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**SOCIAL INDICATORS: UPDATE OF A  
NEW AND DEVELOPING FIELD**

*Moderator: ROBERT J. JOHANSEN. Panelists: ALBERT L. FERRISS\*, GEORGE C. MEYERS\*\**

The subject of social indicators is concerned with measuring social progress and well-being by quantitative measures. Social indicators, while currently in an evolving state as to what constitutes a measure, how to measure, and how to place a value on a measure, has been attracting increasing interest.

Papers by Dr. Ferriss and Dr. Meyers will introduce and describe the subject. Dr. Ferriss' paper is essentially an overview of recent work in the social indicator area. Dr. Meyers' paper will discuss the social sources of differences and changes in mortality.

Following the presentations by the participants from the American Statistical Association, the Discussant will comment from the actuary's viewpoint. Discussion from the floor will follow.

MR. ROBERT J. JOHANSEN: This is the second of two sessions arranged for by the American Statistical Association.\*

Social Indicators is to my way of thinking a somewhat illusive subject. If, as Murray Weitzman of the United States Census Bureau suggests, its emergence can be traced to the 1966 book called Social Indicators edited by Raymond Bauer,\*\* then it is little more than a decade old. Much of the intervening time has been required to define what social indicators is and what sort of data can be used as social indicators. I think you will be impressed with how broad this subject is and how much data have been accumulated and studied.

We are indebted to Robert Parke, Director of the Center for Coordination of Research on Social Indicators, Social Science Research Council, for his assistance in arranging this program.

\* Dr. Ferriss, not a member of the Society, is Professor of Sociology at Emory University in Atlanta, Ga.

\*\* Dr. Meyers, not a member of the Society, is Professor of Sociology and Director of the Center for Demographic Studies at Duke University.

+ See introduction to Concurrent Session, " Biometric Methods for the Analysis of Time to Vital Event Data and the Assessment of Risk" on page 1381.

++ Social Indicators, Raymond A. Bauer, ed., M.I.T. Press, 1966, Cambridge, Mass.

Dr. Albert L. Ferriss has been Professor of Sociology at Emory University in Atlanta since 1970 and was Chairman of the Department of Sociology and Anthropology for the period from 1970 through 1976. Just prior to that he was Research Sociologist, Social Indicator Project, for the Russell Sage Foundation. He was also at one time Chief of the Health Statistics Bureau in the Bureau of the Census. He has both the M.A. and Ph.D. in Sociology from the University of North Carolina. He has a number of published papers to his credit, including "Indicators of Trends in American Education," "Indicators of Change in the American Family" and "Indicators of Trends in the Status of American Women." He was editor of the publication Research and the 1970 Census. Dr. Ferriss has chosen the fascinating title, "What Every Actuary Always Wanted to Know About Social Indicators but was too Busy to Ask."

The second speaker is Dr. George C. Meyers who will talk on "Mortality Data as Social Indicators." Those of you who were at the symposium, The Future of Life Expectancy, last March may recall that Dr. Meyers was on the panel for the non-insurance industry part of implications of changing mortality patterns, which discussed the effect of mortality changes on the elderly, the economy and society.

Dr. Meyers is Professor of Sociology and Director of Duke University's Center for Demographic Studies. He has the M.A. and Ph.D. from the University of Washington in Seattle. In addition to teaching, he is also involved in research. His interests run to data analysis, forecasting and survey research in the areas of demography, health and sociology. He is also a member of the U.S. Census Bureau Advisory Committee.

Anna Rappaport is the formal Discussant for this session. She will discuss these papers and the general subject of social indicators from the viewpoint of the actuary.

DR. ALBERT L. FERRISS:\* Social indicators are statistical time series that reflect the state or condition of some aspect of the social system in which the investigator has an interest. Some who try to define social indicators require that the welfare of the population be reflected in the indicator, while some insist that the indicator provide information that fits into a model of a social process. Others look to social indicators to identify progress toward or retrogression from the attainment of national goals. Indeed, the "social indicators movement" is moving ahead in several directions, stimulating improvements in social reporting and in social statistics, generating models and paradigms that more rigorously integrate and interpret time series data, and finding ways to relate social processes and trends in social phenomena to public policy and the ultimate direction of society.

While moving ahead in several directions, these social indicator interests have not yet ushered in a millennium of comprehensive

\* Additional details of Dr. Ferriss' presentation may be found in his paper "Recent Developments in Social Indicators Research" available from him.

information about the state of society nor rationality in its management, but the dreams of many social indicator advocates aspire in that direction. Private and Federal funds are supporting an expanding number of social indicator research projects. Innovative approaches to the organization and interpretation of data are being advanced. A number of publications in the U. S. and other countries are devoted to social indicators.

These funds, publications and models for interpretation of indicators have not bypassed the essential problems of actuaries, but neither have they primarily concerned mortality and the life table. Social indicators may contribute to decisions made by actuaries through information on trends affecting mortality, morbidity, mental health, the quality of life, and associated indicators of the human condition. Much time series information has significance for the probability of a life contingency and the quality of life. Adequate exploitation, however, may await the development of appropriate models that link time series to the life table and other bases for actuarial decisions. The future use of a vast amount of social indicator data rests upon the evolution of models that provide direct linkage to public and private decision-making models.

Social indicators research now has reached the stage of building models and searching for the most useful orientation upon which to proceed.

Now I want to just sketch over several of the social indicator efforts that I will discuss later on in more detail. The first one is the use of a macrodynamic structural equation model which follows developments in time series analysis that have been developed by economists. The second is the input-output demographic model, which employs the stock of the population at two points in time and the flow in the interim period between states or conditions. This approach enables the development of numerous statistical indicators, among them the transition rate from one state or one time period to another, Markovian processes, and so forth. The third is the interlocking of National Income and Product Accounts with social indicators of household behavior and indicators of welfare. A fourth attempts to develop a theoretical model of social processes which effect change in the social system. The fifth is a system which analyzes local area data that is being developed for planning mental health catchment areas of mental health centers. Finally, use is made of the life table as a device for organizing information in developing social indicators.

The first section deals with elementary time series. A fundamental element of social indicators is the statistic that describes the state or condition of the population during a given period with respect to a characteristic (for example, the rate of unemployment in a given year, the rate of admission to a mental health facility, or the morbidity rate for a given age-sex-color category). Linked in time series, such rates describe the trend in that characteristic for the population and comprise the basic element for study.

As an example of such indicators, Exhibit 1 presents four social indicators showing age-adjusted mortality rates by color and sex for the United States--trends this audience should recognize immediately. The graph comes from Social Indicators 1976, the second compendia of social indicators statistics issued by the U.S. Federal Government. Time series of this kind are used to identify social trends, to contribute to the formulation of public policy, to set goals and assess movement toward their achievement, and other uses related generally to assessing and improving the general welfare.

To contribute to our understanding of social change, such indicators must be predicted by their underlying dependent variables. These social indicators of mortality have been modeled in their dependencies upon economic and demographic influences, indexed by per capita income, the unemployment rate and the inflation rate. Lags of various years were used under the theory that the consequence of an economic downturn requires varying numbers of years to manifest itself in mortality statistics. Exhibit 2 shows these equations indicating a high level of prediction,  $R^2$ , and that the equations are free from auto-correlation.

These macrodynamic structural equations are samples of attempts to model social processes and social trends. A variety of social indicators have been modeled in this manner, not always as successfully. Some attempts have included: occupational structure; property crime rates; educational enrollment and schooling; job satisfaction; marriage, family and population characteristics; mortality and disability; labor force participation and others.

The future use of macrodynamic structural equations in developing public policy matters rests upon several prior developments. The independent variables must represent genuinely causative factors influencing the dependent, criterion variable. In many cases causation may have to be established by experimental methods. The use of genuinely causative variables may require additional measurement and data collection. When predictive equations are satisfactorily developed upon the basis of such variables, then the predictions developed by them may be tested under alternative policy strategies. Such utilization would fulfill one goal of those in the social science community who have urged the development of social indicators for the guidance of public policy.

