Sociodemographic Predictors of Rural Poverty: A Regional Analysis

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SOCIO-DEMOGRAPHIC PREDICTORS OF RURAL POVERTY: A REGIONAL ANALYSIS[1]

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ABSTRACT The focus of the present study is to determine the extent to which the socio-demographic variables of education, occupation, number of children, race, sex, age and willingness to travel for employment and predictors of a rural family's level of poverty. Discriminant analysis is employed to assess the accuracy of these variables in discriminating between poor and nonpoor families randomly selected from thirty low income, rural counties in ten contiguous southeastern states.

The results are supportive of previous studies as these variables are found to be statistically significant discriminants between the poor and the nonpoor. The profile of a rural poor head of household is a poorly educated, semi-skilled, female, black, farm resident who tends to be old, have a large number of children and less willing to travel for employment outside of one's immediate area.

INTRODUCTION

Social scientists have continued to focus their research on the topic of rural poverty. Three considerations mark this inquiry. The first is a concern with the quality of life among impoverished groups in the rural population. Secondly, poverty is a persistent force that affects the motivation and behavior of those affected. The final concern involves the link between poverty and many social problems (crime and delinquency, family and generational problems, prejudice

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and discrimination and unemployment). Collectively, these concerns indicate a need to fill the crucial void in our knowledge concerning the socio-dynamic processes of families and individuals in poverty while concurrently implementing programs designed to promote and increase the number of such families and individuals escaping from poverty.

The preceding concerns together with the Economic Opportunity Act of 1964 (in which President Johnson declared a War on Poverty) have resulted in a plethora of studies which focus on the economic and social problems of the poor, particularly the urban poor. Despite the establishment of the National Advisory Commission on Rural Poverty (1967), a unit that was charged with recommending action "to provide opportunities for the rural population to share in America's abundance. . .," there has been a serious lack of attention given to rural poverty (Bould, 1977:472) and; it remains a major societal problem (Rogers and Burdge, 1972; Rogers, 1977; Chadwick and Bahr, 1973; Horton and Leslie, 1973; Osmond, 1978; Daft, 1980; Hoppe, 1980; Cho, 1982). Some researchers, such as Gans, contend that poverty has not been eradicated because it is functional; that is, it serves useful functions for members of society such as creating a job market for penologists, criminologists, social workers and public health workers. The poor also perform the low-paid 'dirty-work' and other menial tasks (Gans, 1972:272-79). Other frequently cited reasons for the continued existence of poverty include: lack of mobility, low educational attainment, family structure and size, structural constraints, social disorganization, selective outmigration and population redistribution, alienation, anomie, and cultural differences.[2]

Thus, poverty appears to be a multifaceted phenomenon that is woven deeply into the fabric of American society; albeit, to date, the theory is inadequate and the data are skimpy. **Social science research on the poor has failed to provide a body of coedified knowledge.** Miller contends, for example, that "the data upon which generalizations are wrought are indeed very scanty. . . not only do the data collide with each other, but they are based on studies of restricted, constricted situations. . ." (1970:169). Writing in a similar vein, Allen states that "the theory is woefully inadequate for problems presented by poverty" (1970:149). The need for theory and research in furthering our understanding of poverty still persists and consequently, it is **requisite to go beyond descriptive studies of the poor.** With this in mind, the focus of the present study is to determine the extent to which eight socio-demographic variables--race, sex of head of household, age, farm/nonfarm status, education, occupation, number of children, and willingness to travel for employment--are predictors of a family's level of poverty.

DATA SOURCE AND METHOD OF ANALYSIS

Sample

The data for this research consist of 2,580 structured interviews obtained as part of a regional research project entitled, "The Isolation of Factors Related to Levels and Patterns of Living in Selected Areas of the Rural South." A multistage cluster sample was used to select the respondents from thirty racially-mixed, low median income, rural counties in ten contiguous southeastern states--Alabama, Arkansas,

Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Virginia. Sample sizes were assigned in proportion to the size of the county's population.

