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A Short Scale For Measuring Farm Family Level of Living:

A Modification Of Sewell's Socio-Economic Scale

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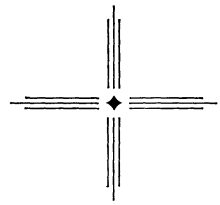

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
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A Tool For Research . . .

This bulletin presents an instrument, or tool, for measuring the level of living of farm families in Oklahoma. Its construction provides a modification of the original Sewell Socio-Economic Scale, which was developed at Oklahoma A. & M. College and used in many rural sociologists' studies throughout the nation.

Tools of some sort are needed for practically all of man's endeavors. It is particularly necessary to have accurate, sensitive instruments with which to work in the area of scientific research.

In the natural sciences, many needed tools—including microscopes, thermometers, and X-ray machines—have been developed to a high degree of perfectibility.

In the more recently developed social sciences, such perfection is more difficult to achieve, but forward strides are continually being made. Among the more widely used of the tools constructed by the social scientists are the "I. Q." (intelligence quotient) tests of the psychologists and the price indices of the economists. Others, such as that presented in this bulletin, are needed for research purposes.

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By JOHN C. BELCHER AND EMMIT F. SHARP
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The Problem

Differentiations among levels of socio-economic status and levels of living within a population form a significant part of sociological research. The ability to identify and measure such differences is important not only for studies dealing directly with socio-economic status or level of living, but also for statistical control in analyses of other types of sociological data.

William H. Sewell constructed the only two widely used standardized multiple-factor scales designed for farm families. The first, a farm family socio-economic status scale, appeared in 1940.[1] The second, a short form of the first, came out in 1943.[2] Useful as these are, they possess certain limitations. This points to possible advantages through the application of new approaches and techniques to the problem of scale construction and validation.[3]

In presenting his first scale, Sewell indicated one such limitation. "A scale, such as the present one, based entirely on cultural traits of one type or another, must of necessity be revised from time to time

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[1] William H. Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families,* Stillwater: Okla. Agri. Exp. Sta. Tech. Bul. 9, 1940.

[2] William H. Sewell, "A Short Form of the Farm Family Socio-Economic Status Scale," *Rural Sociology,* 8 (June, 1943), 161-169.

[3] Genevieve Knupfer and Robert K. Merton, "Discussion," *Rural Sociology,* 8 (June, 1943) 169-170.

to compensate for changes in the rural culture."[4] Such a revision for an Oklahoma population has recently been made.[5] It showed that eight of the 36 items on Sewell's original scale no longer possessed the differentiating ability required for inclusion on the scale. Five of the eight discarded items being included on the 14-item short form of the Sewell scale, its validity, too, is questionable, indicating the need for a new short scale. Undoubtedly, a valid and reliable short scale is of much greater utility than one longer and more cumbersome. This study concerns primarily the construction of a new short scale.

Before proceeding to construct a new short scale, it was expedient to investigate certain problem areas mentioned in Sewell's monograph:

"A further problem of practical and technical importance is to determine whether the items of the scale measure a single common factor. . .

"Another problem of considerable importance will be to develop a more adequate system of weights for the scale items. Recently, techniques have been developed for weighting items according to the extent to which they measure a common factor."[6]

The terms "socio-economic status," "level of living" and "plane of living" are often used loosely and interchangeably. Socio-economic status, in its most definitive use, differs from the plane or level of living in being more inclusive. Sewell, in the construction of his scale, used F. Stuart Chapin's definition of socio-economic status which is, " . . . the position that an individual or family occupies with reference to the prevailing average standards of cultural possessions, effective income, material possessions and participation in the group activities of the community."[7]

Magnus and Cottam define level of living as including the first three of Sewell-Chapin components, but not social participation.[8] Hagood and Ducoff define level of living as " . . . the level of current consumption or utilization of goods and services, with services being broadly interpreted to include both publicly-furnished and privately-secured services which contribute to well-being or provide satisfactions."[9] This definition is essentially in agreement with Mangus and Cottam's usage. For its own purposes, this study differentiates between socio-economic status and plane or level of living in accordance with the above definitions. It defines level of living to include cultural possessions, effective income, and material possessions; and defines socio-economic status as including these components plus a fourth, social participation.

Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families,* p. 54.

John C. Belcher, "Evaluation and Restandardization of Sewell's Socio-Economic Scale," *Rural Sociology,* 16 (September, 1951), pp. 246-255.

Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families,* pp. 53-54.

F. Stuart Chapin, *Measurement of Social Status,* Minneapolis: University of Minnesota Press, 1933, p. 3.

A. R. Mangus and Howard R. Cottam, *Level of Living, Social Participation, and Adjustment of Ohio Farm People,* Columbus: Ohio A.E.S. Bul. 624, 1941, p. 9.

Margaret Jarmon Hagood and Louis J. Ducoff, "What Level of Living Indexes Measure," *American Sociological Review,* 9, (February, 1940), p. 78.

Sewell, however, uses no measure of effective income in his scale; he assumes that other items in the scale adequately measure this component. Significantly, his monograph states that "preliminary results indicate that the social participation items may be dropped without any sacrifice insofar as the present Oklahoma sample is concerned."[10] Apparently, then, the Sewell scale is more correctly, a measure of level of living than of socio-economic status, especially if a revised scale lacking the social participation items were developed. It would be necessary, of course, to consider relabeling the scale if it were determined that it measures more than a single common component.

Purpose

The purposes of the present study were:

(1) To construct a new short scale for the measurement of the factor Sewell designated as "socio-economic status" for the open-country families in Oklahoma;

(2) To test empirically, in the construction of the scale, the presence of a single factor of socio-economic status assumed in previous scales;

(3) If necessary, to redefine what the scale is measuring; and

(4) To explore the possibility of developing more adequate item weights.

Review of the Original Sewell and Related Studies

The primary index used for the measurement of farm family socio-economic status was published by Sewell in 1940.[11] As has been noted, Sewell adopted Chapin's definition of socio-economic status[12]. Chapin's and other scales standardized for urban areas were of considerable importance to Sewell in the development of his scale.[13]

Starting with more than 200 items thought to be indicative of socio-economic status, Sewell eliminated all items which were ill-defined, confusing, or peculiar to a particular regional area. The 123 remaining items were classed by the four components of socio-economic status as defined by Chapin. These items were included on a schedule and administered to farm families in three selected counties of Oklahoma. From this survey, 800 schedules, representing unbroken, white families, were selected for use in the construction of the scale.

The next step was to assign arbitrary scores of *one* for possession and *zero* for non-possession to each of the 123 items. By this procedure,

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[10] Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families*, p. 53.

[11] A criticism of the basic theories and premises involved in the construction of this and similar scales is found in Genevieve Knupfer, *Indices of Socio-Economic Status; A Study of Some Problems of Measurement*, (Unpublished Ph.D dissertation) New York: Columbia University Library, 1946.

[12] Chapin, "A Quantitative Scale for Rating the Home and Social Environment of Middle Class Families in an Urban Community" *Journal of Education Psychology*, 19 (1928), pp. 99-111.

[13] Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families*, pp. 7-19.

total scores were obtained for each schedule. The 800 schedules were then arranged in quartiles and percentage occurrence computed for the separate items in each of the quartiles. Items showing significant differences (critical ratios of two or more) between all consecutive quartiles and between extreme quartiles were considered to have sufficient differentiating capacity for inclusion in the scale. Forty-one items were found to meet this standard. Five were later eliminated because of problems encountered in definition, or in obtaining reliable responses. Of the 36 remaining items, 15 were from the group which had been classified as material possessions, 13 from the cultural possessions group, and eight from the social participation group. The component of effective income was eliminated from the final scale because of difficulty in obtaining accurate responses to the only item in this category.

Sewell's next problem was to select a technique for weighting items retained in the scale. The sigma technique was used for this purpose. The use of this method postulates that the importance of items as determinants of status is in inverse ratio to their frequency of occurrence. Weights were computed by this technique for both possession and non-possession of each item, with the sum of item weights constituting the socio-economic status rating for a family. Extensive tests indicated the scale to be valid and reliable measure of the socio-economic status of families in the Oklahoma population.

