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Unemployment Insurance
Occasional Paper 81-2

U.S. Department of Labor
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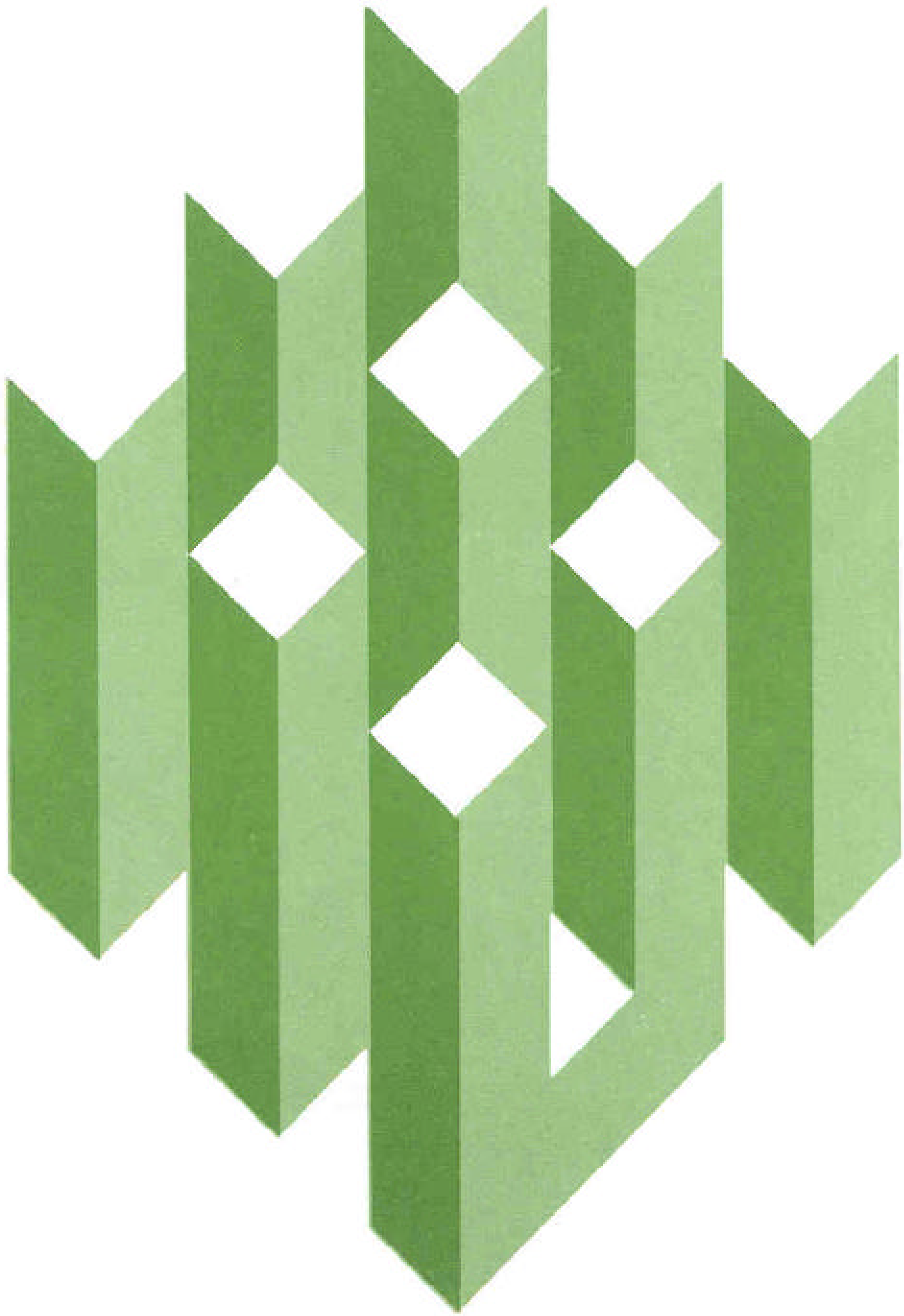

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U.S. Department of Labor
Ray Marshall, Secretary

Employment and Training Administration
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# PREFACE

This study is the fifth in a series of reports based on the Arizona Benefit Adequacy (ABA) Study. The first report emphasized the measurement of benefit adequacy under the prevailing and selected alternative weekly benefit amount formulas. The second report focused on the adjustments undertaken by beneficiary households during periods of thirteen and twenty-five consecutive weeks of compensated unemployment. The third study analyzed the labor market experiences of those study group claimants who exhausted their entitlement to UI benefits. In the fourth report, estimates of the changes in regular UI program costs associated with changes in the weekly benefit amount formula were provided, and a general procedure was developed for assessing the impact of changes in the weekly benefit amount formula on UI program costs and benefit adequacy.

The present report provides an analysis of the possibility of predicting benefit adequacy values for individual claimants. Because the emphasis is on predicting the benefit adequacy measure developed and analyzed in the first ABA Study report,[1] some familiarity with that report is desirable. However, essential background material on the measure of benefit adequacy utilized is provided in summary form in this report for those who do not have access to earlier study reports.

The authors wish to acknowledge the cooperation and support provided by the UI Research and Reports Section of the Arizona Department of Economic Security; Mr. Richard Porterfield, Coordinator of Contract Research, was especially helpful in project administration. We also wish to express our appreciation to Ms. Helen Manheimer, Mr. John Robinson, and Dr. Mamoru Ishikawa of the Unemployment Insurance Service for their valuable suggestions during the course of the project. The careful review of an earlier draft of the report by Mr. Thomas Vaughn of the Arizona Department of Economic Security improved the final report. Mrs. Lynnette Winkelman expertly typed various drafts of the report and the final manuscript.

# OBJECTIVES

Benefit adequacy research probably cannot be expanded significantly during the coming decade unless some technique is developed to replace the costly field research required to obtain the detailed income and expenditure data normally gathered in conventional benefit adequacy studies. Moreover, it also would be important to develop an acceptable methodology for inexpensively updating benefit adequacy studies that already had been completed, and for generalizing the findings of such studies to UI jurisdictions not encompassed by the field research. Because econometric techniques would represent a much less expensive basis for conducting and updating benefit adequacy studies than the costly interviews conducted in conventional benefit adequacy studies, this research effort was designed to assess the feasibility of developing a benefit adequacy methodology that is based on econometric techniques.

To evaluate the feasibility of one econometrically based methodology, the specific purposes of this study are to determine if equations could be developed to predict accurately the values of a benefit adequacy measure for individual unemployment insurance (UI) beneficiaries on the basis of: (1) information normally available as a result of the processing of UI claims; and (2) such normally available UI information combined with data available through the Continuous Wage and Benefit History (CWBH) program. Equations based upon the latter data set are estimated both for the total sample and for relatively homogeneous groups of households that comprise the study group. A basic premise of the study is that if accurate equations could be developed to predict the *known* values of benefit adequacy for individuals who participated in a benefit adequacy study, then consideration should be given to further development of this methodology as a basis for inexpensively conducting and updating benefit adequacy studies. In contrast, if the *known* values of benefit adequacy for this study group can not be predicted accurately on the basis of normally available UI data and CWBH data, there would be no reason to utilize such data for estimating benefit adequacy values for individual claimants whose actual benefit adequacy values are unknown. It should be emphasized at the outset that the prediction equations developed in this report are specific to these study group claimants who drew benefits in Arizona during 1975 and 1976. Thus, the equations estimated should not be used to assess benefit adequacy for claimants in other UI jurisdictions or for the study group during other time periods.

## BACKGROUND

The design of the Arizona Benefit Adequacy Study and the measure of benefit adequacy utilized in this report are discussed in detail in the first ABA Study report (cited above). For convenience, this information is summarized briefly in this section. In addition, the characteristics of the sample analyzed in the present report are provided.

### *Design of Original Study*

The ABA Study was initiated in the summer of 1975 to investigate the adequacy of unemployment insurance (UI) benefits relative to the pre-unemployment standard of living established by the beneficiary household. The study also was designed to assess adjustments undertaken by beneficiaries and their households during an unemployment spell of up to 25 consecutive weeks of compensated unemployment. Three waves of household interviews were conducted. The first, which was administered after five consecutive weeks of compensated unemployment, was designed to obtain information about each beneficiary household's preunemployment income and expenditure levels during a month of typical employment. The second and third interview waves occurred following thirteen and twenty-five consecutive weeks of compensated unemployment; these interviews were designed to obtain information on the adjustments undertaken by each beneficiary household in response to the beneficiary's prolonged unemployment spell. Study group claimants who had exhausted their entitlement to all benefits were surveyed by mail at the end of the second, fourth and sixth months following benefit exhaustion. The survey work for all phases of the study was completed in February, 1978.

