatures]

[Signatures]

Accepted for the Council:

[Signature]

Dean of the Graduate School
ANALYSIS OF THE UTILIZATION OF OUTDOOR RECREATION IN TENNESSEE

A Dissertation
Presented to
the Graduate Council of
The University of Tennessee

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

by
Edward Wayne McCoy
August 1966
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CHAPTER I

INTRODUCTION

Out flew the web and floated wide
the mirror crack'd from side to side
"the curse is upon me!" cried
the lady of Shalott

-Tennyson

Whether curse or blessing, the reality of increased free time is upon us. What is being done with this increased available time is the subject of much interest.\(^1\) It does not matter what indicator is employed, outdoor recreation is taking on more importance in the changing goal structure.

From the early period of the United States, the virtue of hard work has been stressed. Many homilies are based upon the varied evils of leisure time. In terms of Rostow,\(^2\) however, the United States has now moved into a stage of high mass consumption. Some of the basic value judgments have changed. It is now at least partially recognized that the United States is primarily urban and the utility function of an urban society is not necessarily that of a rural society.


There is a thread that exists throughout recorded history. This thread is thick then thin but never completely broken. It might be classed as the idea of leisure. The Greeks with the land to the North, Moore's Utopia, Marx's Communism, Christian Heaven, Huxley's Island all point to a better life somewhere. The concept of leisure and better are inseparably connected, yet de Grazia\(^3\) maintains there is no leisure in our society. Leisure as a concept has been made synonymous with "free time" or the time available to the individual after his working day or week is completed. This inquiry is directed toward the use of free time. To be specific one objective is to determine the amount of free time the individual devotes to outdoor recreation. By further classification the different outdoor recreation activities in which the individual engages can be determined. That is what this study attempts to do.

As a society becomes more mechanized, the amount of free time becomes institutionalized. Man becomes an appendage to a machine—each man and each machine working as a part of an interrelated whole. The absence of one unit of this whole can lead to cessation of production. Thus man and time become inseparable. Time becomes phased in terms of work, and free time means time away from work. This free time represents as it were a commodity. Just as man sells his time to the entrepreneur as a factor of production, so the entrepreneur recovers

his outlays by the worker's consumption during his free time. Unless additional units of outdoor recreation can be acquired at no cost, then increased consumption will require more work time which lessens free time. The increased work time will decrease the amount of free time the individual has available for outdoor recreation. The individual attempts to maximize his satisfaction during his free time. If it is assumed that income can be increased only by selling additional units of free time, then the apparent contradiction is resolved. Additional utilization of outdoor recreation during free time may require a decrease in the free time available to the individual. According to the principle of opportunity cost, the value of the recreational experience undertaken must exceed the value of the opportunity foregone. If the individual, \textit{ceteris paribus}, exchanges one hour of work for one hour of outdoor recreation, then the outdoor recreation has a value, at minimum, of his hourly wage. If, however, the individual substitutes one hour of indoor recreation for one hour of outdoor recreation, the principle remains the same; but the assessment of cost becomes more difficult. The institutionalization of work time has progressed until it is difficult to substitute work for recreation within the standardized minimum. While some individuals may vary their work hours, the majority are not able to do so easily, nor could they necessarily find employment for their free time even if they desired to do so.

Before proceeding with an inquiry into the demand structure of outdoor recreation it is necessary to examine the concepts underlying the very words "outdoor" and "recreation." In the present society
wholesome and even health giving qualities are attributed to the outdoors. The masculinity of outdoor activities may be stressed. Degrees of withdrawal of outdoor privileges may be used as punishment. "Outdoors" then is associated with good health, strength and pleasure while "indoors" carries a connotation of security. Recreation with a short "e" has many connotations. Many persons think of it as games while others denote it as any pleasurable activity. In a sense, recreation may consist of the pleasure portion of a pleasure-pain axis in the utility function. In brief, this outlook would portray man as a leisure seeking being. We work so as to have the wherewithal to enjoy free time. A second connotation of recreation consists of a long "e." In this sense the available time away from work is used to recreate ourselves. Recreation then becomes a necessity. The individual must have free time to prepare himself for further work. In analytical terms the conclusions are the same, but the assumptions and the projections are considerably modified. In the second instance it is assumed that the total utility function for work increases at an increasing rate until some point and the marginal utility function does not reach zero until the end of the working day. In the first instance the total utility function increases at a decreasing rate and declines absolutely within the range of a working day. Figures 1 and 2 depict these instances.
Marginal Utility Work

Time

FIGURE 1
WORK ETHIC
FIGURE 2
LEISURE ETHIC
If one assumes that Figure 1 is a graphic representation of the verbal value judgment of our society then one might postulate that persons who engage in outdoor activities as work will not require outdoor recreation in their free time. If Figure 2 is the actual value judgment, then increased urbanization coupled with shorter work weeks will require an increase in outdoor recreation facilities.

I. DEMAND

In view of the ideas expressed above, one can proceed to an inquiry into the nature of demand for outdoor recreation. Black\(^4\) defines demand as the amount of product a buyer stands willing and able to purchase in the market place at a given time and a given price. According to Stigler a demand curve can be obtained from two approaches: the marginal utility and the indifference curve approach. The indifference curve approach is generally preferred since one must assume only that "the consumer is able to decide whether two combinations of goods are equivalent or whether he prefers one to the other. But it is not assumed that he can tell by how much he prefers one combination to the other."\(^5\) The actual amounts demanded are a subjective evaluation of the consumer. Demand is a function apart from the supply curve. In actual measurement, however, it may be difficult to determine if the quantity


measured is supply or demand. This is especially appropriate for recreation. Recreational facilities are not similar to cans of peas. Each facility differs to a greater or lesser extent. If the problem of scaling these differences could be handled then one could conceivably determine the demand for one facility as opposed to a second by the use of indifference analysis.

In Figure 3 recreation facilities A and B are depicted on the vertical and horizontal axes respectively. At price ratio I, OB₁ of B and OA₁ of A are taken by this consumer. With a shift in price of B the new price ratio II leads to OB₂ of B and OA₂ of A being taken. This is relatively straightforward until one considers further. First, many recreational facilities include multiple activities and secondly many recreational facilities do not have a price as such. Ignoring these problems for the moment one may next inquire what quantity would be taken. This is the crux of the problem. What is the unit of measure of a recreation experience? The consumer, unlike his experience with the peas, does not "use up" the facility after purchase. We can measure the demand for peas by the units of peas the individual purchases at a given price. Peas are standardized and one may quantify the units purchased by the consumer. At this stage one cannot make similar assumptions regarding recreational facilities.
FIGURE 3

CONSUMER INDIFFERENCE CURVE
II. POSSIBLE APPROACHES TO RECREATION DEMAND

Clawson\(^6\) mentions four concepts relating to the demand for outdoor recreation. Each of these concepts have their adherents and each is useful for specific purposes. The gross volume of business generated by outdoor recreation is a measurement quite popular with certain groups. Estimates of this amount, usually related to tourism, are prevalent. There are obvious benefits to this type of measure. First, it is fairly easy to estimate; and secondly, the estimate is generally large. The disadvantages of this method are obvious. The measure does not conform to the national accounts or value added approach. In value added only the amount of additional income resulting from outdoor recreation is computed. In this instance the amount the supplier spent to provide the recreational service is deducted. This approach overcomes some of the objections of the gross volume of business related to outdoor recreation and is not a direct demand concept.

Returning to our earlier discussion of demand let us assume a demand curve for recreation as in Figure 4. At price \(P_0\) the quantity \(Q_0\) is taken.

For the moment the derivation of price and quantity units can be ignored. By varying the price the resultant quantity taken can be seen. It is important to note that the incomes of the consumers are assumed to

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FIGURE 4
DEMAND FOR OUTDOOR RECREATION
remain constant over the time period under observation. The demand curve is a summation of the quantities taken at various prices on the individual indifference curves. Thus it is implicitly stated that the prices of competing facilities remain constant. Assuming further that a facility with a price is present then using this type of analysis the price this facility should charge to maximize profits within whatever constraints the operator wishes to set can be determined. Moving from the individual facility basis to aggregate demand for outdoor recreation some real problems must be recognized. In deriving the total demand curve for the economy the consumption function is used. Some similar measure must be derived for recreation. Our problem then is to measure the utilization of recreation at varying income levels.

III. STATE OF PRESENT RECREATION RESEARCH

The Outdoor Recreation Resource Review Commission Study Report No. 27 is a survey of the literature published in the area of outdoor recreation. The first thought that strikes the reader is the wide diversity of topics included in outdoor recreation literature; however, "the one important outdoor topic currently receiving methodological treatment is the assignment of dollar values to the intangible benefits of outdoor recreation." Most of the titles are devoted to assigning dollar values to the demand for a specific facility. As an example one

can hypothesize the problem of determining the demand for a national park which charges no entrance fee. The problem then is to derive a demand curve when the variable of price is not present. Clawson\textsuperscript{8} suggests that total costs of the recreation experience be considered. To do this one may assume that distance traveled to the facility will serve as differential costs or prices for demand curve derivations. Certain problems arise regarding other demand determinants but statistical techniques are available to account for other variables. These techniques are refined enough so studies regarding one facility can be made with accuracy and projections can be made.

The ORRRC Study Reports Nos. 19 and 26 consider the demand for outdoor recreation.\textsuperscript{9} They recognize that the type of analysis useful for facilities is not applicable to total demand. They attempt to overcome the problem of the measurement unit by devising activity scores. The logic of this approach is obvious when one considers the difficulty of aggregating the distance traveled for swimming and golf as opposed to vacation activities. It is apparent that some index number must be used for the recreation experience until research in depth can be conducted. Such depth research must determine the total amount expended on recreation. This may present problems of

\textsuperscript{8}Marion Clawson, \textit{op. cit.}, p. 12.

identification beyond the scope of present researchers. As de Grazia has noted,¹⁰ problems of distinguishing between work and leisure activities are extremely difficult. As an example of a similar type of difficulty, a trip to visit relatives often involves outdoor recreation; however the purpose of the trip may be something entirely different. Certain aspects of work for one or more individuals may be involved. The total cost of the trip obviously should not be credited to outdoor recreation yet a portion of it should be. More sophisticated research in the future may develop guidelines for handling such problems.

CHAPTER II

METHODOLOGY OF STUDY

Recognizing the conceptual and measurement problems discussed in Chapter I, this study was designed to attempt to answer three specific questions: (1) what is outdoor recreation, (2) what are the factors that influence the utilization of outdoor recreation, and (3) what is the quantitative measure of the utilization of outdoor recreation?

I. THE SAMPLING METHOD

The outdoor recreational survey samples were conducted by telephone. The sampling areas were selected by stratified random sampling (see Appendix A for sample statistics). The sample respondents were selected by random sampling within the sampling areas. The sampling areas included three urban areas: Memphis, Nashville, and Knoxville, and four rural counties: Gibson, Marshall, Monroe, and Washington. The sampling frame was the population of listed telephone numbers in each of the sampling areas. Interviews were conducted with whichever household had the listed number alleviating the problem of household movement. A random digit was selected in advance to allow for non-working numbers. When a nonworking number was encountered, the interviewer counted ahead in the telephone book the random digit amount and the number encountered became the sampling unit. Multiple call backs
were made to all numbers which did not answer or when a busy signal was encountered. Calls were conducted from 8:30 a.m. to 4:00 p.m. and from 6:00 to 10:00 p.m. By this method, households with both husband and wife employed were contacted.

The telephone interview became standardized over time and ranged from 10 to 60 minutes elapsed time varying with the respondent. Interviews with household heads and evening calls tended to consume more elapsed time than morning calls. The percent response varied according to the area. The rural areas consumed more elapsed time per interview and yielded the highest response rate. Response rates in Nashville were low based primarily on a series of prank and obscene callers who were active in the area. The presence of telephone solicitors in a sampling area tended to lengthen the elapsed time of interview.

Heads of household were interviewed when possible, other household members were acceptable when the household head was not present. In every case the respondent was well aware of his recreational activities but exposed varying degrees of awareness of the recreational activities of the remainder of the household. As a check on the telephone survey technique, in the Knoxville area one-half the interview time was used to make home visits for interview, the remainder used for telephone interviews (see Appendix B for analysis comparing results).

II. WHAT IS OUTDOOR RECREATION?

Previously the concepts underlying outdoor recreation were discussed. It was determined that the term signifies non-work activities
which are undertaken in the open air. There are various methods by which information about such activities can be obtained. In this study a two-fold method was used. The interviewer first asked the respondent what he did for outdoor recreation; having obtained this information, the interviewer then read a list of other outdoor recreation activities and inquired if the respondent had engaged in any of these activities. In most cases (92 percent) the respondents mentioned additional activities. In a clear majority (69 percent) of the interviews, the respondents mentioned outdoor recreational activities which were not included on the list. The mean number of additional activities mentioned was five (5) with a range of one (1) to twenty (20). In all cases the participation rate in the additional activities mentioned was small (mean of 1.6, standard deviation .37, range 1 to 3). In no case interviewed did the respondent mention attendance at a sporting event as an outdoor recreation activity until asked. Attendance at some sports event—school, college, professional, church league—was revealed in 73 percent of the interviews after presentation by the interviewer of the list of recreational activities. The survey results indicate that outdoor recreation has differing meanings to different persons. An individual may indulge in various outdoor activities only a few of which he considers as outdoor recreation. The question then arises whether we are interested in outdoor activities or outdoor recreation. Referring again to time as a saleable product, this study will consider all non-work outside activities as outdoor recreation. Under this constraint we have, for example, considered stock
raising as outdoor recreation for a retired farmer while considering the same activity as work for the individual actively engaged in farming. Numerous instances of this type appeared during the survey, primarily in response to the inquiry regarding what they did for outdoor recreation.