In 1943, Sewell published a short scale. It consisted of 14 items from the original scale which field experience had shown to be easiest to enumerate. [14] He reanalyzed the scale for sample groups from Kansas, Louisiana, and Oklahoma, using the techniques established in the construction of the original scale. He combined these items proved to be valid differentiators of socio-economic status into a scale for further testing. Although the short scale resulted in a sacrifice of reliability, Sewell found it adequate and useful for studies where use of the longer scale seemed inadvisable.

As has been brought out, Belcher revised the original scale in the spring of 1950 at the Oklahoma Agricultural Experiment Station.[15] A correlation of .986 between scores from the original and revised scales indicated that, while certain items had suffered a loss in differentiating capacity, the original scale as a whole had suffered no significant loss of validity insofar as the Oklahoma sample was concerned.

Methodology

SOURCE AND NATURE OF DATA FOR THE PRESENT STUDY

In the spring and summer of 1947, Robert T. McMillan conducted a survey of 825 open-country families in four selected counties of Oklahoma with sampling procedure designed to reflect information for the

[14] William H. Sewell, "A Short Form of the Farm Family Socio-Economic Status Scale," *op. cit.*, 161-169.

[15] John C. Belcher, *op. cit.*

open-country population of the state as a whole.[16] These data provide the essential material for the present study as well as the study by Belcher previously cited.

In evaluating the applicability of McMillan's sample for use in the present study, criteria previously established by Sewell have been accepted.[17] The requirements set for the selection of the test population in Sewell's work were: (1) " . . . it should be representative of the state as a whole in as many characteristics as possible" and (2) " . . .it should contain within its boundaries as many levels of socio-economic status as possible . . ." Regarding the first of these requirements, comparisons were made of data from McMillan's sample and from the 1945 Census of Agriculture.[18] The two sources were compared for distribution of farm operators by tenure, distribution of farm operators by age classifications, and proportions of farms at varying distances from all-weather roads. Close relationships prevailed when census data for McMillan's four sample counties and census data for the state as a whole were checked against data from McMillan's sample. This agreement indicates that the sample probably is closely representative of both the combined rural-farm populations of the four counties and the total rural-farm population of the state.

Since level of living is known to be closely associated with socio-economic status, Hagood's 1945 county level of living index was used in testing the extent to which the sample conforms to the second requirement.[19] When counties of the state were arranged in quartiles on the basis of this index, one of the sample counties fell in each of the four quartiles. This premises that the sample includes the total range of socio-economic status levels within the state and that it distinguishes them as quartile test groups should do.

Since the present scale is to be standardized for unbroken white families, 165 schedules in McMillan's data for families not meeting these requirements were eliminated. The responses of the remaining 660 families in the sample to the 29 items included in Belcher's revised scale constitute the data for the present study.

In addition to the question of sample adequacy in the present use of McMillan's data, another may rise concerning the reliability of schedule responses to the socio-economic status scale questions. The nature of the scale response is such as to make accurate responses readily obtainable and permit *a priori* confidence in these data.

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[16] The counties selected were Pittsburg, Mayes, Comanche, and Blaine. Three of these, Pittsburg, Comanche, and Blaine, are adjacent to Haskell, Cotton, and Craig counties, respectively—the counties used by Sewell (*The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families*, pp. 22-23) in the construction of his scale. The fourth county, Mayes, lies adjacent to Craig county from which Sewell (*Ibid.*, p. 47) obtained his standardization sample.

[17] *Ibid.*, p. 22.

[18] These data were computed in the previously cited Belcher study. *Op. cit.*, p. 2.

[19] Margaret Jarman Hagood, *Farm Operator Family Level of Living Indexes for Counties of the United States*, 1940 and 1945, Washington: United States Department of Agriculture, Bureau of Agricultural Economics, 1947.

PROCEDURE

The present problem demands the combining and weighting of a set of variables to determine if they measure a single, common factor, i. e., socio-economic status. The lack of such a direct measure of this dependent variable precludes the use of common, multiple, or partial correlation, but factor analysis provides the necessary technique.

Factor analysis, like all statistical procedures, is concerned with the simplification of data. It is a technique for analysis of intercorrelations of the other variables with the essential information being retained in a set of categories of "factors" which are fewer in number than the original variables. The foundation for the technique is the premise that a set of factors can be extracted, each common to one or more variables, which can be used to interpret the intercorrelations of the variables. Factor loadings are computed for items on each factor extracted. The square of a factor loading is approximately equal to the proportion of the variance of a variable accounted for by that common factor.[20]

A factor, then, is a result of any cause or group of causes which will produce a systematic set of intercorrelations among a group of variables. In the present problem, a group of variables shown through internal consistency techniques to be associated with what Sewell called socio-economic status is to be analyzed. The hypothesis is that a single statistical factor will account for the correlations of these variables. Factor analysis provides a test of the hypothesis that the Sewell scale measures a single factor. In addition, it is possible to use factor analysis as a criterion for the selection of items measuring a common factor that are to be retained in a short scale.

WEIGHTING CONSIDERATIONS

The present study weights the items retained in the short scale on the basis of their association with the common factor as indicated by their factor loadings. Subsequently, it compares these weights with those obtained through other procedures.[21]

Does the Sewell Scale Measure a Single Common Factor?

The first phase of this study was to determine whether the Sewell scale measures a single common factor which can logically be called

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[20] A treatment of the major methods of factor analysis may be found in Dael Wolfle, *Factor Analysis to 1940*, Chicago: University of Chicago Press, 1940, and Karl J. Holzinger and Harry H. Harman, *Factor Analysis*, Chicago: University of Chicago Press, 1941.

[21] For a discussion of the assumptions implicit in the weighting of scale items, see Walter C. McKain, Jr., "The Concept of Plane of Living and the Construction of a Plane of Living Index," *Rural Sociology*, 4 (September, 1949), pp. 337-343.

socio-economic status.[22] This was done by making a factor analysis of the Belcher revision of the Sewell scale. This study uses the revised scale because it has 29, whereas the original scale has 36 items. Since the scales are essentially the same, the results will be relevant to both, but the time involved in making the factor analysis for 29 items is much less than for a 36-item scale.

CORRELATION OF ITEMS

A matrix of intercorrelations of the items to be analyzed provides the basic data for factor analysis. Thus the first phase of the present analysis was to compute intercorrelations for the 29 items of the revised scale. The first step in this procedure was to cross-tabulate all possible pairings of the items in two-by-two frequency tables for correlation.[23] A question arose at this point as to which of the available techniques to use for the estimation of correlation from such tables. Considering the assumptions underlying the use of each of the various techniques, tetrachoric r, or r_t, is the technique most nearly valid for use with the present data.[24]

The use of this technique assumes that the total frequency is large, that variables being correlated are continuously distributed, that they are normally distributed, and that the relationship between them is linear.

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[22] A preliminary analysis by Sewell indicated that the items do measure a single, common factor. The results of his investigation are dubious because: (1) He did not do his tabulations for items but for indexes of classes of items: material possessions, social participation, etc.; and (2) His classification procedure might account for the common factor running through the indexes of the scale. See Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families,* Appendix F, p. 84.

[23] To facilitate the correlation process and produce comparable coefficients, the multiple-response items were tabulated as dichotomous variables. The point of division of these items was identical with that used by Sewell, *Ibid.,* Appendix A, pp. 62-66, in the construction of his original scale.

[24] The rationale for the selection of rt may be summed up in a brief discussion of the nature of the variables to be correlated, in connection with the assumptions required for the use of other techniques. It is assumed that the yes-no or possession-non-possession response categories for the items represent arbitrary classifications rather than true dichotomies. It is hardly probable that all yes and all no responses to an item represent equal degrees of attainment with reference to that item. In other words, it is postulated that, if each of the variables were classified according to some independent index of quality, a continuous uni-modal distribution would result.

Since both fourfold r and Yule's Q are designed for the correlation of variables, which are characterized by true dichotomies or point distributions, the use of either of these techniques in the present problem cannot be justified. Both biserial r and point biserial r are designed for situations in which one of the variables is dichotomized and the other continuously measureable. Point biserial r is further limited for use with the present data in that it is designed for use in cases where the dichotomized variable is characterized by a true dichotomy. While it is possible to modify these techniques for use with two dichotomized variables, such a procedure would be questionable.