*The Measure of Benefit Adequacy*

The size of the weekly benefit amount (WBA) to which the beneficiary is entitled depends on the claimant's prior earnings in covered employment. These earnings, combined with the earnings of other household members and any nonwage income the household may receive, provide for a certain level and pattern of monthly expenditures to which the beneficiary household becomes accustomed prior to the onset of the beneficiary's unemployment spell.

Previous studies of the adequacy of UI benefits consistently have focused on a measure of benefit adequacy based upon a comparison of the WBA with the expenditures for specific types of goods and services. Which expenses should form the benchmark against which the WBA is to be compared has been a matter of judgment. The larger is this expenditure set, the less adequate UI benefits would appear to be, unless some offsetting reduction in the proportion of these expenditures that the WBA "should" replace is considered. For the purposes of this study, the relevant expenditure set encompasses paid expenses for "necessary/obligated" goods or services during the preunemployment month--a month of employment prior to unemployment selected by the claimant as most "typical" of his/her usual employment situation. This expenditure set consists of "necessary" expenses for goods and services acquired and consumed by the household on a regular basis, and "obligated" expenses that are expected to be met on a regular basis because of established commitments. The rationale for this definition is derived from the concept of the standard of living established by the beneficiary household. Expenses which meet the above criteria are assumed to constitute the "core" component of the household living standard. Generally, the household unit becomes accustomed to this standard of living, and rapid downward adjustments in it are difficult to make following the onset of the beneficiary's unemployment spell.

The items included in the necessary/obligated expense definition are the following:[2]

(1) housing (including utilities and necessary maintenance);
(2) food purchased in grocery stores;
(3) medical care (including prescriptions and payments on past medical care);
(4) credit and loan payments;
(5) clothing;
(6) transportation (including gasoline and maintenance);
(7) insurance (including union dues);
(8) services and other regular payments;
(9) continuing and regular support of persons outside of the household; and
(10) lump-sum payments for property and income taxes.

It should be emphasized that the beneficiary's share of these necessary and obligated expenses may be considerably less than the total for the entire household. Because UI benefits are wage-related, it reasonably can be argued that the weekly UI benefit payment should be expected to sustain (at most) the same share of the total of necessary and obligated expenses that the beneficiary's wages sustained while the beneficiary was employed. Hence, the total of the beneficiary household's necessary and obligated expenses in the preunemployment month should be adjusted by the ratio of the beneficiary's gross wage in the preunemployment month to the total of gross recurring household income in the preunemployment month. The measure of benefit adequacy employed in this analysis is the ratio of WBA to the beneficiary's "proportionate share" of the (weekly) necessary and obligated household expenses that were paid during the preunemployment month. This measure is given by:

$$\text{BENAD} = \frac{\text{WBA}}{(\text{EXPENSES}) \times (\text{BEN. SHARE})}$$

where:

BENAD is the measure of the adequacy of the weekly benefit payment for an individual beneficiary;

WBA is the maximum UI weekly benefit payment to which the beneficiary is entitled on the basis of earnings in the high quarter of the base period;

EXPENSES is the total of (weekly) necessary and obligated expenses of the beneficiary household during the preunemployment month;

BEN. SHARE is the ratio of the beneficiary's gross wages in the preunemployment month to total gross recurring household income during the same month; this ratio defines the beneficiary's "proportionate share" of the necessary and obligated expenses of the beneficiary household.

*Definition of Beneficiary Household*

Definition of an appropriate household unit concept is of major importance in benefit adequacy research because income and expenses are obtained for this entire unit; as a result, the measure of benefit adequacy itself depends importantly on who is and is not included in the beneficiary's household. The definition of the household unit used in the ABA study revolves around the beneficiary, rather than around the "head" of the household as often is done in other types of survey research. The basis for this distinction is that the beneficiary is the focus of interest for the UI program and for benefit adequacy research, and the beneficiary is not the household "head" in many instances. The household definition used in the ABA study and in this report includes the beneficiary and spouse, if present, plus all persons who reside with the beneficiary/ spouse and receive at least 50 percent of their monthly support from the beneficiary/spouse. Spouses are included in the household unit on the assumption that they share expenses and income with the beneficiary. The appropriate basis for including/excluding other persons in the household unit is somewhat more a matter of judgment, however, and it is recognized that the 50 percent criterion is somewhat arbitrary. Overall, however, the issue confronted in the formulation of the ABA study was the need to develop a household definition that: (1) was sensible for analyzing the adequacy of weekly UI benefit payments; and (2) would facilitate the accurate collection of income and expense data for the entire household unit.

*Classification of Household Types*

Previous analysis of the ABA study data has revealed an important relationship between relatively homogeneous household types and the adequacy of the weekly UI benefit payments (as defined above). Of particular importance in classifying households are the number of earners in the household unit, the total size of the household unit, and the presence or absence of a spouse. Accordingly, seven household type classifications were developed on the basis of these criteria. These household types include:

| Household Type | Abbreviation | Description |
|---|---|---|
| 1 | 1E-1HH-NR | A one-person household (1HH), single earner (1E) who lives alone or with nonrelated (NR) persons. |
| 2 | 1E-1HH-REL | A one-person household (1HH), single earner (1E) who lives with related (REL) persons. |
| 3 | 1E-2HH-SP | A two-person household (2HH), a single earner (1E) with spouse present (SP). |
| 4 | 2E-2HH-SP | A two-person household (2HH), two earners (2E), with spouse present (SP). |
| 5 | 1E-3+HH-SP | A three-or-more person household (3+HH), a single earner (1E), with spouse present (SP). |
| 6 | 2+E-3+HH-SP | A three-or-more person household (3+HH), two or more earners (2+E), with spouse present (SP). |
| 7 | 1+E-2+HH-SA | A two-or-more person household (2+HH), one or more earners (1+E), spouse absent (SA). Nearly all of the units included here have only one earner, but those with two or more earners were included because there were too few of them for separate analysis. |

Classification of the beneficiary households into the seven household types provides for relatively homogeneous household units. As is explained in more detail below, benefit adequacy prediction equations are estimated separately for each of these household types in the subsequent analysis.

*Characteristics of the Sample Analyzed*

The sample for this study was drawn throughout the twelve-month period beginning in mid-September of 1975. During this period, approximately one-fourth of those who filed the first claim in their benefit years and had the necessary earnings to qualify for benefits under Arizona's benefit formula were selected randomly for potential inclusion in the study. Those who had previously initiated a benefit year were excluded, because adjustments to unemployment after thirteen and twenty-five consecutive weeks of *compensated* unemployment were to be analyzed as one part of the study.[3] These claimants were screened further seven weeks after the effective dates of their new, initial claims. At this screening, those who had served a valid waiting week and had received payment for five consecutive weeks of unemployment were selected for the preunemployment month interview, with the following exceptions:

(1) those who had moved out of state, because household interviews could not be conducted for them;

(2) those who had entered "approved training," because their adjustments to unemployment most likely would reflect their unusual circumstances;

(3) those who had delayed filing for benefits for more than 21 days after their job separation dates, because of the possible difficulty involved in accurately

obtaining information about income and expenditures in a "typical" month of employment prior to unemployment;

(4) those whose new, initial claims were transitional claims, because their adjustments to unemployment likely would differ substantially from those of persons just beginning unemployment; and

(5) those who filed "true partial" claims (such persons continue to work for their last employer but receive partial UI benefits since their earnings have been reduced sufficiently to meet the UI qualifying requirements), because their adjustments to unemployment would reflect their "partial" earnings.