In the first stage, the probability of a county's selection was to be in proportion to its population size within the state's sampling frame of low income, rural counties. For the second stage, national geological survey maps (2° series) with a 15 minute by 15 minute grid superimposed were used to define the "open country" sampling frame of clusters while census maps were used to define the "town" sampling frame of clusters. Cluster sizes were fixed at eight households and a serpentine procedure insured a standardized method of defining entry into each sample cluster. Wheelock, White and Phillips (1982:6-7) affirmed the representativeness of the sample.

Variables

The criterion variable, poverty status, is based upon methods developed by Orshansky (1965:6-8). The standard is based on a food budget estimated as an "economy food plan for emergency use;" the poverty level is set at three times the amount of the total food budget. In addition, adjustments of family annual incomes were made for the number of persons in the household dependent on the income as their sole means of support and farm/nonfarm occupation of head of household.[3]

Most of the predictor variables are straightforward and require little explanation. Two exceptions are occupation and willingness to travel for employment. The occupational categories are assigned average Duncan Socioeconomic Index Scores and treated as interval[4] (see Hauser and Featherman, 1977). The latter variable is taken from

question: "If employment for which you qualify is not available in your immediate area, how far would you be willing to travel from your home to the job (i.e., one way mileage) daily?"

The interval level variables are found to adhere to the multivariate normal assumptions crucial to discriminant analysis. That is, the scores on the discriminating variables are independently and randomly sampled from a population of scores; the sampling distribution of any linear combination of discriminating variables is normally distributed and is not a function of other discriminating variables; the ranges are not restricted; and there is a linear relationship among all the discriminating variables within each group.

Finally, a quadratic, instead of a linear, discriminant function is used because of the heterogeneity of the variance-covariance (dispersion) matrices. A linear discriminant function is estimated by pooling the variance-covariance matrices; however, since the two matrices differ in variability and cannot be pooled, separate matrices are used to extract the discriminant function. This function is termed 'quadratic' and prevents respondents from being overclassified into groups with greater dispersion (see for example, Gilbert, 1967:505-509; Lachenbruch, 1975:46-47; Tabachnick and Fidell, 1983:300-301). Thus, the quadratic function leads to more accurate classification equations and hence, a maximum separation of groups.

Method of Analysis

Direct discriminant analysis is used to determine those characteristics which distinguish between rural residents in and out of poverty. The aim of this analysis is to weigh and linearly combine

the discriminating variables--race, sex of head of household, age, farm/nonfarm status, education, occupation, number of children and willingness to travel for employment--in a manner that renders the group as distinct on these measures as possible.

Discriminant analysis provides two types of output that are particularly useful for this investigation. First, it extracts a discriminant function that represents the dimension along which the two groups differ. **These discriminant function coefficients, when in** standardized form, indicate the relative importance of each predictor variable, analogous to Beta weights in regression analysis.

The classification of respondents, the second valuable output, is a direct measure of the predictive accuracy of the procedure and **confirms the degree of group separation.** In other words, once the discriminant function has been extracted, it suggests how well the function correctly classifies the respondents relative to chance prediction. Adhering to a procedure outlined by Hair et al. (1979:94-97) and Tabachnick and Fidell (1983:296-297), the split sample or cross validation approach is used to classify the respondents. That is, the total sample of respondents is randomly divided into two groups; the first group (the analysis sample) is used to derive the discriminant function whereas the second group (the hold-out sample) is used to test the discriminant function. In this study, after developing the best weighting equation for the eight predictor variables from the analysis sample (N = 830), we tested the equation on the hold-out sample (N = 834). **This procedure eliminates the upward bias** that tends to occur in the predictive accuracy of the discriminant

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function if the individuals used in developing the classification matrix are the same as those used in computing the function or alternatively, it indicates how well the classification function perform with a new sample of cases (Hair et al, 1979:94). Both the classification accuracy criteria and tau (proportional reduction in error statistic) are used to assess the discriminating ability of the predictor variables.

FINDINGS

Poverty Differentials

Table 1 presents the predictor variables by poverty status.