The remaining techniques which were considered are tetrachoric r and the coefficient of contingency. Because of inaccuracy of the coefficient of contingency when used with small tables, rt appeared to be the preferable technique. The degree to which the present data conform to assumptions required for the use of this technique is treated in the text of this chapter.

For detailed discussions of the above techniques, see J. P. Guilford, *Fundamental Statistics in Psychology and Education,* (second edition) New York: McGraw-Hill Book company, Inc., 1950, pp. 328-345; Margaret Jarman Hagood, *Statistics for Sociologists,* New York: Henry Holt and company, 1941, pp. 495-519; Truman Lee Kelly, *Fundamentals of Statistics,* Cambridge: Harvard University Press, 1947, pp. 379-388; Thomas Carson McCormick, *Elementary Social Statistics,* New York: McGraw-Hill Book company, Inc., 1941, pp. 208-217; and Charles C. Peters and Walter R. Van Voorhis, *Statistical Procedures and their Mathematical Bases,* New York: McGraw-Hill Book company, Inc., 1940, pp. 362-393.

Under the assumed conditions, r_t is numerically equivalent to the Pearson product-moment coefficient and may be regarded as an approximation of it. Of course, reservations must be made in the interpretation of the coefficients, if the above assumptions cannot be justified.

An examination of the present data will reveal the extent to which it conforms to the above requirements. The requirement of a large total frequency is met. As pointed out (footnote 24), what is known of the data implies a continuous uni-modal distribution. One may further rationalize that, for a relatively homogeneous farm population, such a distribution would approach normality. Although knowledge of the nature of the variables is insufficient to justify an assumption of linear relationships, this assumption may be disposed of with little risk. [25]

The computation of the tetrachoric coefficient by formula is a long and arduous process. Fortunately a set of diagrams is available from which coefficients with two-place accuracy may be taken.[26] These diagrams were used in arriving at the coefficients for the present study. A matrix of the intercorrelations of the variables is presented in Table 1 (see center insert).

EXTRACTION OF THE FIRST COMMON FACTOR

The second phase of the analysis was the extraction of the first common factor from the matrix of intercorrelations. The Hotelling component analysis technique was selected because a rather clear-cut rationale has been developed for its use as a weighting device for similar indexes.[27] Also, a simple exposition of the computational procedure for this technique is available.[28]

The computation procedure may be explained rather briefly. The largest entry in each column of the intercorrelation matrix is placed in the corresponding blank diagonal cell. The columns are then summed and the resulting column sums divided by the largest column sum to obtain preliminary weights. These weights are multiplied by the entries in corresponding rows of the matrix to form a new matrix. Another set of preliminary weights are computed from the second matrix by the same procedure as described above. These weights are, in turn, multiplied by entries in the corresponding rows of the original matrix to form a third matrix. This process is repeated until weights

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[25] This assumption is implied in the use of any linear correlation technique. Because of the difficulty of computing curvilinear coefficients, linear techniques are often employed when data is known to be characterized by curvilinear relationships. See McCormick, *op. cit.*, p. 214.

[26] L. Chesire, M. Saffir and L. L. Thurstone, *Computing Diagrams for the Tetrachoric Correlation Coefficient*, Chicago: The University of Chicago Press, 1933.

[27] A number of studies employing this technique has been made. See S. S. Wilks, "Weighting Systems for Linear Functions of Correlated Variables When There Is No Independent Variable," Psychometrika, 3 (March, 1933), pp. 23-43; and Robert J. Wherry, "An Approximation Method for Obtaining a Maximized Multiple Criterion," Psychometrika, 5 (June, 1940), pp. 109-115, in technical treatments of weighting devices, have recommended it as the most accurate of the various techniques.

[28] Margaret Jarman Hagood, Nadia Danilevsky, and Corlin O. Beum, "An Examination of the Use of Factor Analysis in the Problem of Subregional Delineation," *Rural Sociology*, 6 (September, 1951), pp. 216-233.

TABLES 1, 3, and 5

Descriptions of the 29 items in Tables 1, 3, and 5.

1. Construction of house.
2. Room: person ratio.
3. Separate dining room.
4. Separate kitchen.
5. Separate living room.
6. Living room floors finished.
7. Living room woodwork finished.
8. Living room wall construction.
9. Living room walls decorated.
10. Living room lounge.
11. Lighting facilities.
12. Water piped into house.
13. Kitchen sink.
14. Linoleum on kitchen floor.
15. Power washer.
16. Refrigerator.
17. Deep-freeze unit or town locker.
18. Furniture insured.
19. Family takes daily newspaper.
20. Number of magazines taken regularly.
21. Approximate number of books in home.
22. Husband's life insured.
23. Husband attends church.
24. Husband a church member.
25. Husband attends Sunday School.
26. Husband a member of a farm cooperative.
27. Wife a church member.
28. Wife attends church.
29. Wife attends Sunday School.

Table 1. --- Intercorrelations of the Twenty-nine Items of the Revised Scale.