Such developments also rest upon the selection of dependent variables which have real relevance for public welfare in the variety of areas that are subject to public policy intervention. The modeling of their underlying dependencies requires independent variables that are subject to intervention and manipulation through a public program.

The next section deals with demographic accounts. Demographic accounts provide a technique for accounting for the state of the population during a time interval, showing the state at the beginning of the period, at the end of the period, and the transitions from one state to another during the interval. This has

been called the "stock and flow" model of population accounting and has been formally stated by Richard Stone, an English economist/demographer, and further elaborated in the United States by Kenneth Land and his associates at the University of Illinois.

Simply stated, the system requires that the inflow of population at the beginning of the period equal the outflow at the end of the period. When disaggregated according to particular states, the system should show the transition from one state to another occurring between the beginning and end of the period. A demographic account may be developed for any state or condition of interest (for example, in the labor force or not in the labor force, enrolled in school or not enrolled in school, married or not married, and so forth).

Entrance to the stock of the population through birth and exit upon death are the most reliably recorded transitions of the U. S. population. Upon the basis of survey data, the members in other states of the population may be estimated. The transition coefficients may be estimated, but only with a degree of unreliability. This is one trying problem in developing demographic accounts.

The social indicators objective of demographic accounts is to identify the stock and flow of the population annually, preferably by single year of age by sex, the population being classified according to significant social categories. To set up such an elaborate accounting system, even upon the basis of estimates, would require sample survey information on the previous state (last year) and the current state (this year) of the population, information that is seldom asked of respondents in national sample surveys. The benefits of such data acquisition need to be demonstrated in order to firmly justify this change in the basis of collecting data.

The "case" for the change in the state of the population may be justified when the stock and flow model is moved back an additional dimension to include information on the cause of the change in the state of the population. For example, consider the state, employed/unemployed. What social forces effected the change in the population from unemployed to employed? The answer to such a question would rest upon understanding the macrodynamic forces stimulating employment and the microdynamic influences which affected the employment status of individuals. Thus, the model rests, ultimately, upon understanding behavioral aspects of social change. This question, however, is not unique to social indicators nor demographic accounting but is central to all social science disciplines, and much research has contributed to understanding change processes. It remains to be systematized under the demographic accounting framework.

I turn now to income and time accounts. Economists have advanced the concepts upon which the National Income and Product Accounts have been developed. They rest upon monetary transactions in the market sector of the economy and are useful for identifying sources of fluctuations in the economic system, serving to identify points

for intervention through manipulating the flow of resources. The Accounts, however, have been criticized because the aggregate Gross National Product does not faithfully reflect the "things that make life worth living." Variations in the welfare of the people are not reliably reflected in changes in the per capita Gross National Product.

Accordingly, many have set out to find measures that reflect the quality of life or the well-being of the people.

Juster, Courant and Dow are attempting to develop social accounts of household activity (behavior) which may be linked to the National Income and Product Accounts. The monetary value of goods flowing into the household may be categorized and considered as material inputs into the household. They have developed a basis for identifying the outcome of these inputs in terms of the well-being of the householders. The system is based upon the distribution of the use of time among activities within the household, data which must be assembled through a survey of a sample of households. Coupled with the stock of resources at the beginning of the period and the input of resources during the period, the use of time results in certain subjective satisfactions ("process benefits"), in flows of material goods and, ultimately, in a change in the level of "stocks" at the end of the period. Observations upon a panel of households, or upon successive cross-sections of households would yield social indicators reflecting changes in these elements and would provide the basis for analyzing social change.

A household output account would trace the household use of GNP-type goods (food, clothing, housing, public health care, etc.) to produce household outputs. Household outputs would be consumed in the process of production or would contribute to the net investment or would affect the "process" benefits.

A social output account would distribute the objective and subjective indicators of well-being, the "process benefits," and other exogenous indicators of social welfare in terms of the source of production, whether in the household, the public sector or elsewhere.

The bottom-line control totals of this account system is the total GNP and the total time available to householders. In categorizing the latter, that is, the objective indicators of well-being, the authors have employed a list of "social concerns," advanced by the Organization for European Cooperation and Development (OECD) such as employment, work, leisure, health, justice, public safety, etc.

The authors of this system admit to difficulties in categorization, measurement, data assembly and analysis, but they envision the system of social accounts as a basis for modeling which will enable the evaluation of alternative public policies. One problem involves the relationship between macro-based data on goods input into the household with micro-based data on the use of time by the householders, a problem which as yet is only partially solved.

Another conceptual problem involves the assessment of capital stocks such as skills, health, friendship and organizational patterns, and their transformation through the application of time. The authors are still attempting to formulate a basis for incorporating these elements into the system.

Empirically the authors have combined two surveys of time use for 1965 and 1975. These show the hours devoted to various activities in relation to the flow of goods and services. Exhibit 3 (taken from their publication) illustrates changes in time use and in dollars per hour between 1965 and 1975. The authors point out the dramatic shift in time use from production to consumption. The shift has been away from household production (home maintenance, shopping, cooking, etc.) to passive leisure time activity (especially watching television).

Within the category "Investment", time use has increased for medical care, education and home improvement, while time devoted to child care has declined--results which may be affected by changes in the age distribution of householders.

The increase in time devoted to medical care per person, from .76 percent to 1.33 percent of total time, exceeded the increase in expenditures. It may be explained, say the authors, by an increase in the queuing associated with Medicare and Medicaid services.

In addition to assembling data from households on time use in 1975, the authors obtained an evaluation from householders of the satisfactions derived from various activities. Combined into a measure of "process well-being," the authors found income to be independent of such subjective satisfactions. In addition, the direct question concerning satisfaction with life generally turned out to be independent of the measure of process well-being.

Richard Ruggles, who is an economist at Yale, has pointed out certain advantages of the system proposed. In relating the use of an individual's resources, at the micro-level, the system is innovative and opens up many analytical possibilities. The use of the national sample survey of households makes it possible to link National Income and Product Accounts with demographic and other socioeconomic data, thereby giving the advantage of alternative schemes of aggregation. One difficulty may lie in the measurement of relevant variables which bear upon well-being, a problem, of course, that besets any search for underlying causes of social products and outcomes.

Another attempt to do the same thing has been developed by Nestor Terleckyj, of the National Planning Association. He has attempted to develop a framework for incorporating economic, demographic and time-use data into one comprehensive system. He aims for a system which will account for all of the costs to society of obtaining different objectives. It is built around the concept of social production, by which it is meant that the outputs of the economy become inputs to the production of current and future well-being in the household. The use of time becomes a resource input to social

production. One problem is to evolve a common system to categorize the resource inputs, both time and consumer goods, to social production.

Terleckyj has attempted the joint combination of the 1976 National Income Accounts and time use of households from the 1976 survey by the Institute for Social Research, the University of Michigan, and has arranged some 287 items into 20 resource-use categories. The categories involve such things as "production of current well-being" (food, clothing, personal care, health care, housing, household operation, recreation, religion and welfare, income security, transportation, personal business, communication, public safety, national defense, general government) and investment (basic education, higher education, science and research and development, gross investment, etc.)

For example, his account for Health Care shows expenditures by households, non-profit institutions, state and local government and the federal government, amounting to \$136.2 billion (1976) and the contribution of 13.9 minutes of household time per adult per day.

The next phase of this analysis is to integrate social indicators reflecting demographic data into this framework. Terleckyj points out that a number of population characteristics, such as marriage, divorce, number of children, etc., have already been examined as part of household production.

Social indicator research also has developed around the attainment of specific goals and the inputs necessary for such goal attainment. Terleckyj has developed such a system around a limited number of indicators reflecting some 18 social concerns, ranging from health and public safety to science and the arts. He selected indicators to broadly represent goals such as life expectancy or the percent of the population with major disabilities to reflect the state of health. For each goal, specific programmatic activities are identified which will move the population toward the goal. In the case of health, for example, activities include such objectives as the elimination of smoking, the improvement of nutrition and fitness, the prevention of accidents, a reduction of alcoholism and alcohol abuse, and others.