(Table 1 about here)

In 1975, although three-fourths of all rural poor were white, poverty was more pervasive among rural blacks. Approximately forty-one percent of all rural blacks, but only twelve percent of all rural whites, had incomes below the minimum subsistence level. Further, more than ninety percent of all low income rural blacks lived in the South (Hoppe, 1980:7). This finding is also evident in Table 1 as 61.3 percent of the black respondents are impoverished compared to 31.1 percent of the white respondents.

Besides race, families with a female head of household are more likely to be impoverished than families with a male head of household. Women who are heads of families typically have many handicaps when it comes to securing an adequate living. For example, the presence of minor children in the home may make it extremely difficult

for mothers to work outside the home; moreover, the token amount of child support paid, if paid at all, by the father usually does not permit a decent standard of living. Also, women tend to be confronted with discriminatory hiring practices and consistently lower wages (Horton and Leslie, 1973:337; Wheelock, White and Phillips, 1982:2-3). Feminization of poverty is manifested in the sample data by the finding that 61.4 percent of the female heads of household live below the poverty income threshold level compared to 32.7 percent of the male heads of household.

Poverty among the rural elderly is exacerbated by the problems associated with aging. Older persons not only live on fixed incomes, but tend to have greater transportational, nutritional, and health care needs. In fact, the most often cited reason for poverty among the elderly is the inadequacy of welfare, social security and other public assistance programs on which they are heavily dependent (McKee and Robertson, 1975:263). The elderly poor have few resources and consequently, little hope of escaping poverty. In this sample, the poor respondents are, on the average, older than the nonpoor respondents (55.7% and 47.5% respectively); however, large standard deviations tend to obscure this difference.

Poverty appears to be more prevalent among farm residents. The present data show that sixty-one percent of the farm residents are below the poverty level as compared to 38.2 percent of the nonfarm families. The mechanization and commercialization of agriculture have greatly decreased the likelihood of farm residents escaping poverty. Further, recent demonstrations by the American Agricultural

Movement (AAM) seem to suggest that farming as a viable occupation or as a route out of poverty is at best, unpromising, hopeless or bleak.

The present study also includes two social status variables, education and occupation, and a fertility variable, number of children. An inverse relationship has been found between these variables and poverty status (Tien, 1961:243; Levitan, 1969:54; Horton and Leslie, 1978:332-333; Bourvier and Lee, 1972:4). Being poor typically means being poorly educated, at best, a semiskilled occupation, and a large number of children. The data in Table 1 reflect this differential in that rural poor persons have an average educational level of about eight years and an average occupational scale value of 24.5, values that are below the levels of the rural nonpoor. The average number of children for the poor and nonpoor sample respondents are 3.8 and 2.4, respectively.

A close examination of 'pockets' of poverty indicates that high underemployment rates are usually responsible for the low average incomes of the poor (Schiller, 1973:37). Persistent, localized subemployment of this kind is generally the consequences of economic and technological changes; for example, the displacement of small farmers and occupational workers by automation. Given this relationship, willingness to travel is included in the analysis to ascertain if the poor in this sample are more or less likely to travel to employment outside of their immediate area than the nonpoor. Table 1 suggest that the poor, on the average, travel shorter distances. The question remains as to the importance of this factor in discriminating

between the poor and nonpoor. Of course, several other factors not addressed in this study such as availability of transportation, cost, etc. could be the key.

In summary, the literature, along with the data in Table 1, suggest that poverty tends to be concentrated among blacks, female heads of household, the elderly, poorly educated, low or semiskilled workers, farm workers, families with large number of children and perhaps, families that are less willing to travel to employment outside of their immediate area. Let us engage in a more rigorous examination of the data.

Discriminant Analysis

A direct discriminant function analysis was performed using eight socio-demographic variables as predictors of membership in two groups, poor and nonpoor.

Of the original 2,580 cases, 870 were dropped from the analysis owing to missing data. Missing data were dispersed over cases and variables, with no evident patterning on the basis of groupings. Again, an evaluation of assumptions outlined earlier revealed no threat to multivariate analysis.

Table 2 shows the standardized and unstandardized discriminant function coefficients, the univariate F-ratios, group centroids, Wilk's Lambda and the canonical correlation coefficient.

(Table 2 about here)

The partial F's indicate that all eight of the variables are statistically significant beyond the .001 level. In other words,

all eight variables discriminate the rural poor from the rural non-poor.

