detailed data on approximately 60 to 70 percent of total family expenditures. An additional 20 to 25 percent of total expenditures are accounted for by using global questions for food and other selected items. The Diary is designed to collect information on frequently purchased items and relatively small expenditure items. Items include, among others, detailed nonprescription drugs, and personal care products and services. Expenditures incurred while away from home overnight or longer are excluded from the Diary; they are collected in the Interview Survey.

METHODOLOGICAL COMPARISON: DIFFERENCES

Refinements in survey methodology introduced with the CCE Survey can be grouped into four categories: overall design, definition, Interview-specific, and Diary-specific changes. Each of these refinements is discussed in this section.

Overall Design

Overall design changes include changes in time frame, sample design, variance estimation, and weighting. In addition to the differences introduced with the CCE Survey when compared to the 1972-73 CE Survey, differences introduced in sample methodology due to the change in sampling frame in 1986 are also noted.

Time Frame. One of the most important differences in the two methodologies is the change in time frame. The current survey is continuous. In contrast, the previous survey was conducted to obtain information for one time period, 1972-73. One reason the change was implemented was to improve the timeliness and efficiency of future CPI revisions. Another reason for the change was that the periodic nature of past expenditure surveys did not respond to the increasing demand from public and private sectors for more current information on consumer spending and income. These data compose the first continuous cross-sectional series in the United States which can be used to analyze expenditure patterns (Gieseman and Rogers 1986). Given the continuous nature of the survey, longitudinal data bases of addresses can also be created to examine changes over time. However, movers are not followed as would be done in a true longitudinal survey.

Sample Design. The sample design specifies the selection of households from a sampling frame. A sampling frame is a list from which housing units are chosen. For the BLS expenditure surveys, the sampling frames are based on Census files with augmentation of the samples using new construction permits and coverage improvement techniques. Augmentation is used to update the samples to include housing units which have been built since the Census was taken and to eliminate recognized deficiencies in the Census. Housing units are selected from primary sampling units (PSUs) included in the sampling frame. PSUs consist of counties (or parts thereof), groups of counties, or independent cities. Housing units within each PSU are stratified by certain variables to maximize efficiency in collecting reliable expenditure data. The sampling frame, PSUs, and stratification

variables differ for the 1972-73 CE and the Continuing CE Surveys.

The 1972-73 CE Survey sample was generated from the 1970 Population Census 20 percent sample file. The CE Survey sample covered 216 PSUs. Housing units were stratified by household size, primary family income, and housing tenure. The BLS selected these characteristics because they are relevant to expenditure patterns (Pearl 1978). If housing units are not stratified by variables which are expected to be highly correlated with expenditures, the variance for expenditure and income data would be higher (Hsen 1986).

Changes in sample design were introduced with the CCE Survey. The 1970 Census 100 percent detailed file was used for the CCE Survey through 1985. This file includes information on the total population but does not include income data (Hsen 1986). The set of sample PSUs for this period was composed of 101 areas, with 85 urban and 16 rural areas. The rural areas within the 16 supplemental PSUs were temporarily eliminated from the sample from October 1981 through December 1983 due to budget constraints. They were included again beginning in January 1984. Housing units in the CCE sample for this time period were stratified by type of living quarters, value of home, and rent of home.

The sampling frames used since January 1986 are generated from the 1980, rather than the 1970, Census 100 percent detailed file, and thus reflect changes in movements of the population and updates in geographic definitions. With this change in sampling frame, the set of sample PSUs was updated. Until April 1988, the set was composed of 109 areas. The urban population was represented by 91 PSUs; 18 PSUs were included to represent the rural nonmetropolitan areas. Due to budget cuts in 1987, the number of PSUs was reduced to 101 areas with 16 rural PSUs included; this change was initiated in April of 1988. Housing units are stratified by value of home, rent of home, and household size.

Variance Estimation. Variance estimation for the two survey periods also differs. In 1972-73, a random group approach was used. For this procedure, the sample was divided into several non-overlapping subsamples. Each subsample was designed to mimic the entire sampling procedure. Estimated variances were produced for each subgroup and for the combined sample. Based on regression results, researchers within the BLS determined that, for each class of items, different sets of characteristics were related to expenditures for white families and for black and other families. Thus, two sets of generalized constants, for each class of items, were used to produce variance estimates for different sample sizes and clustering factors (Hsen 1986).

A pseudo-balanced half-sample replication procedure is used to estimate variances for the CCE. Twenty-one replicates were used in the calculation of variances for the CCE Survey through 1985; 45 replicates are currently being used. The half-sample replication procedure takes advantage of the complex structure of the CCE by accounting for the PSU and stratification features of the sample design and the

weighting procedures in estimating variances, thereby producing a more reliable estimator of the variance. Variances are cell-specific for the CCE (Hsen 1986; Tucker 1985a).

Weighting. Similar weighting procedures have been used for the 1972-73 CE and the CCE Surveys, with the addition of a compositing procedure for the Interview and Diary components of the latter survey. Principal person (PP) weighting has been used to produce population estimates for the 1972-73 CE Survey and for the CCE Survey. The CCE compositing technique uses generalized least squares (GLS). GLS composite weighting was introduced in 1984 and has been used since 1985 to produce published estimates. PP weights and GLS weights both are included in the the 1984 CE public use tape files; after 1984 only the composited GLS weights are available for public use. For a detailed discussion of the steps used in weighting, see USDoL 1986c.

GLS weighting was introduced to deal with two problems which results from the use of PP weighting. First, PP weighting sometimes results in numbers of persons in several demographic groups which differ from the Census counts. In addition, estimates of the total number of consumer units based on the PP weights differ between the Diary and Interview components. Some of the inconsistencies arise from different sampling problems in the two components. To reduce or eliminate the inconsistencies, the GLS procedure is now used to perform the final step in weighting. The composition criterion adjusts consumer unit weights from the Diary and Interview so that they sum to the same totals for each survey component for the set of consumer unit subpopulations defined by region of residence, sampling frame, tenure status, and family type.

The weights for the 1972-73 and the CCE Surveys are generated for different time periods. PP weighting for the 1972-73 Survey are used to produce annual weights. The weighting methodologies applied to the CCE Survey are used to produce weights on a monthly basis for the Interview and on a weekly basis for the Diary to facilitate estimation and processing.

Definition

Changes in the definition of four terms used in the Consumer Expenditure Surveys have been introduced with the CCE Survey. The terms include population, consumer unit, reference person/head, and complete/incomplete income reporter.

Population. The data are collected from a national probability sample of households designed to represent the total civilian noninstitutional population and that portion of the institutional population living in the following groups quarters: boarding houses; housing facilities for college students and workers; staff units in hospitals and homes for the aged, infirmed, or needy; permanent living quarters in hotels and motels; and mobile home parks. Housing units for college students living away from home were added to the list of group quarters surveyed for the CCE Survey. For the 1972-73 CE Survey, expenditures made by college students living away from home were to be included among the expenditures reported by their families or household groups to which they had permanent attachments. However, researchers suspected that these expenditures were being underreported (Carlson 1986; Westat 1976). Thus, for the CCE Survey, students living in college- or university-related housing report their own expenditures directly, while at school, rather than as part of their parents' households.

Consumer Unit. The unit for which expenditure reports are collected with the CE Surveys is the individual or set of individuals who compose a consumer unit. For the 1972-73 CE Survey, a consumer unit was defined as two or more persons, usually living together, who pool their income to make joint expenditure decisions, or a person living alone or sharing a household with others or living as a roomer in a private home, lodging house, or hotel, but who was financially independent. A consumer unit was considered to be financially independent if two of the three major expenditure categories, food, housing, and clothing, were provided by the respondent (Carlson 1986; Pearl 1975). For the CCE Survey, an additional criterion was added to the definition of consumer unit to make it more consistent with the definition of a reporting unit used in other household surveys conducted by the Census. This definition specifically includes all members of a household who are related by blood, marriage, adoption, or other legal arrangement. Financial independence is now determined by the three major expense categories of housing, food, and other living expenses.

Reference Person/Head. The definition of the reference person or head changed between the two survey periods. For the 1972-73 CE Survey, the husband was designated "head" of the consumer unit for households in which both the husband and wife were present. In other than husband/wife households, the head was the person noted as such by the other CU members. In contrast, for the CCE Survey the term "householder" or "reference person" was adopted. The "householder" or "reference person" is the first CU member identified by the respondent when asked to "Start with the name of the person or one of the persons who owns or rents the home." The relationship of other CU members is determined with respect to that person. This change was made in accordance with procedures adopted for other government surveys such as the Current Population Survey.

Complete/Incomplete Income Reporter. The BLS identifies consumer units as "complete income reporters" or "incomplete income reporters" in order to produce population estimates of expenditures by income for publication. Only expenditures for complete income reporters are included in these tabulations. This distinction can also be used by public tape users to identify consumer units for analysis when income is a variable of interest. In general, the distinction between complete and incomplete income reporters is based upon whether the respondent provides values for major sources of income, such as wages and salaries, self-employment income, and Social Security income. However, it is possible even for complete income reporters not to provide a full accounting of all income from all sources. For the 1972-72 CE Survey, a consumer unit

reporting zero income was considered a complete income reporter as long as there was no evidence of refusal to answer the income question. With the CCE Survey, records with across-the-board zero income are considered to be invalid and are identified as incomplete income reports.

Interview-Specific

There are five primary differences in survey methodology for the 1972-73 Interview and the CCE Interview. These include the introduction of a panel rotation survey design, a different target sample size, a different procedure to deal with consumer units which move into a housing unit which is already included in the sample and consumer units in which consumer unit members change during the survey period, a change in questionnaire design and reference periods, and a different criterion to determine which consumer units surveyed are included in the final data base upon which population estimates are based and from which microdata tapes are created.

Survey Design. Since the CCE Survey is designed to be ongoing, a rotation panel design was introduced for the Quarterly Interview. This is perhaps the most profound change for the Interview between the two survey periods. The panel rotation design was selected as a way to produce "best" estimates of quarterly and annual expenditure levels and changes (Hsen 1986). The 1972-73 CE Survey had no panel rotation, although panels of consumer units were followed over five consecutive quarters. For that survey, a full-year sample was introduced in the first quarter of each year, concentrating a very heavy work load in that quarter. A consensus developed among persons working with the 1972-73 CE Survey that the annual panels of respondents design was inefficient and costly. Census had success in using rotating panel survey designs and thus it was decided that this approach would be used for the CCE Survey (Carlson 1974; Westat 1976).