A total of 4,452 beneficiaries were selected for inclusion in the study over the twelve-month sampling interval.[4] From this group, completed household interviews were obtained for 3,332 persons, or 75 percent of the total. Because extensive information was obtained on both the income and the expenditures of the beneficiary household during the preunemployment month, it was possible to obtain a rough check on the accuracy of the data obtained by conducting a "balancing differences" test. For the preunemployment month, the total itemized cash outlays of each beneficiary household were compared with the household's total cash resources available to meet those outlays. If the ratio of cash outlays to cash resources available to meet those outlays fell between 0.75 and 1.25, the information was accepted as given (unless obvious problems were found by the project staff during the editing process). Any questionnaire with a ratio outside of these bounds was subjected to additional verification with the beneficiary to account for the apparently large discrepancy. Large discrepancies between household outlays and cash resources could not be reconciled for 152 cases (4.6% of the completed interviews), and these cases were excluded from the analysis. Of the remaining 3,180 persons, it was necessary to exclude 116 cases (3.5% of the completed interviews) from the data base for this analysis because of missing data elements for variables of particular importance for this study.[5] Hence, of the original total data base, 3,064 cases are analyzed in this report, and 1,388 cases are excluded from the analysis.

Provided in Table 1 is a comparison of the characteristics of the 3,064 cases analyzed, relative to the characteristics of the 1,388 cases excluded because of nonresponse, missing data or other problems. Because these groups can be viewed as independent, random samples (one from the population of claimants for whom "complete/accurate" information can be gathered, and the other from the population of claimants for whom "complete/accurate" information can not be gathered), the appropriate statistical test is one which permits an assessment of whether these two samples were drawn from the same or different populations. Given the 18 tests reported in Table 1, the probability is at least .05 that one or more of these results would be less than .05/14 or .0036 due to chance alone, even if the two samples were drawn from the same population.[6] Thus, only those proportions tests for which the probability is less than or equal to .0036 are denoted with an asterisk in Table 1 to call attention to instances in which the difference between the sample proportions is statistically significant at the .05 level.

The results of the tests summarized in Table 1 indicate that there were no statistically significant differences (at the .05 level) between the group analyzed and the group not analyzed for sex, weekly benefit amount, potential duration of regular benefits and for four of the five

TABLE 1

CHARACTERISTICS OF THE GROUP ANALYZED/NOT ANALYZED

| Characteristic | Percentage Distributions for[a] Group Analyzed | Group Not Analyzed | Probability of Obtaining Observed Difference Due to Chance Alone[b] |
|---|---|---|---|
| Sex | | | |
| Male | 67.5 | 70.8 | .0278 |
| Female | 32.5 | 29.2 | .0278 |
| Age | | | |
| Less than 25 years | 23.7 | 17.7 | .0020* |
| 25-34 years | 30.5 | 34.5 | .0078 |
| 35-44 years | 17.9 | 20.8 | .0220 |
| 45-54 years | 16.3 | 15.3 | .4010 |
| 55 years and up | 11.6 | 11.8 | .8494 |
| Potential Duration | | | |
| 12-15 weeks | 7.8 | 9.8 | .0258 |
| 16-18 weeks | 8.0 | 8.7 | .4296 |
| 19-21 weeks | 8.0 | 8.6 | .4966 |
| 22-25 weeks | 12.2 | 11.9 | .7794 |
| 26 weeks | 64.1 | 61.0 | .0466 |
| Weekly Benefit Amount | | | |
| $15-$44 | 12.1 | 13.8 | .1142 |
| $45-$54 | 8.6 | 10.3 | .0688 |
| $55-$64 | 10.1 | 8.7 | .1442 |
| $65-$74 | 9.1 | 8.1 | .2758 |
| $75-$84 | 9.2 | 7.9 | .1556 |
| $85 | 51.0 | 51.2 | .9104 |

[a]The group analyzed totals 3,064 persons; the group not analyzed totals 1,388.

[b]These values indicate the probability of obtaining, due to chance alone, a difference between the two sample proportions that is as large or larger than the one actually observed, if the two samples were drawn from the same population. The probability is at least .05 that one or more of the probability values would be less than .05/14 = .0036 due to chance alone. Hence, only those probability coefficients that are .0036 or less are identified with an * in the table to indicate statistically significant differences.

age categories. However, a significantly greater percentage of the analyzed group than of the group not analyzed was under the age of 25 years (23.77% vs. 17.7%). Moreover, it should be noted that, because a larger percentage of the group not analyzed than of the group analyzed was aged 25-34 years (34.5% vs. 30.5%), the percentage of each group under 35 years of age is very similar (54.2% for the analyzed group, compared with 52.2% for the group not analyzed). On the basis of the entire set of comparisons summarized in Table 1, there is no indication of any exclusion bias that would limit inferences to the broader population from which the 3,064 persons analyzed were selected.

It also is possible to make some limited comparisons of the characteristics of the 3,064 persons analyzed and the broader population of all Arizona UI claimants who received benefits during approximately the same period that the study group was receiving UI support. These comparisons are provided in Table 2. Even though the group analyzed was not drawn from the entire population of UI claimants during the twelve-month sampling interval, the extent of similarity between the sex and age characteristics of the study group and all Arizona claimants is quite remarkable. In fact, none of the differences reported in Table 2 is statistically significant at the .05 level.[7] This may suggest that some implications of the study could be generalized to all Arizona claimants who drew benefits during this period, although direct generalization would have to assume that the WBA and household income/expense distributions for the study group also closely approximate the (unknown) distributions for all Arizona beneficiaries.

TABLE 2

CHARACTERISTICS OF GROUP ANALYZED VS. ALL ARIZONA UI CLAIMANTS

| Characteristic | Percentage Distributions For: Study Group[a] | All Ariz. Claimants[b] | Probability of Obtaining Observed Difference Due to Chance Alone[c] |
|---|---|---|---|
| Sex | | | |
| Male | 67.5 | 68.0 | .56 |
| Female | 32.5 | 32.0 | .56 |
| Age | | | |
| Less than 25 years | 23.7 | 22.4 | .08 |
| 25-34 years | 30.5 | 30.7 | .82 |
| 35-44 years | 17.9 | 18.2 | .66 |
| 45-54 years | 16.3 | 15.6 | .28 |
| 55 years and up | 11.6 | 13.1 | .02 |

[a]Includes the 3,064 persons analyzed in this report.

[b]Based on information contained in the *Monthly Summary of Claims and Claimants* published by the Unemployment Insurance Administration of the Arizona Department of Economic Security. Included are those who filed continued claims for unemployment during the sample intake period for the study.

[c]These values indicate the probability of obtaining, due to chance alone, a difference between sample and population proportions as large or larger than the one actually observed, if the sample were drawn from the population. The probability is at least .05 that one or more of the 7 probability values would be less than .05/5 = .01 due to chance alone. Hence, only those probability coefficients that are .01 or less are identified with an * to indicate statistically significant differences.

## ESTIMATION OF THE PREDICTION EQUATIONS

Multiple linear regression techniques were utilized to estimate the equations developed to predict the values of the benefit adequacy measure for the individuals included in the study group. After discussing the regression procedures utilized, the independent variables considered for inclusion in the prediction equations are considered in this section.

### *Estimation Methodology*

Multiple regression analysis may be used to test specific hypotheses about relationships between variables, or to predict the values of a dependent variable on the basis of information about the values of one or more independent variables. In the former orientation, the emphasis is on the size and statistical significance of the regression coefficients estimated for the independent variables included in the model tested. Given a focus on hypothesis testing, a major issue is the specification of the empirical model so as to satisfy the requirements of the particular theoretical structure to be tested, and little emphasis is placed on the proportion of variation in the dependent variable "explained" by the independent variables included in the equation. In the present study, however, the emphasis is not on the size and statistical significance associated with the regression coefficients estimated for the independent variables included in the equations. Rather, the emphasis is placed on statistics such as $R^2$ and the standard error of the regression, because they provide information about the predictive capability of the estimated regression equations.

Multicollinearity among the independent variables included in a regression equation may create problems for either hypothesis testing or predicting.[8] Multicollinearity can be particularly serious for hypothesis testing because it can make it virtually impossible to identify the independent effect on the dependent variable of individual explanatory variables. Multicollinearity presents less of a problem for predicting, but it still must be recognized as a possible problem. This is the case because, when the independent variables are collinear, the predicted values for a dependent variable are valid only for observed combinations of the values of the independent variables.[9] As will be evident from the discussion below, multicollinearity clearly exists among some of the independent variables included in this study. Thus, the consequent restriction on the predicted values of the dependent variable that arises because of multicollinearity is relevant for the results reported below.