If each specific goal shown in Exhibit 4 is achieved to a given degree (e.g. 90 percent of smoking is eliminated), the author estimates the increase in life expectancy that would follow as a consequence. For example, an improvement in nutrition and fitness of 70 percent of the population will increase the average life expectancy by 3.8 years, according to Terleckyj's estimates. Being an economist, he also estimates the cost, the input necessary to effect the change. Overall, he estimates that \$64 billion over a 10-year period (1974-1983) would add 5.3 years to average life expectancy of the U.S. population. While Terleckyj's system relates the economic investment to specific outcomes, he cannot always give assurance that an investment can be translated into a program which will have the desired effect. For example, in the case of alcoholism, he assumes that a 33 percent rate of cure is technically



feasible, without being specific as to the mode of intervention, but citing the experience of Alcoholics Anonymous as effecting cures in 80 percent of its cases.

The chief utility of such an analytical system which could contribute to the understanding of changes in the quality of life is that it lays upon the table the entire range of social goals within the framework of the economic system from which the money must necessarily come, if teleological change is to be realized. His system includes assessment of the interactive effects of one change upon another. For example, a 33 percent reduction in alcoholism would reduce homicides by 20 percent and traffic deaths by 16 percent, according to his estimates.

As you can see, this goal-oriented approach to the use of social indicators is far more concrete and integrated with the concepts of national budgeting and policy than are other efforts. Hurdles of cost estimation and, particularly, of specific programmatic steps need to be overcome through experimental field trials in order to render such intervention reliable. Remember the poverty program!

The next topic is the perception of one's well-being or perception of the quality of one's life. In assessing the quality of life another approach asks the individual to provide his or her own subjective evaluation, not only of his life condition generally, but also of specific areas and "social concerns" contributing to well-being: such topics as "your health and physical condition", "the way you handle the problems that come up in your life", or "the way you spend your spare time". Satisfaction with such life concerns are then analyzed in relation to the physical objective conditions of one's life and one's social environment, in order to explore the linkage between the two. Results indicate that the two provide separate, independent items of information about the well-being of the person.

Effort in this area has been concerned with comparing different approaches to measuring perceived well-being, to reducing (by factor analysis and other means) the number of areas of concern, to analyzing variations in perceived life quality among subsets of the population and to comparing studies of the quality of life in different countries (e.g., Canada, Australia, Great Britain, Ireland, Japan).

Effort also has gone into devising a basis for incorporating subjective perceptions of well-being into some type of social accounting system. Thus far a satisfactory integration into a social account has not been found, but the most promising possibility appears to be with time-budget accounting. The entry of evaluations in this account would appear to be evaluations of the outcomes of the use of time, evaluations of one's resources, and evaluations of the process of producing an outcome. Along with these research problems, investigators in this area are conceptualizing the psychodynamics of the cognitive and affective aspects of how evaluations are made.

Surveys of perceived life quality have been conducted in the U. S. by the University of Michigan and in Canada by the Institute of Behavioral Research at York University and at the University of Guelph. The initial orientation to this approach was set forth by Campbell and Converse in a book called The Human Meaning of Social Change. The U. S. Department of Agriculture has laid out a program of research into the quality of life of the rural population.

The next section deals with local area data, i.e., that dealing with cities, counties, natural areas of cities, and groups of counties, etc. Social indicators are based upon decennial census data and these have been identified by a program of research at the National Institute of Mental Health which is called the Mental Health Demographic Profile System. These geographic areas are called catchment areas. They have been organized around political and census tract boundaries for the delivery of mental health services. The Mental Health Demographic Profile System has been computerized so as to generate some 130 statistics from the 1970 decennial census. Developed upon the basis of the 1970 Census, the system will be extended to the 1980 Census, to provide comparable baseline data, and will be adapted to accommodate the 1990 Census, when the data are released.

The underlying idea behind the amassing of social indicators by local area lies in the potential predictive power of information on social rank, lifestyle or urbanism, and ethnicity to reflect the state of mental illness of the population. Studies have shown various indicators and various combinations of indicators to signify the need for mental health services as revealed by epidemiological and ecological studies. The statistical system, then, has proven to be quite useful in planning, in needs assessment, in evaluation, and in related aspects of health organization. In a recent review in World Health Statistics a number of these relationships have been identified. The statistical methodology has recently been reviewed which provides a basis for further exploration of combinations of local area characteristics to reflect environmental traits that are of interest in mental health planning.

Additional studies are underway to relate institutional and psychiatric case evidence to the environmental characteristics of catchment areas.

The Mental Health Demographic Profile System has demonstrated the practical application of demographic indicators for mental health planning and related uses. The expansion in the use of this resource for other planning and evaluation activities lies in the development of combinations of social environmental characteristics as more sensitive indicators of criterion phenomena, such as prevalence rates. Research on this problem is now being conducted on areas of St. Louis, Missouri, Baltimore, Maryland, New Haven, Connecticut, and Gainesville, Florida.

I would not want to conclude this unless I mentioned something about various social indicator publications. The Federal Government has published several compendia of statistical series. Toward a Social

Report (Dept. of HEW) was the first of these which attempted to interpret trends and identify implications for public policies, doing so without an extensive presentation of statistical trends. It was based upon some 23 essays prepared by government and nongovernment experts and was conceived as a social report on the state of the nation, somewhat analogous to the Economic Report of the President. A full-fledged social report on the state of the nation, however, has not yet been created, although the idea has not died. One attempt in 1970 resulted in a publication called Toward Balanced Growth: Quantity With Quality (National Goals Research Staff). In seven essays this report attempted to identify future problems and to present "a comprehensive, long-range view of policy alternatives that can serve as an aid in the process of decision-making," the strategy being to stimulate public discussion of these issues.

Social indicators as estimates of public policy and planning were given a more deliberate stimulus with the publication in 1973, 1976, and again now in 1980 of a volume called Social Indicators. These volumes are massive accumulations of statistical time series encompassing the entire range of social statistics, primarily those federally assembled, but also including other public data. Statistical series are presented essentially without comment or interpretation. However, the 1976 volume, and again the current 1980 volume, are subject to extensive essays of interpretation through special issues of the Annals of the American Academy of Political and Social Science. The January 1978 issue of the Annals interpreted the data in Social Indicators 1976 and the January 1981 issue of the Annals will interpret Social Indicators 1980 (now properly called Social Indicators III). This pattern of periodically releasing compilations of time-series statistics in graph and table form has also been followed in Canada with its Perspective Canada series, in Great Britain with its annual Social Trends series, and in other countries with less frequent releases.

Other publications of the Federal Government include such titles as The Condition of Education, which comes out every year, Science Indicators, Health: U.S.A., The Status of Children, Social Indicators of the Equality of Minorities and Women, and Indicators of Housing and Neighborhood Quality.

These volumes are useful in placing trends before the public and assembling data for further use and study. The benefits of such publications will rest upon the development of models that employ the data and provide a basis for its interpretation. The bare bones of statistical series will provide minimal intellectual guidance unless accompanied by models to facilitate interpretation.

A bibliographic service on social indicators of health has been set up by the National Center for Health Statistics of the U. S. Department of Health and Human Services. It issues annotated bibliographies of health indicators. Coverage includes monographs, articles in medical and social science journals, and international publications.

The Social Science Research Council has set up the Center for the Coordination of Research on Social Indicators in Washington, D. C., which also will provide bibliographic help as well as a news letter which tells of recent developments in social indicators. Another news letter is being published by the American Institute for Research, a research organization in Stanford, California.

Finally, Social Indicators Research is a journal which is published in Holland but edited at the University of Guelph in Ontario which provides a publication outlet for social indicator papers and research.

Funds for research on social indicators initially came primarily from the Russell Sage Foundation, but the National Science Foundation initiated a research program on social indicators in 1971 and has since invested about \$15 million in the program. Much of the research reviewed here this afternoon has been supported by the National Science Foundation.