The Interview component of the CCE Survey is a national ongoing rotating panel survey in which each consumer unit in the sample is interviewed once per quarter for five consecutive quarters. A panel consists of all the consumer units selected to be interviewed during the same months over the five quarters. Each quarter three new panels are introduced into the sample, one new panel is introduced each month. A rotation group consists of all the consumer unit panels introduced into the sample during the same quarter. The sample consists of four rotation groups over a year. New consumer units are introduced into the Interview sample on a regular basis as other consumer units complete their participation. After being interviewed for five consecutive quarters, each panel is deleted from the sample, hence the rotating nature of the design. Each quarter 20 percent of the panel sample is dropped and a new 20 percent added; the panels are overlapping. This procedure distributes the work load over a year uniformly and improves the operational efficiency of the sample design, since an objective of the Interview is to provide estimates of both level and change simultaneously (Hsen 1986).

Sample Size. The sample sizes for the 1972-73 and the CCE Surveys differ. Approximately 10,000 housing units in 1972 and a different set of 10,000 units in 1973 were designated for interview during the 1972-73 Survey period. The number of eligible sample units responding in 1972 was 9,914 and for 1973 the number was 10,158 (Carlson 1974). The sample sizes for the CCE Survey differ for the periods 1980-85 and 1986-forward. For the earlier period approximately 8,400 addresses were contacted in each of five calendar quarters. The number of completed interviews per quarter was targeted at 4,800. In 1986, approximately 9,150 addresses were contacted in each of the five calendar quarters. The number of completed interviews per quarter was targeted at 6,760. Due to budget cuts in 1987, the target sample size was reduced to 4,800.

Changes in Consumer Units or Sample Address Composition. For the 1972-73 CE Survey, a detailed procedure was used to account for changes in the composition of the reporting units for the reference period being considered. This procedure dictated the time period for which consumer units were to report their expenditures and income. At each Quarterly Interview, deletions and additions in the consumer unit were checked by the Census interviewer. Expenditure information covering the quarterly reporting period was requested for new consumer unit members and persons who were not members of the consumer unit as of the interview date, but who had been part of the consumer unit in an earlier reporting period (Carlson 1974; Westat 1976). The reporting guidelines and procedures of the 1972-73 CE Survey became more complex when movers were encountered, that is, consumer units which were formed at a sample address subsequent to the initial quarterly reporting period for the sample panel. There was no attempt to follow earlier occupants who had been interviewed, or had refused to be interviewed, to their new addresses. For consumer units which moved to the sample address, a special questionnaire was used to record survey year expenditure and income information. Consumer units entering the survey after the first quarter were screened to determine if the family existed as a consumer unit prior to moving to the sample address. If it did, all expenses at previous residences during the survey year were included in the survey. The procedure was followed so that the file of expenditure data would correspond to both the universe of consumer units in existence as of the end of a survey year and to persons who changed consumer unit affiliation during the survey period (Carlson 1974; Westat 1976).

For the CCE Survey, emphasis is placed on the individuals composing the consumer unit at the time of the Quarterly Interview. The interviewer is instructed to obtain an expenditure report for the entire quarter for all persons listed as part of the consumer unit at the interview date. Expenditures and income reports refer back to the beginning of the survey reference period primarily. Reports include expenditures made and income received by consumer unit members when living at other addresses and as members of other consumer units. This procedure was designed to simplify data collection, to promote more accurate reporting, and as a result, to produce more reliable data.

Questionnaire Design and Reference Periods. The questionnaire design and reference periods for expenditures in the 1972-73 Interview were geared to a calendar year. The current Interview is a quarterly survey; thus both quarterly and annual estimates can be produced. This difference is reflected in the types of questions asked during each Interview and in the reference periods used for recalling expenditures. For the 1972-73 CE Interview, the initial interview was used to collect socioeconomic characteristics of the consumer unit, an inventory of major durable items, and data covering a variety of regularly purchased items bought since the first of the year. The expenditure data were used to produce expenditure estimates while the inventory data only were used for bounding, i.e., to classify the consumer unit for analysis and to prevent duplicate reporting expenditures in subsequent interviews. The BLS intended to use the initial reports from the 1972-73 CE Survey for calendar year estimates because it was felt that the bound created by the beginning of the year reference period was sufficient. A uniform bounding procedure was introduced with the CCE Survey (Hsen 1986). The bounding procedure was introduced since, in surveys such as the CE, first interviews on average result in a substantial overstatement of expenditures. This is the net effect of memory losses and associating expenditures with the wrong time period; the principal source of error arises from a phenomenon known as "telescoping". Telescoping results when more expenditures are reported within the reference period of the interview than actually occurred within the period. Expenditure and inventory data collected during the initial interview of the CCE Survey is used strictly for bounding. Expenditure information during this interview is collected using a one month recall.

Questions included in the second through fifth interviews of the 1972-73 CE Interview and corresponding reference periods varied according to the anticipated difficulty of recall. For frequent purchases and small items a three month reference period was used; thus, questions for these items appeared on the questionnaire each quarter. For slightly more expensive items a six month reference period was used. For expensive or infrequently purchased items a one year recall was used. The final interview in the fifth quarter was used to obtain regularly recorded quarterly expenditures, information on housing expenditures, work experience, changes in assets and liabilities, estimates of consumer unit income, and other selected financial information (Carlson 1974).

With the advent of the CCE Survey, a change was made in the reference period to reflect expenditures made since the last Quarterly Interview. For some items a question is asked for the purchase month directly for each reported expenditure, while a second type of question is asked for a quarterly amount of expenditures. This change results in a uniform questionnaire to collect expenditure information in each quarter for the second through fifth interviews. Questions are added for income and work experience in the second and fifth interviews. Income and work experience questions are included in the third and fourth interviews for updating previously provided information. As in the 1972-73 CE Interview, an annual supplement in the fifth interview is used to obtain a financial profile of the consumer unit. A twelve month recall period is used to collect these data.

Data Base Criterion. The criterion used to determine which consumer unit records are included in the data base used by the BLS differs for the two survey periods. For the 1972-73 CE Survey, the file of expenditure records for consumer units which participated in a fifth interview were included. In addition to full-year records this file also included some part-year records for consumer units which reported during interview five. This procedure was followed as a result of the orientation to a calendar year. The interviews of approximately 7,000 consumer units which reported for one or more quarters, but not for quarter five, were not used by the BLS (Westat 1976). Implementation of this procedure resulted in a data base biased toward fifth quarter consumer units (Dippo 1986). In contrast, for the CCE Survey, all consumer units which participate in a Quarterly Interview are included in the BLS data base. Implementation of this procedure avoids the loss of information that would occur if consumer units participating in a Quarterly Interview were not used.

Diary-Specific

The Diary is completed by the consumer unit and is used primarily to obtain expenditure information which is either not collected in the Quarterly Interview or is collected as a global estimate in the Interview. Diary-specific changes introduced with the CCE Survey include a smaller sample size and a minor change in design of the recordkeeping survey instrument.

Sample Size. For the 1972-73 CE Diary, the target sample size was 10,000 consumer units per year (Carlson 1974). The sample for each year was subdivided into 52 systematic subsamples of approximately equal size. A different subsample was introduced each week of each year so that expenditures over the years would be covered. The samples for the four weeks prior to Christmas each year were doubled in size in order to measure more reliably the large volume of purchases at that time of year (Pearl 1978).

For the CCE Survey the sample size was reduced. As with the Quarterly Interview, the sample sizes for the years 1980-85 and 1986-forward also differ. The address sample of households for the earlier years of the CCE Survey included 6,800 households annually. The target annual sample size was 4,800. Samples of 8,180 addresses were requested to participate in 1986 and 1987. The target sample size was 6,050 households annually. Budget cuts have resulted in a smaller target sample size of 4,800 beginning in 1988. The sample sizes reflect the doubling of the Diary sample during the last six weeks of the year to collect expenditures during the peak shopping period of the Christmas and New Year holidays. The workload of interviews is spaced over the 52 weeks of the year.

Form Design. A change in the form design or layout used for recording expenditures has been introduced. For the 1972-73 CE Survey, categories of items were listed in the Diary in line-specific blocks by type of food and beverages, meals and snacks purchased at a restaurant, carry-out, etc., all other purchases and expenses, and gifts. For this survey, consumer units were to record whether alcohol was purchased as part of the meal but were not asked to record the cost. In addition, consumer units participating in this earlier survey were to note where the meal or snack was purchased. Line-block specificity was eliminated for most of the Diary for the CCE Survey (Hsen 1986). For example, the current Diary is designed so that purchases of food and beverages for home consumption are recorded in one block rather than in several blocks as in the 1972-73 Diary. Specific examples of the types of items and expenditures consumer units are to record are listed in the margins of the CCE Survey Diary. For food and beverages purchased at restaurants or other places away from home, consumer units are now requested to note whether alcoholic beverages were included in the cost, and if so how much was spent for these beverages. However, where the meal or snack is purchased is no longer requested (Doddy 1987).

SUMMARY

The Consumer Expenditure Survey provides researchers with a rich source of data on the variables affecting household spending patterns and welfare. To take full advantage of these data, researchers using the public use tapes need to understand the design of the survey. The purpose of this paper is to review BLS publications and related materials in order to compare and contrast the survey methodologies used to collect expenditure data by focusing on the 1972-73 CE Survey and the CCE Survey. This review does not provide an exhaustive discussion of the similarities and differences between the two survey periods; it does, however, provide a discussion of several of the _major_ issues. Other topics of possible interest to researchers using the BLS expenditure survey data include refinements in processing, for example, allocation and imputation (see USDoL 1982 and USDoL 1988a), and changes in top coding rules which are applied to the microdata before they can be released for public use (see USDoL 1977b and USDoL 1987a,b).

Future refinements in the survey methodology are expected to be based on current statistical research being conducted within the BLS. The purpose of these research studies is to improve the measurement of consumer expenditure variables. This research includes, for example, examinations and evaluations of the differential effects of recall length bias, time in sample, and telescoping for the Interview (Silberstein and Jacobs 1986; Silberstein 1987), recordkeeping behavior of Diary respondents (Tucker 1985b, 1986a, 1986b, 1987), the influence which survey procedures have on response error (Tucker 1986b), the physical layout of the Diary (Tucker 1986b), development of composite estimates for quarterly change for the Interview (Holmes 1984a), a multivariate analysis package for non-normal distribution testing (Holmes 1984b), and an income imputation methodology for small size sample surveys (for a discussion of preliminary research concerning income response see Garner 1987). A new area of research for the BLS is the application of methods from the field of cognitive psychology to study respondent conditioning and questionnaire design (see Bienias, Dippo, and Palmisano 1987).