*Selection of the Independent Variables*

The prediction equations developed for this study were estimated on the basis of two sets of independent variables: (1) those available from UI agency records as a result of the normal processing of UI claims; and (2) those in (1) plus data available from the CWBH data files. The potential contribution of the CWBH data elements to the development of the prediction equations could be an important issue because the CWBH program currently has been implemented on a uniform basis in 14 states. If the results of this analysis were to demonstrate that the availability of the CWBH data elements might provide a reasonable basis for conducting relatively inexpensive benefit adequacy studies by means of prediction equations, this would be an important finding for policy purposes.

The data base for this study contains most of the variables available as a result of the normal taking and processing of UI claims. From among this set of variables, the following were used in this analysis:

(1) the weekly UI benefit amount;
(2) high quarter earnings;
(3) base period wages;
(4) the ratio of base period to high quarter earnings;
(5) delayed filing time;
(6) an urban-rural dummy variable;
(7) sex;
(8) age;
(9) ethnic group;
(10) occupation;
(11) industry; and
(12) a union-nonunion dummy variable.

The definitions and codes for these variables, together with the mean value of each of these variables for the total sample analyzed, are provided in Appendix A. As just noted above, multicollinearity clearly exists among some of these variables, particularly among the first three variables above.

The ABA study data base also includes a number of variables similar (or identical) to those now available through the CWBH program. Efforts were made to identify these common data elements, and to include them in the analysis together with those data elements available from UI agency records. The following are the CWBH data elements that could be matched with those available in the study data base for this study:

(1) educational attainment;
(2) household type;
(3) total annual household income;
(4) beneficiary's gross wages in a typical month;

(5) household size;
(6) number of dependents; and
(7) the ratio of the beneficiary's gross wages to total household income during a typical month.

The definitions and codes for these variables, together with their mean values for the total sample, also have been placed in Appendix A.

Two prediction equations were estimated for the total sample. The first equation was based just on the variables normally available as a result of processing UI claims. The second equation for the total sample was based on the variables utilized for the first equation and, in addition, the variables that could be obtained from the CWBH tapes, as listed above. In addition to estimating the two equations for the total sample, separate regression equations were estimated for each of the seven household type categories that comprise the total sample. The rationale for this approach was based partly on the results of previous research for the study group that indicated the existence of a strong relationship between these household type categories and benefit adequacy. The objective was to determine whether more accurate prediction equations might be formulated if they were estimated separately for relatively homogeneous households, rather than for the total sample of households. Because the CWBH data would be required to separate beneficiary households into the seven types utilized in this analysis, only a single set of variables (those available from UI claims data or the CWBH data) was utilized to develop the prediction equations for these household types. Thus, a total of nine equations was estimated for the study group.

The variables available for potential inclusion in each of the nine equations estimated have been noted above. However, the exact variables included in each equation were determined on the basis of a criterion designed to maximize the predictive capability of each equation. For any given set of independent variables, the standard error of the regression will be minimized if all variables included in the equation have estimated regression coefficients that exceed (in absolute value) their standard errors, and all variables excluded from the equation have estimated regression coefficients that are less (in absolute value) than their standard errors. This criterion also insures that the value of the "adjusted" $R^2$ will be maximized. The actual procedure utilized to estimate each of the nine equations was a stepwise regression procedure with a forward F test. Application of the above criterion for including additional variables meant that an additional independent variable (from the relevant set) was allowed to enter an equation only if the absolute value of the estimated coefficient for that variable was at least equal to its standard error.[10] At the point in the stepwise regression procedure at which no remaining excluded variables could satisfy this criterion, the stepwise procedure was terminated and the variables included in the equation at that point were those utilized for the final prediction equation.[11] The empirical results of this procedure are discussed in the next section.

## EMPIRICAL RESULTS

Analysis of the error residuals that resulted from the nine initial equations estimated (two for the total sample and one for each of seven household types) suggested that some experimentation with respect to alternative transformations of the dependent variable (the benefit adequacy measure) should be considered. After a substantial amount of experimentation with alternative transformations had been completed, it was determined that the natural logarithm of the benefit adequacy measure would be utilized as the dependent variable in the equations estimated for the total sample and for household types 1 through 6, whereas the square root of the benefit adequacy measure would be utilized as the dependent variable for the equation estimated for household type 7.[12] The regression results of immediate interest for the two equations estimated for the total sample (one with and one without the CWBH data elements) and for the individual equations estimated for each of the seven household types are summarized in Table 3; the detailed regression results for these nine equations have been placed in Appendices B and C.

The adjusted $R^2$ for the equation estimated for the total sample without the CWBH data elements (Equation 1) is only 22 percent. Moreover, the tolerance interval limits are extremely wide (from 27% to 142%), and this clearly indicates that the values of the benefit adequacy measure for individual beneficiaries cannot be predicted accurately from this equation.[13]

The predictive capability of the regression equation estimated for the total sample is somewhat improved by including the CWBH data elements in the potential set of independent variables used to construct the prediction equation for the total sample (see Equation 2). For example, the value of the adjusted $R^2$ is almost doubled from the equation estimated without the CWBH variables, from 22 percent to 42 percent. Nonetheless, the 95 percent tolerance interval remains extremely wide; compared with Equation 1, the lower limit of this tolerance interval is raised from 27.2 to 30.4 and the upper limit is reduced from 142.1 to 127.1. In

TABLE 3

SUMMARY OF REGRESSION RESULTS

| Equation # | Group Analyzed | HH Type Definition[a] | Conditional Mean of Benefit Adequacy[b] | Actual Values of 95% Tolerance Interval[c] | | $R^2$ [d] | F | Sample Size |
|---|---|---|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound | | | |
| 1 | Total Sample | All Types | 62.1 | 27.2 | 142.1 | 22.4 | 53.0 | 3064 |
| 2 | Total Sample | All Types | 62.1 | 30.4 | 127.1 | 41.9 | 89.4 | 3064 |
| 3 | HH Type 1 | 1E-1HH-NR | 67.2 | 32.8 | 137.6 | 26.9 | 12.1 | 482 |
| 4 | HH Type 2 | 1E-1HH-REL | 92.3 | 32.9 | 258.6 | 15.6 | 3.4 | 267 |
| 5 | HH Type 3 | 1E-2HH-SP | 57.2 | 27.3 | 120.1 | 28.2 | 7.6 | 321 |
| 6 | HH Type 4 | 2E-2HH-SP | 78.7 | 42.7 | 144.8 | 39.8 | 14.5 | 347 |
| 7 | HH Type 5 | 1E-3+HH-SP | 46.8 | 25.7 | 85.1 | 40.8 | 35.1 | 745 |
| 8 | HH Type 6 | 2+E-3+HH-SP | 65.1 | 37.2 | 114.1 | 52.5 | 31.9 | 616 |
| 9 | HH Type 7 | 1+E-2+HH-SA | 61.5 | 28.9 | 106.4 | 43.9 | 12.7 | 286 |

[a] E = number of earners; HH = number of household members; NR = living alone or with nonrelated persons; REL = living with related persons; SP = spouse present; SA = spouse absent.

[b] Antilog of the mean of the logarithms for equations 1 through 8; squared value of the mean of the square roots for equation 9.

[c] Computed around the mean of the transformed value of the benefit adequacy measure; then, the inverse transformation was taken to obtain the values reported. Technically, the approach used to construct these tolerance intervals would be exact only if the sample sizes were infinitely large.

[d] Adjusted for degrees of freedom. Equation 1 is estimated without the data elements from the CWBH data files. Equations 2-9 are estimated with variables available from the CWBH data files.

short, a wide range of error remains in predicting the values of the benefit adequacy measure for individuals in the study group, even after including CWBH data elements in the set of independent variables.