DR. GEORGE C. MEYERS:\* It would be irreverent, if not unwise, to begin a presentation on mortality statistics as social indicators without rendering homage to that great pioneer of demography and actuarial science, John Graunt. Graunt in his Natural and Political Observations..., published in 1662, observed not only the variations in plague over a 60 year period, but also related the fluctuations in specific causes of mortality to other environmental, social and economic conditions of the people of London and surrounding districts. In the later efforts of William Petty, the importance of vital statistics took on added meaning for analyzing the conditions of the State.

The gradual development of mortality statistics continued in the centuries following to provide basic data for analyzing practical problems, but also led to important developments in mathematics and applied statistics. The works of Halley, Bernoulli, Makeham,

Pearson, and Dublin and Lotka can be cited in this regard. But perhaps the most eminent contribution of all was made by William Farr, a notable figure in the English Registrar General's Office for much of the 19th century. Among these contributions we can cite the creation of the occupational mortality studies that continue to the present, which provide an historical series of incomparable importance. We will refer to them in greater detail later in this presentation. So too, the series of English life tables that Farr first designed in 1843 provide a vivid index of social and health progress that he was able to elaborate on in the quest for improved public health programs. Noteworthy in this regard are the ideal life tables of the most healthy areas in the country and the efforts of determining the capital value of a man and, thus, the cost of premature death.

Our purpose in this brief historical review has been to emphasize

\*Additional details of Dr. Meyers' presentation may be found in his paper "Mortality Data as Social Indicators" which is available from him.

that the analysis of mortality statistics holds a special place in the evolution of many disciplines -- public health, statistics, actuarial science, demography and not a few of the social sciences. These developments were due not only to the implicit importance given to reducing mortality and improving health, but to certain distinctive features of these vital statistics. Among these may be noted:

- (1) Death is itself an unambiguous event--the termination of life is scarcely questionable.
- (2) The importance of the event from legal, religious and social points of view has meant that the registration of its occurrence was recognized historically quite early and led to the continued practice to the present.
- (3) The importance of death, considered in aggregate terms, is such that recognition has focused on what this terminal event tells us about the underlying health, social and economic conditions of the societies involved. This is enhanced by the fact that additional information about the decedent and the conditions describing the event are generally recorded.
- (4) Thus, it is important to note that death registration evolved into a data system that is periodic, available in long time series, nationally comprehensive in its coverage, often rich in detail and, for many of the world's countries, relatively reliable.

Even Graunt was surprised that the weekly Bills of Mortality, established initially for purposes of monitoring plagues, should have developed into a data resource that provided aggregated annual statistics and included such information on decedents as age, sex and causes of death other than plague. Mortality statistics today continue to provide a basis for a multitude of different types of research investigations directed to a wide array of purposes. Let us now turn our attention to some of these efforts, including the main purpose that concerns us today--the use of mortality statistics as social indicators--and how certain changing features of the data systems and recent modes of analysis promise continued widespread use of mortality statistics in the future.

The "social indicator movement", as it has come to be known, emerged as an important force in the late 1960's largely through the efforts of such international organizations as the United Nations and the OECD; several very effective programs mounted by the Russell Sage Foundation and the Social Science Research Council in the United States; and other scholars such as Bauer who was mentioned earlier. The main emphasis in these efforts was placed on the development of time series of aggregate government statistics that would complement the well-known economic indicators -- the C.P.I., the G.N.P., etc. - in charting the course of the country's well-being toward certain generally recognized and approved national goals. As is true in any social movement, there have been considerable shifts in emphasis and

conceptualization over the past years and it is fair to say that the movement is still stock-taking and accounting (to use Dr. Ferriss' term) for itself. Nonetheless, there are some key perspectives that are widely accepted:

- (1) Measures should be quantitative, generally regarded as valid, available for a nation on a periodic basis, and reliable.
- (2) Social indicators should be isomorphic with the main concept ultimately being measured -- quality of life. This refers to the notion that they should be direct and not subject to dispute over whether they reflect on a desirable goal.
- (3) It is appropriate to include both subjective as well as objective measures.
- (4) Somewhat less agreed upon are questions relating to the extent of disaggregation that should be pursued and to the extent to which the measures should be mathematical models of social concern.

Our purpose in this presentation is not to assess whether or not the objectives of the movement have been realized, or even the degree to which development of social indicators has been accomplished, but rather to comment on mortality statistics as social indicators. We can begin by noting that mortality statistics are invariably included in compendia of social indicators (for example, Social Indicators 1976), but usually under a category of health or related topics.

There is universal agreement that the concept of health should be included in any list of national goals and, indeed, it has been formally recognized in the United States since the first list was derived in 1933. There is far less agreement on what health connotes and how one should go about measuring it. Definitions range from the often cited, "Health is a state of complete physical, mental and social well-being..." of the World Health Organization to such simply-conceived versions as the absence of ill-health. Many argue that health is multifaceted and can be assessed by the absence of disease, disability, dysfunction, dissatisfaction, and death -- the five D's. It is evident that many of these dimensions depend on the age and sex composition of the population and its racial, ethnic and geographic homogeneity, as well as on the coverage and utilization of health services which are in turn influenced by the effective demand for services and the financial capacity to pay for services. A formidable challenge it is to even conceptualize how one would go about assessing on a periodic, aggregate basis such an array of elements. Moreover, it is clear that many of the factors can only be "social" indicators in the sense that they are not "economic" indicators per se.

How do mortality statistics fit into all of this? One, we have noted that mortality statistics have long been viewed as global

markers of the health and well-being of a society. In fact, such measures as the infant mortality rate (actually a ratio, not a rate) has been frequently used as an indicator of economic and social development, especially in cross-national comparative studies. In terms of the U. S. Department of Health, Education and Welfare's definition of social indicators that "...if it changes in the 'right' direction, while other things remain equal, things have gotten better, or people are better off," it would appear to be eminently qualified. Yet some have started to raise the general issue that has recently been referred to as the "failures of success", especially by Greenberg. Although I am not going to amplify in length on this perspective, especially in front of so many life insurance people, it is important to note that an increasing amount of attention is being given to the implications of increasing life expectancy and the heightened survivorship for a vast segment of the recent cohorts, including those who in years gone by would have died quite early from congenital malformations, mental impairments and the like. On the other hand, one can point to increasing survivorship in the older ages that raises issues relating to prolonged disability and threats to a dignified demise produced by lifesaving technologies, etc. Although some have claimed that longevity (that is, changes in the "normal" life span) has not been altered markedly, some advances have been made and potential developments in diagnosis, treatment and rehabilitation seem imminent. Thus, even mortality improvements have been questioned with respect to improved well-being. Nonetheless, we still need to know how mortality has changed.

The second point with respect to mortality statistics is that there is less controversy over the use of mortality statistics for monitoring specific diseases as they reflect on underlying morbidity trends. This is especially true of diseases that are difficult to detect and which are involved in the complex process of chronic disease deterioration that leads to death. Moreover, there are some fatal disease outbreaks, such as the Legionnaire's disease event of several years ago, that alerted epidemiologists and public health officials to a major disease that was unknown to that point in time. Indeed, although epidemiologists concern themselves with a wide range of research approaches, mortality analyses still are widely used. For example, recent analyses of cancer incidence have used mortality statistics to assess the value of existing information from U. S. Tumor Registries.

The third factor is that population growth and projection models utilize mortality statistics as one important input parameter. The importance of these models for anticipating and planning for major shifts in population structure is generally recognized. This is particularly crucial in considering the aging population, its distribution and changing composition, which has vital implications upon many of the societal institutions--especially those dealing with health and welfare.

A fourth point is that from a policy point of view, there is also concern with the social and economic implications of mortality at certain ages which can be regarded as wasted lives. This is

especially true of deaths taking place in early life. Vaupel has recently noted that early death differs from late death in both the nature of the losses and the character of the policy instruments that might be used to reduce these losses. The notion of "quality-adjusted life-years" lost as a result of death is an appealing topic from the standpoint of assessing the overall well-being of society but, in addition, has strong policy implications as well.

Finally, it is appropriate to mention at this meeting that mortality statistics have direct applications in the private and public sector for enhancing the personal and social welfare of a population. Early studies of mortality contributed in creating concern for establishing life insurance and other insurance programs. In turn, they play an important role in pension and annuity programs and in social security arrangements generally. Other applications in the spheres of health care and burial enterprises should also be cited.