Improvements in survey methodology are expected to result from current and future research efforts. Users of the Consumer Expenditure Survey data will be notified of refinements in the survey methodology as they are introduced through BLS publications such as the _Monthly Labor Review_, news releases, bulletins, and public use tape documentation. Through joint efforts of providers and users of the data, the full potential of the Consumer Expenditure Survey can be realized as an invaluable instrument for analyses of family spending behavior and welfare.

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CHILD SUPPORT REFORM STRATEGIES FOR REDUCING CHILDREN'S POVERTY

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Family structure correlates of children's poverty are examined to evaluate the potential anti-poverty effects of child support reform. Two types of reform are compared: "ordinary reform," which includes better child support awards and improved collection; and Wisconsin's proposed Child Support Assurance System. The Wisconsin proposal guarantees a minimum child support benefit, and it provides a wage subsidy to help end welfare dependency.

In 1982, 48 percent of single-parent families were poor, compared with 10 percent of other family types. Single parents constitute about one-fifth of all families in the U.S. and the majority (55 percent) of all poor families (DHSS, 1983). Nearly all of them are legally eligible to receive child support payments. This paper focuses mostly on child support (CS) reform and its likely effects on children's poverty. Our Wisconsin CS project began in 1979 to consider policies originally proposed by the Wisconsin Welfare Reform Commission. Nine years later we are finishing a survey of 3,500 custodial and noncustodial parents from court records in 10 pilot and 10 matched control counties to assess the impacts of a uniformly applied percentage of income standard with mandatory wage withholding for CS awards and collection. A second, more innovative pilot phase of this reform will begin next year. This Child Support Assurance System (CSAS) also assures a minimum benefit for support-eligible children and it provides a wage subsidy for custodial parents. (Evanson and Uhr, 1987).

The sources cited here and recent media reports easily establish that children are receiving attention because they have remained disproportionately needy during the slow but real and sustained income growth after the early Reagan years. This attention follows quite naturally from the discovery of poverty feminization, with its message that many women are greatly disadvantaged by their single parenthood. Perhaps children are also emphasized because their poverty cannot be endogenous, whereas the public now seems to hold their parents more personally responsible for those family and work choices that are associated with poverty.

The special situation of children was not neglected during the expansion of our welfare state. In fact the long-term growth in AFDC, Medicaid, and food stamp benefits and the nature of their program eligibility rules results much from the public need to invest in all children. (Nelson, 1987). Yet somehow we still needed

Sam Preston's galvanizing paper (Preston, 1984) to document forcefully that children's dependency has become relatively neglected compared to that from old-age.

CHILDREN'S POVERTY AND FAMILY STRUCTURE

There has been a spate of high quality studies about the nature and causes of children's poverty. I will focus on family structure because child support reform is directed at problems that stem from changes in living arrangements. Danziger and Gottschalk found that the 1984 poverty rate for all family units with children was 17 percent, up from 14 percent in 1967. With respect to family structure their Current Population Survey analysis revealed some disturbing trends: the incomes of female-headed households decreased in spite of their increased earnings; and the major factor accounting for the increases in incomes of two-parent families was the increased earnings of wives, which comes at the cost of reduced time for leisure and home production. (Danziger and Gottschalk, 1986).

Martha Hill's study for the Woods Hole Conference (Hill, 1983) provides the most comprehensive view of trends in family income to needs and family structure correlates during the highly fluctuating economy of the seventies. Her main conclusions from longitudinal analysis of PSID data for up to ten years was that family situation changes--particularly shifts toward mother-only families and greater mother's labor force participation--had stronger impacts on the economic well-being of families with children than other changes in the economy. Increases in divorce and separation, with growth in births out of wedlock, moved more children into low-income mother-only families, but the associated increases in mother's work hours were not able to prevent large drops in children's economic status. Unless the mother remarried, family income usually did not approach its former level. The incidence of single parent status was substantial. During the first eight years of life one-fifth of the children born in the seventies spent some time in a mother-only household; one-quarter of those aged nine at the start of the decade spent some time with a single mother before reaching age 16. Those who were born in 1970 and spent some time in a mother-only household averaged four of their first eight years there.

Using standardization/decomposition techniques Hill also found that differences in living arrangements accounted for a great deal of the racial differences in both the trend and instability of income/needs ratios. However living arrangements were much less important as a

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determinant of the differences in _levels_ of economic resources by race. Consequently she argued that changes in wage levels of black household heads were needed to bring the income level of black children up to that of nonblacks.

Hill, Duncan, and Rodgers (1986) used five-year accounting periods for 1968-72, 1973-77, and 1978-82 to estimate what PSID sample individuals' economic status would have been in the two later periods if they had been as likely to live in married couple families as in 1968-72, but with the average economic status of all persons in each living arrangement held at the observed levels. During all three periods individuals who lived in arrangements other than with married couples had income/needs that averaged only about three-quarters that of the couples, and were three to five times more likely to be poor.

For younger women and children the effects of living arrangements were stronger for poverty rates than for average family income/needs especially when comparing 1968-72 to 1978-82. However these effects were small enough that the bulk of poverty would have remained even if the proportion of married couple families had remained at pre-1970 levels. This supports their conclusion that methods other than maintaining husband-wife families are needed to achieve substantial reductions in childhood poverty.

Further work by Duncan and Rodgers (1987) elaborates on the theme that family structure should not be overemphasized. The PSID study relied on increment-decrement life tables to estimate expected years of poverty for children's subgroups and the importance of various events associated with poverty transitions. The observation period was the first fifteen years of life. Along with the unexpected impacts of changes in the labor supply of persons other than a head or spouse, the authors were surprised that the labor supply of male heads was often more important for entering or escaping childhood poverty than changes for female heads. When the transition to female headship did occur the consequences tended to be disastrous, but the frequency of this event was low relative to that for the changes in male head's work.

The impact on the expected years of poverty from living with one-parent was estimated to be an increase from one-half to 3.2 years for nonblacks and from 3.0 to 7.3 for blacks. If the mother had never married, the children could expect six years of poverty irrespective of race. On the average, children experienced 1.5 years of poverty. One-third were poor at least one year, but only about five percent experienced poverty over ten or more years.

In summary the research findings on the importance of living arrangments demonstrates that marital dissolution and births out of wedlock are certainly deleterious, but that these events are infrequent enough in the population to be subordinate to other determinants such as changes in the labor supply of parents or other household members.

Two conclusions seem to follow. First the poverty rate reduction impacts of child support reform are strictly limited by the fact that many families are poor for reasons other than single parenthood. This reminds us that there are no magic bullets to end poverty of all types. Second, efforts are needed to increase the earnings of parents, which includes female heads as well as male heads. The CSAS pilot program does seek to generate labor supply responses to raise the income and earnings of female heads.

CHILD SUPPORT REFORM AND ITS EVALUATION

Although most empirical studies of child support and reform strategies are concerned with evaluating the potential to assist all support-eligible children, national policy makers have primarily been interested in the impacts on AFDC costs and caseloads (corresponding legislation is discussed below). As public funding for child support research has grown the literature has also paid more attention to measuring cost savings as it continues to assess the family economic impacts for custodial and noncustodial parents. Additionally the current literature on child support is much more sophisticated than its early antecedents (Sorenson and MacDonald, 1983). These improvements include the application of better theoretical approaches as well as much richer data sets. Hence this brief treatment of some key aspects will necessarily be simplistic as well as selective.

Some recent PSID research (Hill, 1985) provides essential background on the determinants and consequences of the existing CS regime as well as a good example of a simulation approach for understanding what "ordinary" child support reform might accomplish: By ordinary I mean strategies that establish more generous awards and try to improve their collection. The Wisconsin project is studying a version of ordinary reform now, but it will implement a CSAS beginning in the fall. (Findings from simulations of that system will be discussed after explaining how it differs from ordinary reform).

For her 1985 paper, Hill matched ex-spouses in 1968-82 for the years after a divorce or separation to study what absent fathers do and could provide. (Note that she excluded paternity cases from her analysis). Her description of CS payment performance over time demonstrates the severity of the problems quite forcefully. Only about half of the years after a marital split involves one in which the father pays some child support. By the eighth year the proportion of ex-spouses with the father paying support falls to only one in three from a high of two in three in the second year since disruption. For only about one in six ex-couple years did he pay as much as $1,000 1968 dollars in support.

The poverty implications of these payment patterns is clear. Across all ex-couple years 10 percent are ones with the custodial mother poor, while the corresponding absent father was poor

for only one in ten of these same poverty years.

Given the likely importance of remarriage for both CS payments and poverty status it is also significant that the father was remarried with children in about one-third of ex-couple years, with the custodial mother remarried in about 60 percent of them.

Like Beller and Graham (1985), Hill also studied how post-split conditions influence economic well-being via the association of ex-spouse's resources and family obligations with the level of support from the absent father. As expected the father's income and time since the split were very important, and high income fathers reduced their support more over time. To my surprise, the variables that reflected new family obligations on the father's part did not have significant effects. Whether the mother remarried was very influential, although her ability to earn was not. Hill summarized: "The greater the ability and desire of the absent father to pay and the less the extent to which the absent father had been replaced in the husband role, the larger the transfer of CS monies." (Hill, 1985, p. 15).

Evidently the post-split dynamic of CS payments is one of exponential decay punctuated by a discontinuity and drop if the custodial mother remarries. Hill (1987), and others e.g., Sawhill, (1983) have simulated how drastically altering this dynamic might improve children's well-being, and how this would affect the absent fathers and any new families they begin. These simulations are intended to be illustrative rather than exact because they must abstract from questions of enforcement and transaction costs and from the limits that the courts might place on the ability to establish the child support awards implicit in the simulations.

Hill assesses the potential for raising a substantial proportion of single-mother families out of poverty assuming that enough income is transferred to place the typically poor mother on an even par in terms of ability to satisfy needs with very rarely poor absent fathers. This required poverty rate comparisons between existing and simulated, pooled incomes. Furthermore she experimented with a counterfactual in which the welfare system is abolished. Although many of the absent fathers had remarried, only about 5 percent would be made poor under an equalized income/needs regime. The poverty rate of poor custodial mothers would change more substantially, but in three-quarters of observed ex-couple years they would remain poor with the welfare system as is. Abolishing welfare and transferring more income from the father would still leave one-half of the mothers poor. Given that these results stem from simulations which assume more drastic redistribution than any which policy makers are likely to adopt, they clearly delineate the outer limits of ordinary child support reform.