It is possible, of course, that it is so difficult to predict benefit adequacy values for the total sample because of the diversity of household circumstances among those included in the total sample. Earlier analysis of ABA study data consistently has indicated a strong relationship between benefit adequacy and the seven household type categories investigated. To determine whether predictive accuracy might be improved dramatically by estimating separate equations for more homogeneous subgroups, equations were estimated for each of the seven household types. When estimating these equations, the CWBH variables were included in the potential set of variables. These additional results also are summarized in Table 3. Unfortunately, these results indicate that little is gained from estimating separate equations for each household type. For example, the equation with the smallest tolerance interval is the one estimated for household type 5. Even in this case, however, the tolerance interval ranges from 26 percent to 85 percent (around a predicted mean of 47 percent). Thus, substantial error would result in utilizing this equation, which could be considered to be the "best" of these nine equations, to predict benefit adequacy values for individual claimants. The inability to develop reasonably accurate prediction equations for beneficiaries within fairly homogeneous groups of households, even on the basis of the large number of variables included in study, strongly suggests that household circumstances that importantly affect the beneficiary's share of necessary/obligated expenses (and thereby the beneficiary's level of benefit adequacy) simply are not reflected well by the available data set. This suggests that even fairly detailed information about household income and size does not provide a basis for accurately predicting the beneficiary's share of household expenditures in those same households.

The above results clearly indicate that the equations developed would not be particularly useful in predicting values of the benefit adequacy measure for individual beneficiaries. However, the overall benefit adequacy distribution for the entire study group obviously could be predicted with more accuracy, since some prediction errors for individuals cancel or nearly cancel.[14] At the same time, it should be noted that the resulting information on the overall benefit adequacy distribution would have severe limitations from a policy viewpoint because of substantial prediction errors for individual claimants. In fact, such errors would preclude the use of the predicted distribution in analyzing the types of claimants for whom benefits are/are not adequate. The predicted distributions for the entire group that result from Equations 1-9 in Table 3, together with the actual benefit adequacy distribution, are reported in Appendix D. As might be expected, the prediction equations are very weak in identifying claimants with either extremely low or high benefit adequacy values.

## CONCLUSIONS

The major purpose of this study was to determine whether very detailed information about household size, composition and income would provide a basis for accurately predicting the values of a benefit adequacy measure for individual beneficiaries. The answer to this question is an important one from a policy viewpoint because the methodology explored in this report would provide a much less expensive technique for conducting benefit adequacy studies than the relatively expensive field research efforts that form the basis of conventional studies. Unfortunately, the results of the study strongly indicate that the values of the benefit adequacy measure analyzed can not be predicted accurately for individual beneficiaries on the basis of detailed information about household income and composition. The predictive capability of the estimated equations was improved by supplementing the data available from the normal processing of UI claims with information that can be obtained from the current CWBH program. However, even these "improved" equations resulted in a very substantial range of error in predicting benefit adequacy values for individual beneficiaries. The inability to predict accurately indicates that even extremely detailed information on household composition and income is not sufficient to identify the extremely diverse expenditure patterns that exist for beneficiaries with similar income and household composition. Because of this problem it was not possible to predict benefit adequacy values for individual beneficiaries with any reasonable degree of accuracy.

Because some of the prediction errors for individual beneficiaries cancel or nearly cancel, it was possible to predict the overall benefit adequacy distribution for the entire study group with more accuracy than was possible for individual beneficiaries. The major exception is that the estimating equations provide a very poor approximation for very high and very low values in the actual benefit adequacy distribution. It also should be noted that predicting the distribution for the overall study group has severe policy limitations because of very large prediction errors for particular types of beneficiaries. Hence, the types of claimants for whom benefits are/are not adequate can not be identified accurately from this overall distribution. As a result, policy could not be targeted to affect beneficiaries with either high or low benefit adequacy values.

Overall, the results of this study strongly indicate that the methodology in this report does not represent a useful basis for developing relatively inexpensive techniques for conducting benefit adequacy studies. Thus, the search for a relatively inexpensive methodology for conducting studies similar to traditional benefit adequacy studies should concentrate on other approaches. In particular, these results clearly indicate that information on income and household composition must be supplemented with actual or estimated data on household expenditure patterns to predict individual benefit adequacy values with any reasonable degree of accuracy. Certainly, this is the case if the goal is to obtain reasonably accurate estimates of a conventionally defined benefit adequacy measure for individual beneficiaries.

# FOOTNOTES

[1]See Paul Burgess, Jerry Kingston and Chris Walters, *The Adequacy of Unemployment Insurance Benefits: An Analysis of Weekly Benefits Relative to Preunemployment Expenditure Levels*. U.S. Department of Labor, Employment and Training Administration, Unemployment Insurance Service. Washington, D.C.: Government Printing Office, 1978.

[2]Further perspective on this expense concept is provided by indicating what items were excluded from the necessary/obligated criterion. The following expenditures were excluded:

(1) expenses for remodeling; rather than maintaining a home;
(2) contributions to charity;
(3) payments for gifts;
(4) purchases of meals/snacks away from home;
(5) entertainment expenses;
(6) out-of-town travel or vacation expenses;
(7) educational expenses;
(8) other important payments (e.g., legal or accounting fees); and
(9) lump-sum payoffs of past debts or purchases of major consumer durables.

[3]This analysis is contained in Jerry Kingston, Paul Burgess, and Chris Walters, *The Adequacy of Unemployment Insurance Benefits: An Analysis of Adjustments Undertaken Through Thirteen and Twenty-Five Weeks of Unemployment*. U.S. Department of Labor, Employment and Training Administration, Unemployment Insurance Service. Washington, D.C.: Government Printing Office, 1978.

[4]Earlier project reports have shown this total to be 4,468 persons. In processing data from the benefit year history files, 16 cases were found not to satisfy the original criterion for inclusion in the ABA study data base. In most instances, revised wage statements (not available at the time the sample first was drawn) indicated that claimants were not entitled to benefits under the Arizona Employment Security Law. In a few other cases, benefits were paid under SUA or other special programs not encompassed by the ABA study. Hence, 16 cases were removed from the potential data base used for this study.

[5]In 66 of these cases, it is not possible to compute the benefit adequacy measure for the household unit, because of missing data elements. In the remaining cases, information on one or more of the variables used to develop the prediction equations was unavailable.

[6]Since the differences across any variable must sum to zero, only 14 of the 18 tests reported in Table 1 are independent. Therefore, the probability is at least .05 that one of the probability values reported in Table 1 would be less than .05/14 = .0036, even if the true value for all of the differences were 0. See Leo A. Goodman, "Simultaneous Confidence Intervals For Contrasts Among Multinominal Populations," *Annals of Mathematical Statistics*, Vol. 35, 1964, pp. 716-720.

[7]Since the differences across any variable must sum to zero, only 5 of the 7 tests reported in Table 2 are independent. Therefore, the probability is at least .05 that one of the probability values reported in Table 2 would be less than .05/5 = .01, even if the true value for all of the differences were 0. See idem.

[8]When the independent variables selected for a regression analysis are correlated among themselves, intercorrelation or multicollinearity is said to exist. For a discussion of the consequences of multicollinearity, see: John Neter and William Wasserman, *Applied Linear Statistical Models* (Homewood, Illinois: Richard D. Irwin, Inc., 1974), pp. 250-254 and 339-347; or J. Johnston, *Econometric Methods,* 2nd ed., (New York: McGraw-Hill Book Company, 1972), pp. 159-168.

[9]It always is the case that predictions for a dependent variable are reliable only within the range of the observed values of the independent variables upon which the equation is based. However, the existence of multicollinearity among a group of independent variables means that the predicted values of the dependent variable are reliable only for the actually observed combinations of values for that group of independent variables. The restriction that results when multicollinearity exists is, of course, much more serious than the restriction present in the absence of multicollinearity.

[10]This condition, of course, simply implies that the t statistic for an additional variable must have a value of at least 1.0 in order for the variable to be added to the regression equation.

[11]This procedure can be criticized since: (a) it may have been possible to explain more of the variation in the dependent variable by some other subset of the set of potential independent variables; and (b) it does not guarantee that a variable which is included in an equation because it satisfies the criterion for inclusion at some step in the procedure will continue to satisfy the criterion for inclusion after additional variables are selected. Criticism (a) above could have been avoided only by using an "all possible subsets" algorithm. Criticism (b) above could have been avoided by using a stepwise algorithm that provided for a "backward looking glance." Unfortunately, these options are not available in the software packages available for this study. An ex-post analysis of the variables selected for inclusion indicated that the procedure actually utilized did not create a problem because: (a) the variables entered in the analysis are plausible; and (b) only a few of the included variables do not satisfy the inclusion criterion at the final step. For a brief discussion of the various stepwise algorithms, see Norman H. Nie et. al., *Statistical Package For The Social Sciences,* 2nd edition, McGraw-Hill Book Company (New York, 1975), pp. 344-347.