III. WHAT ARE THE FACTORS INFLUENCING THE UTILIZATION OF OUTDOOR RECREATION?

Under the ceteris paribus assumption earlier given, it was assumed that all other factors were held constant, and one observes the fluctuations in quantity taken as price is varied. In the present study such is not the case. One cannot perform this classical experiment under such conditions. Here the best that can be done is to relax some of the ceteris paribus assumptions so as to minimize the unexplained variation of the data. In doing this it is recognized that all variables cannot be considered. Thus an attempt is made to isolate that group or number of variables such that the inclusion or exclusion of one variable will lead to a less significant explanation of the variation of the data.

Intuitively one might initially consider the following variables: price of the recreation service (in this ideally we would include all cost accruing to the user from the recreation experience), income of the user, education of the user, age of the user, health status of the user, and amount of free time the user has available for outdoor recreation.
Other important variables that can be considered are family size, ages of the youngest and oldest family member, occupation of user, and place of residence. The latter variable could serve to remove variations due to availability of facilities.

A simplified mathematical model would be:

$$X_{gk..p} = M + A_i + B_j + C_k + F_l + ... + M_p + E_{ijkl...pq}$$

where $X$ is the index of recreational activity $A$, $B$, etc., are the variables assumed to influence demand for outdoor recreation and $E$ is the error term.

In this type of model one seeks the true treatment effects. In order to do so it must be assumed (1) the treatment effects are additive, (2) the treatment effects are constant, and (3) the observation on one unit is unaffected by the treatment applied to other units.¹

A stepwise regression model was chosen for analytical purposes. This type of model fulfills the precondition that any variable which enters makes the greatest reduction in the unexplained variance of the data. This type of analysis involves the use of a sequence of multiple linear regression equations in a stepwise manner. At each step one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum of squares. Equally the additional variable is the one which has the highest partial

correlation with the dependent variable after the dependent variable has been partialed on the previously added variables. In addition the variable which is added is the one with the highest F value.

IV. COMPUTATIONAL PROCEDURE OF STEPWISE REGRESSION

Let P denote the number of variables including the dependent variable n as the number of experimental units (households) and x the value of the jth variable for the ith experimental unit.

The means \( \bar{x}_i = \frac{1}{n} \sum_{k=1}^{n} x_{ki} \) for \( i = 1, \ldots, P \) are computed.

The matrix \( a_{ij} = \frac{1}{n} \sum_{k=1}^{n} (x_{ki} - \bar{x}_i)(x_{kj} - \bar{x}_j) \) is computed. This is the cross product matrix. The covariances, standard deviations, and simple correlations are computed:

- Covariance \( S_{ij} = a_{ij}/n-1 \) for \( i, j = 1, \ldots, P \)
- Standard deviation \( S_i = S_{ii} \) for \( i = 1, \ldots, P \)
- Simple correlation \( r_{ij} = S_{ij}/S_iS_j \).

Then at each step in the stepwise regression procedure the variables \( x_1, \ldots, x_p \), where \( p \) is the number of variables in the equation, are divided into two sets, \( x_1, \ldots, x_{ip} \), the independent variables in the regression equation and \( x_{gi}, \ldots, x_{gr} \), the remaining variables including the dependent variable \( x_d \). Assume that \( x_{11}, \ldots, x_{1q} \) are the first of variables \( x_1, \ldots, x_g \). Then at each step the equation has the form

\[
y = M + B_1 x_1 + \ldots + B_i x_i + \ldots + B_p x_p.
\]
Then let

\[ A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix} \]

where \( A \) is \( q \) by \( q \)

\[ A^{-1} = \begin{bmatrix} A_{11}^{-1} & -A_{11}^{-1}A_{12} \\ -A_{21}A_{11}^{-1} & A_{22}^{-1} - A_{21}A_{11}^{-1}A_{12} \end{bmatrix} \]

Then

- degrees of freedom = \( m - q \)
- sum of squares = \( b_{dd} \)
- mean square = \( SS/df \)
- regression degrees of freedom = \( q \)
- regression sum of squares = \( a_{dd} - b_{dd} \)
- regression mean square = \( RSS/rdF \)
- \( F = R \)
- the standard error of estimate = \( MS \)
- the multiple correlation coefficient = \( RSS/a_{dd} \)

For each independent variable in the equation

- the regression coefficient = \( b_{id} \)
- the standard error = \( \frac{1}{\sqrt{b_{ii}S}} \)
- the \( F \) value = \( \left( \frac{B_i}{S_i} \right)^2 \cdot \)

For those variables not yet included in the equation

- the partial coefficient = \( \frac{b_{id}}{\sqrt{b_{ii}b_{dd}}} \)
- the \( F \) value = \( \frac{b_{id}^2 (m - q - 1)}{b_{ii}b_{dd} - b_{id}^2} \cdot \)
Our final regression model will be of the form,

\[ y = A + B_1 x_1 + B_2 x_2 + \ldots + B_n x_n \]

where the \( x_i \) values which are included are those whose regression coefficients are significant.\(^2\)

V. QUANTITATIVE MEASURE OF RECREATION

The recreation experience is primarily subjective and in many cases extremely difficult to convert to numerical quantities for measurement purposes. Price and expenditures alone will not suffice for every recreational activity. Swimming is properly classified as outdoor recreation; and, according to our earlier definition, sunbathing is also outdoor recreation. We can determine the distance traveled to the swimming facility and the cost of use. However sunbathing does not require any travel or any direct costs. Like classical economists in their search for value, one must delve into recreation to determine what aspect every recreational experience has in common. It is immediately apparent that the use of time is a common characteristic of all recreational experiences. One may assume then that the amount of free time an individual is willing and able to devote to a recreational activity is one direct measure of his utilization for this activity. It is implicitly assumed that within his constraints of age, income, education, etc., the

individual maximizes his recreational utility. He engages in various activities because they result in the greatest amount of satisfaction. Having designated time as the utilization indicator one may then examine the time-cost relationship. In the previous section it was indicated that distance to the recreational site was included as an independent variable in the demand function. Distance here has a two-fold purpose: (1) it represents direct cost of reaching the site, and (2) it represents the amount of time necessary to reach the site. Thus cost is properly included as an independent variable in the utilization function rather than a portion of the dependent variable.

VI. INDIVIDUAL RECREATIONAL ACTIVITIES

While it is important to establish parameters for the total outdoor recreational utilization, it may be of special interest to analyze subdivisions of this utilization. The individual does not use outdoor recreation per se but engages in only certain activities which have been grouped into the outdoor recreation classification. The major outdoor recreational activities are subjected to the same analysis used for total recreational utilization. In this manner the utilization functions can be determined for these individual activities.

As an adjunct to this study, special attention will be devoted to the vacation activities of the sampled population. This analysis will differ from the other work by the inclusion of a variable denoting presence or absence of paid vacation time. The study will briefly attempt to disclose the vacation activities of the population and devote
special attention to outdoor recreational activities. It was postulated that differences exist between the vacation and non-vacation subpopulations. These mean differences will be tested to determine both their magnitude and their direction of effect.

VII. THE UTILIZATION EQUATION

The demand equation has become stylized over time and customarily signifies the response in amount taken to a change in price. It was recognized, as discussed earlier, that a direct measure of price for the recreational experience is difficult to obtain in many cases. What one must seek is a function which will express the household's willingness to partake of outdoor recreation subject to variables other than price. One measure which can be used is the household use of outdoor recreation. Whereas demand is an expression of the household's willingness to purchase a quantity at a price, utilization is a measurement of the amount they did purchase at a given cost. No assumptions are made regarding their willingness to take more or less under different conditions of availability. It was assumed that under the prevailing supply conditions, each household attempted to maximize family satisfaction within its own constraints. Utilization then and not demand is the measuring unit used here and what is derived is not demand curves but utilization predictor curves.
CHAPTER III

ANALYSIS OF OUTDOOR RECREATIONAL UTILIZATION

I. THE AGGREGATE UTILIZATION

In beginning this analysis of outdoor recreation utilization it was first assumed that the dependent variable was some linear function of the independent variables. The first test then is to determine if the sample data reveals any significant relationships. The model subject to test is

\[ y = f(x_1, x_2, \ldots, x_n) \]

or more specifically

\[ y = a + b_1 x_1 + b_2 x_2 + \ldots + b_4 x_4 + \ldots + b_{n-1} x_{n-1} \quad i = 1, \ldots, 9 \]

where:

- \( x_1 \) is age of the household head,
- \( x_2 \) education, (Ed.),
- \( x_3 \) physical condition, (Con.),
- \( x_4 \) type of work, (Work),
- \( x_5 \) part-time work, (P.T.),
- \( x_6 \) the amount of time available for outdoor recreation, (Time),
- \( x_7 \) income, (Inc.),
- \( x_8 \) the distance the family unit travels to recreation per year, (Dist.),
- \( y \) the index of utilization of outdoor recreation.

Before proceeding with the analysis of utilization the \( y \) index requires some comment. The physical measure of \( y \) is the square root of the actual number of times per year the household engaged in outdoor
recreational activities. The square root transformation was taken to normalize the data. It was explicitly recognized that the model will tend to overestimate recreational utilization at the lower levels and underestimate at the higher levels. Since this analysis is of a preliminary nature and not intended for policy decisions except those regarding directions of effect, this built-in error was not considered so serious as to destroy the usefulness or validity of the results.

The results of the first linear regression were as follows. The B coefficients are entered in their order of significance.

\[ y = A + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + b_{12}x_{12} \]

variable name (Dist.) (Con.) (Inc.) (Ed.) (Time) (P.T.) (Age) (Work) F to remove (81.269) (38.305) (11.667) (2.265) (2.383) (1.456) (0.075) (0.136)

The multiple R² is .1833 with a multiple R of .4281. The first four listed variables accounted for an R² of .1782 and an R of .4221. Note that b₆ and b₄ have larger F values than those immediately preceding them. This indicates that after the effect of the preceding variable is considered then b₆, for example, has a greater effect than it did before the preceding variable was considered. There is a significant negative partial correlation between x₂ (education) and x₆ (time available for recreation); both F values are significant at the .05 level. Education is significantly positively correlated at the .05 level with y while available time is significantly (.05 level) negatively correlated with y with the negative and positive partial correlation coefficients having approximately the same magnitude. The inter-relationship of the two factors and their opposing effects upon y are
such that education depresses the F level of available time until education enters the regression equation. When the total regression equation is considered with all variables allowed to enter, the equation becomes:

\[ y = 1.772 - .051x_1 + .208x_2 + 1.002x_3 + .075x_4 + .542x_5 - .369x_6 \]

standard error (.124) (.138) (.246) (.204) (.441) (.241)

\[ t \]

(1) (1.5) (4.06)** (1) (1.22) (1.52)

\[ + .188x_7 + 1.108x_8 \]

standard error (.096) (.187)

\[ t \]

(1.96)* (5.94)**

Only \( x_3 \), \( x_7 \), and \( x_8 \) have significant coefficients; \( x_7 \) and \( x_8 \) at the .01 level and \( x_3 \) at the .05 level. Considering only the regression equation composed of these variables would give the following values:

\[ y = 1.872 + 1.163x_3 + .280x_7 + 1.135x_8 \]

standard error (.216) (.082) (.186)

\[ t \]

(5.384)** (3.414)** (6.102)**. All values are significant at .01 level. The multiple R equals .4187. The introduction of additional variables does not significantly increase R. At this point the variables included in the equation are: physical condition of the household head (3), total family income (7), and the yearly distance traveled to recreation (8). In a negative sense the analysis indicates that the age of the household head and the education of the household

* Significant at .05 level.

** Significant at .01 level.
head are not significant use determinants in the equation. Age and education are significantly negatively correlated indicating that the educational level is increasing throughout the state. Since educational level and income level are positively correlated and, as shown, income is a determinant of utilization, the continued increase in education can lead to increased utilization of recreation operating via the change in income level.

It is probable that the simple linear utilization function cannot adequately measure all the complexities of the variable relationships. One can assume that the relationship between recreational activity and age is not negative throughout its entire range. Alternatively one might expect to find recreational activity constant or increasing at lower age levels, leveling off at some age level and then declining with increasing age as illustrated in figure 5. One may also postulate that recreational activity and educational level do not follow a simple linear relationship. The negative relationships between available time and income coupled with the positive relationships between income and education may indicate a backward bending supply curve for labor or a recreation-education curve which is concave to the x axis as shown in figure 6. Introduction of a squared term in both educational level and age level will allow these effects to be expressed. In the same equation we can investigate the effect the number of children in the family unit has upon recreational activity. The new equation is:
FIGURE 5

AGE-RECREATION FUNCTION
FIGURE 6

INCOME-RECREATION FUNCTION
\[ y = A + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + b_7 x_7 + b_8 x_8 + b_9 x_9 + b_{10} x_{10} + b_{11} x_{11} 
\]

\[ (\text{Dist.})(\text{Child})(\text{Cond.})(\text{Inc.})(\text{Ed.})(\text{Ed.}^2)(\text{Age}) \]


\[ b_9 x_9 + b_4 x_4 
\]

\[ (\text{Age}^2)(\text{Time}) \]

F to remove \( (1.181)(.046) \)

Considering all variables in the equation give the following values:

\[ y = .698 + .663 x_1 + .761 x_2 + .854 x_3 - .027 x_4 + .164 x_5 + 1.126 x_6 
\]

standard error \( (.549) (.474) (.237) (.217) (.092) (.183) \)

t \( (1.207) (1.605) (3.603)** (1) (1.782) (6.153)* \)

\[ .496 x_6 - .063 x_9 - .065 x_{10} 
\]

\( (.103) (.063) (.060) \)

\( (4.815)* (1.00) (1.08) \)

\( x_3, \) physical condition, \( x_6 \) distance, and \( x_8 \) number of children are at the .01 level, \( x_5 \) income is significant at the .10 level. Considering only those variables which have significant coefficients the equation then becomes

\[ y = .91719 + .673 x_2 - .059 x_2^2 + .837 x_3 + .194 x_5 + 1.095 x_6 + .494 x_7 
\]

standard error \( (.463) (.059) (.222) (.087) (.182) (.093) \)

t \( (1.45) (1.00) (3.77)** (2.22) (6.016)**(5.312)** \)

Although the curvilinear education function is not significant, it is shown that the previous hypothesis was not proven. Multiple R equals .4625.
A third regression analysis could be made to determine the effect of the age of the youngest family member on recreational activity. An indicator of time available for recreational activities can be made by considering how many family members are employed and the number of hours per week worked by the household head. A final examination of age and education can be made by introducing a cubic term in each function. The variables entered the equation in the following order: recreation index = f (distance, number of children, physical condition, income, education, education^3, age, age^3, number of hours worked, number working, education^2, age of youngest family member, age^2). Multiple R equals .4678.