In summary, we have emphasized in this cursory review of the purposes of mortality statistics certain applications that bear only marginally on direct health concerns. We have done this purposefully in order to avoid arguments over whether or not these types of data are of benefit for such things as health care planning, policymaking and evaluation of program effectiveness. Moreover, stress has been placed on aspects of mortality statistics that are relatively distinctive and contribute to their continued wide usage. A final conclusion is that mortality statistics as social indicators would appear to have their greatest benefit for monitoring in one form or another. To gain better perspective on these statistics, let us next examine some dimensions of these data systems for monitoring.

Exhibit 5 gives in outline form some of the major considerations that can be taken into account in examining mortality statistics. It should be noted that in certain cases particular indicators can, and indeed sometimes do, involve all five of the dimensions given. For example, in the most recent U.S. reports on social indicators nine time series mortality tables and charts are given--three deal with life expectancy, three with death rates, two with selected causes of death, and one with expectation of life with certain causes eliminated. Most of the tables include breakdowns by age, sex and race. In the text that was prepared making use of these statistics there is an article by Wilson, Feldman and Kovar where approximately one and one-half pages are given to discussion of these data--very scanty treatment at best. Thus, we are left with the conclusion that existing social indicators dealing with mortality are not accorded much consideration, although it should be noted that other specialized volumes do provide considerably more information about trends in these dimensions.

Three examples provide additional insights into the use of mortality statistics as social indicators:

- (1) The rising level of infant mortality in the USSR in the 1970's provides an interesting case of an indicator moving in a



direction that is clearly not desired nor efficacious. The official reported Soviet figures have been recently included in an article by Davis and Feshbach (1980) for the years 1958 to 1973-74 with estimates to 1975-76 and these can be found in Exhibit 6. The reason for the estimates is simply that the Soviet Union ceased publication of these rates in 1974 after indications of an increase emerged. It may be noted that the infant mortality rates (the ratio of deaths under age one to live births) for the USSR do not include premature births that result in death in the first week of life, as is commonly practiced for most other countries. If we estimate this omission on the basis of U.S. figures, the results raise the rates by about 15 percent and produce a rate in 1976 of 35.6 per 1,000 live births. Incidentally, estimates for 1979 place the USSR rates at three times the U.S. level of 12.9. Determining the causes of this trend is not a simple matter in the absence of adequate information, but some investigation has been made both by foreign experts and by special committees in the USSR. (Unfortunately, the latter effort has been kept secret.)

Demographic analyses have shown that the increased levels cannot be accounted for by improved reporting, such as in rural areas. Other explanations such as the greater share of deaths in areas with high fertility, changes in birth order, and modifications in the pattern of age of childbearing also fail to explain the trend. On the other hand, changing patterns of diet (shortages of protein and milk products have been reported), smoking, and alcohol consumption have been noted frequently by those attempting to explain the increase. Indeed, the alcoholism argument seems to have some merit in explaining the rise in some areas but hardly applies in the case of Muslim areas in which drinking is tabooed and the rates have also risen. Somewhat more convincing are facts relating to family structure and female employment. More ample housing has enabled young married persons to split off from their families with the loss of a built-in mother or grandmother as a babysitter. The lowering desire for children has resulted in extremely high abortion rates (perhaps as many as four for every live birth) and it has often been noted that higher infant mortality rates occur for women with histories of multiple induced abortions. So too, the high divorce rate may play a role in this regard.

Although Soviet authorities, and many others as well, have long felt that the infant mortality rate is an indicator of the effectiveness of the health services, it is not easy to evaluate the factors which may be operating. One does not on the face of it expect health services to decline in quality (especially in a socialist state), but facility overload, poor access to clinics, infectious diseases, poor quality pre- and post-natal attention, and inadequate nutrition, diagnostic evaluation and therapies could exist. Explanations are clearly inadequate, but it does indicate how mortality statistics can alert us to significant societal changes. It also suggests the importance of utilizing ancillary data to examine shifts in major indicators. In this case, even infant death data by neonatal or post-neonatal period would be extremely valuable.

- (2) While mortality levels have declined substantially in the last century at least for most of the world's nations, especially those of western industrialized nations, these changes have not been evenly distributed among all societal groups. A review of existing national studies of socioeconomic differentials in mortality that I recently completed for the United Nations, (forthcoming in a volume on World Mortality Trends and Differentials) reveals a striking social inequality in every study that has been conducted. Classifying decedents by occupation, social class or education shows mortality differentials that favor nonmanual as opposed to manual workers, upper as distinct from lower classes, and those better educated. This is true for males and for females (whether the latter are classified by their own occupations or by those of their spouses). The differentials are true for infant, perinatal and mortality at all ages, although the differences do decline with age. What is particularly significant about these results is that the socioeconomic relationship holds true for virtually all of the major disease categories -- chronic diseases, such as cardiovascular and cancer, as well as infectious diseases where they might be considered to be more common.

The most extensive studies of the so-called classical type, in which occupation is determined from death certificates and related to census populations in these occupations, are found for England and Wales. Farr's efforts in this regard (started in 1851, as we noted earlier, and with later social class distinctions dating back to 1911) enable us to examine time-series data over a considerable length of time. The latest report on Occupational Mortality 1970-72 provides an in-depth examination of these differentials by social class. Exhibit 7 shows the distribution of various mortality measures by social class. Exhibit 8 shows the age-standardized male mortality levels for ages 15 to 64 for each decennial period. The inverse relationship by social class is clearly in evidence at each time point and, notably, the differences do not appear to have declined over time. What this says about the National Health Service and the presumed availability of health treatment in the United Kingdom, I will leave to you to speculate upon. The same trend is evident for infant mortality as shown in Exhibit 9. Sharp declines have occurred in the rates, but **persistent social class differentials remain.**

Several observations that are worth **noting** pertain to the fact that the proportions of population found in the different social classes have shifted in England and Wales, so that in 1971, Classes I and II increased by 4.8 percentage points from that in 1961, while Classes IV and V declined by 4.1 percentage points. Thus, compositional change reduced the net "excess mortality" due to social class even though the differentials did not diminish.

A second observation is that mortality in the prime working ages has declined markedly for most western countries such as the

United Kingdom. Thus, the effect of socioeconomic mortality differentials, which are greater in the early adult ages, are over time having less impact on overall mortality. The extent to which socioeconomic differentials operate in the ages over 65 years, in which two-thirds of the total deaths occur, remains a little-studied subject.

Nonetheless, the existence and apparent persistence of socioeconomic differentials suggest that this is a topic of considerable importance for which social indicators of a disaggregated nature are certainly worthy of development. Unfortunately, the data base for these studies has been extremely weak; but the promise of improved data from national health indexes, record linkage studies, longitudinal studies, and special surveys should alleviate these deficiencies in a number of countries.

- (3) The most publicized recent efforts at examining time trends in mortality levels and related societal factors is the work of Harvey Brenner. Brenner's research follows in the long tradition of studying both secular and cyclical trends in the economy and its impact upon such factors as mortality. Inasmuch as mortality levels are the dependent variables in these relations, one cannot view them strictly as social indicators. Nonetheless, the relationships are interesting from the standpoint of highly interactive societal systems in operation and warrant our attention. Moreover, Brenner expands on the notion of purely economic variables at work. From his U.S. studies for the period 1909-1976 he concludes that recession causes severe economic loss and downward social mobility which places many of those affected in a long-term state of vulnerability to subsequent recessions and periods of rapid economic growth, and that severe economic loss and downward mobility can initiate long-term processes of chronic illness which may endure for several years prior to mortality.

What is arresting about these efforts is the wide claim made for different disease states (suicide, homicide, infant mortality, cardiovascular disease mortality, mental illness, etc.) which purportedly stem from unemployment and accompanying stress--the different lags that seem to be operating, the long and short-term effects, differential impacts by age, and, more recently, his efforts to include rapid economic upturns in the theoretical model. The latter may be the result from attention to similar studies by Eyer which appear to show that prosperity, not recession, increases mortality.