[12]The plots of the error residuals for the equations in which the benefit adequacy measure was not transformed indicated that extreme values were exerting an unwarranted influence (i.e., the values for many non-extreme observations were overestimated in order to compensate for the values of the few extreme observations which were underestimated). This

pattern is consistent with the positively skewed distribution of values for benefit adequacy (because there is a lower limit of zero but no upper bound on the measure of benefit adequacy). These facts suggested that the dependent variable (the measure of benefit adequacy) should be transformed to obtain a more symmetrical distribution. The results of applying both square root and logarithmic transformations were analyzed for each of the nine equations; the transformations utilized for the final equations (reported in the text and in Appendices B and C) were selected on the basis of the symmetry of the transformed dependent variable and the plots of the error residuals for each regression equation.

[13]The tolerance limits reported in Table 3 are based on the following assumptions: (a) the distribution of benefit adequacy values, given any configuration of values for the set of independent variables, is a normal distribution; (b) the estimated regression surface equals the true regression surface; and (c) the estimated standard deviation of the stochastic disturbance in the regression model equals the true value of the standard deviation of the error component of the model. Since none of these assumptions actually was strictly satisfied, all of these assumptions led to the construction of tolerance intervals that are narrower than would be the case for more realistic assumptions. That is, tolerance intervals based on more realistic assumptions (which would provide for 99 percent confidence that at least 95 percent of the observations would be contained therein) would be at least as wide as the ranges reported in Table 3. See Rupert G. Miller, Jr., *Simultaneous Statistical Inference,* McGraw-Hill Book Company (New York: 1966), pp. 109-128 for a discussion of confidence intervals, prediction intervals, and tolerance intervals in regression analyses.

[14]This assumes the estimated and true regression surfaces are nearly identical. This is a reasonable assumption, given the sample sizes for each equation.

## APPENDIX A
## VARIABLE DEFINITIONS AND CODING

| Variable | Definition | Coding | Total Sample Mean Value |
|---|---|---|---|
| WBA | Weekly Benefit Amount | Dollars | $71.26 |
| HIQTR | High Quarter Earnings | In thousands of dollars | $ 2.60 |
| BPE | Base Period Earnings | In thousands of dollars | $ 7.57 |
| QTRATIO | BPE/HIQTR | Decimal Ratio | 2.89 |
| DELAYFIL | Elapsed Time from Job Separation to UI Claim | Days | 4.26 |
| URBAN | Urban-Rural Dummy Variable | 1 = Urban; 0 = Rural | 82.90% |
| SEXFEM | Sex = Female | 1 = Yes; 0 = No | 32.47% |
| AGELS25 | Age Less than 25 Years | 1 = Yes; 0 = No | 23.66% |
| AGE2549 | Age 25-49 Years | 1 = Yes; 0 = No | 56.82% |
| AGE50UP | Age 50 Years and Up | 1 = Yes; 0 = No | 19.52% |
| RACEWT | Race = White | 1 = Yes; 0 = No | 82.11% |
| RACESP | Race = Spanish | 1 = Yes; 0 = No | 14.30% |
| RACEOT | Race = Other | 1 = Yes; 0 = No | 3.59% |
| PROF | Occupation = Prof., Tech., Mgrl. | 1 = Yes; 0 = No | 20.10% |
| CLER | Occupation = Clerical | 1 = Yes; 0 = No | 23.50% |
| SERV | Occupation = Services | 1 = Yes; 0 = No | 8.65% |
| FARM | Occupation = Farming | 1 = Yes; 0 = No | 1.14% |
| PROC | Occupation = Processing | 1 = Yes; 0 = No | 1.53% |
| MACH | Occupation = Machine Trades | 1 = Yes; 0 = No | 5.48% |
| BENC | Occupation = Bench Work | 1 = Yes; 0 = No | 4.67% |
| STRUCT | Occupation = Structural Work | 1 = Yes; 0 = No | 25.52% |
| MISCOCC | Occupation = Miscellaneous | 1 = Yes; 0 = No | 9.40% |
| MANDR | Industry = Manufacturing: Durables | 1 = Yes; 0 = No | 13.05% |
| MANNDR | Industry = Manufacturing: Nondurables | 1 = Yes; 0 = No | 3.33% |
| MINQR | Industry = Mining and Quarrying | 1 = Yes; 0 = No | 1.70% |
| CONSTR | Industry = Construction | 1 = Yes; 0 = No | 26.50% |
| TRANS | Industry = Transportation, Communications, Public Utilities | 1 = Yes; 0 = No | 2.81% |
| TRADE | Industry = Wholesale & Retail Trade | 1 = Yes; 0 = No | 27.51% |
| FIRE | Industry = Finance, Insurance & Real Estate | 1 = Yes; 0 = No | 5.35% |
| SERVIND | Industry = Services | 1 = Yes; 0 = No | 17.36% |
| INDOTH | Industry = Other | 1 = Yes; 0 = No | 1.24% |
| UNION | Union Attachment | 1 = Yes; 0 = No | 2.12% |
| EDLSHS | Education Less Than High School | 1 = Yes; 0 = No | 23.40% |
| EDEQHS | Eduation = High School | 1 = Yes; 0 = No | 37.37% |
| EDGTHS | Education Greater Than High School | 1 = Yes; 0 = No | 27.71% |
| EDMISS | Education = Missing | 1 = Yes; 0 = No | 11.52% |
| HHTYPE1 | Household Type 1 | 1 = Yes; 0 = No | 15.73% |
| HHTYPE2 | Household Type 2 | 1 = Yes; 0 = No | 8.71% |
| HHTYPE3 | Household Type 3 | 1 = Yes; 0 = No | 10.48% |
| HHTYPE4 | Household Type 4 | 1 = Yes; 0 = No | 11.33% |
| HHTYPE5 | Household Type 5 | 1 = Yes; 0 = No | 24.31% |
| HHTYPE6 | Household Type 6 | 1 = Yes; 0 = No | 20.10% |
| HHTYPE7 | Household Type 7 | 1 = Yes; 0 = No | 9.33% |

(continued)

APPENDIX A (continued)

| Variable | Definition | Coding | Total Sample Mean Value |
|---|---|---|---|
| HHINC1 | HH Income Less Than $3000 | 1 = Yes; 0 = No | 1.08% |
| HHINC2 | HH Income $3000 - $4999 | 1 = Yes; 0 = No | 5.48% |
| HHINC3 | HH Income $5000 - $9999 | 1 = Yes; 0 = No | 30.81% |
| HHINC4 | HH Income $10,000 - $14,999 | 1 = Yes; 0 = No | 25.85% |
| HHINC5 | HH Income $15,000 - $19,999 | 1 = Yes; 0 = No | 18.96% |
| HHINC6 | HH Income $20,000 - $24,999 | 1 = Yes; 0 = No | 10.31% |
| HHINC7 | HH Income $25,000 - $29,999 | 1 = Yes; 0 = No | 4.44% |
| HHINC8 | HH Income $30,000 and Up | 1 = Yes; 0 = No | 3.07% |
| BENSHARE | Ratio of Beneficiary's Earnings to Total Household Income During Employed Month | Percentage | 79.26% |
| HHSIZE | Total Household Size | Number of Persons | 2.86 |
| DEPEND | Beneficiary's Dependents | Number of Persons | 1.02 |
| BENWAGES | Beneficiary's Gross Wages in Employed Month | Dollars | $554.12 |