The curvature of the age and education variables is not proven. None of the newly introduced variables entered into the equation at a significant level. The final aggregate utilization predictor then is:

\[ y = 1.5779 + .2294x_2 + .8781x_3 + .1933x_4 + 1.0958x_5 + .495x_7 \]

standard error (.1309) (.2188) (.0875) (.1818) (.0929)

t (1.752) (4.013)** (2.209)* (6.027)** (5.336)**

\( x_2 \) is significant at the .10 level. Where \( x_2 \) is education, \( x_3 \) is physical condition of the household head, \( x_4 \) is total family income, \( x_5 \) is distance traveled to recreation and \( x_7 \) is number of children in the household, the aggregate R is .4612. The novelty of this final equation rests not upon the variables which are included but in the variables which have been excluded. A portion of this is explained by the nature of the activity index. This index is an expression of the household utilization of outdoor recreation whereas the predictors are
measurements on the household head. Since the sample was selected by a random procedure it can be used to predict the changes in consumption ceteris paribus with a change in one or more of the variables. Holding each of the variables at their mean value then:

\[ y = 7.7026 \text{ with a standard error of estimate of 3.4995.} \]

All significant variables have a positive effect upon utilization. Even though the additional terms of age and education were not significant, the analysis did reveal the slope relationship of these variables. Figures 7 and 8 illustrate these slopes. The partial correlation coefficients between recreational index and age and education are more revealing. The recreation index is significantly negatively correlated with age while it is significantly positively correlated with education. The absolute slope of age thus is negative while the absolute slope of education is positive. While the total amount of variability removed by plotting the regression line was significant but small, the direction of effect of five significant variables was determined. The preliminary survey results indicated education of the household head, the physical condition of the household head, the total distance traveled to recreation, the total family income and the number of children in the household are all positive determinants of outdoor recreation.

II. SUBAREA OUTDOOR RECREATION

The sampled population can be divided into subsamples by areas. This subdivision allows the computation of seven recreation predictor
FIGURE 7

OBSERVED AGE-RECREATION FUNCTION
FIGURE 8

OBSERVED INCOME-RECREATION FUNCTION
equations each with its own significant independent variables. The areas are Memphis, Nashville, and Knoxville, and Gibson, Marshall, Monroe, and Washington Counties.

Memphis

The outdoor recreation predictor equation for Memphis is:

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 \]

where

- \( x_1 \) = physical condition of household head
- \( x_2 \) = distance traveled to recreation
- \( x_3 \) = age of youngest child
- \( x_4 \) = number of children
- \( x_5 \) = education of the household head.

The age of the youngest child has replaced family income in the recreation predictor equation. Memphis represents a difficult area of interpretation within the total sample. There is a highly significant partial correlation between income and distance traveled to recreation. It was assumed that the racial situation may have had a positive effect on the distance traveled to recreation and a negative effect on the total amount of recreational activity. This point will be touched upon later.

The actual equation is:

\[ y = .66025 + 1.326x_1 + .9756x_2 + .0836x_3 + .3652x_4 + .3333x_5 \]

standard error \( (.4280) \) \( (.2734) \) \( (.0284) \) \( (.1835) \) \( (.2035) \)

t \( (3.098)^* \) \( (3.568)^* \) \( (2.944)^* \) \( (1.990)^* \) \( (1.64) \).
The Nashville utilization predictor equation is:

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \]

where

- \( x_1 \) = family income
- \( x_2 \) = physical condition of household head
- \( x_3 \) = distance traveled to recreation.

However, if one considers the six best possible utilization predictors, the following equation is given:

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 \]

where

- \( x_4 \) = education of household head
- \( x_5 \) = age of household head
- \( x_6 \) = age\(^3\) of household head.

None of the three additional variables are significant excepting \( x_6 \). This indicates the nature of the index-age relationship is such that after, and only after, considering the effect of the previous five variables, the cubic age term has a significant effect upon \( y \). Equally interesting is the fact that the quadratic term of age enters the equation ninth but at a higher level than the linear term which entered fifth. Figure 9 illustrates the shape of the age-index relationship for Nashville. The function first slopes sharply down to approximately age 38, then upward at approximately one-fourth of its downward slope, to approximately age 60 where it turns downward again. The larger downward slope is also the least significant. The educational level of the household head does not enter the equation unless it is forced.

The utilization predictor equation for Nashville is:
FIGURE 9

NASHVILLE AGE-RECREATION FUNCTION
\[ y = 0.3666 + 5510x_1 + 1.7109x_2 + 0.6395x_3 \]

standard error (3.5088) (.1544) (.4461) (.3375)

t (3.568)**(3.835)** (1.894). Significant at .10 level. The multiple R is .4908.

**Knoxville**

In terms of all types of outdoor recreation, Knoxville is more favorably located than any of the other subsample areas. It lies within an hour's drive of numerous lakes and the Great Smoky Mountains. The utilization predictor equation is:

\[ y = a + b_1x_1 + b_2x_2 \]

where

\[ x_1 = \text{distance traveled to recreation} \]

\[ x_2 = \text{number of children in the family} \]

No other variables were significant in the equation. When additional variables were entered into the equation, they were entered in the following order: age of youngest child, age of household head, cubic age term, quadratic education term, family income, number of hours worked, quadratic age term, quadratic education term, linear education term, physical condition of household head, number of hours worked by household head. Although none are significant utilization determinants, age of household head and age of youngest child are significantly positively correlated. Family income, which enters the regression equation seventh, is significantly positively correlated with education, physical condition, distance traveled, age of youngest child, number of household members working, and number of hours worked.
Family income is not significantly correlated with the number of children in the household. Since the primary purpose is to identify indicators for recreation utilization prediction, it is most useful to attempt to identify variables that are not directly connected to the recreation experience. Thus, although it was implicitly assumed that distance traveled expressed the distance that must be traveled to reach the recreation site, it is recognized the individual's subjective evaluation of sites enters into their utilization of recreation. In brief it is preferable to determine effects not influenced by subjective evaluation for the utilization predictors, in short to find the objective factors that relate to the subjective factors which in turn are the utilization determinants. The Knoxville recreation utilization predictor equation is:

$$ y = 6.4918 + 1.0206x_1 + .6928x_2 $$

standard error (3.1928) (1.3494) (1.1869)

$ t $ (2.921) (3.706)

with an $ R $ of .4496. From this equation one can postulate as family income increases, outdoor recreation will increase via the travel coefficient. If family size decreases, there will be a decrease in total utilization of outdoor recreation. The interrelationship of these factors is indeterminant. The relationship between income and distance traveled is not perfect nor can one predict whether increased income will lead to increased visitations to the same sites or the same visitation rates at more distant sites. One can assume Knoxville's
favored geographical position allows its population to engage in many types of recreation without encountering appreciable cost factors due to distance.

**Gibson County**

Here one may observe the effect of industrialization of a rural area and its possible effect upon outdoor recreation. The traditional rural recreation pattern due to choice or necessity has been home, school, and church based. The infusion of urban-industrial ways of life into a rural economy may, over time, shift these patterns to more closely conform to urban areas. Individuals still live upon the land; but many of these, especially the younger individuals no longer are actively engaged in farm operation.

The outdoor recreation utilization predictor equation for Gibson County is:

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 \]

where

- \( x_1 = \) family income
- \( x_2 = \) distance traveled
- \( x_3 = \) age of youngest child
- \( x_4 = \) cubic age

The inclusion of the cubic term of age as a significant variable is necessary to allow the age of the youngest child to enter the equation. The \( x_3 \) variable removes more of the unexplained variation than the \( x_4 \) variable even though \( x_4 \) is the first to enter the equation. The cubic age term in itself is not meaningful to our analysis. Analysis of the
partial correlation coefficients between age and the remaining variables shows a negative significant correlation with education, physical condition, income, number of children, number of hours worked, and the recreation utilization index. As mentioned above, the population observed here is in a process of change. The older members of the sample are farm oriented; the younger members are farm based; but their recreational pattern is beginning to conform to more urban characteristics. This separation is so apparent that the cubic function of age was able to be expressed. Figure 10 illustrates the apparent age-index relationship. The linear and cubic terms in the age equation are suppressed in the actual predictor equation. This occurs because the middle range of age is not a significant utilization determinant. At the higher age levels age becomes highly correlated with types of work, and the farm recreation utilization pattern is expressed. The early downward slope can be explained by the young individual's entry into the work force, his comparatively low income, and the beginning of a family. The upward curvature comes with increased income, and the entry of the children into the recreation index. The sharp break and downward slope represents the farm segment and perhaps illustrates the early stages of the industrialization.

The outdoor recreation utilization predictor equation is:

\[ y = 0.4028 + 0.8190x_1 + 3.059x_2 + 0.1034x_3 - 0.0123x_4 \]

\[ (2.8762) \quad (2.4176) \quad (1.5602) \quad (2.007) \quad (2.196) \]

\[ t \quad (1.96) \quad (1.98) \quad (2.007) \quad (2.196) \]
FIGURE 10

GIBSON COUNTY AGE-RECREATION FUNCTION
where \( x_1 = \text{family income} \)
\( x_2 = \text{distance traveled} \)
\( x_3 = \text{age of youngest child} \)
\( x_4 = \text{cubic age term} \).

The multiple \( R \) is .7214. The inclusion of four variables accounted for 52.05 percent of the variation of the \( y \) variable. The inclusion of the remaining variables increased this to 66.3670.

Marshall County

Marshall County represents a rural area which has experienced industrialization over a longer period than Gibson County. It differs from the more urbanized areas in that the choice of job alternatives is limited; accordingly the wage rate is not high. The outdoor recreation utilization predictor equation for Marshall County is:

\[ y = a + bx_1 \]

where \( x_1 = \text{hours worked} \).

While hours worked by the household head is highly significant, the second entering variable distance traveled to recreation is not significant. Our partial correlation coefficients with hours worked indicate a highly significant negative relationship with age and significant positive relations with physical condition, family income, the number of children, and the number of persons employed.

Two possible interpretations can be given to the conclusions; one is to revert back to the definition of recreation as rebuilding energy to meet the demands of work. In this instance the increased work
hours would require more recreation. A second and perhaps more reasonable explanation lies in the relationship between hours worked and family size. In a period of expanding product demand the individual may increase his income by working additional hours. If the person also must provide for a family the tendency may be to work overtime. The increased income can allow increased recreation utilization not by the household head but by the other household members. Perhaps what is being observed here is a population segment on the lower end of the backward bending labor supply curve. The negative income-hours relationship does not mean that additional work time leads to decreasing income. It illustrates that those individuals working the longest hours also are the low income segment. It would appear that an increase in hours worked would increase the utilization of outdoor recreation whereas the actual relationship is the opposite. An increase in income over time may lead to a decrease in the number of hours worked, and the head of household may join his family as a recreator.

The Marshall County outdoor recreation predictor equation is:

\[ y = 4.0514 + 0.0478x_1 \]

\[ (3.3465) \quad (0.0172) \]

\[ t \quad (2.779) \]

\[ x_1 = \text{hours worked}. \]

Multiple R is .3194. The inclusion of the additional variables increases R to .4200.
Monroe County

This county again represents a rural industrialized sample. It differs from the others in the distance required to reach the industrial plants. Many former farm persons now commute to Alcoa, Knoxville, and Oak Ridge daily. While the work opens up new avenues of income and interest, it also decreases the amount of time available for recreation. The variable of work time does not adequately express the amount of time spent away from home and the opportunity to recreate.

The Monroe County outdoor recreation utilization predictor equation is:

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \]

where

- \( x_1 \) = distance to recreation
- \( x_2 \) = hours worked
- \( x_3 \) = education of household head.

Income would be the next variable to enter the equation, the inclusion of income with its relationship to distance traveled causes both to become nonsignificant. In the equation as stated one can again see the hours effect with an important difference. In the Monroe County sample there is a variable not present in the Marshall County sample. The commuting accounts for additional time beyond work hours, and it removes the family car from the household. The family car must provide transportation to work daily, and it tends to isolate the nonworking members of the family to the farm. The third variable education is correlated only with income. The numerical equation is:
\[ y = 3.2675 + 2.4187x_1 - .0504x_2 + .8959x_3 \]

\[ t = 3.2005 \quad (0.8529) \quad (0.0191) \quad (0.4331) \]

Multiple R equals 0.5236. The inclusion of the remaining variables increases R to 0.6005.