The Wisconsin CSAS is both a development of and an alternative to recent changes in state and federal legislation for CS enforcement. These changes began when Congress established Title IV-D of the Social Security Act in 1975. Under IV-D, states are required to establish paternity, locate absent parents, establish child support orders, and enforce them for all AFDC families and for non-AFDC families who request these services. Under current AFDC rules families must assign their child support rights to a state IV-D agency, which can use the federal parent locator service. AFDC recipients can keep the first $50 of child support collected each month but any remainder reduces welfare payments dollar for dollar. The 1984 Child Support Enforcement Amendments authorize mandatory wage withholding nationwide in cases where the absent parent is delinquent in his support payments for one month or more.

Garfinkel, Robins, and Wong make the case for further reform as follows:

> Although child support enforcement has considerable appeal as an anti-poverty device recent research suggests that the current federal approach may fall far short of its intended objectives. The primary reasons for this pessimistic outlook are low child support award amounts and lack of any earnings incentives under the current collection process. The average child support award nationwide for AFDC recipients in 1981 was $180 per month, while the average AFDC benefit was $282 per month, and the average poverty-level income was $650 per month. These figures suggest that current child support enforcement procedures simply will not be able to generate enough increase in income to cause many families to escape welfare dependence or poverty. Hence, for this approach to be successful, higher award amounts and/or other sources of income (principally earnings) appear necessary. (Garfinkel, Robins, and Wong, 1987, pp. 2-3).

Wisconsin has gone considerably beyond the federal legislation in an attempt to increase the antipoverty effectiveness of CS enforcement. The CSAS has four components: These are:

1. A uniform percentage standard of gross income for establishing CS obligations--currently set at 17 percent for one child, and 25 percent, 29 percent, 31 percent, 34 percent respectively for two, etc.

2. Immediate wage withholding of the CS obligation to eliminate arrearage for all employees.

3. An assured, or minimum guaranteed child support benefit for each family.

4. An hourly wage subsidy to encourage work by custodial parents.

The first two became state law last July, and were piloted prior to that in a 10 county demonstration. The assured benefit and the wage subsidy will be field tested in at least two counties beginning January 1989.

A citizen's advisory committee has recommended $3,000 per year for one child as the guaranteed amount of CS. When the noncustodial parent's support is below that level the custodial parent is subject to a tax up to the assured level (this serves as a resource test with respect to the custodial's income). Any difference between the assured level and the sum of the contributions from both parents is supplemented by the state.

The wage subsidy in the demonstration will be $1.00 per hour ($1.75 for two or more children), up to one-half the maximum income for eligibility (or cap). For earnings above half the cap the wage subsidy is taxed at the rate needed to entirely phase it out once that cap is reached. The full subsidy is paid to custodial parents with family income up to $8,000 and it phases out at a maximum of $16,000 for all families.

Once CSAS is in place, income maximizing custodial parents will choose between CSAS, AFDC, or neither depending upon their related choice of work hours. The main point about CSAS is this: Those who can work sufficient hours will be better off in CSAS and off AFDC. And the reason they will be better off is that welfare always reduces the net gain from working among its recipients, whereas CSAS always subsidizes work hours.

Some custodial parents who are not now eligible for AFDC will be eligible for CSAS and may consequently reduce their labor supply via the income effect of the wage subsidy. Therefore the overall impact of CSAS on labor supply will result from whatever hours increases for AFDC families occur, as offset by reductions in hours among non-AFDC families.

Now suppose you are the Governor of Wisconsin. Thus transformed, you become keenly aware that the net cost to the Treasury of CSAS will depend on the exact nature of the labor supply response, all direct costs of the program, and expected gains from CS collection. To the extent that custodial parents behave as CSAS tries to induce, the State will get more AFDC savings to help finance CSAS and there will be less children's poverty.

POVERTY REDUCTION AND OTHER CSAS IMPACTS

Data about the impacts of CSAS on poverty, government costs, and the mix of benefits households receive is limited to estimates from simulations provided by Garfinkel, Robins, and Wong (1987). Their work was based on a 1986 survey of all Wisconsin households and records from the Wisconsin Computer Reporting Network (the state's system for monthly extracts of current AFDC cases). National data from the 1979 Child Support Supplement to the Current Population Sur-

vey of Income and Education were used to derive estimates of absent parent's incomes. The function for deriving the labor supply responses was derived with evidence from the Seattle-Denver Income Maintenance Experiments. Plans corresponding to four child support guarantee levels were simulated.

For the $3,000 guarantee recommended for the demonstration, the AFDC participation rate is predicted to decline from 46 to 39 percent. Another 30 percent of eligible families participate in CSAS. And the total number of families receiving either of these public benefits would increase by 28 percentage points, from 46 to 69 percent. These results assume medium improvement in support collection, which would be an improvement to 75 percent collected, from the current 46 percent of all payments owed.

At the $3,000 CS guarantee, labor supply is predicted to increase substantially for preprogram AFDC families, from an annual average of 110 hours to 205 hours, or 186 percent. Non-AFDC families would reduce their annual work hours by an average of eight percent, to 1,230 from 1,339 hours. Work hours for all families would rise five percent.

Now consider the sources of net program costs for alternative $2,500, and $3,000 guarantees (we focus mostly on the results for $3,000). To obtain the net cost of both AFDC and CSAS after implementation required comparing the "before" AFDC expenditure ($370 million) to the sum of the "after" AFDC and CSAS expenditures ($234M; $110M) plus the tax loss which would result as some non-AFDC households reduce their earnings ($12M). This comparison suggests that the state would gain $1 million from CSAS. At a $2,500 guarantee there would be a net cost of $5 million. The "trick" for the State is to set the guarantee high enough to reduce AFDC costs via increased earnings, to offset that same increase in CSAS payments. Setting the guarantee too low would "damp" the desired labor supply response. Of course to get CSAS costs to "wash" it is also important that support collections increase to the assumed median level of 75 percent.

Poverty reduction, family incomes, and the extent of government dependency will also depend on interactions among the assured benefit, labor supply, and collection rate. Recall that Hill estimated that increasing payments from absent parents to cause equal family income/needs ratios would reduce children's poverty by 25 percent for the entire U.S. Under CSAS the decline in the poverty rate for Wisconsin would be about 10 percent (a five point drop, compared to a 52 percent base). These Wisconsin estimates include paternity cases, assume medium collection, and apply in the context of relatively high AFDC benefits. Compared to Hill's simulations the first two of these factors clearly imply lower poverty reduction for Wisconsin than she found in excluding paternities and assuming perfect collection. The impact of Wisconsin's high AFDC benefits is also toward lower poverty reduction than would apply in a CSAS for the entire nation,

in that high AFDC guarantees unambiguously reduce labor supply. Nevertheless the poverty reduction effects of CSAS for Wisconsin are not overwhelming.

The poverty gap reduction from CSAS sheds more favorable light on the program. At $3,000 the additional dollars needed to move all post-CSAS poor up to the poverty line would be $209 million compared to $292 million now--CSAS could shrink the gap by 38 percent. And even with the $2,500 guarantee the poverty gap would fall to $215 million.

For all eligibles CSAS would raise average family income approximately $1,400. As mentioned before more families would receive public benefits after CSAS takes effect; but public dollar dependency would drop seven percentage points from the pre-CSAS base of 40 percent.

Overall, the CSAS simulators concluded that it would contribute significantly toward relieving many of the economic pressures facing families having only one parent in the household. Hence the thrust of CSAS is to help all one parent families as it reduces dependency among those who need the most help. By covering everyone CSAS may seem to sacrifice some poverty reduction that might appear attainable if it targeted benefits more on poor single parents. However targeting that way would require imposing a benefit reduction rate on earnings, a la AFDC, which actually fosters dependency.

CSAS also has the potential to end more poverty spells earlier than AFDC. However as yet there are no estimates of its impact on spell lengths, which certainly matter to real children. As the CSAS demonstration proceeds it will be possible to compare durations between pilot and control counties.

SUMMARY

We have considered family structure correlates of children's poverty to assess how child support reform might be expected to affect its extent. Estimates obtained primarily from the PSID suggested that the incidence of marital dissolution and births out of wedlock is low relative to other events that antecede poverty among all children. On the other hand the evidence that severe and long-term poverty can result from these family structure changes is also quite strong.

Two types of child support reform were compared with respect to their likely impacts--ordinary reform, which includes better CS collection and increased awards; and the proposed CSAS. CSAS adds a guaranteed minimum CS benefit and wage subsidy to promote work among AFDC recipients as it assures economic security for all support-eligible children. Because of the wage subsidy CSAS can make current AFDC recipients better off via increased earnings even though the maximum benefit is less than the AFDC guarantee. As families leave AFDC the resulting cost savings

to the government helps to finance the minimum benefit, as does increased CS collection incentives. For Wisconsin CSAS may even save money.

The evidence from studies of ordinary child support reform yields pessimistic conclusions about poverty rate reductions. Wisconsin researchers blame low CS awards and the lack of earnings incentives for their findings that the existing legal environment for CS enforcement has no discernible effect on poverty or welfare dependency. However their simulations of CSAS reveal at least a 10 percent reduction in poverty rates, and a 38 percent reduction in the poverty income gap. Because these gains stem primarily from reduced AFDC dependency they should also generate long term improvements in the economic security of support-eligible children. CSAS may not have magic bullets to end poverty, but it is aimed correctly.

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SPELLS OF POVERTY AND GENDER DIFFERENCES IN MORTALITY

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Very little is known about the role economic well-being plays in explaining differential mortality rates. In this paper, we examine (a) how economic resources alter an individual's risk of mortality, and (b) the extent to which the relationship differs by sex. Poverty is found to increase the hazard of dying more for women than for men. The different estimates of poverty effects between men and women is supportive of the hypothesis that financial constraints operate to prevent poor women from obtaining preventive and curative medical services they would otherwise seek.