ITEM NO. *	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1.	.83	.53	.67	.67	.61	.83	.82	.60	.64	.65	.64	.73	.68	.46	.50	.50	.55	.65	.36	.43	.44	.47	.32	.27	.30	.62	.34	.34	.32
2.	.53	.73	.63	.64	.73	.59	.50	.34	.41	.64	.43	.48	.44	.37	.27	.39	.45	.36	.29	.24	.16	.13	.14	.21	.14	.39	.18	.08	.07
3.	.67	.63	.99	.99	.75	.64	.63	.53	.46	.61	.55	.64	.59	.35	.43	.37	.47	.50	.33	.30	.34	.37	.35	.32	.33	.45	.35	.31	.35
4.	.67	.64	.99	.99	.70	.63	.60	.55	.46	.61	.57	.60	.59	.33	.34	.37	.46	.53	.33	.33	.33	.36	.28	.34	.30	.47	.33	.28	.32
5.	.61	.73	.75	.70	.94	.66	.66	.50	.50	.94	.55	.67	.67	.52	.55	.54	.51	.50	.43	.42	.35	.38	.23	.29	.22	.53	.22	.23	.20
6.	.83	.59	.64	.63	.66	.90	.90	.64	.64	.73	.73	.72	.73	.54	.55	.60	.50	.60	.34	.37	.38	.51	.23	.28	.24	.63	.32	.26	.23
7.	.82	.50	.63	.60	.66	.90	.90	.68	.77	.69	.61	.71	.72	.67	.62	.59	.60	.53	.42	.51	.43	.48	.25	.27	.22	.62	.20	.22	.17
8.	.60	.34	.53	.55	.50	.64	.68	.68	.63	.60	.55	.60	.67	.56	.57	.49	.58	.51	.26	.38	.47	.37	.25	.24	.20	.50	.23	.23	.19
9.	.64	.41	.46	.46	.50	.64	.77	.63	.77	.54	.47	.63	.59	.68	.46	.48	.50	.49	.26	.40	.42	.43	.21	.15	.20	.54	.19	.15	.18
10.	.65	.64	.61	.61	.94	.73	.69	.60	.54	.94	.65	.64	.65	.55	.61	.60	.55	.56	.42	.40	.42	.36	.29	.37	.30	.61	.30	.26	.25
11.	.64	.43	.55	.57	.55	.73	.61	.55	.47	.65	.90	.80	.73	.31	.53	.51	.55	.61	.43	.44	.43	.42	.45	.24	.42	.90	.29	.44	.41
12.	.73	.48	.64	.60	.67	.72	.71	.60	.63	.64	.80	.96	.96	.65	.64	.82	.57	.61	.42	.52	.45	.55	.30	.22	.20	.68	.27	.27	.22
13.	.68	.44	.59	.59	.67	.73	.72	.67	.59	.65	.73	.96	.96	.57	.68	.66	.55	.62	.46	.52	.53	.54	.28	.27	.20	.63	.27	.23	.23
14.	.46	.37	.35	.33	.52	.54	.67	.56	.68	.55	.31	.65	.57	.68	.47	.60	.50	.37	.38	.34	.33	.37	.14	.13	.14	.40	.22	.14	.12
15.	.50	.27	.43	.34	.55	.55	.62	.57	.46	.61	.53	.64	.68	.47	.68	.55	.64	.48	.36	.45	.41	.48	.26	.30	.24	.51	.24	.24	.22
16.	.50	.39	.37	.37	.54	.60	.59	.49	.48	.60	.51	.82	.66	.60	.55	.82	.69	.57	.42	.37	.43	.47	.33	.37	.30	.60	.30	.38	.35
17.	.55	.45	.47	.46	.51	.50	.60	.58	.50	.55	.55	.57	.55	.50	.64	.69	.69	.38	.40	.54	.48	.56	.27	.33	.15	.56	.23	.31	.21
18.	.65	.36	.50	.53	.50	.60	.53	.51	.49	.56	.61	.61	.62	.37	.48	.57	.38	.65	.43	.45	.37	.47	.39	.41	.34	.54	.37	.30	.24
19.	.36	.29	.33	.33	.43	.34	.42	.26	.26	.42	.43	.42	.46	.38	.36	.42	.40	.43	.48	.48	.43	.34	.18	.27	.19	.50	.25	.20	.22
20.	.43	.24	.30	.33	.42	.37	.51	.38	.40	.40	.44	.52	.52	.34	.45	.37	.54	.45	.48	.51	.45	.41	.21	.25	.21	.43	.28	.24	.25
21.	.44	.16	.34	.33	.35	.38	.43	.47	.42	.42	.43	.45	.53	.33	.41	.43	.48	.37	.43	.45	.53	.46	.28	.16	.25	.45	.23	.30	.29
22.	.47	.13	.37	.36	.38	.51	.48	.37	.43	.36	.42	.55	.54	.37	.48	.47	.56	.47	.34	.41	.46	.56	.22	.27	.22	.46	.25	.16	.18
23.	.32	.14	.35	.28	.23	.23	.25	.25	.21	.29	.45	.30	.28	.14	.26	.33	.27	.39	.18	.24	.28	.22	.97	.75	.97	.28	.64	.98	.86
24.	.27	.21	.32	.34	.29	.28	.27	.24	.15	.37	.24	.22	.27	.13	.30	.37	.33	.41	.27	.25	.16	.27	.75	.88	.73	.30	.88	.63	.59
25.	.30	.14	.33	.30	.22	.24	.22	.20	.20	.30	.42	.20	.20	.14	.24	.30	.15	.34	.19	.21	.25	.22	.97	.73	.98	.25	.69	.95	.98
26.	.62	.39	.45	.47	.53	.63	.62	.50	.54	.61	.90	.68	.63	.40	.51	.60	.56	.54	.50	.43	.45	.46	.28	.30	.25	.90	.27	.25	.25
27.	.34	.18	.35	.33	.22	.32	.20	.23	.19	.30	.29	.27	.27	.22	.24	.30	.23	.37	.25	.28	.23	.25	.64	.88	.69	.27	.88	.74	.73
28.	.34	.08	.31	.28	.23	.26	.22	.23	.15	.26	.44	.27	.23	.14	.24	.38	.31	.30	.20	.24	.30	.16	.98	.63	.95	.25	.74	.98	.97
29.	.32	.07	.35	.32	.20	.23	.17	.19	.18	.25	.41	.22	.23	.12	.22	.35	.21	.24	.22	.25	.29	.18	.86	.59	.98	.25	.73	.97	.98

* See Page 2 of insert for descriptions of items corresponding to these numbers.

Table 3. -- Residuals of Observed Correlations After the Correlation Accounted for by the First Common Factor had been Subtracted.

ITEM NO. *	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1.	.156	.054	.049	.061	-.034	.143	.130	.016	.070	-.022	-.019	.017	-.017	-.051	-.065	-.109	-.030	.069	-.069	-.037	-.018	-.005	-.108	-.138	-.103	.001	.065	-.074	-.073
2.	.054	.394	.192	.210	.275	.105	.013	-.072	.007	.165	-.036	-.023	-.052	.009	-.129	-.040	.040	-.051	-.013	-.090	-.164	-.206	-.162	-.078	-.145	-.047	-.106	-.212	-.208
3.	.049	.192	.418	.429	.157	.007	-.005	-.008	-.065	-.009	-.057	-.016	-.052	-.120	-.090	-.191	-.064	-.035	-.065	-.130	-.082	-.068	-.044	-.056	-.041	-.120	-.023	-.071	-.012
4.	.061	.210	.429	.439	.118	.009	-.023	.022	-.055	.002	-.026	-.044	-.040	-.132	-.170	-.181	-.065	.005	-.057	-.092	-.084	-.070	-.107	-.029	-.064	-.089	-.036	-.094	-.035
5.	-.034	.275	.157	.118	.324	.003	.001	-.058	-.045	.297	-.080	-.011	.004	.032	.010	-.042	-.045	-.056	.020	-.027	-.088	-.075	-.179	-.100	-.165	-.062	-.167	-.166	-.176
6.	.143	.105	.007	.009	.003	.199	.197	.045	.059	.044	.058	-.007	.019	.019	-.026	-.021	-.092	.007	-.097	-.106	-.087	.025	-.206	-.136	-.171	-.001	-.093	-.162	-.171
7.	.130	.013	-.005	-.023	.001	.197	.194	.083	.187	.002	-.065	-.019	.007	.148	.042	-.033	.006	-.065	-.018	.032	-.039	-.006	-.188	-.147	-.192	-.013	-.214	-.203	-.232
8.	.016	-.072	-.008	.022	-.058	.045	.083	.174	.137	.018	-.021	-.017	.066	.118	.081	-.038	.077	.007	-.111	-.025	.073	-.042	-.120	-.113	-.049	-.036	-.121	-.128	-.151
9.	.070	.007	-.065	-.055	-.045	.059	.187	.137	.288	-.028	-.087	.028	.001	.248	-.017	-.035	.009	-.001	-.102	.005	.033	.028	-.152	-.195	-.141	.017	-.152	-.200	-.152
10.	-.022	.165	-.009	.002	.297	.044	.002	.018	-.028	.269	-.008	-.071	-.045	.041	.047	-.008	-.029	-.020	-.008	-.066	-.037	-.114	-.137	-.037	-.102	-.008	-.104	-.153	-.142
11.	-.019	-.036	-.057	-.026	-.080	.058	-.065	-.021	-.087	-.008	.255	.103	.048	-.189	-.022	-.086	-.018	.041	.011	-.017	-.018	-.045	.032	-.159	.026	.295	-.106	.035	.025
12.	.017	-.023	-.016	-.044	-.011	-.007	-.019	-.017	.028	-.071	.103	.207	.223	.110	.043	.176	-.044	-.005	-.033	.026	-.034	.047	-.152	-.211	-.226	.026	-.158	-.167	-.196
13.	-.017	-.052	-.052	-.040	.004	.019	.007	.066	.001	-.045	.048	.223	.239	.042	.096	.030	-.050	.019	.017	.037	.056	.048	-.162	-.152	-.217	-.010	-.149	-.198	-.177
14.	-.051	.009	-.120	-.132	.032	.019	.148	.118	.248	.041	-.189	.110	.042	.293	.042	.138	.060	-.070	.055	-.014	-.017	.010	-.184	-.179	-.165	-.069	-.087	-.173	-.178
15.	-.065	-.129	-.090	-.170	.010	-.026	.042	.081	-.017	.047	-.022	.043	.096	.042	.207	.040	.154	-.007	.001	.059	.026	.082	-.098	-.042	-.098	-.009	-.099	-.107	-.110
16.	-.109	-.040	-.191	-.181	-.042	-.021	-.033	-.038	-.035	-.008	-.086	.176	.030	.138	.040	.269	.165	.045	.033	-.052	.016	.040	-.057	.001	-.064	.041	-.066	.006	-.005
17.	-.030	.040	-.064	-.065	-.045	-.092	.006	.077	.009	-.029	-.018	-.044	-.050	.060	.154	.165	.190	-.121	.031	.138	.085	.151	-.098	-.021	-.197	.027	-.119	-.046	-.129
18.	.069	-.051	-.035	.005	-.056	.007	-.065	.007	-.001	-.020	.041	-.005	.019	-.070	-.007	.045	-.121	.149	.060	.047	-.025	.060	.021	.058	-.008	.006	.021	-.057	-.099
19.	-.069	-.013	-.065	-.057	.020	-.097	-.018	-.111	-.102	-.008	.011	-.033	.017	.055	.001	.033	.031	.060	.208	.183	.139	.038	-.092	.011	-.066	.106	-.007	-.063	-.030
20.	-.037	-.090	-.130	-.092	-.027	-.106	.032	-.025	.005	-.066	-.017	.026	.037	-.014	.059	-.052	.138	.047	.183	.216	.132	.081	-.056	-.033	-.069	.001	-.001	-.047	-.023
21.	-.018	-.164	-.082	-.084	-.088	-.087	-.039	.073	.033	-.037	-.018	-.034	.056	-.017	.026	.016	.085	-.025	.139	.132	.219	.137	-.011	-.117	-.024	.029	-.045	.019	.023
22.	-.005	-.206	-.068	-.070	-.075	.025	-.006	-.042	.028	-.114	-.045	.047	.048	.010	.082	.040	.151	.060	.038	.081	.137	.225	-.082	-.018	-.064	.023	-.035	-.132	-.097
23.	-.108	-.162	-.044	-.107	-.179	-.206	-.188	-.120	-.152	-.137	.032	-.152	-.162	-.184	-.098	-.057	-.098	.021	-.092	-.056	-.011	-.082	.699	.491	.714	-.113	.383	.717	.610
24.	-.138	-.078	-.056	-.029	-.100	-.136	-.147	-.113	-.195	-.037	-.159	-.211	-.152	-.179	-.042	.001	-.021	.058	.011	-.033	-.117	-.018	.491	.633	.486	-.075	.635	.380	.352
25.	-.103	-.145	-.041	-.064	-.165	-.171	-.192	-.149	-.141	-.102	.026	-.226	-.217	-.165	-.098	-.064	-.197	-.008	-.066	-.069	-.024	-.064	.714	.486	.739	-.120	.448	.703	.745
26.	.001	-.047	-.120	-.089	-.062	-.001	-.013	-.036	.017	-.008	.295	.026	-.010	-.069	-.009	.041	.027	.006	.106	.001	.029	.023	-.113	-.075	-.120	.331	-.102	-.130	-.111
27.	.065	-.106	-.023	-.036	-.167	-.093	-.214	-.121	-.152	-.104	-.106	-.158	-.149	-.087	-.099	-.066	-.119	.021	-.007	-.001	-.045	-.035	.383	.635	.448	-.102	.637	.492	.494
28.	-.074	-.212	-.071	-.094	-.166	-.162	-.203	-.128	-.200	-.153	.035	-.167	-.198	-.173	-.107	.006	-.046	-.057	-.063	-.047	.019	-.132	.717	.380	.703	-.130	.492	.726	.729
29.	-.073	-.208	-.012	-.035	-.176	-.171	-.232	-.151	-.152	-.142	.025	-.196	-.177	-.178	-.110	-.005	-.129	-.099	-.030	-.023	.023	-.097	.610	.352	.745	-.111	.494	.729	.751