**Washington County**

This county lies in the extreme eastern portion of Tennessee. While Washington County itself is rural, it lies in the area of rapidly developing industrialization. Much of the industrialization in the area has been occurring for twenty years or more, and new plants are being built yearly. The commuting variable which assumed such importance in the Monroe County sample and the limited work opportunities of the Marshall County sample are both present in the Washington County sample, but not to the same extent. The outdoor recreation utilization predictor equation is:

\[ y = a + bx_1 \text{ where} \]

\[ x_1 = \text{distance traveled}. \]

Distance traveled, the only significant variable, is negatively correlated with age and positively correlated with income. Again the measurements can be phrased in nonrecreation oriented variables. If the average age level of the population decreases or the average income level of the population increases, the utilization of outdoor recreation will increase. The numerical equation is:
y = 6.2461 + 1.706lx_1 + 3.1161x^3.1161 (r=0.6852)

\[ t = (2.489), \]

Multiple R = .3292. The inclusion of the additional variables increases R to .5869.

IV. SUBSAMPLE SUMMARY

While it may be informative to examine the differences between the sample areas, the type of model chosen for analysis is not conducive to this purpose. In brief one can repeat the predictor equations for the sample areas.

Memphis
\[ y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 \]

Nashville
\[ y = a + b_1x_1 + b_2x_2 + b_6x_6 \]

Knoxville
\[ y = a + b_2x_2 + b_4x_4 \]

Gibson County
\[ y = a + b_2x_2 + b_3x_3 + b_6x_6 + b_7x_7 \]

Marshall County
\[ y = a + b_8x_8 \]

Monroe County
\[ y = a + b_2x_2 + b_5x_5 + b_8x_8 \]

Washington County
\[ y = a + b_2x_2 \]
where

\[ x_1 = \text{physical condition of household head} \]
\[ x_2 = \text{distance traveled to recreation} \]
\[ x_3 = \text{age of youngest child} \]
\[ x_4 = \text{number of children} \]
\[ x_5 = \text{education of household head} \]
\[ x_6 = \text{family income} \]
\[ x_7 = \text{age of household head} \]
\[ x_8 = \text{hours worked per week by household head} \]
CHAPTER IV

INDIVIDUAL OUTDOOR RECREATION ACTIVITIES

While Chapter III was concerned with aggregate outdoor recreation this section is devoted to the analysis of the various outdoor recreation activities in which the sampled household engaged.

Sample results indicated the percentage participation in individual outdoor recreation activities listed in declining order of participation in Table I.

I. SWIMMING

The sample results indicated swimming represented the largest individual outdoor recreation activity. It is most probable that swimming was also the most erratic or unstable activity during the sample period. The changing social structure in some sample areas was most strongly expressed in the swimming activity. The racial integration issue may have introduced an additional variable to the individual household's swimming function. In effect an integrated neighborhood or municipal pool may have ceased to represent an acceptable swimming alternative. Private swimming clubs or more distant sites become the only alternatives in the individual household's indifference function. This would tend to place low income households in a disadvantageous position; furthermore this population segment might be the least likely to passively accept racial integration.
<table>
<thead>
<tr>
<th>Activity</th>
<th>% Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Swimming</td>
<td>46.09</td>
</tr>
<tr>
<td>2. Football attendance</td>
<td>45.94</td>
</tr>
<tr>
<td>3. Inland fishing</td>
<td>39.81</td>
</tr>
<tr>
<td>4. Picnicking</td>
<td>31.85</td>
</tr>
<tr>
<td>5. Small game hunting</td>
<td>24.81</td>
</tr>
<tr>
<td>6. Baseball attendance</td>
<td>17.91</td>
</tr>
<tr>
<td>7. Play baseball, softball</td>
<td>16.84</td>
</tr>
<tr>
<td>8. Gardening</td>
<td>16.69</td>
</tr>
<tr>
<td>9. Sight-seeing</td>
<td>16.23</td>
</tr>
<tr>
<td>10. Golf</td>
<td>13.16</td>
</tr>
<tr>
<td>11. Walking</td>
<td>12.09</td>
</tr>
<tr>
<td>12. Yard games</td>
<td>12.55</td>
</tr>
<tr>
<td>13. Boating</td>
<td>10.71</td>
</tr>
<tr>
<td>14. Tennis</td>
<td>9.95</td>
</tr>
<tr>
<td>15. Water skiing</td>
<td>9.49</td>
</tr>
<tr>
<td>16. Outdoor theatre</td>
<td>9.34</td>
</tr>
<tr>
<td>17. Camping</td>
<td>8.72</td>
</tr>
<tr>
<td>18. Stock car races</td>
<td>8.72</td>
</tr>
<tr>
<td>19. Bicycle</td>
<td>7.81</td>
</tr>
<tr>
<td>20. Horseback riding</td>
<td>7.35</td>
</tr>
<tr>
<td>22. Football play</td>
<td>4.59</td>
</tr>
<tr>
<td>23. Hiking</td>
<td>4.44</td>
</tr>
<tr>
<td>24. Deep-sea fishing</td>
<td>1.83</td>
</tr>
<tr>
<td>25. Boat races</td>
<td>1.68</td>
</tr>
<tr>
<td>26. Track meet attendance</td>
<td>1.53</td>
</tr>
<tr>
<td>27. Other activities*</td>
<td>5.82</td>
</tr>
</tbody>
</table>

*Other activities include snow skiing, scuba diving, mountain climbing, attending fairs and auctions, running dogs, training and showing horses, raising calves and so forth. Each of these activities represents less than .5 per cent of the sample population.
The swimming utilization predictor equation was:

\[ y = a + bx_1 + bx_2 + bx_3 \]

where

\[ x_1 = \text{family income} \]
\[ x_2 = \text{number of children} \]
\[ x_3 = \text{distance to the recreation site}. \]

Swimming is essentially an activity for the young. The entrance of number of hours worked and number in the household working as the next two variables may indicate why. Swimming is usually done in the summertime during the day. To engage in this activity one must have free time during the day. Excepting weekends, this precludes most of the household heads. An increase in hours worked also eliminates a portion of the weekend for the household head. With a decrease in the work week one might expect to find an increase in adult participation in swimming. The comparatively later age of entrance into the work force, if continued, will also tend to increase utilization of swimming. The numerical model was:

\[ y = 4.1168 + .1894x_1 + .1515x_2 - .3669x_3 \]

standard error (1.9519) \hspace{1cm} (.0589) \hspace{1cm} (.0783) \hspace{1cm} (.0754) \hspace{1cm} t \hspace{1cm} (3.215) \hspace{1cm} (1.93) \hspace{1cm} (4.866) \hspace{1cm} \text{multiple } R = .3410. \]

The introduction of all variables increases multiple R to .3790.

II. FOOTBALL ATTENDANCE

The Southeast in general historically has enjoyed great national football teams on the collegiate level. A football grant-in-aid has
represented a means to a college education and the possibility of professional employment for many of the South's young men. Competitive football is played at many levels throughout the state from Pee Wee leagues for grade school youngsters to Southeastern Conference football at the University of Tennessee and Vanderbilt University. There is a league and a school for almost every age and ability group. Excepting the semi-professional and professional games, football attendance is related to players. Many persons attend games because of school or family relationships. When this relationship ceases, the attendance ceases. Football attendance is also a local activity. This factor was so apparent during interviews that distance was not included as a variable. Of those individuals attending football games 92 percent attended only home games excepting especially significant games such as championship or bowl games.

There are no major professional football teams in Tennessee. The results obtained from this survey are not necessarily valid if used to predict attendance at such events. The difficulty with the predictor equation lies in the relationship of the determinants. Objective factors such as income and education are not necessarily related to family characteristics which influence football attendance. The football attendance predictor equation was:

\[ y = a + b_1 x_1 + b_2 x_2 \]

where

- \( x_1 = \) number of children
- \( x_2 = \) number of family members working
The first variable illustrates two factors to be considered. The greater the number of children the greater the probability at least one of them will be playing football on a team. Secondly, even if none of the children are actively engaged in playing football, those attending a school or of the same age level as a team tend to attend the games. One might expect the second factor to have a negative effect upon football attendance. Working would seem to remove some potential participants from attending the games. Examination of the partial correlation coefficients is no more revealing. The number of family members employed is not significantly correlated with any of the remaining variables. At this point one should consider football attendance as resting principally on the number of children in the family. The numerical football attendance predictor equation is:

\[ y = 2.3398 + 0.0539x_1 + 0.1078x_2 \]

standard error (.7149) (.0288) (.0634) 

\[ t \]

(1.87) (1.700)

multiple R = .1477, which is nonsignificant.

In effect the data does not reveal a valid predictor equation for football attendance. In general one can postulate football attendance will remain family orientated. One might assume that football attendance will vary according to the caliber of both the home team and the opposition. But what seems clear is that distance, age, and education are not likely to influence attendance as much as some close association with the team or school.
III. INLAND FISHING

Tennessee has many inland waterways. The state abounds in rivers, lakes, and streams as well as privately owned stocked ponds. The fishing regulations are such that fishing can be engaged in almost any time. If distance to a fishing site does not impose a time constraint, then work time will not restrict fishing time. Fishing could be separated into at least two categories, working day fishing and weekend fishing. If this were done, one would expect to find distance entering the equation with a negative sign. In the present equation,

\[ y = a + b_{1}x_{1} + b_{2}x_{2} \]

where

- \( x_{1} \) = age of household head
- \( x_{2} \) = distance traveled,

\( x_{2} \) enters with a positive sign. In effect the greater the distance to the fishing site, the more often one would go fishing. Taken in this form one would attribute increasing utility to distance. It may be more reasonable to assume the more frequently one fishes, the further total distance one travels for fishing. In effect total distance traveled to fish is virtually a constant for all fishermen, and what has been measured is the frequency of visitation. Thus the more often one visits the site, the greater total distance he has traveled. The separation of the fishing activity into the above segments would isolate the distance variable and allow it to function as a cost constraint.
The numerical function,

\[ y = 3.9273 + 0.2017x_1 - 0.2159x_2 \]

standard error (1.8511) (0.0877) (0.0636)

\[ t \]

\[ 2.299 \quad 3.394 \]

multiple \( R = 0.2513 \),

\( x_2 \) enters as a negative quantity seemingly invalidating the above discussion. It seems reasonable to presume however that distance may have elements of positive utility which cannot be expressed because of time constraints. This subject will be reviewed below.

IV. SIGHT-SEEING

Sight-seeing is perhaps the most nebulous of all outdoor recreation activities. Is sight-seeing a planned activity? Can one engage in this activity while traveling to or from work? Can one avoid this activity when traveling over some distance? Must one actively engage in this activity? These and other questions arose during the course of the survey. The interviewee requested all respondents to use their own definition in determining if they engaged in the activity. On the basis of these individual definitions slightly more than 16 percent of the sample surveyed reported sight-seeing as an outdoor recreation activity during the sample period. There were no significant coefficients. The independent variables entered in the following order:
\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + b_7 x_7 + b_8 x_8 \]

where

- \( x_1 \) = age of youngest child
- \( x_2 \) = family income
- \( x_3 \) = number of family members employed
- \( x_4 \) = age
- \( x_5 \) = physical condition
- \( x_6 \) = number of children
- \( x_7 \) = education of household head
- \( x_8 \) = number of hours worked per week.

There are five negative coefficients and three positive coefficients.

The general slope of the function is negative. From the sample data one cannot predict the utilization of the outdoor recreation activity designated as sight-seeing for two reasons. First, one cannot define sight-seeing in a meaningful manner without introducing bias into the sample, and, two, the population of sight-seers have differing interpretations of the activity which they engaged in. To illustrate, one can examine variables 1 and 4 of the equation, the negative 1 variable if significant would indicate a decrease in sight-seeing with younger children or conversely an increase in sight-seeing as the children's age level increases. On the other hand, negative 4 variable represents age of household head which implies as this age increases the sight-seeing activity decreases. However, we know that the age of the youngest child will increase with an increase in age of the household head. In effect the negative factors are cancelling each other. This subject will be reviewed below.
Small game hunting encompasses several types of hunting and different seasons of the year. Rabbits, squirrels, dove, quail, turkeys are all included in this category. The small game hunting utilization predictor equation was:

\[ y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_3^2 + b_5x_3^3 \]

where

- \( x_1 \) = number of children
- \( x_2 \) = distance traveled to recreation
- \( x_3 \) = age of household head

Small game hunting seems to be a father-son outdoor recreation activity. One might assume the number of children is a measurement of the presence of a son of hunting age. The significant cubic age function is of interest. The numerical equation, below, yields

\[ y = -.4876 + .2005x_1 - .1434x_2 + 3.6640x_3 - 1.0528x_3^2 + .0944x_3^3 \]

standard error (1.6620) (0.0883) (0.0852) (2.2356) (0.5705) (0.0455)

t (2.270) (1.683) (1.64) (1.845) (2.074)

multiple R = .3236.

An age-index relationship concave to the x axis. In effect small game hunting declines during some middle years of life. In the early age segment the individual hunts alone or with his father, during the early family years hunting declines then increases as the individual and his son begin to hunt. The entrance of age of the youngest child with a positive sign tends to substantiate this hypothesis.
VI. BICYCLING

There are essentially two types of bicycle riding with respect to outdoor recreation. There is the bicycle as a means of transportation for some of the family members, usually children, and bicycle trips by all or most of the family members. The second type was not encountered during the survey. The bicycling reported in the sample survey generally conformed to a multiple purpose: one, a means of transport, and two, an enjoyable activity in itself. Number two was present even when the primary objective was number one. Under the stated circumstances one would anticipate only numbers of children as an independent variable. In fact there were no significant coefficients discovered for bicycling though number of children was the first variable to enter. Given the presence of children and a bicycle one cannot predict how often they will ride it. It may be of greater importance to discover the variables underlying the decision to purchase a bicycle. Such an analysis was not made.