APPENDIX B
ESTIMATED REGRESSION COEFFICIENTS AND STANDARD ERRORS: EQUATIONS 1 THROUGH 4[a,b]

| Variable | Equation 1: Regression Coefficient | Equation 1: Standard Error | Equation 2: Regression Coefficient | Equation 2: Standard Error | Equation 3: Regression Coefficient | Equation 3: Standard Error | Equation 4: Regression Coefficient | Equation 4: Standard Error |
|---|---|---|---|---|---|---|---|---|
| WBA | .00901 | .00058 | .01228 | .00054 | .01361 | .00144 | .01409 | .00318 |
| HIQTR | .01924 | .02000 | .02992 | .02000 | -.03546 | .03000 | ------ | ------ |
| BPE | -.05193 | .01000 | -.02431 | .01000 | ------ | ------ | -.05968 | .02000 |
| QTRATIO | .11305 | .02049 | .03950 | .01781 | ------ | ------ | ------ | ------ |
| DELAYFIL | -.00114 | .00110 | -.00099 | .00095 | ------ | ------ | -.00747 | .00487 |
| URBAN | ------ | ------ | -.04870 | .01801 | -.06030 | .05514 | ------ | ------ |
| SEXFEM | .10056 | .02046 | ------ | ------ | -.11413 | .03884 | ------ | ------ |
| AGELS25 | .19555 | .01983 | .05528 | .01779 | ------ | ------ | .11583 | .07858 |
| AGE2549 | ------ | ------ | ------ | ------ | -.04533 | .03541 | ------ | ------ |
| AGE50UP | .07619 | .02011 | ------ | ------ | ------ | ------ | ------ | ------ |
| RACEWT | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| RACESP | -.07611 | .02219 | -.04040 | .02009 | -.12633 | .07919 | -.18386 | .09103 |
| RACEOT | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| PROF | -.03230 | .02179 | ------ | ------ | -.10346 | .04113 | ------ | ------ |
| CLER | ------ | ------ | ------ | ------ | ------ | ------ | -.08778 | .08366 |
| SERV | ------ | ------ | ------ | ------ | ------ | ------ | -.16192 | .10410 |
| FARM | -.11887 | .07304 | -.08000 | .06246 | -.53748 | .20719 | -.48671 | .27350 |
| PROC | ------ | ------ | ------ | ------ | ------ | ------ | -.40986 | .24805 |
| MACH | -.05334 | .03567 | ------ | ------ | ------ | ------ | ------ | ------ |
| BENC | ------ | ------ | .06046 | .03190 | ------ | ------ | ------ | ------ |
| STRUCT | -.06019 | .02509 | ------ | ------ | ------ | ------ | ------ | ------ |
| MISCOCC | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| MANDR | ------ | ------ | ------ | ------ | ------ | ------ | -.20240 | -.10305 |
| MANNDR | ------ | ------ | ------ | ------ | .13488 | .09702 | ------ | ------ |
| MINQR | -.09745 | .05990 | ------ | ------ | ------ | ------ | -.29879 | .31493 |
| CONSTR | -.07169 | .02311 | ------ | ------ | ------ | ------ | -.20318 | .11122 |
| TRANS | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| TRADE | ------ | ------ | -.01890 | .01559 | ------ | ------ | ------ | ------ |
| FIRE | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| SERVIND | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| GOVT | -.12688 | .07215 | -.11003 | .06267 | ------ | ------ | ------ | ------ |
| INDOTH | ------ | ------ | ------ | ------ | .33336 | .20639 | ------ | ------ |
| UNION | -.14180 | .05408 | ------ | ------ | -.23180 | .14006 | .82588 | .53179 |
| EDLSHS | ******* | ****** | ------ | ------ | ------ | ------ | -.14372 | .08526 |
| EDEQHS | ****** | ****** | ------ | ------ | ------ | ------ | ------ | ------ |
| EDGTHS | ****** | ****** | -.05058 | .01533 | ------ | ------ | ------ | ------ |
| EDMISS | ****** | ****** | ------ | ------ | ------ | ------ | ------ | ------ |
| HHTYPE1 | ****** | ****** | .07115 | .02687 | ****** | ****** | ****** | ****** |
| HHTYPE2 | ****** | ****** | .37884 | .03262 | ****** | ****** | ****** | ****** |
| HHTYPE3 | ****** | ****** | ------ | ------ | ****** | ****** | ****** | ****** |
| HHTYPE4 | ****** | ****** | .08030 | .02567 | ****** | ****** | ****** | ****** |
| HHTYPE5 | ****** | ****** | -.07521 | .02217 | ****** | ****** | ****** | ****** |
| HHTYPE6 | ****** | ****** | ------ | ------ | ****** | ****** | ****** | ****** |
| HHTYPE7 | ****** | ****** | -.05824 | .02628 | ****** | ****** | ****** | ****** |
| HHINC1 | ****** | ****** | .50832 | .07102 | .23901 | .12471 | .17292 | .16542 |
| HHINC2 | ****** | ****** | .31852 | .03983 | .16572 | .06131 | ------ | ------ |

(continued)

APPENDIX B (continued)

| Variable | Equation 1: Regression Coefficient | Equation 1: Standard Error | Equation 2: Regression Coefficient | Equation 2: Standard Error | Equation 3: Regression Coefficient | Equation 3: Standard Error | Equation 4: Regression Coefficient | Equation 4: Standard Error |
|---|---|---|---|---|---|---|---|---|
| HHINC3 | ****** | ****** | .14001 | .02188 | ------ | ------ | ------ | ------ |
| HHINC4 | ****** | ****** | ------ | ------ | -.09083 | .04502 | .26108 | .15978 |
| HHINC5 | ****** | ****** | ------ | ------ | ------ | ------ | .77617 | .33106 |
| HHINC6 | ****** | ****** | ------ | ------ | ------ | ------ | 1.28740 | .59242 |
| HHINC7 | ****** | ****** | -.03535 | .03469 | ------ | ------ | ------ | ------ |
| HHINC8 | ****** | ****** | ------ | ------ | .24298 | .18069 | ------ | ------ |
| BENSHARE | ****** | ****** | -.00636 | .00048 | ------ | ------ | .01141 | .00530 |
| HHSIZE | ****** | ****** | -.03369 | .00614 | ------ | ------ | ------ | ------ |
| DEPEND | ****** | ****** | ------ | ------ | ------ | ------ | ------ | ------ |
| BENWAGES | ****** | ****** | -.00028 | .00003 | -.00048 | .00008 | -.00088 | .00032 |
| CONSTANT | 3.47715 | | 4.05028 | | 3.83887 | | 3.40467 | |

Table Notes:

[a]Equations are numbered in Table 3.

[b]****** indicates that the variable was not permitted to enter the equation.
------ indicates variable did not satisfy the criterion for inclusion in the equation.

APPENDIX C

ESTIMATED REGRESSION COEFFICIENTS AND STANDARD ERRORS: EQUATIONS 5 THROUGH 9[a,b]