* See Page 2 for description of items corresponding to these numbers.

Table 5. -- Residuals of Observed Correlations After the Correlations Accounted for by the First and Second Common Factors had been Subtracted.

ITEM NO.*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1.	.145	.032	.044	.053	.012	.121	.102	-.001	.046	-.038	-.019	-.006	-.040	-.075	-.077	-.113	-.043	.068	-.073	-.041	-.019	-.013	-.027	-.074	-.017	-.011	.130	.009	.009
2.	.032	.348	.181	.194	.228	.059	-.044	-.109	-.043	.131	-.037	-.073	-.101	-.042	-.155	-.049	.012	-.051	-.021	-.099	-.167	-.223	.008	.056	.035	-.073	.033	-.034	-.033
3.	.044	.181	.415	.425	.146	-.009	-.018	-.016	-.076	-.016	-.057	-.027	-.063	-.131	-.096	-.193	-.070	-.035	-.067	-.132	-.082	-.072	-.005	-.025	.000	-.126	.008	-.030	.028
4.	.053	.194	.425	.433	.102	-.014	-.042	.009	-.071	-.009	-.026	-.060	-.056	-.149	-.178	-.184	-.074	.004	-.060	-.095	-.085	-.076	-.050	.015	-.004	-.097	.012	-.035	.023
5.	.012	.228	.146	.102	.276	-.046	-.057	-.096	-.096	.262	-.081	-.062	-.046	-.020	-.016	-.052	-.073	-.056	.010	-.036	-.091	-.093	-.005	.036	.018	-.088	-.025	.014	.001
6.	.121	.059	-.009	-.014	-.046	.153	.139	.007	.008	.010	.056	-.057	-.030	-.032	-.052	-.030	-.119	.006	-.105	-.115	-.090	.007	-.035	-.001	.009	-.027	.046	.015	.004
7.	.102	-.044	-.018	-.042	-.057	.139	.120	.035	.123	-.040	-.066	-.082	-.055	.083	.008	-.045	-.028	-.066	-.029	.020	-.043	-.028	.027	.022	.035	-.046	-.038	.020	.011
8.	-.001	-.109	-.016	.009	-.096	.007	.035	.143	.095	-.009	-.022	-.058	.025	.075	.059	-.046	.054	.006	-.118	-.032	.070	-.056	.019	-.002	-.000	-.057	-.006	.017	-.007
9.	.046	-.043	-.076	-.071	-.096	.008	.123	.095	.233	-.065	-.088	-.027	-.052	.191	-.045	-.045	-.021	-.001	-.111	-.004	.029	.008	.034	-.047	.056	-.011	.000	-.005	.039
10.	-.038	.131	-.016	-.009	.262	.010	-.040	-.009	-.065	.243	-.009	-.108	-.081	.003	.027	-.015	-.049	-.020	-.015	-.072	-.039	-.127	-.010	.062	.031	-.027	-.000	-.021	-.012
11.	-.019	-.037	-.057	-.026	-.081	.056	-.066	-.022	-.088	-.009	.255	.101	.046	-.190	-.022	-.086	-.018	.041	.010	-.017	-.018	-.045	.036	-.155	.031	.294	-.102	.040	.030
12.	-.006	-.073	-.027	-.060	-.062	-.057	-.082	-.058	-.027	-.108	.101	.151	.168	-.053	-.014	.165	-.074	-.005	-.042	.016	-.037	.027	.035	-.062	-.027	-.003	-.004	.028	-.003
13.	-.040	-.101	-.063	-.056	-.046	-.030	-.055	.025	-.052	-.081	.046	.168	.186	-.013	.067	.019	-.079	.018	.007	.027	.052	.028	.020	-.007	-.023	-.038	.000	-.008	.010
14.	-.075	-.042	-.131	-.149	-.020	-.032	.083	.075	.191	.003	-.190	-.053	-.013	.235	.012	.127	.029	-.070	.045	-.024	-.020	-.010	.006	-.028	.037	-.098	.069	.025	.018
15.	-.077	-.155	-.096	-.178	-.016	-.052	.008	.059	-.045	.027	-.022	-.014	.067	.012	.091	.034	.138	-.007	-.004	.053	.024	.071	-.000	.035	.005	-.024	-.019	-.005	-.009
16.	-.113	-.049	-.193	-.184	-.052	-.030	-.045	-.046	-.045	-.015	-.086	.165	.019	.127	.034	.266	.159	.044	.031	-.053	.015	.036	-.020	.029	-.025	.035	-.036	.043	.032
17.	-.043	.012	-.070	-.074	-.073	-.119	-.028	.054	-.021	-.049	-.018	-.074	-.079	.029	.138	.159	.173	-.121	.025	.132	.083	.140	.004	.059	-.088	.011	-.035	.060	-.023
18.	.068	-.051	-.035	-.004	-.056	.006	-.066	.006	-.001	-.020	.041	-.005	.018	-.070	-.007	.044	-.121	.149	.059	.046	-.025	.059	.023	.055	-.005	.005	.023	-.054	-.096
19.	-.073	-.021	-.067	-.060	.010	-.105	-.029	-.118	-.111	-.015	.010	-.042	.007	.045	-.004	.031	.025	.059	.206	.181	.138	.034	-.058	-.015	-.031	.100	.020	-.028	.004
20.	-.041	-.099	-.132	-.095	-.036	-.115	.020	-.032	-.004	-.072	-.017	.016	.027	-.024	.053	-.053	.132	.046	.181	.214	.131	.077	-.022	-.006	-.033	-.004	.026	-.012	.011
21.	-.019	-.167	-.082	-.085	-.091	-.090	-.043	.070	.029	-.039	-.018	-.037	.052	-.020	.024	.015	.083	-.025	.138	.131	.218	.135	.000	-.107	-.011	.027	-.035	.031	.035
22.	-.013	-.223	-.072	-.076	-.093	.007	-.028	-.056	.008	-.127	-.045	.027	.028	-.010	.071	.036	.140	.059	.034	.077	.135	.218	-.015	.034	.006	.012	.019	-.027	-.028
23.	-.027	.008	-.005	-.050	-.005	-.035	.027	.019	.034	-.010	.036	.035	.020	.006	-.000	-.020	.004	.023	-.058	-.022	.000	-.015	.065	-.008	.043	-.015	-.135	.057	-.040
24.	-.074	.056	-.025	.015	.036	-.001	.022	-.002	-.047	.062	-.155	-.062	-.007	-.028	.035	.029	.059	.055	-.015	-.006	-.107	.034	-.008	.238	-.042	.002	.226	-.139	-.161
25.	-.017	.035	.000	-.004	.018	.009	.035	-.000	-.056	.031	.031	-.027	-.023	.037	.005	-.025	-.088	-.005	-.031	-.033	-.011	.006	.043	-.042	.029	-.016	-.100	.005	.056
26.	-.011	-.073	-.126	-.097	-.088	-.027	-.046	-.057	-.011	-.027	.294	-.003	-.038	-.098	-.024	.035	.011	.005	.100	-.004	.027	.012	-.015	.002	-.016	.315	-.022	-.028	-.010
27.	.130	.033	.008	.012	-.025	.046	-.038	-.006	.000	-.000	-.102	-.004	.000	.069	-.019	-.036	-.035	.023	.020	.026	-.035	.019	-.135	.226	-.100	-.022	.213	-.046	-.037
28.	.009	-.034	-.030	-.035	.014	.015	.020	.017	-.005	-.021	.040	.028	-.008	.025	-.005	.043	.060	-.054	-.028	-.012	.031	-.027	.057	-.139	.005	-.028	-.046	.040	.052
29.	.009	-.033	.028	.023	.001	.004	.011	-.007	.039	-.012	.030	-.003	.010	.018	-.009	.032	-.023	-.096	.004	.011	.035	-.028	-.040	-.161	.056	-.010	-.037	.052	.083