VII. BOATING AND WATER SKIING

Boating and water skiing are essentially such complementary activities that they are considered together. It is possible to go boating without water skiing and sample survey results indicate some respondents do so; however, it is difficult to water ski without boating. None of the sample respondents reported water skiing without reporting boating as well. The boating utilization predictor equation was:
\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \text{ where} \]
\[ x_1 = \text{age} \]
\[ x_2 = \text{education} \]
\[ x_3 = \text{income} \]

The water skiing predictor equation was:
\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 \text{ where} \]
\[ x_1 = \text{age} \]
\[ x_2 = \text{income} \]
\[ x_3 = \text{age of youngest child} \]
\[ x_4 = \text{number of hours worked per week by household head} \]

The numerical equations are:

**Boating**
\[
y = -3.189 + 0.5659 x_1 + 0.3703 x_2 + 0.1800 x_3
\]
standard error (1.6262), (.1929) (.2433) (.1270)
t (2.933) (1.521) (1.417)
multiple R = .4968 essentially all (.4222) explained by variable 1 (age).

**Water skiing**
\[
y = 2.1546 + 0.6696 x_1 + 0.1652 x_2 - 0.0772 x_3 - 0.0341 x_4
\]
standard error (1.2876) (.2218) (.0979) (.0344) (.0110)
t (3.018) (1.687) (2.244) (3.10)
multiple R = .4969

Even though boating and water skiing are represented by essentially the same persons, the utilization predictor equations differ greatly. The only common factors are age and income. Water skiing is a young person's activity. Age of household head with a positive sign signifies older children at home. It is these older children who constitute the
water skiers. This hypothesis is strengthened by the negative effect of younger members in a household. Examination of the partial correlation coefficients of hours worked reveals a significant positive correlation with physical condition, income, number of children, and number of members of the household employed. Examined in a straightforward manner one observes that additional hours worked detracts from the amount of time available for outdoor recreation even as it increases income. The combined effect of increasing income and decreasing time available for recreation is hours worked entering the equation with a highly significant but small negative coefficient while income enters with a larger but less significant positive coefficient. For the family unit the income effect is a more powerful utilization determinant.

VIII. GOLF

Unlike some other activities, golf is severely limited by the availability of facilities. It is difficult to find a close substitute for a golf course. The respondents who listed golf as a recreational activity were limited almost exclusively to the suburban areas. The golf utilization predictor equation was:

\[ y = 3.3614 + .4168x_1 \text{ where } x_1 = \text{age} \]

standard error (2.2231) (0.2169)

t (1.92)

multiple R = .2052 which is not significant.

The means and partial correlations of the golfing sector of the sample are of special interest. The mean educational level is beyond the B.S.
degree, the mean income level is in the $8,000 to $10,000 per year range and the mean number of hours worked per week exceeds 46. This is a relatively well educated, high income and hard working (in terms of hours) group. Why then do these variables not appear in the equation? In terms of the significant variable, age, education, and hours worked are negatively correlated with age while income is positively correlated. Education is positively correlated with income and hours worked. Income is positively correlated with hours worked. Education is negatively correlated with the utilization index while income and hours worked are not correlated with the index at all. From these sample survey results we can see that a first requirement for golfing is a relatively high income. After attaining this income and beginning the activity, the rate of participation is influenced only by age.

IX. TENNIS

Tennis, like golf, is closely associated with the availability of facilities. It differs in that tennis courts do not represent the major outlay as golf courses do. The tennis utilization predictor equation was:

\[ y = a + b_1 x_1 + b_2 x_2 \]

where

\[ x_1 = \text{income} \]

\[ x_2 = \text{number of family members employed.} \]

Survey results indicate there is generally no specific charge for the use of tennis facilities nor does the equipment to participate in the activity represent a major outlay. There is no apparent objective
reason why income and tennis utilization should be related unless income is somehow related to the availability of facilities. The numerical equation:

\[ y = 3.7756 + 0.2923x_1 - 0.5891x_2 \]

standard error (1.6181) (0.0977) (0.3567)
t (2.991) (1.651)
multiple R = 0.3639

The negative coefficient on number of family members employed perhaps indicates a time constraint.

X. PICNICKING

The picnicking activity affords an opportunity to explain the relevance of the statistical technique used in the utilization predictor equations. The numerical equation for picnicking was:

\[ y = 1.4401 + 0.2821x_1 + 0.2015x_2 \]

standard error (0.8910) (0.1259) (0.0903)
t (2.240) (2.231)
multiple R = 0.2321 with 205 degrees of freedom which is significant at the .05 level. With two coefficients significant at the .05 level and a significant R, however, only 5.39 percent of the variation in y has been explained. One can postulate that \( x_1 \) (physical condition) and \( x_2 \) (number of household members employed) are determinants of picnicking; however, these factors cannot adequately predict this activity. Some other factor or factors which have not been considered have a greater influence upon picnicking than the factors included within the model.
XI. YARD GAMES--BADMINTON, CROQUET

Yard games is a general term specifying those outdoor games which are engaged in at home. The distance factor is reduced to zero thus connecting the analysis to opportunity cost. The subjective evaluation of any alternative activity must exceed the time cost of reaching the site by more than the subjective evaluation of yard games. It should be explicitly recognized that some individuals may receive value from the trip to a site.

The numerical year game utilization predictor equation was:

\[ y = 1.7794 - .5162x_1 - .3585x_2 + .0656x_3 \]

standard error (2.9203) (0.1798) (0.2137) (0.0192)

\[ t (2.870) (1.677) (3.416) \]

multiple R = .4324 where:

\[ x_1 = \text{income} \]
\[ x_2 = \text{number of children} \]
\[ x_3 = \text{hours worked per week by household head} \]

The equation indicates increasing income leads to decreasing utilization of yard games. In this respect yard games represent an inferior type of outdoor recreation. The \( x_3 \) variable introduces time again as a constraint, increased work time reduces the time available for recreation. \( x_3 \) is positively correlated with numbers of family members employed which would further decrease the time available for outdoor recreation for the household. Survey results indicated yard games are a family activity. One might expect the family size to be positively related
with utilization of yard games, especially when one recognizes that family size and family income are negatively correlated for the sample. This was not the case as the predictor equation indicates.

XII. STOCK CAR RACING ATTENDANCE

There are numerous stock car racing facilities in Tennessee. Every sample area had one or more tracks within a one hour's driving distance. The quality of the tracks and caliber of the competition varied greatly from area to area. Factory backed cars race on the Bristol, Tennessee track (Washington County) while the Monroe County area was essentially locally owned older model cars. The numerical stock car attendance predictor equation was:

\[ y = 6.0951 + 0.2037x_1 - 1.1055x_2 - 0.6530x_3 \]

standard error (1.1644) (0.1211) (0.6322) (0.2834)

\[ t (1.682) (1.748) (2.304) \]

multiple R = 0.3698 where:

- \( x_1 \) = age of household head
- \( x_2 \) = physical condition of household head
- \( x_3 \) = number of members of household employed.

The absolute slope of the equation is negative. The \( x_1 \) variable is highly positively correlated with the age of the youngest child which is as expected. The question arises whether the older household heads or the older children are the activity utilizers. Physical condition is negatively correlated with age; however, this would not preclude attendance at a stock car race. The number of members of the household
employed is negatively correlated with physical condition and positively correlated with income. The key to understanding the function may lie in the education variable. Age of household head is negatively correlated with education; physical condition is highly positively correlated with education. It appears stock car racing attendance may be an inferior type of recreation with respect to educational level. The mean educational level of the stock car racing attendance sample is less than a high school education with a small standard deviation.

XIII. BASEBALL ATTENDANCE

Baseball resembles football in terms of who attends the games. Unless there is personal involvement in the outcome of the game, one does not attend. There are numerous levels of baseball played within the state. During the spring and summer months there are league games involving all ages from 6 to 60. Most respondents attended these games because of some personal relationship with some of the players. The games are essentially local. Only three respondents traveled any appreciable distance to attend baseball games. Of these only one specifically made the trip for baseball viewing. Recognizing these facts it is not surprising to discover the numerical baseball predictor equation:
\[ y = 2.4648 + .2120x_1 \]

\[
\text{standard error (1.0454) } (.0584) \\
\text{t (3.631)}
\]

multiple R = .3207 where:

\[ x_1 = \text{number of children in the family.} \]

These games are essentially no fee contests with distance a constant for all users. The only variable under consideration is time. Given time to attend baseball games at the level available or engage in some other activity, the respondents prefer some other activity unless there is some family member involved in the game. The larger the family size the greater the probability at least one member will be involved in playing baseball.

XIV. CAMPING

Camping is a major time using activity. It is difficult to engage in camping without some minimum of time free from work. One can camp overnight, over the weekend, or for longer periods. Lesser periods than this generally would fall within some other recreational activity such as picnicking. Camping also represents one facet of a multiple recreation activity. Camping is generally associated with one or more recreational activities such as hiking, swimming, fishing, and hunting. While camping in itself was listed as the major recreational activity, all camping respondents listed other activities engaged in while camping. The numerical camping predictor equation was:
\[ y = 2.8268 + 0.1863x_1 - 0.0136x_2 \]

standard error (1.0753) (.0953) (.0110)

t (1.954) (1.23)

multiple R = .2725 where:

\( x_1 = \) number of children

\( x_2 = \) number of hours worked by household head.

\( x_2 \) is not significant but was included to indicate the necessity of available time to engage in this activity. A secondary cost factor to be considered is contained in family size. Larger family sizes could represent sizeable outlays in food and housing at recreation sites. Camping could allow participation in other activities over longer periods at less cost. Disregarding the significance levels and examining only the signs of the coefficients the total camping utilization function is:

\[ y = a + b_1x_1 - b_2x_2 - b_3x_3 - b_4x_4^3 - b_5x_5^3 - b_6x_6 + b_7x_7^2 - b_8x_8^3 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} - b_{12}x_{12} + b_{13}x_{13} \]

where:

\( x_1 = \) number of children

\( x_2 = \) number hours worked

\( x_3 = \) age of household head

\( x_4 = \) education of household head

\( x_5 = \) physical condition

\( x_6 = \) household income

\( x_7 = \) age of youngest child

\( x_8 = \) number working

\( x_9 = \) distance traveled
The age variable is curvilinear and concave to the x axis with respect to the index. The education variable is similar to the age variable. One might anticipate a negative relationship with income whereas the relationship is positive. It is interesting to note that income is positively correlated with both time variables, hours worked and number employed. These are both negative influences acting on camping while income has a positive effect. This is another example of the work time-income relationship. Additional work time may increase income which has a positive effect upon recreational activities; however, the additional work time decreases the time available for recreation.

**XV. HORSEBACK RIDING**

There are at least three subsamples within a sample of horseback riding. First, there is that portion of the sample who go to a riding stable, rent a horse and ride for some fee. Second, there is a suburban portion with a small acreage where they maintain a horse or horses for family use. Third, there is the farm population, many who have horses for work and pleasure purposes. All three types were encountered in the survey. Although there are appreciable differences between the utilization of the three segments, the distance to the activity does not adequately express the differences in the costs involved. The numerical horseback riding utilization predictor equation was:
\[ y = 3.0332 + 1.3805x_1 + 0.7491x_2 - 1.8684x_3 - 0.1322x_4 \]

standard error \( (2.2183) \quad (0.4410) \quad (0.3038) \quad (0.9789) \quad (0.0626) \)

t \( (3.130) \quad (2.465) \quad (1.906) \quad (2.111) \)

multiple R = .5130 where:

\[ x_1 = \text{age of household head} \]
\[ x_2 = \text{education of household head} \]
\[ x_3 = \text{physical condition of household head} \]
\[ x_4 = \text{age of youngest child} \]

The equation is unusual in that physical condition has a negative effect upon the utilization of the horseback riding activity. One must first recognize the sample includes only those individuals who already engage in horseback riding. Within the sample, hours worked and physical condition are positively correlated indicating more free time available for physically disabled individuals. The presence of increased free time leads to increased utilization of the horseback riding activity.

XVI. SOFTBALL-BASEBALL PLAYING

While football is primarily a spectator sport except for the young, baseball and softball are participation sports at all age levels. These games can be engaged in formally or informally on playing fields of differing sizes. Like other activities of this type, distance can be considered a constant for all users in the various areas. The numerical softball-baseball utilization predictor equation was:
\[ y = 3.5564 + .2262x_1 + .0400x_2 \]

standard error (1.4958) (0.0896) (0.0270)

\[ t \]

(2.524) (1.481)

multiple R = .2704 where:

\[ x_1 = \text{number of children} \]

\[ x_2 = \text{age of youngest child}. \]

The variates \( x_1 \) and \( x_2 \) do not explain a significant amount of the variation in \( y \). They are the variables one would expect to enter the equation.

XVII. GARDENING

Gardening in this survey represents numerous activities. It includes raising flowers and vegetables, working on the lawn, and other activities related to growing some vegetation. This activity differs from some of the other activities in its complementarity. Gardening represented the only activity for many of the gardening respondents. Gardening is entirely a home based activity. Gardening does not require any specific time period and can be carried on to almost any degree. More specifically the gardening activity can be engaged in any available time period. The numerical gardening utilization predictor equation was:
\[ y = 8.5079 - 0.6464x_1 + 0.0104x_2 \]

standard error (1.1463) (0.2887) (0.0078)

\[ t \]

(2.24) (1.36)

multiple R = 0.2218 where:

- \( x_1 \) = number of household members employed
- \( x_2 \) = number of hours worked.