SPELLS OF POVERTY AND GENDER DIFFERENCES IN MORTALITY

Today, American adults are living longer than at any other time in history. In 1900, the average life expectancy at age 20 was 62.8. By 1960, it had risen to 72.6 years and by 1984, it had reached an all-time high of 76.1 years (National Center for Health Statistics, 1987). While there has been a steady rise in average life expectancy, some groups have enjoyed greater gains than others.

One frequent observation made in the literature is that married individuals live longer than people who are not married (Helsing, Szklo, and Comstock, 1981; Korbin and Hendershot, 1977; Mergenhagen, Lee and Gove, 1985; Stroebe and Stroebe, 1983). Marriage-related mortality differences are usually attributed to either (a) the positive emotional environment associated with marriage, or (b) the self-selection of long-lived people into the state of marriage (Korbin and Hendershot, 1977).

Another frequent observation is that employed people live longer than individuals who are not employed in the labor market (Wingard, 1984; Verbrugge, 1983). As in the case of marital status, some have argued that the relationship between longevity and employment is an artifact of self-selection. That is, only those who are relatively healthy seek and maintain employment in the labor force. Others have speculated that the work environment promotes good health (Verbrugge, 1983).

In the face of generally declining mortality rates, attempts to understand mortality differentials have focused primarily on social phenomena. In particular, marriage and employment related mortality differences have generally been ascribed to self-selection or to the positive emotional climates associated with these states. Yet, married individuals also have generally higher levels of income than do nonmarried individuals, particularly those who are widowed or divorced (Zick and Smith, 1988; Duncan and Hoffman, 1985). Thus, it could be argued that it is not the state of marriage per se, but married individuals' comparatively better economic position that explains their relatively greater longevity. Similarly, employed individuals generally have higher incomes and it is possible that it is their higher incomes and not self-selection or the work environment that insulates them from premature deaths.

Very little is known about the role income plays in explaining differential mortality rates. In this paper we examine (a) how economic resources alter an individual's risk of mortality, and (b) the extent to which the relationship differs by sex. Particular attention is given to gender differences because, on average, women live longer than men, and in recent years the gender-related gap in life expectancy has been growing. Although several researchers have focused on social and environmental factors that may explain a portion of the observed gender differences in mortality, no one has explicitly examined the role of economic resources in this complicated relationship.

The fairly disparate literatures on (a) income and mortality, and (b) gender and mortality are reviewed in the next section of the paper. These literature reviews are followed by the specification of a mortality model and a description of the data set that is used in its estimation. In the final two sections of the paper, the empirical results are discussed.

LITERATURE REVIEW

Income and Mortality

It is generally thought that there is a negative relationship between income and mortality. Yet, only a small number of researchers have examined the question of how income affects adult mortality within the United States. Furthermore, the few studies that have been done provide no consensus about the risk of income in altering mortality rates.

Early work by Auster et al. (1969) and Silver (1972) made use of 1960 U.S. Census data to

examine the relationship between income and mortality. Auster et al. estimated age-sex adjusted death rates using state level census data. In their multivariate analyses of the socioeconomic determinants of mortality, education had the anticipated negative effect, but total income had an unexpected positive effect. Silver (1972) extended the research of Auster et al. by also adjusting for race and sex, and using both SMSA's and states as the units of analysis. Like Auster et al., Silver generally found that either income had a statistically significant positive coefficient or the estimated coefficient was not significant. In both studies, the researchers speculated that rising income might be associated with rising mortality rates because high incomes were associated with occupational and behavioral changes that have adverse impacts on health (e.g., high income occupations are associated with high levels of stress). However, this conclusion is not shared by others who have reported that the occupation-mortality relationship is reversed (e.g., low income occupations have higher rates of mortality) (Wilkinson, 1986).

Luft (1978) also found no support for the hypothesis that higher income promotes better health. He used the 1960-62 National Health Examination Survey of Adults to estimate the age-adjusted correlations between specific health conditions (e.g., decayed teeth, hypertension) income, and education. With the exception of dental problems, Luft generally found no relationship between income and health conditions in the cross-section. Luft devotes considerable discussion to the possibility of a simultaneous relationship between health status and income. He concludes, based on his empirical work, that while poor health may lead to reductions in income, rarely does low income precipitate poor health. It should be noted that Luft never looked at the correlation of income and mortality but rather all of his empirical work centered around the relationship between income and morbidity.

Mixed support for a negative relationship between income and mortality was found by both Orcutt et al. (1977) and Hadley (1982). Orcutt et al. estimated age-sex-race specific mortality equations using 1970 U.S. Census data with counties as the unit of observation. In three of the fourteen estimated equations the coefficient on income was negative and statistically significant. Hadley (1982) used 1970 U.S. Census county level data to estimate mortality equations. He argues that past studies had found ambiguous results regarding the relationship between income and mortality because they had not look at the impact of income received from specific sources. Hadley decomposed income in to specific components that were entered separately in the equations. In the specification where both earned income and unearned income were entered separately, Hadley found that earned income had statistically significant negative effects in four of the eight equations. In contrast, unearned income was never statistically significant.

Two studies demonstrate strong support for an inverse relationship between income and mortali-ty. Kitagawa and Hauser (1973) used 1960 U.S. Census data to examine the effects of income and education on mortality. They found that within education categories, income had a negative effect on mortality for individuals who were less than 65 years old. For those over age 65, the relationship was reversed. Based on these results, Kitagawa and Hauser hypothesized that higher income may serve to alter the probability of dying only to the extent that a death is preventable.

The other study which found strong support for higher incomes reducing mortality was done by Duleep (1986). Duleep argued that the reciprocal relationship between income and health status cannot be disentangled based on the cross-sectional data used by previous researchers. She developed a model where income has an indirect effect on mortality through changing health status as well as a direct effect on mortality. To test her model, Duleep drew on Social Security records for white males between the ages of 35 and 65. She estimated the probability that an individual died between 1973 and 1978 as a function of the individual's age, income, education, and health status prior to 1973. In the estimated equations, income was measured by a series of dummy variables. She found that only the men in the two lowest income categories had significantly higher probabilities of dying compared to the highest income group.

Why do these studies arrive at such varied conclusions regarding the relationship between income and mortality? The answer to this question can be found in part by focusing on the data used in the empirical work presented in these studies. Virtually all of the studies, with the exception of Duleep's and Kitagawa and Hauser's, used aggregate cross-sectional census data. As these researchers point out, the use of cross-sectional data makes it difficult to disentangle the reciprocal relationship between income and mortality. Furthermore, because the unit of analysis in these studies has generally been large geographical areas (e.g., counties, SMSA's, states), the potential for over-interpreting ecological correlations is high. That is, just because average income is not related to mortality rates at the county level, does not mean that income is unrelated to the probability of dying at the individual level. Indeed, the only two studies to use individual-level data (Kitagawa and Hauser, 1973; Duleep, 1986), were also the only two studies to find a consistently negative relationship between mortality and income.

While past research on the relationship between income and mortality may not offer consistent results, there are still important insights to be gained from these studies. First, each of these studies found that it was important to control for age, sex, race, and education when specifying a mortality equation. Interestingly, only Silver (1972) and Hadley (1982) include both marital status and employment status variables in their equations. Orcutt et al. (1977) only include marital status and the remaining studies omit both variables. The general absence of these

variables from the variables from the mortality-income equations is somewhat surprising given the attention these factors have received by social epidemiologists.

Second, these works clearly raise an important question: what is it about income that matters as it relates to mortality? Kitagawa and Hauser (1973) concluded that income matters only to the extent that it could be used to avoid "preventable" deaths. Hadley (1982) makes a similar argument when he states that the relationship between income and mortality may be subject to a "ceiling" effect. That is, above a certain level, income cannot be used to improve one's health or prolong life. These views are supported by Duleep's work (1986). Recall that she divided respondents into five income groups. In her estimation it was only the lowest two income groups that demonstrated significantly higher probabilities of dying.

All of these findings suggest that it is not income that affects an individual's probability of dying, but rather it is whether or not an individual has sufficient income to avoid "preventable" deaths. In the vast majority of cases, sufficient income to avoid preventable deaths translates into having the necessary income to meet basic food, clothing, and shelter needs. This suggests that our focus should shift from estimating the relationship between mortality and income _per se_, to estimating the relationship between mortality and poverty status.[4]

Gender and Mortality

The relationship between mortality and poverty cannot be properly estimated without giving careful attention to the role that gender might play in the analysis. Indeed, the literature on sex differences in mortality suggests that the relationship between mortality and poverty may differ significantly be gender.

Epidemiologists have often noted that women generally live longer than men (Helsing, Szklo, and Comstock, 1981; Nathanson, 1984; Verbrugge, 1983; Waldron, 1986; Wingard, 1984). Some epidemiologists have argued that men are inherently disadvantaged for biological and hormonal reasons (particularly as they affect atherosclerosis), and these biological variables are the source of the observed differences in women's and men's longevity (Hazzard, 1986). Still others have emphasized the importance of sex-related sociobehavioral factors in explaining the relative survival advantage of women (Nathanson, 1984).

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[4]Skeptics might be tempted to argue that the provision of health care services to the poor through the federally sponsored Medicaid program should have eliminated any link between poverty and mortality. However, a recent study shows that almost 60 percent of the poor are ineligible for Medicaid (Davis and Rowland, 1983) and projections are that poor people's access to publicly provided medical care will decline still further in the future (Starr, 1986).

These researchers usually cite the greater risk-taking behavior on the part of men (e.g., higher rates of smoking) and the greater use of preventive and curative medical services on the part of women (Nathanson and Lorenz, 1982; Nathanson, 1975; Wingard, 1984) to explain observed gender differences in mortality.

If women's growing longevity advantage over the past century is attributable to their greater use of medical care, what happens when financial constraints prevent women from obtaining requisite medical care they would otherwise seek? In all likelihood, this would imply that poor women would have greater mortality rates than nonpoor women because their relatively low incomes would prevent them from obtaining medical care. In contrast, because males are generally less likely to use preventive and curative medical services, the estimated relationship between mortality and poverty for them should be weaker.

THE ANALYSIS

The Model

Most of the past research that has focused on the relationship between mortality and income has either implicitly or explicitly made use of a health production model (Grossman, 1972). The equations estimated in this paper are also consistent with such an approach.

In a health production framework, individuals are posited as gaining satisfaction from their stock of health and all other goods. People then make choices that maximize their health stock and their consumption of all other goods subject to their financial constraints and their ability to "produce" health. The production of health is determined by biological factors (e.g., sex, age, race) and environmental factors (e.g., education, marital status and employment status). In this framework, a health status equation can be estimated. The independent variables in this equation would include income, biological health production factors, and environmental health production factors. Application of such an approach to mortality analyses assumes that mortality is an appropriate single-item indicator of health status. (See Hadley (1982) pp. 41-44 for an extensive discussion of this point.)