The standardized coefficients, measures of the relative importance of the predictor variables, suggest that education and sex contribute the most to determining scores on the function. Occupation, race, number of children, farm status, willingness to travel, and age follow next in order of importance. Further, education, occupation, and sex contribute at least twice as much to the separation of groups as the remaining five variables.

The values of the group centroids for the nonpoor and poor are respectively, +0.56 and -0.82.[5] These values indicate the direction of the action of the dependent variable as the discriminating variables change with the movement always in the direction of the increase in the centroids. This being the case, the movement of these group centroids is from the poor to nonpoor and therefore; the characteristics of the discriminant function coefficients can be interpreted as the inverse of the signs. In short, the profile of a rural poor head of household is more likely to be poorly educated, female, semi-skilled, a black farm resident who tends to be old, have a large number of children and less willing to travel for employment outside of one's immediate area. Further, Figure 1 graphically illustrates the difference in the group centroids, hence, the separation of groups. The intermingling of groups is low. Relatedly, Wilk's Lambda (0.680) and the canonical correlation (.565) suggest that discriminatory power exists among the eight variables.

(Figure 1 about here)

(Table 3 about here)

Table 3 indicates that the discriminant equeation is able to correctly classify 76.26 percent of the respondents. A comparison of this percentage with one by chance, proportional chance criterion, indicates that the discriminant function correctly classified a significant number of respondents, forty-four percent higher than one would expect to occur by chance (53.0%) and ten percent higher than the accuracy criterion (66.25%).[6]

Finally, another measure of the predictive accuracy of the discriminant function is tau (Klecka, 1980:51). Tau is a proportional reduction in error statistic that serves as a standardized measure of improvement.[7] Based upon the eight discriminating variables, tau is equal to 0.53, a value that means that this classification made 53.0 percent fewer errors than would be expected by random assignment.

DISCUSSION AND CONCLUSION

This research has been undertaken with the aim of testing eight socio-demographic variables as predictors of rural poverty. The results are supportive of previous studies as education, occupation, sex, race, number of children, farm status, age and willingness to travel for employment are found to distinguish the poor from the non-poor. The composite portrayal of a rural poor head of household is a poorly educated, semi-skilled, female, black farm resident with a large number of children. Age and willingness to travel for employ-

ment, however, do not sufficiently contribute (although statistically significant) to the separation of the two groups.

Despite the multi-billion dollar budget of more than ten major programs developed by the War on Poverty, poverty differentials are still discernible. Based on this analysis, solutions to rural poverty in the South revolve chiefly around increases in the educational and occupational levels of the population and increasing opportunities for female head of households. Solutions will be difficult given the present state of the economy, the requirements of the present-day job market, and the Federal government's cutbacks in financial aid to institutions of higher education. The War on Poverty reduced the level of poverty (Horton and Leslie, 1977:326-327), but a concerted action by local, state and Federal agencies in areas of post secondary education, job opportunities and training and reduction of wage disparity between men and women are critically necessary to help rural families raise their level of living above minimum subsistence.

NOTES

2. The most frequently cited cultural explanation for the existence of poverty is the "culture of poverty" thesis advanced by Oscar Lewis. Briefly, he contended that after long periods of deprivation, persons tend to develop a distincitve set of norms, values and roles, development fosters the emergence of a different set of psychological and personality traits (Lewis, 1966).

3. The poverty income threshold levels used in this study were:

FAMILY SIZE	INCOME (Farm)	INCOME (Nonfarm)
1	3250	3790
2	4280	5010
3	5310	6230
4	6340	7450
5	7370	8670
6	8400	9890
OVER 6 MEMBERS ADD:	[13]$1030 per person	$1220 per person

4. The occupational categories were: professional, technical and kindred worker; manager or administrator; sales worker; clerical or kindred; craftsman or foreman; operative involved in manufacturing; transport equipment operative; laborer (except farm); farmer or farm manager; farm laborer or farm foreman; and service worker and private household worker.

5. The group centroids are obtained by averaging the individual discriminant scores for all cases within each group. The farther apart the group centroids are, the more significant the function.