The negative sign on \( x_1 \) indicates two possible explanations. \( x_1 \) is highly negatively correlated with age and highly positively correlated with income. Age and income are also highly negatively correlated. If it is assumed that the \( x_1 \) variable is an expression of the income effect upon gardening and \( x_2 \) is an expression of the available time effect, then gardening is an inferior activity with respect to income. If it is assumed that the relationship is a measurement of the age effect then it would appear that gardening activity is more probable with increasing age.

XVIII. OUTDOOR THEATRE

Outdoor theatre as an activity includes drive-in movies, outdoor dramas, concerts, and other types of attendance activities normally conducted indoors. Whether these differing activities constitute more than one type of outdoor activity is a matter of conjecture. One might assume the same persons who participate in this type of activity indoors also participates in the activity outdoors. The outdoor theatre utilization predictor equation was:
\[ y = 4.1774 - 0.2394x_1 - 0.2588x_2 + 0.0561x_3 + 0.2094x_4 + 0.0174x_5 \]

\[
\text{standard error (1.2355) (.1435) (.1332) (.0343) (.2711) (.0113)}
\]

\[
t (1.668) (1.942) (1.635) (1) (1.539)
\]

multiple R = 0.3896 where:

- \(x_1\) = age of household head
- \(x_2\) = education of household head
- \(x_3\) = age of youngest child
- \(x_4\) = number in household employed
- \(x_5\) = number of hours worked.

The five variables do not have significant coefficients but were included since each removed essentially the same amount of variation in \(y\). The correlation between \(x_1\) and \(x_3\) coupled with their opposite signs in the equation leads one to conclude that one of the variables is expressing the effect of some other factor. Age is positively correlated with income and income is negatively correlated with attendance at outdoor theatres. Within the sample outdoor theatre may be an inferior good. The second variable education is positively correlated with income indicating possible validity for the above assumption.

**XIX. BIG GAME HUNTING**

Tennessee, like most densely populated states, is not a big game hunting area. There is some boar hunting and deer hunting within the state boundaries. Big game hunting requires travel to reach the site. When distance enters so strongly into the equation, a large sample may
be required to detect variations in the number of visits made to a site.

The linear big game hunting predictor equation for the sample was:

\[ y = a + b_1 x_1 + b_2 x_1^2 + b_3 x_1^3 + b_4 x_2 + b_5 x_2^2 + b_6 x_2^3 + b_7 x_3 + b_8 x_4 + b_9 x_5 + b_{10} x_6 + b_{11} x_7 + b_{12} x_8 \]

where:

- \( x_1 \) = age
- \( x_2 \) = education
- \( x_3 \) = income
- \( x_4 \) = number of children
- \( x_5 \) = age of youngest child
- \( x_6 \) = number of employed
- \( x_7 \) = hours worked
- \( x_8 \) = distance traveled to site.

None of the variables are significant. The multiple R = .5480. The relationship between distance traveled and income and the remaining variables is such that essentially the entire equation could be explained by income alone.

XX. WALKING

Walking for pleasure was difficult for the sampled population to define. In general the respondents specified there must be no specific goal in mind on the walk. The respondents further specified the walk should begin or terminate at the home. Any movement on foot which did not meet this criteria was specified as hiking or walking as a mode of transportation. Walking proved to be almost entirely a function of age. The numerical pleasure walking utilization predictor equation was:
$y = 4.2950 + .4805x_1$

standard error (1.8751) (.1234)

t (3.893) where:

$x_1 = \text{age of household head}$

Within the sample, age was negatively correlated with education, physical condition, income, number of children, number employed, and hours worked. The elderly persons in the sample are relatively less well educated and have a lower income than the general population. Walking may represent the outdoor recreation activity which is most readily available to this segment of the population.

**XXI. SUMMARY OF INDIVIDUAL UTILIZATION FUNCTIONS**

The type of analysis above requires further interpretation. The purpose was not an attempt to predict whether an individual will participate in an activity. Having determined the subpopulation of individual recreation users, the purpose was to determine which variables influenced the degree of participation and to signify whether the entire recreation activity percentage may tend to increase or decrease. In general, unless the activity was obviously an inferior or superior activity relative to income it has been implicitly assumed the percentage of participation remains constant for the variables under consideration. It would be of interest to planners if one could predict which individuals will participate in various outdoor recreation activities.
As a small step in this direction the following analysis will compare the differences between the participating and nonparticipating individuals for several of the most important recreational activities.

**Swimming, Nonswimming, Total Sample**

Table II gives the t values and the direction of effect for the mean differences.* The nonswimming subpopulation is significantly different from the swimming subpopulation and the total sample population. The analysis tends to indicate an aging, low income population will include a high proportion of nonswimmers; or, to express the results in positive terms, the young, higher income families are the most likely participants. The t values relating to distance and recreational index indicate older individuals are low level utilizers of outdoor recreation in toto.

**Sight-Seeing, Nonsight-Seeing, Total Sample**

Analysis of the mean differences between sight-seeing and nonsight-seeing and the total sample reveals only one significant t value. The sight-seeing subpopulation is significantly \((t = 2.305)\) younger than the nonsight-seers. The nonsight-seers are not significantly different from the total sample.

**Inland Fishing, Noninland Fishing, Total Sample**

Table III gives the t values and direction of mean difference for inland fishing vs. nonfishermen and nonfishermen vs the total sample.

*\(n > 100\)
### TABLE II
MEAN COMPARISONS BETWEEN SWIM AND NONSWIM SUB SAMPLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Swim vs. nonswim t</th>
<th>Nonswim vs. total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>-11.895</td>
<td>5.466</td>
</tr>
<tr>
<td>2. Education</td>
<td>7.458</td>
<td>-4.251</td>
</tr>
<tr>
<td>3. Physical condition</td>
<td>7.254</td>
<td>-3.130</td>
</tr>
<tr>
<td>4. Income</td>
<td>8.021</td>
<td>-4.302</td>
</tr>
<tr>
<td>5. Recreation distance</td>
<td>--</td>
<td>-4.988</td>
</tr>
<tr>
<td>6. Recreation index</td>
<td>--</td>
<td>-5.631</td>
</tr>
<tr>
<td>7. Number of children</td>
<td>10.614</td>
<td>-6.123</td>
</tr>
<tr>
<td>8. Age of youngest child</td>
<td>4.532</td>
<td>-2.150</td>
</tr>
<tr>
<td>9. Number employed</td>
<td>6.656</td>
<td>-3.167</td>
</tr>
<tr>
<td>10. Hours worked</td>
<td>8.364</td>
<td>-3.810</td>
</tr>
</tbody>
</table>
### TABLE III

**MEAN COMPARISONS BETWEEN INLAND FISHING AND NONINLAND FISHING SUB SAMPLES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>I.F. vs. N/I.F.</th>
<th>N/I.F. vs. T.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>-5.966</td>
<td>2.561</td>
</tr>
<tr>
<td>2. Education</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3. Condition</td>
<td>3.598</td>
<td>-1.559</td>
</tr>
<tr>
<td>4. Income</td>
<td>2.495</td>
<td>1</td>
</tr>
<tr>
<td>5. Distance</td>
<td>--</td>
<td>-3.456</td>
</tr>
<tr>
<td>6. Index</td>
<td>--</td>
<td>-2.649</td>
</tr>
<tr>
<td>7. Number of children</td>
<td>4.261</td>
<td>-2.391</td>
</tr>
<tr>
<td>8. Age of youngest child</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9. Number employed</td>
<td>4.885</td>
<td>-2.139</td>
</tr>
<tr>
<td>10. Hours worked</td>
<td>6.069</td>
<td>-2.459</td>
</tr>
</tbody>
</table>
Inland fishermen as a group are younger, in better physical condition, have higher incomes and more children than nonfishermen. The nonfishermen are essentially the same group as the nonswimmers, older low level recreators.

**Small Game Hunting, Nonsmall Game Hunting, Total Population**

Small game hunting represents a fourth large segment of the population. Results of the computation of t tests on the mean differences with their direction of effect is given in Table IV.*

The small game subpopulation is again younger, in better physical condition, and have more children than the nonhunters. The significant employment differences coupled with no income differences reveal this as a rural activity as previously discussed. The nonhunters are not significantly different than the total sample.

**Recreation and Type of Work**

It is of interest to determine the effect of work environment upon the individual's utilization of outdoor recreation. It was earlier postulated that there are two indifference curves for recreation, one based on a rejuvenation of health after the stifling influence of indoor work. The second is basically pleasure seeking. In the first instance recreation is a necessity; in the second, it is a competitive good. The results of t tests upon mean differences between indoor and outdoor work as well as both of these and the total sample are given

---

*\[n > 100\]*
# Table IV

**Mean Comparisons Between Small Game Hunting and Nonsmall Game Hunting Sub Samples**

<table>
<thead>
<tr>
<th>Variable</th>
<th>S.G. vs. N/S. G.</th>
<th>N/S.G. vs. T.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>-3.761</td>
<td>1.889</td>
</tr>
<tr>
<td>2. Education</td>
<td>-1.509</td>
<td>1</td>
</tr>
<tr>
<td>3. Condition</td>
<td>5.733</td>
<td>-1.523</td>
</tr>
<tr>
<td>4. Income</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5. Distance</td>
<td>--</td>
<td>2.142</td>
</tr>
<tr>
<td>6. Index</td>
<td>--</td>
<td>-1.751</td>
</tr>
<tr>
<td>7. Number of children</td>
<td>2.833</td>
<td>-1.066</td>
</tr>
<tr>
<td>8. Age of youngest child</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9. Number employed</td>
<td>3.403</td>
<td>1</td>
</tr>
<tr>
<td>10. Hours worked</td>
<td>5.634</td>
<td>1.224</td>
</tr>
</tbody>
</table>
in Table V.* The total sample includes persons retired and unemployed as as well as the two groups tested.*

The recreation index is not significantly different between indoor and outdoor workers. The indoor workers utilize more outdoor recreation than the total population. This can be explained by the income variate which is significantly different between types of work and between each of the types and the total sample. The distance variate is very revealing. The indoor and outdoor workers utilize the same amounts of total recreation; however, the indoor workers must or do travel a greater distance to reach recreational sites. The outdoor workers receive significantly lower incomes than indoor workers and the total sample. The analysis of the mean differences suggests that recreation is sought most probably for pleasure rather than for some other purpose.

Interactivity Relationships

The analysis revealed some individuals were low recreation utilizers. It may be of interest to determine the interrelationship of activities for the different forms of outdoor recreation. Tables VI, VII, VIII and IX give the participation rates within the three major active recreation activities and one major passive recreation activity. A significant positive t value could indicate complementarity between the activities. A negative t value could indicate competitive relationships between activities. Water skiing and boating were previously

*n>100
TABLE V
MEAN COMPARISONS BETWEEN INDOOR AND OUTDOOR TYPE OF WORK

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outdoor vs. Indoor Workers</th>
<th>Outdoor vs. T.S. Workers</th>
<th>Indoor vs. T.S. Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>4.561</td>
<td>1</td>
<td>-7.076</td>
</tr>
<tr>
<td>2. Education</td>
<td>-8.091</td>
<td>-4.966</td>
<td>4.521</td>
</tr>
<tr>
<td>3. Condition</td>
<td>-1.932</td>
<td>3.742</td>
<td>6.585</td>
</tr>
<tr>
<td>4. Income</td>
<td>-4.726</td>
<td>-4.114</td>
<td>5.304</td>
</tr>
<tr>
<td>5. Distance</td>
<td>-3.563</td>
<td>-2.422</td>
<td>3.062</td>
</tr>
<tr>
<td>6. Index</td>
<td>1</td>
<td>1.421</td>
<td>2.128</td>
</tr>
<tr>
<td>7. Number of children</td>
<td>-1.624</td>
<td>1.058</td>
<td>2.030</td>
</tr>
<tr>
<td>8. Age of youngest</td>
<td>1.371</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>child</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Number employes</td>
<td>2.724</td>
<td>2.487</td>
<td>3.847</td>
</tr>
<tr>
<td>10. Hours</td>
<td>2.865</td>
<td>7.353</td>
<td>6.526</td>
</tr>
</tbody>
</table>
### TABLE VI

**WITHIN SWIMMING RELATIONSHIPS**

<table>
<thead>
<tr>
<th>Within activity</th>
<th>%A</th>
<th>%B</th>
<th>%C</th>
<th>t A-B</th>
<th>t A-G</th>
<th>t B-G</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. S. fishing</td>
<td>3.65</td>
<td>91.66</td>
<td>1.83</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>I. fishing</td>
<td>51.15</td>
<td>59.23</td>
<td>39.81</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>B. G. hunting</td>
<td>9.96</td>
<td>7.50</td>
<td>6.12</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>S. G. hunting</td>
<td>33.22</td>
<td>61.73</td>
<td>24.81</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Camping</td>
<td>13.29</td>
<td>70.17</td>
<td>8.72</td>
<td>**</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Horseback</td>
<td>13.29</td>
<td>83.33</td>
<td>7.35</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Water skiing</td>
<td>16.94</td>
<td>82.26</td>
<td>12.09</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Walking</td>
<td>16.28</td>
<td>62.03</td>
<td>9.49</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Hiking</td>
<td>7.64</td>
<td>79.31</td>
<td>4.44</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Sight-seeing</td>
<td>18.27</td>
<td>51.89</td>
<td>16.23</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
</tbody>
</table>

Note: Where A is the major subclassification, B is the minor subclassification, and C is the total sample.