A recent empirical test by Brenner (1979) utilized data for England and Wales over the period 1936 to 1976. The following multiple regression equation for total age-adjusted mortality rates was reported:

Total Mortality Rates	=	12.57*
	-	.10* (Economic growth trend)
	+	.02* (Annual change in growth rates)
	-	.33 (Welfare expenditures)
	+	20.68* (Unemployment over 0-10 year period)
	*	Significant at .001 level
		$R^2 = .97$

In terms of age, the economic growth trend, welfare expenditures and unemployment all are most influential for infant and childhood mortality, and, indeed, the overall pattern shows less effect with increasing age. A crucial factor in any studies of this type has to do with how time lags are introduced. For this study, several lags were introduced with the greatest impacts felt two to three years after unemployment rises and persisting for 10 to 15 years. Although Kasl has recently called into question such statistical manipulations, Brenner's findings for England and the U.S. appear to provide convincing evidence of the long-term positive influence of economic growth, the shorter-term negative effects of recessions and the more questionable positive short-term effects of rapid economic growth on mortality.

In this paper I have not only suggested an outline of different kinds of approaches in terms of monitoring and other efforts that mortality statistics can be used for, but I have also tried to provide a few examples of where important underlying factors may be operating as suggested by the mortality statistics. I am not trying to claim that mortality statistics per se are a social indicator, but they are indicating something and that is the critical dimension in all of these efforts.

MS. ANNA RAPPAPORT: I am going to try to relate this topic to what I think that actuaries are concerned about. When I heard about this subject of social indicators, I first thought that it might be something strange. However, I have concluded that it really is not something strange but rather something that I have been concerned about for a long time. In looking at the transactions I asked the question, "Have actuaries been concerned about external forces?" I could find, for example, in the 1973 Transactions a session on pollution, population, and the quality of life. I could also find in the 1973 Transactions a session on socioeconomic and political forces shaping pension plan design and a paper on the future of the actuarial profession. I have done some work on external forces, and the Society of Actuaries has a Committee on Futurism which has been very concerned about these external forces. Our difficulty as actuaries lies not in that we have not been concerned, but rather in how to translate that concern with external forces into the design and the management of the financial systems with which we work. A question facing us is: Can we do more? We should thank Doctors Ferriss and Meyers for some perspective on the data that is being developed and the research techniques that are being used today. These tools can help us do just that, that is, translate our concern into information that we can use better.

Social indicators research represents an attempt to go beyond economic issues for a broader measure of well-being and quality of life. It uses data and statistical analyses to measure these concepts. The data can take a wide variety of forms. From the actuary's perspective, I think we need to look at two questions. How does this relate to what actuaries do and does this tell us something about what actuaries ought to do?

Actuaries can be viewed in a couple of different ways. They can be viewed in terms of their scientific and mathematical discipline. In our mathematics we use contingent events which occur over long periods of time. We base that mathematics on three elements: amounts that are going to be paid or collected at some future time, measures of probabilities, and time values of money. Risk is also an element in our mathematics as is the variability of the result. Actuaries can be viewed alternatively in terms of the areas to which we apply these mathematics. Our application areas are concerned with the financing, design, and management of financial security systems. These are the traditional areas of practice and the areas of practice where most of us are working today. In doing this work, actuaries measure experience and they build experience tables. These tables and experience measures have various uses. They are tools for our calculations. They also tell stories about our society, and in telling stories about our society, they serve as social indicators, and that, of course, was the focus of Dr. Meyers' talk. Salary increases which we use for pension plan work are also tools that we use in our calculations, as are disability rates, and they also can be used to tell stories about our society and help us understand that society. From the actuaries' point of view, our primary goal is the economic soundness and the proper design of the systems, not the use of the experience to provide evidence of how well our society is doing.

Now, I would like to answer my first question. How does this relate to what actuaries do? I think there are three areas, but we should consider a dual viewpoint to enhance the work we do. First of all, we are looking both for a likely current level of experience and a likely future level of experience. We need to understand trends because the systems that we are working with are very long term. We need to be concerned about experience over the lifetimes of our plan participants. Social indicators can help us to understand trends and experience and to set assumptions with an understanding of what is likely to happen. They can also help us to understand the underlying social structure; such understanding is extremely important. These systems are built on certain assumptions about the underlying social structure. They are relevant only if they fit the social structure, and our social structure is changing. What social indicators can do is help us to understand that change and to gain some insight into what the social systems might be like. This is important if the system will have changed by the time the benefits are to be paid.

Before I finish I will touch on some issues where we should look for social indicators in order to understand the structures that are likely in the future. Our security systems themselves flow from the

social patterns, but they can also change the underlying social pattern.

I will give a couple of examples. Retirement is very common in the United States between ages 60 and 65. The Social Security System provides for payment of benefits starting at age 62. The Social Security retirement ages influence markedly the ages at which people actually retire and the retirement ages in our other retirement systems. We are responding to the need for retirement funds by building a financing system and at the same time, we are creating retirement experience. We will have a similar situation with respect to health care financing. The systems we have built can influence the patterns of health care. They can encourage people to use preventive care or they can discourage them from using preventive care by not paying for it. They can encourage or discourage people to have diagnostic work done in a hospital or in an out-of-hospital facility. The same is true for many forms of surgery. If there are alternate treatment methods possible and if the economic result to the individual is different, the system will encourage behavior. We need to develop greater awareness of how our systems influence behavior, and we need to monitor results to make sure that we are not doing things we do not want to do and that we are doing things we do want to do.

I would like to move on to the question: Does this tell us something about what actuaries ought to do? There are two areas here that I would like to cover. First, the current areas of social change affect what actuaries do now in that they affect the security systems and the needs which these security systems are designed to meet. I will touch on some areas of change that I think are important to us. Additionally, social change and social indicators might suggest some additional areas where application of our actuarial expertise and our actuarial mathematics might be relevant.

I see current issues which are likely to have an effect on our security systems. There is a growing focus on "quality of work-life." That focus is much more extensive in Europe today than in the United States. Perhaps, one of the "quality of work-life" issues that will be raised in the decade to come is whether it will enhance the "quality of work-life" if employees are given a choice about what benefits they have. We should be monitoring issues relative to health and what is health. We need to know how the financing system creates strategies that have a marked effect on health. How does it interrelate with the maintenance of health? Here, again, is an area where actuaries need to look at social data and try to understand them and use them to design better systems.

Our society has a diversity of family structures. The United States workforce is composed as follows: about 45 percent of the workers are either a husband or wife in a two-income family; about 20 percent are traditional family breadwinners; the remaining 35 percent are single with approximately 10 percent of the total being single with dependents. We need to determine how best to provide security for all groups of employees. We need to use the social

indicators to help us understand social patterns. How are these family structures changing? How are divorce rates changing? What are the implications for our benefit plans? If we do not think these are benefit plan issues, we need only look at the recommendations of the President's Commission on Pension Policy. This work includes information on how pension and security benefits work for people in different family situations. Retirement age is another area where there is a whole complex of social forces working together, and we need to look at these.

How should actuaries respond? They should become aware of the social forces that are operating in our society and the implications for our security systems. We should use social indicators, together with economic data and our traditional experience tables, to build systems that will serve people well in a changing world.

MR. WILFRED A. KRAEGEL: The concept of social indicators is becoming more clear to us through discussions such as the one this afternoon. I wonder, though, if enough work has been done to see the possibility of some sort of criteria for measuring these things. In the physical area, we have the Gross National Product which has some important uses and some important abuses. Do you think that a gross social indicator would be desirable, and, if so, would it be possible?

DR. FERRISS: I think what you refer to is an overall global index of the quality of life. This has been a desirable thing from the standpoint of the economists who look upon the Gross National Product as an overall index of the state of the economy. So the analogy would be to find a social indicator that would serve as an overall index of the quality of life.