| Variable | Equation 5: Regression Coefficient | Equation 5: Standard Error | Equation 6: Regression Coefficient | Equation 6: Standard Error | Equation 7: Regression Coefficient | Equation 7: Standard Error | Equation 8: Regression Coefficient | Equation 8: Standard Error | Equation 9: Regression Coefficient | Equation 9: Standard Error |
|---|---|---|---|---|---|---|---|---|---|---|
| WBA | .015393 | .00190 | .01194 | .00141 | .01352 | .00109 | .01284 | .00090 | .06451 | .00605 |
| HIQTR | ------ | ------ | ------ | ------ | -.01900 | .01000 | ------ | ------ | ------ | ------ |
| BPE | -.01961 | .01000 | -.00930 | .01000 | -.00951 | .00000 | ------ | ------ | -.11240 | .05000 |
| QTRATIO | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | .18623 | .13332 |
| DELAYFIL | -.00389 | .00300 | ------ | ------ | -.00264 | .00174 | .00443 | .00184 | .01051 | .00883 |
| URBAN | ------ | ------ | -.11357 | .04782 | -.05676 | .02815 | ------ | ------ | ------ | ------ |
| SEXFEM | ------ | ------ | .09103 | .04352 | .21477 | .05459 | -.04952 | .03390 | -.69056 | .23011 |
| AGELS25 | ------ | ------ | ------ | ------ | ------ | ------ | .06415 | .04214 | .36522 | .20406 |
| AGE2549 | -.05746 | .04837 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| AGE50UP | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| RACEWT | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| RACESP | -.13713 | .09011 | ------ | ------ | ------ | ------ | -.06612 | .03367 | ------ | ------ |
| RACEOT | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| PROF | ------ | ------ | .09389 | .04361 | -.03998 | .03087 | -.04584 | .02985 | ------ | ------ |
| CLER | -.06568 | .06282 | ------ | ------ | -.06737 | .03953 | ------ | ------ | -.26438 | .18286 |
| SERV | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| FARM | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| PROC | .23741 | .17613 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| MACH | ------ | ------ | -.10788 | .09478 | ------ | ------ | ------ | ------ | ------ | ------ |
| BENC | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | .28468 | .29041 |
| STRUCT | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | -.53349 | .30470 |
| MISCOCC | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| MANDR | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| MANNDR | ------ | ------ | .13445 | .05909 | ------ | ------ | .05155 | .03287 | ------ | ------ |
| MINQR | .19452 | .15790 | -.16561 | .16118 | ------ | ------ | ------ | ------ | ------ | ------ |
| CONSTR | ------ | ------ | .11748 | .04977 | ------ | ------ | ------ | ------ | ------ | ------ |
| TRANS | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| TRADE | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| FIRE | ------ | ------ | ------ | ------ | ------ | ------ | -.07157 | .05270 | ------ | ------ |
| SERVIND | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| GOVT | -.26404 | .22342 | ------ | ------ | ------ | ------ | -.10166 | .09337 | -1.02758 | .74400 |
| INDOTH | -.31656 | .17628 | ------ | ------ | ------ | ------ | .13222 | .11924 | ------ | ------ |
| UNION | ------ | ------ | ------ | ------ | -.08668 | .06038 | .24578 | .09950 | ------ | ------ |
| EDLSHS | ------ | ------ | ------ | ------ | ------ | ------ | .03755 | .03266 | ------ | ------ |
| EDEQHS | ------ | ------ | -.04358 | .04328 | ------ | ------ | ------ | ------ | .28186 | .17111 |
| EDGTHS | -.09372 | .05413 | -.09732 | .04564 | ------ | ------ | -.08247 | .03070 | ------ | ------ |
| EDMISS | ------ | ------ | ------ | ------ | ------ | ------ | -.06209 | .03644 | 1.0315 | .23988 |
| HHTYPE1 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHTYPE2 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHTYPE3 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHTYPE4 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHTYPE5 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHTYPE6 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHTYPE7 | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| HHINC1 | ------ | ------ | ------ | ------ | .71049 | .22335 | ------ | ------ | 3.2562 | 1.33887 |
| HHINC2 | .21934 | .13513 | ------ | ------ | .39375 | .09030 | ------ | ------ | 2.24716 | .43469 |

(continued)

APPENDIX C (continued)

| Variable | Equation 5: Regression Coefficient | Equation 5: Standard Error | Equation 6: Regression Coefficient | Equation 6: Standard Error | Equation 7: Regression Coefficient | Equation 7: Standard Error | Equation 8: Regression Coefficient | Equation 8: Standard Error | Equation 9: Regression Coefficient | Equation 9: Standard Error |
|---|---|---|---|---|---|---|---|---|---|---|
| HHINC3 | ------ | ------ | .23302 | .07284 | .13777 | .04387 | .41180 | .07538 | .54794 | .25097 |
| HHINC4 | -.20986 | .05790 | ------ | ------ | -.00309 | .03560 | .17037 | .04608 | ------ | ------ |
| HHINC5 | -.20671 | .07740 | ------ | ------ | ------ | ------ | .08471 | .03573 | ------ | ------ |
| HHINC6 | -.12979 | .10334 | -.08298 | .06381 | ------ | ------ | ------ | ------ | ------ | ------ |
| HHINC7 | ------ | ------ | -.13088 | .08769 | ------ | ------ | ------ | ------ | ------ | ------ |
| HHINC8 | .24904 | .21384 | -.24119 | .12796 | ------ | ------ | -.10392 | .06528 | -1.31309 | 1.06409 |
| BENSHARE | -.00773 | .00152 | -.01311 | .00199 | ------ | ------ | -.01579 | .00144 | - .02975 | .00499 |
| HHSIZE | ------ | ------ | ------ | ------ | -.03505 | .00787 | -.06562 | .01824 | - .13394 | .05798 |
| DEPEND | -.56459 | .39116 | ------ | ------ | ------ | ------ | .03844 | .01750 | ------ | ------ |
| BENWAGES | -.00024 | .00007 | -.00012 | .00012 | -.00026 | .00004 | -.00016 | .00007 | -.00189 | .00052 |
| CONSTANT | 4.17735 | | 4.41751 | | 3.39455 | | 4.36174 | | 7.56638 | |

Table Notes:

[a]The equations are numbered in Table 3.

[b]****** indicates that the variable was not permitted to enter the equation.
------ indicates the variable did not satisfy the criterion for inclusion in the equation.

# APPENDIX D

## PREDICTING THE OVERALL BENEFIT ADEQUACY DISTRIBUTION

Three different equations or equation sets were utilized to predict the distribution of benefit adequacy for the total sample. One distribution was predicted on the basis of the single equation estimated for the total sample without the CWBH data (Equation 1 in Text Table 3). A second prediction was developed from the single equation estimated for the total sample that includes the CWBH data (Equation 2 in Text Table 3). A third prediction of the overall benefit adequacy distribution was developed from the set of equations estimated for the seven different household types (Equations 3 through 9 in Text Table 3). In this latter case, the equation for each household type was utilized to predict the values of the benefit adequacy measure for the beneficiaries in that particular household type category, and then these predicted values were cumulated into a single distribution for the total sample.

The actual benefit adequacy distribution for the total sample and the three predicted distributions are provided in Table D-1. The closest approximation to the actual distribution is the one predicted from the equations developed for the seven different household types. A comparison of the proportion of beneficiaries classified into each of the 5 percent intervals considered provides further evidence that the actual distribution is most nearly approximated by the distribution predicted from the equation set estimated for the seven different household types: for 19 of the 22 five percent intervals considered, the actual proportion of beneficiaries classified into each interval is most closely approximated

## APPENDIX TABLE D-1

## DISTRIBUTIONS OF THE ACTUAL AND PREDICTED VALUES OF BENEFIT ADEQUACY: TOTAL SAMPLE[a]

| Benefit Adequacy Classification | Actual Distribution | Distribution Predicted From Total Equation Without CWBH Data: Equation 1 | Distribution Predicted From Total Equation With CWBH Data: Equation 2 | Distribution Predicted From HH Type Equations With CWBH Data: Equations 3-9 |
|---|---|---|---|---|
| Less than 5% | 0.0 | 0.0 | 0.0 | 0.0 |
| 6-10% | 0.1 | 0.0 | 0.0 | 0.0 |
| 11-15% | 0.3 | 0.0 | 0.1 | 0.1 |
| 16-20% | 1.0 | 0.0 | 0.1 | 0.1 |
| 21-25% | 1.8 | 0.3 | 0.4 | 0.5 |
| 26-30% | 2.8 | 0.7 | 1.1 | 1.2 |
| 31-35% | 4.8 | 1.6 | 2.5 | 3.0 |
| 36-40% | 6.5 | 2.3 | 4.3 | 5.3 |
| 41-45% | 7.3 | 4.0 | 7.1 | 7.2 |
| 46-50% | 7.0 | 6.5 | 7.9 | 9.1 |
| 51-55% | 7.6 | 8.6 | 8.2 | 8.2 |
| 56-60% | 7.6 | 12.0 | 9.5 | 9.2 |
| 61-65% | 8.1 | 15.1 | 10.6 | 9.4 |
| 66-70% | 6.7 | 17.2 | 10.5 | 8.6 |
| 71-75% | 5.9 | 12.7 | 9.0 | 8.3 |
| 76-80% | 4.4 | 9.8 | 8.9 | 6.4 |
| 81-85% | 4.8 | 4.7 | 5.4 | 5.5 |
| 86-90% | 3.4 | 3.4 | 4.5 | 4.7 |
| 91-95% | 3.7 | 0.9 | 2.8 | 3.3 |
| 96-99% | 2.3 | 0.2 | 1.9 | 2.0 |
| 100-104% | 2.1 | 0.0 | 1.8 | 2.1 |
| 105% or More | 11.8 | 0.0 | 3.5 | 5.6 |

[a]The equations utilized to develop these distributions are summarized in Text Table 3 and are reported in more detail in Appendices B and C.

by the proportion of beneficiaries predicted from the equation set developed for the seven different household types. Overall, this predicted distribution provides a reasonably good approximation of the actual benefit adequacy distribution, with the marked exception of low and high benefit adequacy values. This was to be expected, of course, because regression techniques automatically set the mean of the predicted distribution at the known mean of the actual distribution.

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