** Significant at .01 level.

* Significant at .05 level.
### TABLE VII
WITHIN INLAND FISHING RELATIONSHIPS

<table>
<thead>
<tr>
<th>Within activity</th>
<th>%A</th>
<th>%B</th>
<th>%C</th>
<th>t A-B</th>
<th>t A-C</th>
<th>t B-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swimming</td>
<td>59.23</td>
<td>51.15</td>
<td>46.09</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>D. S. fishing</td>
<td>3.84</td>
<td>8.33</td>
<td>1.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. G. hunting</td>
<td>9.23</td>
<td>6.00</td>
<td>6.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. G. hunting</td>
<td>48.07</td>
<td>77.16</td>
<td>24.81</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Camping</td>
<td>12.69</td>
<td>57.89</td>
<td>8.72</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Horseback</td>
<td>9.23</td>
<td>5.00</td>
<td>7.35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water skiing</td>
<td>14.61</td>
<td>61.29</td>
<td>12.09</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Walking</td>
<td>15.00</td>
<td>49.37</td>
<td>9.49</td>
<td>**</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Hiking</td>
<td>6.15</td>
<td>55.17</td>
<td>4.44</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Sight-seeing</td>
<td>18.46</td>
<td>45.28</td>
<td>16.23</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
</tbody>
</table>

Note: Where A is the major subclassification, B is the minor subclassification, and C is the total sample.

** Significant at .01 level.

* Significant at .05 level.
TABLE VIII
WITHIN SMALL GAME HUNTING RELATIONSHIPS

<table>
<thead>
<tr>
<th>Activity within</th>
<th>%A</th>
<th>%B</th>
<th>%C</th>
<th>t A-B</th>
<th>t A-C</th>
<th>t B-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swim</td>
<td>61.72</td>
<td>33.22</td>
<td>46.09</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>D. S. fish</td>
<td>3.09</td>
<td>41.66</td>
<td>1.83</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>I. fish</td>
<td>77.16</td>
<td>48.07</td>
<td>39.81</td>
<td>**</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td>B. G.</td>
<td>15.43</td>
<td>62.50</td>
<td>6.12</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Camping</td>
<td>9.26</td>
<td>26.31</td>
<td>8.72</td>
<td></td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Horseback</td>
<td>9.88</td>
<td>33.33</td>
<td>7.35</td>
<td></td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Water skiing</td>
<td>17.29</td>
<td>45.16</td>
<td>12.09</td>
<td>**</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Walking</td>
<td>16.05</td>
<td>32.91</td>
<td>9.49</td>
<td>**</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Hiking</td>
<td>5.55</td>
<td>31.03</td>
<td>4.44</td>
<td></td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Sight-seeing</td>
<td>18.52</td>
<td>28.30</td>
<td>16.23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Where A is the major subclassification, B is the minor subclassification, and C is the population.

* Significant at .05 level.
** Significant at .01 level.
TABLE IX
WITHIN SIGHT-SEEING RELATIONSHIPS

<table>
<thead>
<tr>
<th>Activity within</th>
<th>%A</th>
<th>%B</th>
<th>%C</th>
<th>t A-B</th>
<th>t A-C</th>
<th>t B-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swimming</td>
<td>55.19</td>
<td>18.27</td>
<td>46.09</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. S. fishing</td>
<td>2.83</td>
<td>2.50</td>
<td>1.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. fishing</td>
<td>45.28</td>
<td>18.46</td>
<td>39.81</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. G.</td>
<td>9.43</td>
<td>2.50</td>
<td>6.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. G.</td>
<td>28.30</td>
<td>18.51</td>
<td>24.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camping</td>
<td>21.69</td>
<td>40.35</td>
<td>8.72</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Horseback</td>
<td>15.09</td>
<td>33.33</td>
<td>7.35</td>
<td>*</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Waterskiing</td>
<td>10.37</td>
<td>17.74</td>
<td>12.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>39.62</td>
<td>67.74</td>
<td>9.49</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Hiking</td>
<td>7.54</td>
<td>27.58</td>
<td>4.44</td>
<td>*</td>
<td></td>
<td>**</td>
</tr>
</tbody>
</table>

Note: Where A is the major subclassification, B is the minor subclassification, and C is the population.

* Significant at .05 level.

** Significant at .01 level.
illustrated as complementary activities. The A column in the table is the percentage of the subsample who also engage in the secondary activity. The B column is the percentage of the secondary activity who engage in the primary activity. The C column is the percentage of the total sample who engage in the secondary activity. To illustrate line one of the swimming table shows: 3.65 percent of the swimmers also deep-sea fish, 91.66 percent of the deep-sea fishermen also swim, and 1.83 percent of the total sample engage in deep-sea fishing. The pairwise difference analysis attempts to determine first if there is a significant difference between the percent of swimmers who deep-sea fish within the swimming and the deep-sea fishing subsamples. Second, to determine if the percentage of swimming deep-sea fishermen is significantly different from the percentage of deep-sea fishermen in the total sample. Third, to determine if the percentage of swimming deep-sea fishermen within the deep-sea fisherman sample differs from the percentage of deep-sea fishermen in the total sample. The highly significant t indicates a significantly greater percentage of the total deep-sea fishing sample swim than one would expect due to chance. The lack of significance between A and C indicates the percent of the swimming sample composed of deep-sea fishermen does not significantly differ from the composition of deep-sea fishermen in the total sample. The major interest is in the t A-C values. The analysis of the swimming table reveals the t A-C column is significant for all variables except deep-sea fishing, water skiing, hiking, and sight-seeing. A highly significant negative difference between A and B indicates a subordinate position of the B variable. A significant positive difference
between A and C indicates a complementary relationship between A and B. A negative A-C difference would indicate competitive activities. A positive significant difference between B and C indicates a complementarity between the two activities with respect to the minor activity. The swimming table reveals inland fishing to be a complementary activity with swimming; the significance of the B-C difference indicates the complementarity exists only with respect to inland fishing. The tables can be used to determine interactivity relationships. The sight-seeing table indicates persons who sight-see also tend to go camping, horseback riding, and walking. The significant A-B differences are positive indicating A is subordinate to B. The significant B-C differences signify competitive relationships between the variables.

XXII, VACATION ACTIVITY

Some recreational studies have been based entirely on vacation activities. Examining vacation activity in isolation allows one to remove a portion of the time and distance constraints. The individual is free to recreate within the limits of his remaining constraints. Of the sampled population 43.27 percent went on or were planning a vacation trip during the sampling period. The purpose of the vacation varied from business orientated trips to trips for recreational activities alone.

Looking first at those families who did not take or plan to take a vacation trip, their outdoor recreation utilization predictor equation in numerical form was:
\[ y = 0.1797 + 0.7142x_1 + 0.6859x_2 + 1.6724x_3 + 0.6132x_4 \]

standard error \( (3.0113) \ (0.2316) \ (0.3007) \ (0.3765) \ (0.1366) \)
t \( (3.083) \ (2.281) \ (4.41) \ (4.49) \)

multiple R = 0.4837

\( x_1 \) = education of household head
\( x_2 \) = physical condition
\( x_3 \) = distance traveled to recreation
\( x_4 \) = number of children.

Excepting the absence of income as a determinant of level of utilization this equation is essentially the same as the total outdoor recreation consumption predictor equation. The mean income of the nonvacationers is lower than the population mean income. While the data do not reveal why some individuals take vacation trips while others do not, one can examine what variables are related to the number of days of vacation away from home an individual household will take. The vacation time predictor equation was:

\[ y = -2.6758 + 0.4259x_1 + 0.5757x_2 + 0.2188x_3 - 0.0478x_4 + 2.4051x_5 + \]

standard error \( (6.4074) \ (0.2631) \ (0.0975) \ (0.0204) \ (0.3069) \ (0.0311) \)
t \( (1.618) \ (2.047) \ (2.286) \ (2.343) \ (7.836) \)

\( .136x_6 \)
\( (.0311) \)
\( (4.379) \)

multiple R = 0.4730

where
$x_1 = \text{age of household head}$

$x_2 = \text{education of household head}$

$x_3 = \text{index of recreational activity}$

$x_4 = \text{hours worked}$

$x_5 = \text{distance traveled on vacation}$

$x_6 = \text{days of paid vacation received}$

While income is not an independent variable in this equation, it is in four of the regression variables. Education, recreational index, hours worked, and days of paid vacation are all positively correlated with income. One might expect a negative correlation between hours worked and income since the number of hours worked per week has a negative influence on recreational activity. The number of hours worked in itself cannot influence vacation activity since a vacation by definition is free time away from work. Number of hours worked is highly negatively correlated with age, and age is negatively correlated with income. Within the subpopulation of individuals who took a vacation, hours worked may be an expression of the age-income interaction. Table X indicates the differences between the vacation and nonvacation subpopulations.
### TABLE X
WITHIN VACATION RELATIONSHIPS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Vac. vs. N/vac.</th>
<th>N/vac. vs. Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>-3.835**</td>
<td>2.424*</td>
</tr>
<tr>
<td>2. Education</td>
<td>14.770**</td>
<td>-4.732**</td>
</tr>
<tr>
<td>3. Physical condition</td>
<td>5.223**</td>
<td>-2.978**</td>
</tr>
<tr>
<td>4. Income</td>
<td>11.844**</td>
<td>-6.358**</td>
</tr>
<tr>
<td>5. Distance traveled to recreation</td>
<td>6.381**</td>
<td>-4.458**</td>
</tr>
<tr>
<td>6. Recreational index</td>
<td>5.778**</td>
<td>-2.532*</td>
</tr>
<tr>
<td>7. Number of children</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8. Age of youngest child</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9. Number employed</td>
<td>5.049**</td>
<td>-2.588**</td>
</tr>
<tr>
<td>10. Hours worked</td>
<td>4.961**</td>
<td>-2.361*</td>
</tr>
</tbody>
</table>
CHAPTER V

SUMMARY AND CONCLUSION OF THE STUDY

I. SUMMARY

The purpose in this study has been the establishment of relationships between certain objective factors and the household use of outdoor recreation. By means of a stepwise regression analysis the size and slope of the regression coefficients have been estimated for several utilization functions. It was the intention to isolate those factors which have the greatest amount of relationship with the measurement of utilization. To begin the study it was postulated that time could be used as a measurement of recreational participation. No attempt was made to distinguish between lengths of visitation but a single visitation was assumed as a measurement unit. The household was considered to utilize one time unit of recreation whenever one or more household members made a visit to a recreational site. Recreational site was defined as the point in space where the recreational activity was engaged in. To remove some of the variations inherent in the measurement unit the data was transgenerated by extracting the square root of the recreational index. Family size as a variable was measured by introducing the variable of number of children. This method allowed number of children to enter as a significant variable in those recreational activities primarily engaged in by children. Multiplication of the
index by family size would have introduced bias in those activities which were primarily engaged in singly. A large family would automatically have a large recreational index.

For the total outdoor recreational utilization predictor equation it was assumed that age and education were curvilinear functions and physical condition, income, distance traveled to recreation, number of children, age of the youngest child, number of household members employed and number of hours worked per week were linear functions. In effect a three-factor utilization function of the order shown below was assumed:

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \]

where \( x_1 \) = time

\( x_2 \) = income

\( x_3 \) = number of individuals involved

It was necessary to consider additional variables since certain interaction terms were likely to appear. Thus the function

\[ y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_{12} x_1 x_2 + b_{13} x_1 x_3 + b_{23} x_2 x_3 \]

where \( x_1 x_2 \) is the interaction of income and time

\( x_1 x_3 \) is the interaction of time and family size

\( x_2 x_3 \) is the interaction of income and family size

It was implicitly assumed that the major variation in recreational utilization could be explained if (a) one could standardize the three variables and eliminate the interaction terms and (b) one could find a measurement device common to all recreational experiences. In the
absence of exact definitional measurements of these factors those variables were included which were deemed appropriate indicators of the major determinants and the interactions.

Using the above method of analysis it was found that household outdoor recreation utilization could be predicted by the following:

\[ y = F(\text{constant} + \text{education} + \text{physical condition} + \text{income} + \text{the number of children} + \text{the distance traveled to recreation}) \]

In this form distance traveled, in the aggregate function, does not express the distance one may be willing to travel to reach recreational sites but simply the distance traveled in order to engage in outdoor recreation. The distance data was ex post the recreational experience. It was implicitly assumed that this value represented the distance the individual must travel to reach the recreational site. This assumption was invalidated by the results of the aggregate utilization function. Distance entered as the cost they did incur rather than the cost they must incur. Distance became an interaction term expressing some relationship with income. In spite of this one must still assume distance to the site represents a cost to the users and if properly measured will exert a downward slope to the utilization function.

The validity of the curvilinear age and education relationships was not proven. Education entered as a linear term. Education is positively correlated with income, and one can assume increases in education may lead to increased awareness of recreational opportunities.

In the recreational activity utilization predictor equation the distance factor normally entered as a negative quantity. In the
inland fishing equation, for example, distance and age were the two significant explanatory variables. Three types of recreational activities were observed in the total sample. The first includes those activities which must be engaged in some distance from the home, the second are activities which can be engaged in either locally or at distant sites, the third would include those activities which must occur at home. Deep-sea fishing is an example of the first type, inland fishing is an example of the second type and gardening is an example of the third type. The highest use rates fall within the second group. Persons tend to fish where time permits them to travel. Weekday fishing is primarily a local activity; weekend fishing is carried on at a greater distance. None of the objective variables served to delineate these types of activities.