Research efforts have been to disaggregate elements in the quality of life, rather than to try to aggregate them into a single index or measure. On the other hand, asking a person how things are or how satisfied he is or how happy he is does provide a kind of global quality of life index of that person at that particular time. Now the problem is the fact that social indicators must be time series, and if you develop an elaborate measure consisting of 64 items, it is not possible to get that data collected over a period of time and have it mean anything. One must look back in time and pick out items in previously conducted surveys which serve as surrogates for what one might mean by the quality of life, and some effort is being expended in this direction. At the same time, efforts are continuing to improve measurement, and the surveys that are conducted annually will have improved measures in them which would be interpretable in terms of the quality of life concept.

MS. RAPPAPORT: From an employee benefit actuary's point of view, the problem is not aggregation. A lot of what we do today is based on average solutions. The problems created by average solutions are that the social structure today includes so much diversity. We must find a way to do a better job of meeting the diverse needs and move away from average solutions to solutions that allow for more choice.

MR. EDWARD A. LEW: I have been engaged in a number of studies of mortality according to lifestyle, and one of the variables that we have been very much interested in is the strength of the social network. Dr. Ferriss, could you direct us to some "sources of strength" of the social network in different communities and perhaps at different times. By "sources of strength" I mean such things as church affiliation, membership in political and civic clubs, membership in social and recreational organizations, and so on, as an indication of the extent to which the individual fits the particular community he is living in. That seems to make a great deal of difference to mortality rates, but we do not understand how or why.

DR. FERRISS: Yes, there are some very interesting studies of this kind. One is the study of the Russian people to the east of the Caspian Sea. These people are more than centenarians, and there have been investigations of their physical condition and verification of their age which goes up to 120 - 130. The oldest one was 167 when he died. In investigations of the relationships, researchers asked these people why they live so long. They say that they have good, simple food and the same stable kind of food over a long period of time and that they are active. One researcher decided that indeed they do have a simple diet and are active and physically fit. She felt, however, it was a social network that supported them. They are useful in the community. They are given tasks. Their decisions are depended upon, and they function effectively in the family and in the local community.

MR. KRAEGEL: I think it is very important to talk about social indicators and to measure the things that are going on. When we get into the social area conceptually, then I think there is something additional that is very important, and that is some idea of goals and criteria. It is good to have indicators but we should have something to measure them against to see if we are going in the right direction. The idea of goals is being pursued in a number of cities and states in the United States, and I presume also in Canada. Would the panelists comment on progress concerning the things against which the social indicators would be compared and how we can do more to foster meaningful goals for society.

DR. FERRISS: I know goals have been very prominent even down at the local level. People are setting goals, but I do not think they pay quite enough attention to the problem of measuring whether or not we are moving toward those goals. There have been some national studies, for example, in the field of education. In an article written by Gardner around 1960, he set down goals. A great deal was said about the importance of attaining them, but if you looked for data to determine whether or not we moved toward those goals, it was very difficult to find. Goals have to be specifically defined in order for the statistician to be able to figure out a measure which would reflect it. In the field of education, the testing program is very important now. They test the ninth grade and the eleventh grade and several other grades, and they do this on a sample of areas every year. They have now had only two or three observations, so we will not be able to tell at this time whether the children are learning more mathematics or learning better reading habits.



Setting goals and simultaneously figuring out ways of measuring them is very important, but unless those measures are instituted, we really do not know whether we are moving toward those goals or not.

Research and consideration of goals has also been done by the futurists. Sometimes they get a little esoteric in the goals that they identify and a little too long range in the outlook. These things really have to be done over a relatively short period, like 5 to 10 years, to be meaningful.

MR. C. L. TROWBRIDGE: I have long been interested in whether mortality rates are basically genetic or basically environmental, and I have never had a satisfactory resolution to that problem. We know that mortality varies by age and sex and I have wondered about the variation by social class. This is the first time I have ever really been exposed to good data. You cannot help but wonder whether variation by social class is environmental or genetic. You can also raise the same question about variation by sex. We heard for many years that the lower mortality for women might be attributed to less strain in the workforce. That sort of environmental factor has been pretty well disproven, because, as the lifestyle of women has become more and more like that of men, the disparity between men and women has increased rather than decreased. I believe most of us now feel that at least most of the differences between male and female mortality is likely to be genetic. It is easy to assume that this is because of the genetic characteristic of sex anyway or the different chromosome.

When we come to socioeconomic class, it is easy to assume that this is environmental. One can say that our lower economic classes have poorer nutrition, or poorer public health or poorer education and, therefore, conclude that the mortality variance is environmental. I am not so sure. People have looked at white versus non-white mortality and assumed that the mortality variance was a racial difference, which assumes that it is kind of a genetic difference. Many of us have felt that it is a socioeconomic difference, and that if you studied blacks and whites by socioeconomic class, you might not find so much difference. If you find higher mortality among the members of lower socioeconomic classes, is that because they are in a lower class, or is it possibly true that they are in a lower class because of weaker genetics, and that the genetic difference is affecting the mortality? Does anybody have any supposition as to how to interpret differences in mortality by socioeconomic class?

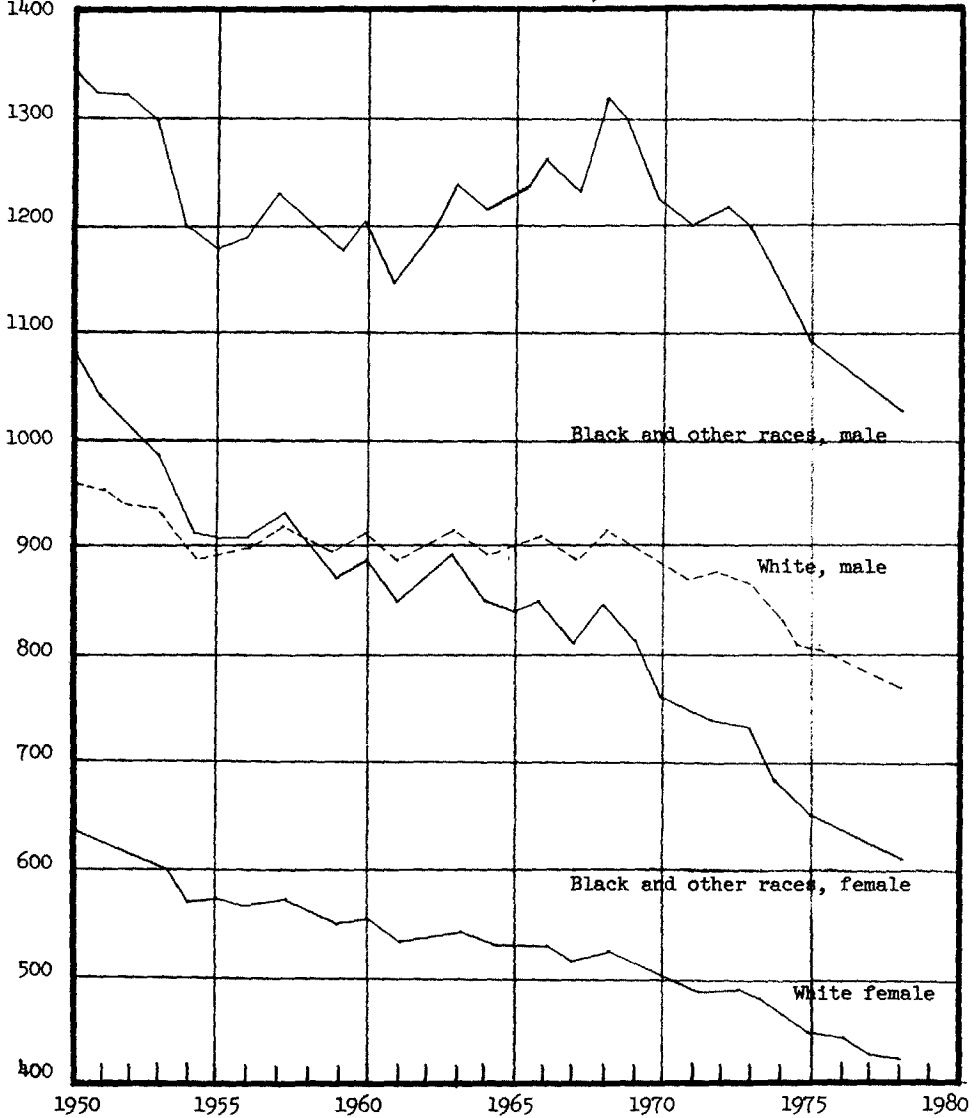
DR. MEYERS: In some of the more current studies researchers are looking at not only class placement but also social mobility--that is, movement between classes. In a study that was done in Norway, for example, they were able to go back to three censuses and identify the occupation of people at those times. These are for known decedents during a specified period of time. It was then possible to work out rate levels by movement between classes as well, which I think gets to some of the issues that you may be raising here. Of course, it can be said that these are proximate kinds of indicators of social class, and there are many other kinds of dimensions you would want to look at in this regard.