In the context of a health production framework, individuals who live below the poverty line are hypothesized to have shorter life expectancies because they have insufficient resources to purchase necessary health care services. Similarly, it is hypothesized that gender differences in the relationship between poverty and mortality exist because given sufficient income, a woman would devote more resources to the production of health than would an otherwise comparable man. As a result, poverty should have a more detrimental effect on women's mortality than on men's mortality.

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The Data

The data used in the estimation come from the Panel Study of Income Dynamics (PSID). The PSID, a nationally representative study of U.S. families, began in 1968 with a sample of five thousand households. These households have been interviewed every year from 1968 to the present. In each interview, data have been gathered on numerous economic, social, and demographic variables. Studying mortality and its determinants based on the PSID has not been possible until 1987. With the 1987 release of the PSID Response-Nonresponse tape, histories of the socioeconomic lives of panel decedents are available for the first time. Prior releases of the PSID data omitted all individuals who had died during the study period.

The PSID data have been selected for the empirical work because they offer some distinct advantages. First, the PSID contains individual-level data on adult females and males of all ages. Estimation with such data will allow us to make generalizable statements about the relationship between poverty, gender, and mortality at the level of the individual—something that has not been done previously to the best of our knowledge.

Second, the panel nature of the PSID will allow us to estimate the mortality-poverty relationship by gender controlling for prior characteristics, including health status as proxied by the respondent's age. Recall, that much of the past work in this area has made use of cross-sectional data to estimate the impact of income on mortality rates. If mortality is an indicator of health status, then the estimation of cross-sectional mortality equations introduces a risk of simultaneous equations bias because health status and income are generally thought to be determined at a point in time. By exploiting the panel nature of the PSID data, simultaneous equations bias can be avoided.

Finally, and perhaps most importantly, the PSID is rich in information on mortality risk factors, particularly those which tend to be differentially distributed across sexes. In particular, the data set contains detailed information on stable and changing measures of the economic status of the women and men in the study, including their ratios of total household income to basic household needs (i.e., food, clothing, and shelter needs). These income/needs ratios can be used to identify spells of poverty among the study respondents.

There have been approximately 1600 deaths in the PSID sample since the study began. The sample used in the analyses that follow has been selected from the PSID Individual Response-Nonresponse file so that it includes (1) all household heads (defined in the PSID to be the husband in married couple households and either a male or female in single-head households) and wives who were in the study in 1968 and who died between 1971 and 1983, and (2) a one-quarter sample of all household heads and wives of heads who entered the study in 1968 and who were still living in 1983. Household heads and wives of heads who left the study for reasons other than death (i.e., institutionalization) have been purposefully excluded from the analysis because they could not be confidently classified as either alive or dead at the time of their attrition. In addition, children were excluded from the sample because the analysis that follows focuses in the determinants of adult mortality only.

The final sample of PSID decedents includes 401 women and 518 men who died at some point between 1971 and 1983, inclusive. The corresponding quarter sample of continuous study respondents includes 611 women and 460 men. In all of the analyses that follow, the sample data have been weighted so that they mirror the general U.S. population.

The Estimation

The analysis of mortality determinants using longitudinal individual-level data is done using discrete-time event-history estimation techniques (Allison, 1984). Discrete time methods have been chosen over continuous time methods because although we know the year in which each PSID death took place, we do not know the exact timing of each death.

In discrete-time event-history estimation, the hazard rate of dying, $P(t)$, is defined to be the probability that the individual will die in year "t", given that the individual was at risk of dying in year "t" (i.e., given that the individual did not die in an earlier year). This probability of dying is hypothesized to be a function of both initial and time-varying conditions that impact on an individual's demand for health.

Mathematically,
(1) $P(t) = XB + X(t)C$
where,
X = a vector of time invariant characteristics,
$X(t)$ = a vector of time-varying characteristics,
$P(t)$ = the probability of dying given that an individual did not die prior to year "t", and B and C are vectors of parameters to be estimated.

Estimation of equation (1) requires the construction of a person-year data file (Allison, 1984). In our analysis, this person-year data file contains 13,779 observations for the women and 10,322 observations for the men constructed from the original samples of 1,012 females and 978 males. Each person-year observation identified whether or not the individual died in the "t" year. In addition, it contains information on time-invariant and time-varying characteristics posited to affect the hazard of dying, including a measure of the individual's poverty status for the preceding three years. Once the person-year file is created, estimation of equation (1) is done using a logit procedure.

Several initial characters that are hypothesized to affect the hazard of dying are available in the PSID. These time-invariant characteristics

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include race[5] and education.[6] Time-varying characteristics posited to affect the hazard of dying include age (which is entered in a nonlinear fashion by including both age and age squared), employment status, marital status, recent changes in marital status, and recent spells of poverty.

Ideally, one would like to have a measure of health status in "t-1" to include among the time-varying regressors. There is a self-defined health status measure available in the PSID but unfortunately, data on this variable have only been collected sporadically. In particular, prior to 1981, the health status question was only asked of an adult woman in the study if she was the head of household. Given that the self-defined health status measure was missing for over 80 percent of the women's person-years, it was decided to exclude prior health status from the equation. In the absence of a true health status measure in "t-1", age becomes the closest proxy for health status.

Equation (1) is estimated separately for men and women. Definitions and descriptive statistics for all of the variables used in the estimation of the equations appear in Table 1. For estimation purposes, an individual is classified as living in poverty if he/she has insufficient income to meet basic needs as defined by the federal government (i.e., income/needs ratio less than 1.0). This definition of poverty is a fairly strict one. The equations have also been estimated using a near-poverty threshold (i.e., income/needs less than 1.5) to examine how sensitive the estimation is to changing definitions of poverty. There are virtually no differences in the estimated coefficients across these two specifications. Thus, we chose simply to present the results of the estimated logits using the strict poverty definition (i.e., income/needs less than 1.0) in Table 2.[7]

THE RESULTS

A test of the overall goodness-of-fit for the two logit equations indicates that both are statistically significant at the .01 level. However, a closer look at the estimated coefficients shows different levels of support for some of the a

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[5] Initially separate models were to be estimated by both gender and race. However, the small weighted sample of black men and women made this approach intractable. Ultimately, a more parsimonious strategy was followed. This involved estimating the mortality model separately by gender with a dummy variable for race entered in both the men's and the women's equations.

[6] In theory, education is a time-varying characteristic. In practice, education level does not change over time for the vast majority of the adult population in the United States. Since our analysis is confined to adult mortality, it seemed appropriate to treat education as a time-invariant characteristic.

[7] The estimated equations using the near-poverty variable (i.e., income-to-needs ratio less than 1.5) are available from the authors upon request.

priori hypotheses by gender. To facilitate the interpretation of the coefficient estimates,

TABLE 1. Descriptive Statistics

Variable	Definition	Females[a] Mean	St. Dev.	Males[b] Mean	St. Dev.
DEATH	dummy variable 1=dies in year t, 0=otherwise	.008	.089	.015	.122
AGE	age in years in year t-1	50.1	15.1	50.2	14.8
EDUCATION	years of formal schooling	11.1	3.52	11.3	4.06
RACE	dummy variable 1=black, 0=nonblack	.081	.273	.068	.252
EMPLOYED	dummy variable 1=worked 500 hrs. or more in t-3, 0=otherwise	.387	.487	.838	.368
MARRIED	dummy variable 1=married in t-2, 0=otherwise	.733	.442	.907	.290
DIVORCED	dummy variable 1=divorced in t-2, 0=otherwise	.089	.285	.046	.210
WIDOWED	dummy variable 1=widowed in t-2, 0=otherwise	.132	.339	.021	.144
NEVMARRIED	dummy variable 1=never married as of t-2 0=otherwise	.046	.209	.025	.157
MARWID	dummy variable 1=widowed between t-2 & t-1, 0=otherwise	.009	.096	.004	.065
MARDIV	dummy variable 1=divorced between t-2 & t-1, 0=otherwise	.011	.106	.011	.104
TOMAR	dummy variable 1=married between t-2 & t-1, 0=otherwise	.011	.102	.011	.106
NOTRAN	dummy variable 1=no marital transition between t-2 & t-1, 0=otherwise	.969	.174	.974	.160
POOR10	dummy variable 1=income/needs is below 1.0 in 1 or more years from t-3 to t-1, 0=otherwise	.228	.420	.180	.385

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[a] Based on 13,779 person-year observations constructed from 1,112 adult female respondents.

[b] Based on 10,332 person-year observations constructed from 978 adult male respondents.

"marginal effects" have also been included in Table 2. In the logit model, the estimated coefficients are cast so that a one-unit change in an independent variable, X_j, produces a B_j percentage change in the natural log of the odds ratio that the respondent will die at time "t", holding all other factors constant. In contrast, marginal effects represent the change in the odds that a respondent will die in year "t" give a small change in X_j, holding all other variables in the equation constant. Marginal effects vary in the logit formulation depending on the values at which the independent variables are set. In Table 2 the marginal effects have been calculated using the mean values for all continuous vari-

ables and the modal values for all dichotomous variables.

TABLE 2. Parameter Estimates of the Logit Analysis (t-statistics in parentheses)

Variable	Females Coefficient	Marginal Effect[a]	Males Coefficient	Marginal Effect[a]
CONSTANT	1.17 (2.73)**	.056	1.71 (3.97)**	.072
EDUCATION	-.00307 (-.443)	-.000015	-.00106 (-.181)	-.000045
AGE	.0404 (3.04)**	.0019	.0424 (3.17)**	.0018
(AGE)^2	-.00009 (-.839)	-.000004	-.00016 (-1.46)	-.000007
DIVORCED[c]	.0114 (.131)	.00054	.232 (2.62)**	.0098
WIDOWED[c]	.0547 (.819)	.0026	.200 (2.49)**	.0085
NEVMARRIED[c]	.171 (1.34)	.008	.0538 (.349)	.0023
MARWID[d]	-.194 (-.748)	-.0093	.232 (1.25)	.0098
MARDIV[d]	.200 (.660)	.0094	.614 (3.33)**	.026
TOMAR[d]	-.391 (-.771)	-.019	-.287 (-.943)	-.012
EMPLOYED	-.252 (-3.35)**	-.012	-.356 (-5.98)**	-.015
RACE	.111 (1.64)	.0053	.0314 (.510)	.0013
POOR10	.180 (2.94)**	.0086	.105 (1.85)*	.0044
Person-Years	13,879		10,332	
X^{2b}				

[a] The marginal effects have been computed using the formula:

$$\frac{\partial P_j}{\partial X_j} = \left[\frac{e^{\bar{X}B}}{(1+e^{\bar{X}B})^2} \right] B_j$$

where $\bar{X}B$ has been computed using the mean values for the continuous variables and the modal values for the discrete variables (Hanushek and Jackson, 1977).