6. The formula for the proportional chance criterion is:

$$C \text{ proportional} = p^2 + (1-p)^2$$

Where:

p = the proportion of individuals in group one and;
$1-p$ = the proportion of individuals in group two.

Therefore:

$$(.6139)^2 + (1 - .6139)^2 = 53.00\%$$

The classification accuracy should be, as a convention, 25 percent greater than by chance; therefore, $\dfrac{.7625 - .5300}{.5300} = 66.25$

7. Tau has the following mathematical form:

$$tau = \dfrac{n_c - \sum_{i=1}^{g} P_1 n_1}{n. \quad \sum_{i-1}^{g} P_1 n_1}$$

Where:

n_c = the number of cases correctly classified;
P_1 = the prior probability of group membership;
n_i = the number of groups; and
$n.$ = the total number of cases.

The prior probability of group membership is 0.50; therefore,

$$tau = \dfrac{636 - [(.50 \times 512) + (.50 \times 322)]}{834 - [(.50 \times 512) + (.50 \times 322)]}$$

REFERENCES

Allen, Vernon L.
      1970 "Theoretical Issues in Poverty Research," Journal of
      Social Issues, 26:149-167.

Bould, Sally
      1977 "Rural Poverty and Economic Development: Lessons from
      the War on Poverty," Journal of Applied Behavioral Science, Vol.
      13, No. 4 (Oct.-Dec.), pp. 471-488.

Bouvier, Leon and Everett S. Lee
      1972 The Bearing of Children, The Center for Information on
      America.

Carlin, Thomas A., Robert A. Hoppe, Linda M. Ghelfi and Janet W. Goffin
      1979 Aspects of Welfare and Poverty in Rural America: Two
      Brief Issues. Economic Development Division, Economics, Statis-
      tics, and Cooperatives Service, U.S. Department of Agriculture,
      Washington, D. C.

Chadwick, Bruce A. and Howard M. Bahr
      1973 "Rural Poverty." Pp. 182-195 in Thomas R. Ford (ed.)
      Rural U.S.A.: Persistence and Change. Ames, Iowa: Iowa State
      University Press.

Cho, Woong K.
      1982 Socio-Economics and Psychological Attributes of Rural Poverty
      in Mississippi. Research Bulletin Number 17, Alcorn State
      University.

Daft, Lynn M.
      1980 "The Rural Poverty Commission: Ten Years Later," Rural
      Development Perspectives, (March), pp. 4-6.

Gans, Herbert J.
      1972 "The Positive Functions of Poverty," American Journal of
      Sociology, Vol. 78, pp. 275-289.

Gilbert, Ethel S.
      1969 "The Effect of Unequal Variance-Covariance Matrices on
      Fisher's Linear Discriminant Function," Biometrics 25:505-516.

Grinstead, Mary Jo and Sandra Scholtz
      1976 "Poverty, Race and Culture in a Rural Arkansas Community,"
      Human Organization, Vol. 35, No. 1 (September), pp. 33-44.

Hair, Joseph F., Jr., Ralph E. Anderson, Ronald L. Tatum, and Bernie
J. Grablowsky
      1979 Multivariate Data Analysis. Tulsa, Oklahoma: Petroleum
      Publishing Company.

Hauser, Robert M. and David L. Featherman
    1977 The Process of Stratification: Trends and Analyses. New
    York: Academic Press, Inc.

Hollings, Ernest F.
    1973 "The Rural Poor," Current History, Vol. 64, pp. 258-273.

Holman, Robert
    1974 "The American Poverty Programme," Journal of Social Policy,
    Vol. 3, No. 1 (January), pp. 21-38.

Hoppe, Bob
    1980 "Despite Progress, Rural Poverty Demands Attention," Rural
    Development Perspectives, (March), pp. 7-11.

Horton, Paul B. and Gerald R. Leslie
    1978 The Sociology of Social Problems. Englewood Cliffs, New
    Jersey: Prentice-Hall, Inc.

Klecka, William R.
    1975 "Discriminant Analysis," in SPSS: Statistical Package
    for the Social Sciences, Nie, Norman H. et al. New York: McGraw
    Hill, pp. 434-467.