* See Page 2 for description of items corresponding to these numbers.

are obtained which do not change with successive "iterations." Factor loadings are obtained from these weights by dividing the largest column sum in the final matrix by the sum of the squared weights. The square root of the quotient is the factor loading of the item with the largest column sum. This factor loading is multiplied by the remaining column weights to obtain factor loadings of the remaining variables.

Table 2 gives the first factor loadings as computed by this technique. They indicate that the items are all positively associated with the first common factor. The next step was to determine if this was the only important factor accounting for the intercorrelations of the items. If a single factor is found to be inadequate in explaining the intercorrelations, further examination of the single-factor hypothesis is necessary.

The amount of correlation between any two items accounted for by a common factor is indicated by the product of the loadings of the items for that factor. It is possible, therefore, to determine the extent to which the first factor explains the correlations between any two items. The expected correlations were computed for all possible pairings of items. These values were subtracted for the correlations in the original matrix. The absolute values of the resulting residuals are presented

Table 2.—Loadings of the 29 Items of the Revised Scale for the First Common Factor.

	Item description	Factor loading
1.	Construction of house	.821
2.	Room: person ratio	.580
3.	Separate dining room	.756
4.	Separate kitchen	.742
5.	Separate living room	.785
6.	Living room floors finished	.837
7.	Living room woodwork finished	.840
8.	Living room wall construction	.711
9.	Living room walls decorated	.694
10.	Living room lounge	.819
11.	Lighting facilities	.803
12.	Water piped into house	.868
13.	Kitchen sink	.849
14.	Linoleum on kitchen floor	.622
15.	Power washer	.688
16.	Refrigerator	.742
17.	Deep-freeze unit or town locker	.707
18.	Furniture insured	.708
19.	Family takes daily newspaper	.522
20.	Number of magazines taken regularly	.569
21.	Approximate number of books in home	.558
22.	Husband's life insured	.579
23.	Husband attends church	.521
24.	Husband a church member	.497
25.	Husband attends Sunday School	.491
26.	Husband a member of a farm cooperative	.754
27.	Wife a church member	.493
28.	Wife attends church	.504
29.	Wife attends Sunday School	.479

in Table 3 (see center insert). This table shows that the first common factor provides a rather good approximation of the actual correlations of several of the variables.

The sum of the squares of each factor loading divided by the number of variables gives a figure representing the percentage of the correlation among all the variables that can be attributed to the common factor. In this study, the first extracted factor accounts for 47 percent of the correlation among the items. It does appear that another factor or factors are measured by the Sewell scale.

EXTRACTION OF THE SECOND FACTOR

The residuals remaining in the correlation matrix after the extraction of the first common factor (see Table 3) are, in general, rather small. The chief exceptions to this are found among the social participation items dealing with church and Sunday school. The large residuals found among these items indicate an additional factor or factors as dominant in accounting for their intercorrelations. To interpret this finding, one must remember that participation in any one aspect of a religious organization usually brings about considerable pressure for participation in the remaining activities of the group. Status does not appear to be the dominant factor in explaining the intercorrelations of these items. Rather it is indicated that the items represent a religious aspect of social participation. Some support for this hypothesis is given by the remaining social participation item, "husband a member of a farm cooperative," which is adequately reflected by the first common factor.

The residuals of the correlation matrix found in Table 3 provide the data from which the second common factor measured by the revised Sewell scale may be extracted. Again following Hotelling's iterative technique, the second factor was extracted from the matrix by the same procedure used to extract the first. Table 4 contains loadings for this second common factor. These loadings are high only for those items dealing with religious participation. This second factor accounts for 14 percent of the correlations found in the original correlation matrix.

The product of the loadings of the items indicate the amount of correlation between any two items attributable to the second common factor. These products have been calculated and subtracted from the figures presented in Table 5 (see center insert). These residuals show the intercorrelations left after removing the influence of the first and second common factors.

After the removal of the first two common factors there are several relatively large residuals affecting, for the most part, isolated pairs of items. One such example is the residual correlation between "lighting facilities" (item 11) and "husband a member of a farm cooperative" (item 26). Crediting families with cooperative membership if the family head participated in the Rural Electrification Administration, the only source of electricity for many open-country families,

Table 4.—Loadings of the 29 Items of the Revised Scale for the Second Common Factor.

	Item description	Factor loading
1.	Construction of house	—.1012
2.	Room: person ratio	—.2140
3.	Separate dining room	—.0490
4.	Separate kitchen	—.0713
5.	Separate living room	—.2177
6.	Living room floors finished	—.2145
7.	Living room woodwork finished	—.2703
8.	Living room wall construction	—.1758
9.	Living room walls decorated	—.2345
10.	Living room lounge	—.1584
11.	Lighting facilities	—.0061
12.	Water piped into house	—.2360
13.	Kitchen sink	—.2295
14.	Linoleum on kitchen floor	—.2398
15.	Power washer	—.1230
16.	Refrigerator	—.0458
17.	Deep-freeze unit or town locker	—.1289
18.	Furniture insured	—.0036
19.	Family takes daily newspaper	—.0416
20.	Number of magazines taken regularly	—.0420
21.	Approximate number of books in home	—.0148
22.	Husband's life insured	—.0837
23.	Husband attends church	.7960
24.	Husband a church member	.6278
25.	Husband attends Sunday School	.8422
26.	Husband a member of a farm cooperative	—.1227
27.	Wife a church member	.6507
28.	Wife attends church	.8280
29.	Wife attends Sunday School	.8173

explains this easily. In like manner, the residual between "separate living room" (item 5) and "living room lounge" (item 10) is understandable.