[b] The critical value for X^2 (df=12; p=.01) = 26.2.

[c] The omitted category in this sequence of dummy variables is composed of those respondents who were married in t-2 (i.e., MARRIED = 1).

[d] The omitted category in this sequence of dummy variables is composed of those respondents who experienced no marital status transition between t-2 and t-1 (i.e., NOTRAN = 1).

**t-value statistically significant at the .05 level.
*t-value statistically significant at the .10 level.

In both the male and female equations there is support for the hypothesis that the hazard of mortality increases with age in a linear fashion. (The coefficients on age in the two equations are statistically significant while the coefficients associated with the age-squared terms are not.) Recall, in this specification age is used as a proxy for prior health status. Thus, the coefficients support the biological tenet that as an individual ages and health deteriorates, the hazard of dying increases. The marginal effects indicate that impact of age is quite similar for both men and women, with the hazard of dying increasing by .18 and .19 percent, respectively, for each year they age.

Employment status also has a consistently significant negative effect across both equations, indicating that women and men employed at "t-3" are less likely to die by year "t." Employment status was purposefully measured at "t-3" to minimize the possibility that we would observe the effect of healthy people self-selecting into the state of employment. The marginal effects indicate that employed women's hazard of dying is 1.2 percent less than the hazard for nonemployed women, ceteris paribus. The corresponding figure for the men is 1.5 percent.

As posited, one or more spells of poverty between "t-3" and "t-1" significantly increases the hazard of dying more for women that for men. This effect is indicated by both the relative levels of statistical significance and the relative magnitudes of the two estimated coefficients. The different estimates of poverty effects between women and men supports our contention that financial constraints operate to prevent poor women from obtaining preventive and curative medical services they would otherwise seek. In contrast, because men are less likely than women to purchase medical services, their mortality hazard is much less sensitive to insufficient financial resources (i.e., poverty) appears to be less likely to alter their mortality hazard.

The final set of statistically significant coefficients are associated with the marital status and the recent marital transition variables. These coefficients are significant in the males' equation only. The estimates indicate that divorced and widowed men have a significantly higher probability of dying than do married males, holding other factors constant. Furthermore, males who have recently divorced (i.e., between "t-2" and "t-1") have a significantly higher hazard of dying than males who had no recent marital status transition.

While past studies have frequently looked at the effect of marital status on mortality, only Helsing, Szklo, and Comstock (1981) looked at the impact of marital transitions on mortality, and their study focused only on the transitions from married to widowed and from widowed to remarried. Helsing, Szklo, and Comstock found that recently widowed males who did not remarry had a significantly higher hazard of dying when compared to the never-widowed men and the widowers who remarried. They speculated that perhaps the loss of a spouse generates transition-specific stress which increases the probability of dying. To further test their hypothesis, we included both marital status dummies and marital transition dummies in our equations. The findings presented here indicate that, for the men, both their current marital state and transitions they may have recently made are important predictors of mortality. In particular, while we found little support for the negative effects of becoming widowed, we did find that a recent divorce, on average, increased the hazard of dying by 2.6 percent for men.

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DISCUSSION AND CONCLUSIONS

Past work by social epidemiologists has emphasized the importance of the social environment, particularly marriage and employment, in enhancing longevity. Yet, if someone is married and/or employed, he/she is also likely to have sufficient income to purchase health care services that may increase longevity (i.e., medical services that help avoid "preventable" deaths). Thus, one cannot conclude that either marital status or employment status affect mortality unless the analysis also controls for economic resources. Similarly, researchers who have examined the relationship between income and mortality should not confidently conclude that economic resources affects the hazard of dying unless marital status and employment status have been controlled for in the analysis.

The empirical work presented in this paper builds on our knowledge of the socioeconomic correlates of mortality by incorporating economic resources, marital status, and prior employment status into a multivariate analysis of mortality differentials. The results indicate that prior employment has a dampening impact on both men's and women's hazard of mortality even when poverty status is included in the equation. This finding is supportive of the argument that the social and emotional aspects of the work environment enhance longevity for both men and women. However, the sign on the employment coefficient may also be indicative of the fact that employed individuals are more likely to have health insurance coverage and it may be that it is the health insurance which allows people to purchase needed medical services at a much reduced cost.

While the relationship between prior employment and mortality warrants further investigation, perhaps the most striking finding of this study is that spells of poverty and marital status have differential impacts on men's and women's risk of mortality. Past analyses that have focused on the bivariate relationship between marital status and mortality have concluded that marriage provides an emotional environment that enhances longevity (Korbin and Hendershot, 1977; Mergenhagen, Lee, and Gove, 1985). Our findings suggest that while this may be true for men, it does not hold for women. Instead, the hazard of mortality for women appears to be influenced not by marital status per se, but by the presence of economic resources that are often highly correlated with marital status.

Recently, the number of women in poverty has been growing. Roughly one in every three families headed by a woman who has minor children in the home lives in poverty (Bane, 1986). Elderly women, usually living alone, comprise over 70 percent of the elderly poor (Minkler and Stone, 1985). Indeed, women of all ages are increasingly being counted among the nation's poor. If the number of women who are poor continues to grow, and if poverty increases a woman's hazard of mortality, what will happen to the trend of declining female mortality? Our findings suggest that such a trend would impede women's future

longevity gains.

While the magnitude of the poverty effect estimated in our work is not large, if it is viewed in combination with other data, it projects a rather disturbing picture of the health-poverty relationship—especially for older women. Statistics show that elderly women have more restricted activity days and they experience more injuries than their elderly male counterparts (U.S. Bureau of the Census, 1979). If these elderly women also have higher health care bills, then these added costs may contribute to their further economic impoverishment (Minkler and Stone, 1985), which in turn may further hasten their deaths. Under such a scenario, the relationship between gender, health status, poverty, and mortality is more complex than what has been estimated here and as such, it suggests a direction that future research in this area might take.

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ASSESSING DIETARY ADEQUACY IN THE DEVELOPMENT OF FOOD AND NUTRITION POLICY

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ABSTRACT

Alternative methods for assessing the adequacy of usual intake classify individuals differently. Precision in the classification is important to the design of public and private programs and policies.

INTRODUCTION

The development of appropriate food and nutrition policy and effective nutrition education based on assessments of the nutritional health of the population require good estimates of dietary intake and the nutritional adequacy of the diet. Food and health policies rely increasingly on survey data to support the development, implementation, and evaluation of many related public and private actions and activities. Major types of policies and programs include the monitoring of dietary status, planning nutrition interventions, program evaluation, the identification of groups at nutritional risk, and food guidance. Food consumption surveys frequently provide data used to evaluate dietary status, by measuring dietary intake and its corresponding nutritional adequacy.

Establishing the appropriate criteria for estimating the adequacy of nutrient intake has received increased attention. Proper interpretation and use of the information obtained from dietary surveys require understanding the concepts and the methodologies that relate to the use of data from dietary surveys for evaluating nutritional adequacy of dietary intake. The objective of this paper is to review alternative methods of assessing dietary adequacy and to assess the implications for development of food and nutrition policy.

In 1986, the Joint Nutrition Monitoring Evaluation Committee (JNMEC) identified a set of nutrients and food components which held priority status in public health monitoring due to excessively low or high dietary intake. Among the food components which JNMEC identified as having priority status for the general population due to low dietary consumption were vitamin C, calcium, iron, and fluoride; those warranting continued public health monitoring because of high dietary consumption were food energy, total fat, saturated fatty acids, cholesterol, sodium and alcohol.

Nutritional status is an outcome brought about by a number of factors including nutrient intake and factors affecting the utilization of nutrients. For the purpose of monitoring nutritional status, dietary data provide good indicators of the condition of health as influenced by the intake and utilization of nutrients. This does not imply that every individual or every group within the population faces the same level of risk. However, among the food components with priority status, a "substantial proportion" of the population was identified as having intakes considerably higher (or lower) than recommended levels (JNMEC, 1986). While the measurement of the nutritional status from dietary data alone should be regarded only as an indicator of what the true nutritional status is, dietary indicators used in conjunction with health indicators of nutritional status provide more complete information on nutritional outcomes than either alone. In addition, dietary data are often used independently of clinical and biochemical data due to the costs associated with clinical and biochemical tests, or for primary purposes, since the development of nutritional deficiency often occurs following inadequate dietary intake (Hegstad, 1972).

One of the goals of dietary surveys is to identify groups in the population that are at risk of having insufficient nutrient intake in order to effectively target education and intervention programs. Efficient targeting involves accurately identifying specific groups needing nutritional aid, and is often facilitated by dividing the population into groups using identifiable criteria such as economic status, race, sex, or age. The groups at risk may vary for specific nutrition related problems. With limited resources, programs more effectively allocate resources by "targeting" very specific groups in order to direct aid to the people most in need. A target group too narrowly set misses those in need of assistance; a target overly wide allows aid to be allocated to "too many" recipients, possibly leaving those with inadequate nutritional status receiving aid short of their needs. Therefore, assessing dietary adequacy and identifying target groups is critical to nutritional program development, implementation, and evaluation.

METHODS FOR EVALUATING DIETARY STATUS

In 1986, the National Research Council (NRC) released a report on Nutrient Adequacy: Assessment Using Food Consumption Surveys. This report, and the associated technical studies commissioned by the NCR, highlighted the interest and need for understanding the criteria and methodologies of dietary evaluation and assessment. While most methods of assessing the nutrient adequacy of the diet make comparison between intake and an assumed known distribution of requirements, they differ in the criteria used to determine "adequacy" of nutritional intake. Two methods for evaluating the adequacy of diets are discussed in this paper.