Lachenbruch, Peter A.
    1975 Discriminant Analysis. New York: Hafner Press.

Lewis, Oscar
    1966 "The Culture of Poverty." Scientific American 215:19-25.

Miller, S. M.
    1970 "Poverty Research in the Seventies." Journal of Social
    Issues 26:169-173.

McKee, Michael and Ian Robertson
    1975 Social Problems. New York: Random House, Inc.

Osmond, Marie W. and Charles M. Grigg
    1973 "Correlates of Poverty: The Interaction of Individual
    and Family Characteristics," Social Forces, Vol. 56, No. 4 (June),
    pp. 1099-1120.

Rogers, Tommy W.
    1977 "Extent and Distribution of Poverty in Mississippi," The
    Mississippi Geographer, Vol. 5, No. 1 (Spring), pp. 11-23.

Schiller, Bradley R.
    1973 The Economics of Poverty and Discrimination. Englewood
    Cliffs, N.J.: Prentice-Hall, Inc.

Tabachnick, Barbara G. and Linda S. Fidell
    1983 Using Multivariate Statistics. New York: Harper and Row,
    Publishers, Inc.

92

Tien, H. Yuan
   1961 "The Social Mobility Fertility Hypothesis Reconsidered:
   An Empirical Study," American Sociological Review, Vol. 26,
   pp. 159-166.

Wheelock, Gerald C., Randall P. White and Robert L. Phillips
   1982 "Sample Design and Multilevel Objectives: Ten Southern
   State Household Survey in Low Income, Rural Counties," paper
   presented at the Rural Sociological Society, San Francisco,
   California.

Table 1

PREDICTOR VARIABLES BY POVERTY STATUS

Variables	Poverty Status Poor	Nonpoor
RACE:		
Black	61.3	38.7
White	31.1	68.9
SEX:		
Male	32.7	67.4
Female	61.4	38.6
FARM STATUS:		
Farm	61.0	39.0
Nonfarm	38.2	61.8
OCCUPATION[1]	24.5* (14.7)	39.8* (23.3)
AGE[1]	55.7* (18.7)	47.5* (16.5)
EDUCATION[1]	7.8* (3.4)	11.2* (3.5)
NUMBER OF CHILDREN[1]	3.8* (3.1)	2.5* (2.1)
WILLINGNESS TO TRAVEL[2] (Miles)	17.4** (8.4)	23.4** (12.6)

[1]The starred value is the mean and the parenthesized value is the standard deviation.

[2]The double-starred value is the median and the parenthesized value is the quartile deviation.

Table 2

DIRECT DISCRIMINANT ANALYSIS

POVERTY STATUS

VARIABLES	STANDARDIZED COEFFICIENTS	UNSTANDARDIZED COEFFICIENTS	PARTIAL F
SEX	- .46	-1.06	61.32*
RACE	.24	.52	78.32*
EDUCATION	.49	.14	194.60*
OCCUPATION	.31	.02	124.50*
FARM/NONFARM	.19	.53	35.56*
NUMBER OF CHILDREN	- .18	- .08	60.78*
WILLINGNESS TO TRAVEL	.16	.07	45.94*
AGE	.03	.01	42.08*
CONSTANT		-2.59	

GROUP CENTROIDS

NONPOOR	.56
POOR	- .82

SUMMARY STATISTICS

CANONICAL CORRELATION	WILK'S LAMBDA	DF	SIGNIFICANCE OF LAMBDA
.565	.680	8	.000

*Statistically significant at the .001 level.