Another factor present in the correlation matrix after the removal of the first two factors appears to be "size of home." There are relatively high correlations among items 2, "room: person ratio;" 3, "separate dining room;" 4, "separate kitchen;" and 5, "separate living room." Similarly, one can explain a few other minor factors. However, none of the factors present seems large enough to justify the extraction of the third or further factors.

CONCLUSIONS

1. It is apparent that the assumption that the Sewell socio-economic scale measured only a single common factor is fallacious. A second major factor, religious participation, was extracted. The first extracted factor accounted for but little of the intercorrelations among these religious participation items.

2. Since the social participation items retained on the Belcher revision of the Sewell scale reflect another factor than that measured

by the first common factor, and since the social participation items not included are no longer valid differentiators, it appears that these items should be dropped in making a modification of the Sewell scale.

3. Since the Chapin definition of socio-economic status adopted by Sewell includes social participation, one asks just what is this first common factor measured by the Sewell scale? To exclude social participation items from the scale would leave those dealing with material and cultural possessions plus effective income, which Sewell assumed to be measured by the material and cultural possession items. As stated earlier, Mangus and Cotton defined "level of living" as including these three components. Other definitions of "level of living" are essentially in agreement with the above. Therefore the conclusion is that the Sewell scale is primarily a measure of level of living and not of socio-conomic status; definitely, "level of living" more accurately labels the first common factor.

4. Defining the first common factor extracted from the Sewell scale as "level of living," the next step in the present analysis was to construct and standardize a level of living scale from the items most indicative of this factor.

Construction and Standardization of a Short Scale for Measuring Level of Living

The 29 items of the revised scale have been analyzed and the first common factor, defined as "level of living," extracted from their intercorrelations. A level of living scale can be constructed by weighting each of the 29 items on the basis of their ability to represent this factor, as indicated by their factor loadings. Such a procedure has been followed by Sharp.[29] The common-factor which he used is expressed algebraically by the following equation:[30]

$$S = a_1z_1 + a_2z_2 + a_3z_3 + \ . \ . \ . \ a_iz_i + \ . \ . \ . \ a_n \ z_n \quad (1)$$

Where

S is equal to the total socio-economic status score of a family,
a_i is equal to the loading of item i for the common factor, and
z_i is equal to the standard score of item i.

When the factor loadings from Table 2 are substituted into equation (1), the following equation results:

$$S = .821z_1 + .580z_2 + .756z_3 + .742z_4 + .785z_5 + .837z_6 + .837z_7 + .840z_8 + .694z_9 + .819z_{10} + .803z_{11} + .868z_{12} + .849z_{13} + .622z_{14} + .688z_{15} + .742z_{16} + .707z_{17} + .708z_{18} + .522z_{19} + .569z_{20} + .558z_{21} + .579z_{22} + .521z_{23} + .497z_{24} + .491z_{25} + .754z_{26} + .493z_{27} + .504z_{28} + .479z_{29} \quad (2)$$

Having arrived at the equation (2) expressing the relationship of each of the items to the common factor, the next step was to devise weights which could be used independently of this equation. Since each of the items is represented by only two response categories, the standard score for any item can assume only two values. Following

[29] Emmit F. Sharp, *A Factor Analysis Approach to the Construction and Validation of a Socio-Economic Status Scale for Open Country Families in Oklahoma* (Stillwater, Oklahoma: Unpublished Master's thesis, Oklahoma A. & M. College, 1951), pp. 28-31.

[30] Hagood Danilevsky and Beum, *op. cit.*, pp. 6, 222.

the formula, $\frac{X_i - m_i}{n}$, standard scores were computed for each item, with arbitrary values of one for possession and zero for non-possession being substituted for the X-values in the equation. Preliminary weights were obtained by multiplying the standard scores by the factor loadings (shown in equation 2). To increase the magnitude of the preliminary weights and make them all positive in sign, a constant of two was added to each and the resulting sum multiplied by the same constant. The resulting values when rounded to the nearest whole number gave the final item weights for possession and non-possession. The computation of these weights is illustrated in Table 6.

Scores on the above scale were computed for each of the 660 families of the construction sample which, correlated with the scores of the same families on the revised scale, gave a coefficient of .99. This extremely high correlation suggests that refinements in item weighting for scales with relatively large numbers of items may contribute little or nothing to the final measurement.[31] To further investigate this hypothesis, the 28 items were assigned arbitrary weights of one for possession and zero for non-possession and the 660 families rated on the basis of the resulting scale. Scores from this scale were then correlated first with scores from the common factor scale and second with scores from the revised scale. The coefficients in each case were .99. These findings indicate that item selection is the primary problem in scale construction.

SELECTION OF ITEMS FOR SHORT SCALE

After making the foregoing determinations, the problem of constructing a short scale for measuring level of living became one of selecting a small number of items capable of measuring this factor. The first criterion of selection is the factor loadings indicating the association of items with the first common factor and, thereby, their ability to represent this component, level of living. As noted above, religious participation items do not greatly reflect level of living. Having low factor loadings (see Table 2) they are excluded from further consideration in the short scale. Since the objective is as short a scale as can be both valid and reliable, all items having factor loadings of .706 or less are excluded. A factor loading of .707 or more means that at least 50 percent of the variation in this item is attributable to the common factor. In the revised scale 14 items failed to meet this standard (Table 2), leaving 15 for further consideration.

[31] The results of previous studies support this hypothesis. Alice M. Leahy, *The Measurement of Urban Home Environment,* Minneapolis: University of Minnesota Press, 1936, pp. 41-49, found that intercorrelation coefficients among sets of scores produced by the sigma technique, simple scoring and the difference method were all .98 or above. Sewell, *The Construction and Standardization of a Scale for the Measurement of the Socio-Economic Status of Oklahoma Farm Families,* footnote 23, p. 43, repeated this experiment in the construction of his scale and obtained very similar results. Similiar results were also obtained by Howard R. Cottam, *Methods of Measuring Level of Living, Social Participation and Adjustment of Ohio Farm People,* Columbus: Ohio Agricultural Experiment Station Bulletin 139 (Mimeographed), 1941, p. 10, in the correlation of scores produced by the sigma technique and those produced by a technique which assigned weights on the basis of critical ratios of the differences between different groupings of the items.

Table 6.—Computation of Item Weights.

Item No.	Factor loading	z-value (Poss.)	z-value (Non-Poss.)	Preliminary Wt. (Poss.)	Preliminary Wt. (Non-Poss.)	Final wt. (Poss.)	Final wt. (Non-Poss.)
1.	.821	0.7845	—1.2746	0.644	—1.046	5	2
2.	.580	0.6703	—1.4919	0.389	—0.865	5	2
3.	.756	1.4678	—0.6813	1.110	—0.515	6	3
4.	.742	1.4781	—0.6765	1.097	—0.502	6	3
5.	.785	0.7225	—1.3840	0.567	—1.086	5	2
6.	.837	1.0726	—0.9323	0.898	—0.780	6	2
7.	.840	0.6547	—1.5275	0.550	—1.283	5	1
8.	.711	0.7895	—1.2666	0.561	—0.901	5	2
9.	.694	0.4764	—2.0989	0.331	—1.457	5	1
10.	.819	0.7779	—1.2855	0.637	—1.053	5	2
11.	.803	0.6765	—1.4781	0.543	—1.187	5	2
12.	.868	1.8559	—0.5388	1.611	—0.468	7	3
13.	.849	1.4678	—0.6813	1.246	—0.578	6	3
14.	.622	0.5650	—1.7698	0.351	—1.101	5	2
15.	.688	0.7895	—1.2666	0.543	—0.871	5	2
16.	.742	0.5078	—1.9693	0.377	—1.461	5	1
17.	.707	1.7367	—0.5758	1.228	—0.407	6	3
18.	.708	1.4249	—0.7018	1.009	—0.497	6	3
19.	.522	0.9119	—1.0966	0.476	—0.572	5	3
20.	.569	0.8954	—1.1168	0.510	—0.636	5	3
21.	.558	0.7354	—1.3598	0.410	—0.759	5	2
22.	.579	1.3748	—0.7274	0.796	—0.421	6	3
23.	.521	1.1373	—0.8792	0.593	—0.458	5	3
24.	.497	1.0555	—0.9474	0.525	—0.471	5	3
25.	.491	1.3568	—0.7370	0.666	—0.362	5	3
26.	.754	1.0471	—0.9550	0.790	—0.720	6	3
27.	.493	0.7763	—1.2882	0.383	—0.635	5	3
28.	.504	0.9550	—1.0471	0.481	—0.528	5	3
29.	.479	1.1513	—0.8685	0.552	—0.416	5	3

An examination of the matrix of intercorrelations revealed that certain items among the remaining 15 were duplicating measures. An example of this is found in the case of the items, "separate dining room" and "separate kitchen." A coefficient of .99 between these two items and their very similar correlations with other items in the group indicate them, for all practical purposes, to be duplicating each other. "Separate dining room" has a slightly higher factor loading and remains in the scale to represent the pair of items.