The first method of assessment is the cutoff method, based on the selection of a standard

requirement level and assigning any person with an intake below that standard to be at risk of having nutrient deficiency. The nutrient requirement is set sufficiently high so that most people meeting the requirement would have adequate intake. The Recommended Dietary Allowance (RDA) criteria are formed in such a way (National Research Council, 1980). The RDA criteria use the average nutrient requirement plus two standard deviations of individual requirements (σ) for the recommended nutrient intake level. Assuming the distribution of requirements is normal, approximately 97.72 percent of the requirements of individuals will be smaller than the mean (μ) requirement plus two times the standard deviation ($\mu + 2\sigma$). It is assumed that almost everybody with an intake equal to or higher than the criterion will be adequately nourished for the nutrient under investigation.

The NRC report in 1986 challenged this assumption. Requirements differ among individuals: some have requirements above average; others below. Hence, it was argued, misclassification will occur. Since the distribution of requirements differs among nutrients and among individuals there is no biological logic to using the fixed point method based on average requirements. While the adjustment for dispersion in requirements in calculating RDAs reduces the number incorrectly classified as meeting their requirement when in fact they do not, the standard of the RDA fixed cutoff method misclassifies relatively more people as not having adequate intake when in fact they do. The misclassification depends on the relative position of the cutoff and the shape of the dispersion of requirements.

The alternative method for estimating the prevalence of inadequate intakes proposed by NRC (1986) is the "probability approach". In this case, the assessment of an individual's having inadequate intake is based on comparing the intake level to the requirement distribution for an individual representative of the group of individuals being considered. Thus, the bias of incorrectly identifying groups of individuals at risk or not is minimized by accounting for the distribution of requirements. It is important to note, however, that little is known about requirement distributions.

The main advantage of the cutoff method is its simplicity. It is appropriate to use for nutrients with distribution of individual requirements which have little dispersion. Also, the cutoff method is helpful when the researcher and policy-maker want to look at consumption patterns and assess trends over time and among sub-groups of the population. However, in practice, the cutoff method is used even when the range of individual requirements is wide, causing the interpretation of the results of a dietary survey to be more ambiguous. Precise inference about the percentage of people with inadequate intake can not be made, nor can groups in need of dietary assistance be properly identified. If the analysis of the survey does not take into account the presence of intra-individual variation, or if the individual intakes have not been adjusted for intra-individual variation, then estimates of

usual intakes are not precise and the conclusions derived from the application of the cutoff method are even more weak (NRC, 1986).

In practice the probability approach, presented by the NRC, is very difficult to apply. First, the probability method assumes a known requirements In fact, little is known about specific distributions. Second, the probability approach as presented in the NRC report assumes that intakes and requirements are independently distributed. While this simplifies the calculation of the probability, it may be an inappropriate assumption to make for many nutrients. Even if data on requirements were available, the independence is not an assumption which can be tested on the basis of empirical data. Only the hypothesis that intakes and requirements are uncorrelated is testable. Without this assumption, the calculations become much more difficult.

And finally, the probability approach assumes normality (or transformation to normality) in calculating the distribution of usual intakes for food components. The normality assumption is unlikely for most nutrients, and the transformation inappropriate (Battese, et al., 1988) for the calculation of the distribution of usual intake.

Thus, while theoretically superior, both the data base and methodological developments to this point limit the application of the probability method.

IMPLICATIONS FOR ASSESSMENT

It is useful to consider the implications of incorrectly assessing nutritional adequacy with respect to programs designed to improve nutritional status through dietary intake. An example from Lorstad illustrates the policy implications that result from the use of a fixed point average requirement as the main criterion for dietary assessment compared to the individual requirements (Lorstad, 1971). The example illustrates the classification of individuals by intake (I), individual requirement (R*) and specific requirement criterion (R) levels (in this case average requirement). As shown in Table 1, according to the average requirement criterion, before any assistance program 17 percent of individuals are classified as having inadequate intake, while 19.2 percent actually have intake below their own requirement. For this example, a completely successful assistance program that targets the group with insufficient intake as identified by the average requirement criterion (17 percent) causes the total number of people with a truly inadequate diet to decline from 19.2 percent to 10.2 percent (not from the 17 to 3.8 percent as predicted by the average requirement rule). The program helps some of the people in need (people with nutrient intake less than the individual's own requirement) and some people who had already satisfactory intake (intake greater than their own requirement). However, individuals with their own requirement greater than their intake and greater than the average requirement (i.e., 6.4 percent of the population) are not targeted to receive aid. Thus the setting of criteria to evaluate dietary

intake, and the use of dietary survey data to specify the usual intake of individuals are important components in assessment of dietary intake and program development.

TABLE 1. Classification of Individuals by the Adequacy of Nutrient Intake: A Comparison of Individual Intake (I) vs. Individual Requirements (R*) and Average Requirement (R)

	I<R	I>R	Total
Before Assistance Program	-----percent-----		
I > R*	4.2	76.6	80.8
I < R*	12.8	6.4	19.2
Total	17.0	83.0	100.0
After Assistance Program			
I > R*	0.0	89.0	89.8
I < R*	3.8	6.4	10.2
Total	3.8	96.2	100.0

Adopted from Lorstad (1971)

The probability approach under current discussion explicitly incorporates the variability of nutrient requirements. It is designed to derive an estimate of the true percentage with inadequate intake and not an estimate of people at risk. If assumptions are met, conclusions based on the probability approach are stronger than conclusions associated with the cutoff method. Hence, theoretically, the probability approach is superior to the cutoff method. Unfortunately, there are many empirical problems associated with the probability approach. Information concerning distributions of requirements, distributions and correlations between intake and requirement is too limited at this time for this approach to be widely used in practice. By using an estimate of the requirement distribution and assuming independence, the probability approach leads only to an approximation of the true nutrient intake deficiency and in many cases may not be more accurate than the cutoff method.

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COMMENTS ON FINANCIAL PLANNING AND FINANCIAL
WELL-BEING

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Many aspects of the financial services market are
changing and among the important changes are the
growth in number of people offering the service of
financial planning and investment advice, and the
variety of new instruments. Good empirical work
is needed to understand consumer preferences about
their portfolios, and the market of services
available to assist them. Both G. Reichbach and
A. Schiano addressed these issues. Their work can
be directly applied to describing responses and
institutions of change.

Reichbach focused on understanding the response of
higher education institutions to the (apparent)
demand for trained and certified planners. Essen-
tially her study reflects the growth and develop-
ment of institutions of financial planning, and
the extent to which universities and colleges are
suppliers in the institutional context. Little
information on the costs of providing such
services was evaluated.

In an interesting paper, Schiano used a Lancaster
model to evaluate the characteristics of the
portfolio. The specification and analysis of the
relative contribution of the characteristics of-
fers policymakers, planners, and consumer educa-
tors evidence on the relative importance of the
different characteristics derived from actual con-
sumer behavior. Of course, this type of analysis
depends on consumers being well informed about the
characteristics in their portfolios and the parti-
cular assumption of linear production technology
from the Lancaster model. Also, it is important
to consider whether all the consumers face the
same investment opportunities.

Finally, Winter's paper addresses the very impor-
tant issue of evaluation of financial satis-
faction. How do people perceive their financial
position? What factors are associated with feel-
ings of satisfaction and improved well-being. It
is apparent that not all consumers evaluate change
and conditions in the same way. She provides evi-
dence that farmers are different than others. It
is constructive to consider why this might be the
case, since those determining factors can provide
the basis for program design and development, par-
ticularly for farmers in periods of distress.
Research on farmers can also provide evidence of
factors which affect the general population as
well.

ESTIMATING GEOGRAPHIC NUTRIENT INTAKE DIFFERENCES FROM NATIONAL DATA

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This paper focused on the use of national food intake survey data to statistically estimate per capita nutrient intake of food energy, fat, calcium, iron and vitamin C at the state level and illustrate the magnitudes of geographic nutrient intake differences.

The discussion of this paper is intended to provide some insight in the procedures used to estimate geographic nutrient intake differences from national survey data and illustrate the magnitudes of these differences. To estimate these differences, procedures previously employed to estimate market quantity requirements (demand) of specific foods or food groups, e.g. beef, eggs, broiler meat, etc., by geographic delineations (state, substate markets) for current and projected years become the starting point for this analysis (Huang and Raunikar). In contrast to previous studies wherein market requirements were estimated using household data, this study uses individual intake survey data sets.

The assumption made in this study is that individuals with comparable characteristics who reside in the same region behave in the same manner. It should be noted that some causal factors affecting intake levels may not have been identified or, even if identified, could not be assigned values of measurement. Furthermore, the completeness of the data from surveys such as those conducted by the USDA may affect the findings. Nevertheless, this presentation provides estimation of the magnitude and significance of the impacts of household characteristics on nutrient intake of individuals and its application at the state level.

Initially, the data base and information available for estimation are briefly described. Then, the model is presented. A discussion of the results from the estimating equations and their use in developing profiles and estimation of nutrient intake at the state level follows. Concluding comments concern the applicability of the results, and data and analysis needed for improvement.

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DATA SOURCE AND DESCRIPTION

The data used are from data tapes of the USDA'S Survey of Food Intake of Individuals (SFII) in the U.S., Spring 1977 and the Bureau of the Census' Censuses of Population and Housing, 1980. The Censuses of Population and Housing were used to determine the proportion of the population within each state and was then combined with the estimated equations describing specific nutrient intake relationships to estimate nutrient intake at the state level.

The SFII contains 8720 observations (individuals) of which 6980 (80%) were included in this study. These observations represent 2525 households. Households with missing values were deleted from the original data set.

Food intake data for 6980 individuals were used to estimate for each region the effect of urbanization, household income, race and age-sex of individuals on their nutrient intake of food energy (kilocalories), fat (grams), calcium (milligrams), iron (milligrams) and vitamin C (milligrams). A description of these variables is listed in Table 1.

The census data were obtained for each variable and used to derive estimates for the four census regions and 48 contiguous states plus the District of Columbia. Variables included in the analysis were restricted to those for which comparable information was available from the 1980 Census of Population and Housing data tapes. Of particular note is the use of urban and rural classifications rather than central city, suburban and nonmetro to match census data that had been previously complied.

The average per capita nutrient intake by geographic region were derived from the SFII (Table 2). The United States and region average per capita nutrient intake values indicate considerable differences across regions for some nutrient categories. Per capita nutrient intake on average is lowest in the South region and highest in the West region except for vitamin C which is highest in the Northeast region.

MODEL

Linear and quadratic models were specified to establish the causal relationship between nutrient intake and the socioeconomic and demographic variables. The quadratic model is