Figure 1

All-Groups Stacked Histogram

== Canonical Discriminant Function 1 ==
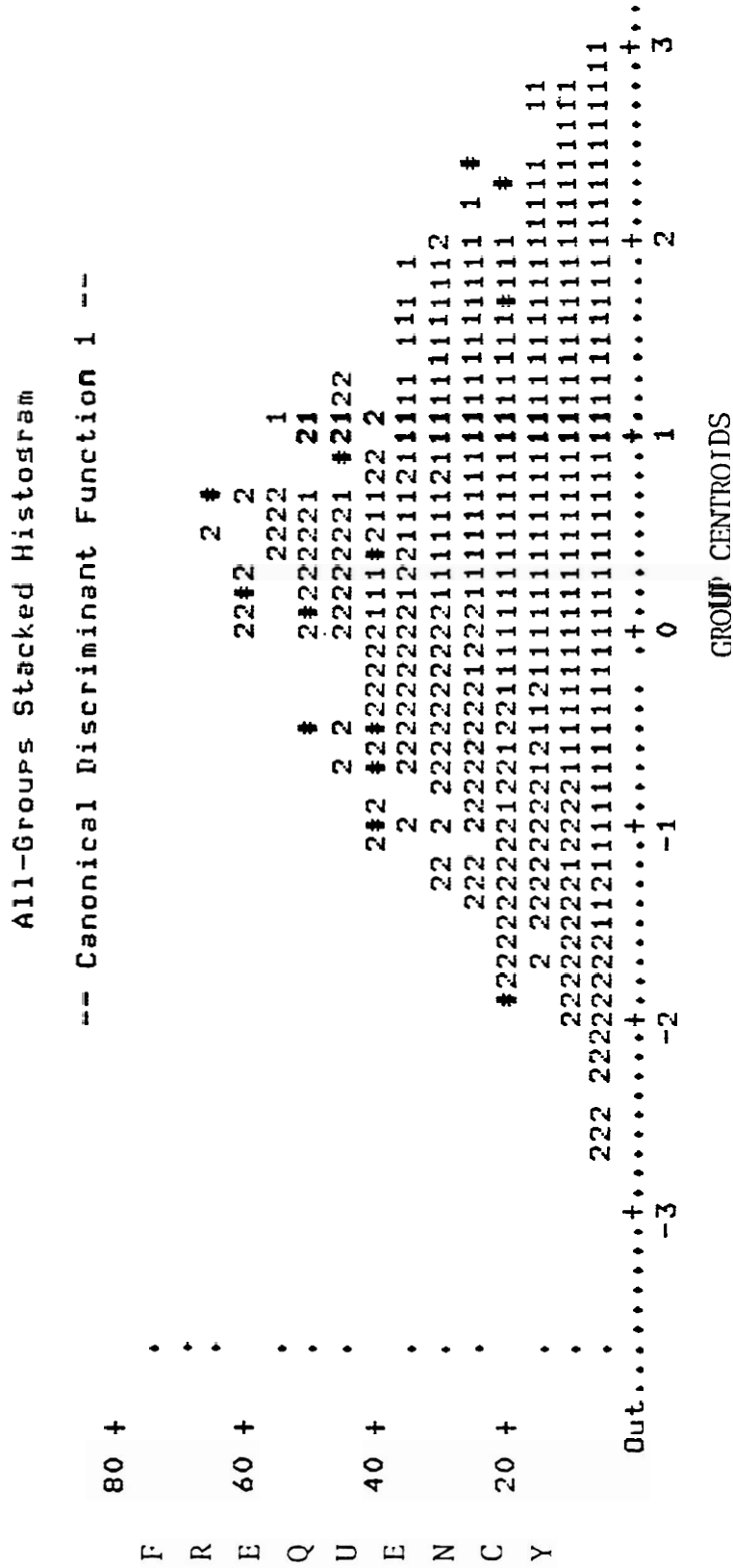
Distribution of Rural Heads of Household along the Discriminant Function

1. Nonpoor respondents
2. Poor respondents
3. Ungrouped cases

Table 3

CLASSIFICATION RESULTS OF DISCRIMINANT EQUATION

| | | | PREDICTED MEMBERSHIP | |
ACTUAL GROUP	NO. OF CASES	PERCENT	NONPOOR	POOR
Nonpoor	512	61.39	396 77.3%	116 22.7%
Poor	322	38.60	82 25.5%	240 74.5%

Percent of "grouped" cases correctly classified = 76.26% (66.25)*

*Classification accuracy criteria = C proportional x 25% + C proportional

C proportional = 53.00%
Classification accuracy criteria = 66.25%
Proportional reduction in error statistic = 52.5%