"Living room floors finished" and "living room woodwork finished," and also in the case of "kitchen sink" and "running water" are similar instances. "Living room floors finished" and "running water" were retained in the scale. Similarly, "husband a member of a farm cooperative" and "lighting facilities" are duplicating items. "Husband a member of a farm cooperative" was excluded from the scale because of its lower factor loading, and also because it was classed as a social participation item. "Separate living room" and "living room lounge" are also duplicating items. Because of its higher factor loading, the latter was retained for the scale construction.

Nineteen of the 29 items in the revised scale were thus excluded. The remaining 10 items were used in constructing and standardizing a short scale for the measurement of the level of living of Oklahoma farm families. The 10 items retained were:

1. Construction of house
2. Separate dining room
3. Living room floors finished
4. Living room wall construction
5. Living room lounge
6. Lighting facilities
7. Water piped into house
8. Refrigerator
9. Deep-freeze unit or town locker
10. Furniture insured

WEIGHTING OF SCALE ITEMS

Weights were given these 10 items on the basis of their ability to represent the first common factor level of living, as indicated by their factor loadings. This was done for the 29 items in the revised scale (see Table 6). The weights for the 10 items used in the short scale come from this table. The scale based on these 10 items, with corresponding weights, is given in Table 7.

Scores for the 660 families, using these weights, were computed and compared with the scores for the same families, weighting each item one for possession or zero for non-possession. The correlation coefficient for these two sets of scores was .998. This again emphasizes that the weighting procedure used in scale construction is of minor importance. However, the common factor weights were adopted for use in the standardization of the short scale because they provide a greater range of possible scores.

STANDARDIZATION OF THE SCALE

The standardization of a scale is accomplished through the demonstration of its validity and reliability as a measure of a given trait or characteristic within a particular population. It was desired to standardize the present scale as a measure of the level of living for the open-country families of Oklahoma.

Validity

Validity is the ability of a scale to measure that which it purports to measure. The most common criterion of a scale's validity is high correlation between its scores for a group of families and scores for the same families by one or more other scales whose validity has been established.

The first test of the new short scale's validity consisted of correlating its scores with scores on the original Sewell scale for the 660 families in the construction sample. This correlation yielded a coefficient of .91. Similar tests based on the same sample yielded a coefficient of .92 between its scores and internal consistency weights for the scores on the Belcher revised scale and a coefficient of .94 between its scores and scores on the common-factor weights for the 29 items on this revised scale. A more accurate test of the validity of the scale was provided by correlating the scores of the new short scale with the scores on the original Sewell scale after all social participation items had been deleted—which was, of course, essentially a level of living scale. The correlation was .94. The results of these tests indicate the new scale is a valid measure of the level of living of open-country families in Oklahoma.

Table 7.—Short Scale for Measuring Farm Family Level of Living.

Item No.*		
1.	Construction of house: Brick, stucco, etc., or painted frame	5
	Unpainted frame or other	2
3.	Separate dining room: Yes 6 No 3	
6.	Living room floors finished. Yes 6 No 2	
8.	Living room wall construction: Plaster or wallboard	5
	Ceiling, building paper or none	2
10.	Living room lounge: Bed, cot, bench, or none	2
	Divan, studio couch, couch, day bed	5
11.	Lighting facilities: Electric, gas, mantle or pressure	5
	Oil lamps, other or none	2
12.	Water piped into house: Yes 7 No 3	
16.	Refrigerator: None 1	
	Mechanical or ice	5
17.	Deep-freeze unit or town locker: Yes 6 No 3	
18.	Furniture insured: Yes 6 No 3	

* These numbers correspond to those found in Table 6. Descriptions of all 29 items are given on Page 2 of center insert.

Reliability

Reliability is the consistency with which a scale measures a characteristic. The second step in the standardization of the scale was the testing of its reliability as a measure of level of living. Several techniques are commonly used in the testing of a scale's reliability, the most common of which are the simultaneous scoring, the test-retest and the split-half techniques. Because of the inability of the writers to perform the field work necessary for the simultaneous scoring and test-retest techniques, only the split-half technique was used in the present study. Briefly, the split-half technique consists of dividing the items of a scale into separate parts, each consisting of alternate items from the original scale, and correlating the scores from the resulting scales.

The correlation of the split-half scores for the 660 families in the construction sample yielded a coefficient of .77. When corrected for attenuation by the Spearman-Brown formula[32], this coefficient became .87. This is well above the minimum of .80 usually required for coefficients obtained by this technique, comparing favorably with those obtained by Sewell for his short scale. These data, then, indicate the scale is a reliable measure of the level of living of families within the population represented by the sample.

Summary and Conclusion

Although the original Sewell socio-economic scale remains a stable and valid instrument for use with the farm population of Oklahoma, there is considerable doubt that the short form of this scale is still a valid and reliable tool for social research because five of the 14 items in this scale are no longer efficient differentiators of various status levels. The present study was designed, therefore, to construct a new short scale for measuring the factor which Sewell designated as "socio-economic status" for the open-country population of Oklahoma. The following areas were also investigated:

1. The assumption that the Sewell scale measures a single, common factor;

2. The need for redefining what the Sewell scale measures if more than one factor is reflected by the scales; and

3. The possibility of developing more adequate item weights.

Hotelling's iterative technique for factor analysis was used to test the single factor assumption and for selecting and weighting the items in the new short scale. Because of the difficulty of making a factor analysis with 36 variables, the procedure was applied to the 29 items included in Belcher's revision of the scale. Since the original and the revision of the Sewell scale are so similar, any conclusions made from the factor analysis may be considered essentially the same for

[32] This formula may be found in H. Sorenson, *Statistics for Students of Psychology and Education,* New York: McGraw-Hill Book Co., Inc., 1936, p. 342.

either. After extracting the first two factors from the correlation matrix of the 29 items in the revised scale, the following conclusions were formulated:

1. The assumption that the Sewell socio-economic scale measures but a single, common factor is erroneous. A second major factor, religious participation, was extracted. The first factor accounted for but little of the intercorrelations among these religious participation items. If all 36 of the items in the original Sewell scale had been included in the factor analysis, it is conceivable that the second factor might have been another aspect of social participation than religious.

2. Since the social participation items reflect a different component from that measured by the first factor, it was concluded that these items could be dropped in making a modification of the Sewell scale.

3. Since the first common factor in the Sewell scale does not reflect social participation but material and cultural possession, which two variables Sewell assumed measured effective income, it was concluded that the first component in the Sewell scale may accurately be labeled "level of living." Thus, the Sewell scale primarily is a measure of level of living rather than socio-economic status.

Defining the first common factor measured by the Sewell scale as "level of living," 10 of the items included on the Belcher revision of this scale that are most indicative of the factor were selected and weighted by the use of factor analysis to construct a Short Scale for Measuring Farm Family Level of Living. This scale was tested for validity and reliability for the open country population of Oklahoma.

The procedure used in weighting the items in the scale is of negligible importance. A limitation of the present study is that the analysis of items included only those on the original Sewell scale except one, possession of a deep-freeze unit or town locker. One possible spurious element in the study was that much of the analysis was with the Belcher revision of the Sewell scale although the conclusions were considered applicable to the original Sewell scale. Consequently, the principal contributions of the study may be considered in the fields of conceptualization and methodology. It is anticipated that the current study may serve as a basis for other level of living studies.