The recreation activities were arbitrarily divided into active and passive types of recreation and there appeared to be close relationship between activities within each group. Individuals who engage in active types of recreation tend to engage in several active activities. Individuals who engage in a passive activity will tend to engage only in passive recreational activities. The delineation of low and high level recreation utilizers tended to conform to utilization of active and passive recreational activities.

A hypothesis regarding the relationship between indoor and outdoor workers was rejected. Outdoor workers utilized recreation at the same rate as indoor workers. They differed with respect to the distance traveled to reach the recreational site. This difference could be
accounted for by income differences or by availability of facilities. The outdoor workers may have been heavily represented in the rural sample.

Persons who engage in the active recreational types are significantly younger, healthier, wealthier, and have more formal education than those who do not engage in these types of activities. The same was true for vacation activity. As a general statement one can say outdoor recreation in Tennessee is utilized primarily by this segment. If the coefficients remain constant then as household income increases, and the educational level of the population increases one would expect the household utilization of outdoor recreation to increase in the aggregate. The specific area of increase would fall within the active types of outdoor recreation.

II. CONCLUSION

In a study of this scope it is difficult to examine the ramifications of every recreational activity. Lack of preliminary knowledge prevented the insertion of variables which would remove some of the ambiguity of the results. A measurement of the distance from the household to the closest site while maintaining the measure of actual distance traveled would have more efficiently served as a distance interaction term. Distance now enters the equation partially as an independent measure of recreational utilization.

The purpose of this survey was to determine the significant coefficients of outdoor recreation utilization and their direction of effect.
The author feels this modest objective has been met in this study. To the extent that the sampled households are representative of Tennessee households, these given outdoor recreation predictor equations have isolated the determinants of utilization with their direction of effect.

III. A FORWARD LOOK

The present study was of an exploratory nature to attempt to determine the relationships of certain variables and the utilization of outdoor recreation by the household. Any exploratory inquiry should be kept comparatively small until guidelines are established. This study has served to establish certain guidelines which may warrant further inquiry.

The study has established evidence that each of the individual outdoor recreation activities has its own particular space-time relationship to the utilization of outdoor recreation. Thus in further studies one should separate, for purpose of analysis, periods of available free time such as after work hours, weekends, vacation time and isolate, as nearly as possible, the activity engaged in with its time of utilization. In this manner the utilization of the various recreational activities can be viewed from the time perspective.

Having determined the significant variables for many of the individual outdoor recreation activities one can now use a more exacting statistical technique to make confidence statements regarding the population parameters. One such model is a complete factorial block
design with or without an assumption regarding interaction between the blocks and treatments. This is a medium design. Knowledge of the experimental material is such that one can block out the area differences. One would then assume that experimental units differ only in response to the treatments. The complete linear model would be:

\[ x_{ijk} = M + A_i + B_j + C_{ijk} \]

where \( A_i \) is the treatment effect

\( B_j \) is the block effect.

One could then further subdivide the treatment term into a factorial design. The subdivision would be as follows: linear model

\[ A = M + a_i + b_j + ab^{(ij)} + g_{ijk} \]

where \( a \) and \( b \) would be variables under consideration and \( g_{ijk} \) is the error term. By equally spacing quantitative levels of the variables one can extract additional information from the analysis. This type of analysis should permit not only a determination of the effect of each factor upon the dependent variable but also determine their effect upon each other. It would be possible to compute response curves of varying degrees of complexity for each of the main effects and the interaction terms. Theoretically one could partition and test every degree of freedom available in the model. Present knowledge of the experimental material indicates, however, that response curves beyond the cubic for main effects and interactions would not be meaningful. It would be
possible to fit orthogonal polynomials to the main effects and interactions as a means of estimating their parameters.\\(^1\)

The major problem involved in this type of analysis is its size and complexity, especially when the treatment levels must be obtained by sampling. To conduct a 3 by 3 factorial with two replicates requires 18 experimental units. The number increases geometrically and the complexity increases with unequal sample sizes. One must necessarily oversample to be assured of filling each sampling space. The amount of information which can be elicited from this type of analysis is such that it is recommended for use in the next inquiry into the nature of utilization of outdoor recreation.

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BIBLIOGRAPHY
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TELEPHONE SAMPLING BIBLIOGRAPHY
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Mitchell, Glen H. Telephone Interviewing, Mimeograph Series No. A. E. 279, Wooster, Ohio: Ohio Agricultural Experiment Station, November 1957.

Penny, N. M., and Elrod, J. C. Interview Methods and Procedures Used in a Survey of Consumer Reaction to an Experimental Peanut Product. Mimeo Series 63, Georgia Experiment Station, March 1953.


APPENDICES
The Sample

The sample consisted of the following numerical quantities:

<table>
<thead>
<tr>
<th>Sample area</th>
<th>Number respondents</th>
<th>Type of work</th>
<th>Number respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memphis</td>
<td>206</td>
<td>Indoor</td>
<td>386</td>
</tr>
<tr>
<td>Nashville</td>
<td>153</td>
<td>Outdoor</td>
<td>131</td>
</tr>
<tr>
<td>Knoxville</td>
<td>109</td>
<td>Unemployed</td>
<td>19</td>
</tr>
<tr>
<td>Gibson County</td>
<td>31</td>
<td>Retired</td>
<td>125</td>
</tr>
<tr>
<td>Marshall County</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monroe County</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington County</td>
<td>53</td>
<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Income classification</th>
<th>Number</th>
<th>Age class</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 2,000</td>
<td>79</td>
<td>Under 20</td>
<td>4</td>
</tr>
<tr>
<td>2,000 - 4,000</td>
<td>140</td>
<td>20 - 30</td>
<td>74</td>
</tr>
<tr>
<td>4,000 - 6,000</td>
<td>138</td>
<td>30 - 40</td>
<td>129</td>
</tr>
<tr>
<td>6,000 - 8,000</td>
<td>127</td>
<td>40 - 50</td>
<td>164</td>
</tr>
<tr>
<td>8,000 - 10,000</td>
<td>68</td>
<td>50 - 60</td>
<td>136</td>
</tr>
<tr>
<td>10,000 - 12,000</td>
<td>35</td>
<td>60 - 70</td>
<td>75</td>
</tr>
<tr>
<td>12,000 - 14,000</td>
<td>16</td>
<td>Over 70</td>
<td>74</td>
</tr>
<tr>
<td>Over 14,000</td>
<td>47</td>
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<td></td>
</tr>
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### Education (Years of School or degree)

<table>
<thead>
<tr>
<th>Education</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 4</td>
<td>41</td>
</tr>
<tr>
<td>4 - 8</td>
<td>138</td>
</tr>
<tr>
<td>8 - 12</td>
<td>322</td>
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<tr>
<td>Business college</td>
<td>79</td>
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<tr>
<td>B.S.</td>
<td>49</td>
</tr>
<tr>
<td>M.S.</td>
<td>16</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>15</td>
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</tbody>
</table>

### Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number Engaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swimming</td>
<td>301</td>
</tr>
<tr>
<td>Football attendance</td>
<td>300</td>
</tr>
<tr>
<td>Inland fishing</td>
<td>260</td>
</tr>
<tr>
<td>Picnicking</td>
<td>208</td>
</tr>
<tr>
<td>Small game hunting</td>
<td>162</td>
</tr>
<tr>
<td>Baseball attendance</td>
<td>117</td>
</tr>
<tr>
<td>Soft ball-baseball</td>
<td>110</td>
</tr>
<tr>
<td>Gardening</td>
<td>109</td>
</tr>
<tr>
<td>Sight-seeing</td>
<td>106</td>
</tr>
<tr>
<td>Golfing</td>
<td>86</td>
</tr>
<tr>
<td>Yard games</td>
<td>82</td>
</tr>
<tr>
<td>Walking</td>
<td>79</td>
</tr>
<tr>
<td>Boating</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number Engaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tennis</td>
<td>4</td>
</tr>
<tr>
<td>Water skiing</td>
<td>62</td>
</tr>
<tr>
<td>Outdoor theatre</td>
<td>61</td>
</tr>
<tr>
<td>Camping</td>
<td>57</td>
</tr>
<tr>
<td>Stock car races</td>
<td>57</td>
</tr>
<tr>
<td>Bicycle</td>
<td>51</td>
</tr>
<tr>
<td>Horseback riding</td>
<td>48</td>
</tr>
<tr>
<td>Big game hunting</td>
<td>40</td>
</tr>
<tr>
<td>Football</td>
<td>30</td>
</tr>
<tr>
<td>Hiking</td>
<td>29</td>
</tr>
<tr>
<td>Deep-sea fishing</td>
<td>12</td>
</tr>
<tr>
<td>Boat races</td>
<td>11</td>
</tr>
<tr>
<td>Track meet attendance</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>48</td>
</tr>
</tbody>
</table>
TELEPHONE SAMPLING VERIFICATION

The sample size was 676 of a projected 800 usable samples for a completion rate of 84.5 percent. Table XI illustrates the completion ratio for each sample area. The use of telephone sampling introduced an upward bias to the income ranges for the state.\(^1\) Mitchell\(^2\) lists the advantages and disadvantages of sampling by telephone. He also reports research results which indicate no significant difference between households with listed telephone numbers and those without listed numbers.

In the present study a random sample of 125 individual addresses were selected from the Knoxville Telephone Directory. The numbers were subdivided by prefix to localize addresses. Days were then divided in half by from 8 A.M. to 12 noon and from 1 P.M. to 5 P.M. The half days were randomly divided into two sets. A coin flip designated set I as telephone survey and set II as personal at homesite interview. A one way analysis of variance was used to determine if any difference existed in the mean number of completed samples collected by the two methods. All call backs were made using the method of original contact. There was a significant difference between the response rates between the two


<table>
<thead>
<tr>
<th>Area</th>
<th>Projected Sample Number</th>
<th>Actual Sample Number</th>
<th>% Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memphis</td>
<td>250</td>
<td>206</td>
<td>82.4</td>
</tr>
<tr>
<td>Nashville</td>
<td>200</td>
<td>153</td>
<td>76.5</td>
</tr>
<tr>
<td>Knoxville</td>
<td>125</td>
<td>109</td>
<td>87.2</td>
</tr>
<tr>
<td>Gibson</td>
<td>50</td>
<td>31</td>
<td>62.0</td>
</tr>
<tr>
<td>Marshall</td>
<td>75</td>
<td>70</td>
<td>93.3</td>
</tr>
<tr>
<td>Monroe</td>
<td>50</td>
<td>54</td>
<td>108.0*</td>
</tr>
<tr>
<td>Washington</td>
<td>50</td>
<td>53</td>
<td>106.0*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>800</strong></td>
<td><strong>676</strong></td>
<td><strong>84.5</strong></td>
</tr>
</tbody>
</table>

*A 10% oversample was made in each area to allow for nonusable responses.*
types of sampling. There was no significant difference between the types of data collected by the two methods. This is in agreement with the findings of the consumer economics section at Texas A & M College.\(^3\)

It was concluded that the sampling method introduced an upward bias in the income level of the sampled population, but there is nothing inherent within the sampling method which would introduce further bias.

\(^3\)Robert E. Branson and R. George Dillin, Jr., Response Variations Between Telephone and Personal Interviews in Consumer Market Surveys. (College Station, Texas: Texas A. & M College System, Undated).
<table>
<thead>
<tr>
<th>Age - Years</th>
<th>Education - Years of Schooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Under 19</td>
<td>1. Under 4</td>
</tr>
<tr>
<td>2. 20-29</td>
<td>2. 5-8</td>
</tr>
<tr>
<td>3. 30-49</td>
<td>3. 9-12</td>
</tr>
<tr>
<td>4. 50-59</td>
<td>4. Business school or some college</td>
</tr>
<tr>
<td>5. 60-69</td>
<td>5. B.S.</td>
</tr>
<tr>
<td>6. Over 70</td>
<td>6. M.S.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Condition of Household Head in Terms of Outdoor Recreation</th>
<th>Type of Work Household Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 40-100 percent disabled</td>
<td>1. Indoor</td>
</tr>
<tr>
<td>2. 11-39 percent disabled</td>
<td>2. Outdoor</td>
</tr>
<tr>
<td>3. 0-10 percent disabled</td>
<td>3. Unemployed</td>
</tr>
<tr>
<td></td>
<td>4. Retired</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part-Time Work Household Head</th>
<th>Free Time Available For Outdoor Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yes</td>
<td>1. Work over 48 hours</td>
</tr>
<tr>
<td>2. No</td>
<td>2. Work 36-48 hours</td>
</tr>
<tr>
<td></td>
<td>3. Work less than 36 hours</td>
</tr>
<tr>
<td>Income-Family-Per Year</td>
<td>Distance - Round Trip</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>1. Under $2,000</td>
<td>Aggregate</td>
</tr>
<tr>
<td>2. $2,000-3,999</td>
<td>1. 0-999</td>
</tr>
<tr>
<td>3. $4,000-5,999</td>
<td>2. 1,000-1,999</td>
</tr>
<tr>
<td>4. $6,000-7,999</td>
<td>3. 2,000-2,999</td>
</tr>
<tr>
<td>5. $8,000-9,999</td>
<td>4. 3,000-3,999</td>
</tr>
<tr>
<td>6. $10,000-11,999</td>
<td>5. 4,000-4,999</td>
</tr>
<tr>
<td>7. $12,000-13,999</td>
<td>6. Over 5,000</td>
</tr>
<tr>
<td>8. Over 14,000</td>
<td>7. Over 400</td>
</tr>
</tbody>
</table>

All other variables are actual values.