One of the impressive pieces of evidence in the study that I noted in this presentation is the fact that these differentials seem to hold for almost all the major causes of death, and that would suggest that there is something operating which is more than environmental. When you look at occupational accidents as a cause of death, you can reasonably expect higher rates for lower class people, i.e. manual workers, and the difference can be considered environmental. However, when you look at some of the other causes of death, it would be very hard to identify environmental agents per se as operating in there.

EXHIBIT 1

AGE-ADJUSTED DEATH RATES, BY RACE AND SEX: 1950-1978

Deaths per 100,000 population



## EXHIBIT 2

Relationships Between Natural Economic Indicators and Total Mortality Rates  
U.S., 1940-74 for Sex-Color Groups

Lag = 0-5 Polynomial Distributed Lag, Second Degree#

Dependent Variable	Intercept	Per Capita Income	Unemployment Rate	Inflation Rate	R <sup>2</sup>	F-Value	D.W.+
white male	116.7	-.77E-2* (2.11)	.23 (n.s.)	.88 (2.14)	.84	14.7	2.21
white female	75.6	-.18E-2 (n.s.)	.97 (8.34)	.90 (3.37)	.90	25.0	2.11
non-white male	136.4	-.32E-1** (6.55)	1.67 (6.95)	2.83 (5.16)	.96	74.1	1.67
non-white female	143.5	-30.0E-1** (5.15)	1.83 (6.38)	3.26 (4.98)	.94	43.6	1.72

\* Polynomial Distributed Lag of 2 years, second degree polynomial

\*\* Polynomial Distributed Lag of 1 year, second degree polynomial

# "t" values in parenthesis. At .95 confidence level, t=1.71, F=2.28. At .99 level, t=2.49, F=3.31.

+ The Durbin-Watson (D-W) statistic reflects autocorrelation of residuals. Support of the hypothesis of zero autocorrelation is indicated by the values in this column.

Source: Estimating the Social Costs of National Economic Policy: Implications for Mental and Physical Health and Criminal Aggression, by Harvey Brenner, Paper No.5, Vol. 1- Employment, of the series, Achieving the Goals of the Employment Act of 1946--Thirtieth Anniversary Review, a Study of the Joint Economic Committee, Washington: Government Printing Office, 1976, pp. 136-140.

## EXHIBIT 3

THE ALLOCATION OF TIME AND THE GOODS INTENSITY OF ACTIVITIES:  
A CROSS-TIME COMPARISON, 1965-1975

Activity	% of Total Time		Dollars per Hour		Percentage Change in \$/Hour 1965-1975
	1965	1975	1965	1975	
<b>INVESTMENT</b>					
Education	0.74	1.42	7.95	6.17	-22.4
Child Care	2.02	1.74	1.44	2.37	64.6
Medical Care	0.76	1.33	4.33	3.94	- 9.0
Home Improvement	0.50	0.73	1.00	0.83	-17.0
Social	4.51	4.31	0.29	0.38	31.0
Organizations	1.94	1.68	0.75	0.84	12.0
Interpersonal	1.66	1.27	0.47	0.82	72.3
SUBTOTALS	12.13	12.48	1.33	1.83	37.6
<b>INTERMEDIATE</b>					
Home Maintenance	5.62	4.36	0.62	0.85	37.1
Personal Care	3.55	2.85	0.54	0.69	27.8
Shopping/Admin.	3.85	2.60	1.73	2.79	61.3
Cooking	4.73	3.70	2.25	2.77	23.1
Market Work	15.50	14.62	0.18	0.22	22.2
SUBTOTALS	33.25	28.13	0.77	0.94	22.1
<b>CONSUMPTION</b>					
Sports	0.57	1.05	0.68	0.77	13.2
Spectator Events	0.61	0.41	0.68	1.09	60.3
Active Leisure	1.67	1.85	0.57	0.86	50.9
Passive Leisure	7.29	10.80	0.29	0.38	31.0
Reading	2.61	2.30	0.43	0.58	34.9
SUBTOTALS	12.75	16.41	0.39	0.52	33.3
<b>OTHER</b>					
Eating	6.41	6.43	0.69	0.92	33.3
Sleeping	34.07	35.34	0.15	0.20	33.3
Unallocated	1.34	1.21	0.14	0.21	50.0
SUBTOTALS	41.82	42.98	0.23	0.31	34.8
TOTALS	99.95	100.00	0.57	0.72	26.3

Source: "The Theory and Measurement of Well-Being: A Suggested Framework for Accounting and Analysis," by F. Thomas Juster, Paul N. Courant, and Greg K. Dow, Ann Arbor, Michigan: Institute for Social Research, University of Michigan, April 1980 (Working Paper Series), p.58.

## EXHIBIT 4

Estimated Outputs and Costs of Changes in Health-Related  
Habits and Patterns

Activity and Maximum Percent of Relevant Population Affected	Average Life Expectancy (years)	Percent of Population Disabled	Total 10-Year Cost (billions of 1973 dollars)
Reduction of smoking (90%)	+1.8	-0.4%	\$ 5
Improvement of nutrition and fitness (70%)	+3.8	-1.6	35
Prevention of accidents (50%)	+0.6	-0.2	1
Reduction of alcoholism and alcohol abuse (33%)	+0.3	-1.3	17
Reduction of drug abuse (90%)	+0.1	-0.5	6
Total output (adjusted for overlap)	+5.3	-3.3%	\$64

Source: Improvements in the Quality of Life: Estimates of Possibilities in the United States, 1974-1983, by Nestor E. Terleckyj, Washington, D.C.: National Planning Association, 1975, p. 77.

## EXHIBIT 5

DIMENSIONS OF MORTALITY STATISTICS  
FOR MONITORING

- I. Nature of Metric
  - A. Numbers of events
  - B. Rate level
  - C. Rates of change
- II. Temporal Focus
  - A. Cross-sectional
  - B. Cyclical
  - C. Secular
- III. Direction of Change
  - A. Upwards
  - B. Stable
  - C. Downwards
- IV. Level of Disaggregation
  - A. Causes of death
  - B. Sociodemographic - Age, sex, race, marital status, education
  - C. Socioeconomic - Occupation, income, class
  - D. Geographic
- V. Model
  - A. Life table
  - B. Population growth and structure
  - C. Age patterns
  - D. Competing risks of death - cause and pattern elimination

## EXHIBIT 6

REPORTED AND ESTIMATED INFANT AND CHILD  
MORTALITY RATE IN THE USSR: 1958 to 1976<sup>a</sup>

Year	Age at death	
	under 1 yr.	0-4 yrs.
1958-59	40.6	11.9
1959-60	35.3	NA
1960-61	32.3	9.9
1962-63	30.9	8.7
1963-64	28.8	7.8
1964-65	27.2	7.2
1965-66	26.1	6.9
1966-67	26.0	6.9
1967-68	26.4	7.0
1968-69	25.8	7.0
1969-70	24.7	6.9
1970-71	22.9	6.7
1971-72	24.7	6.8
1972-73	26.4	7.2
1973-74	27.9	7.7
1974-75	29.4 <sup>b</sup>	8.2
1975-76	31.1 <sup>b</sup>	8.7

<sup>a</sup> The infant mortality rate (age under 1) is a yearly one, starting in 1959, while the 0-4 death rate is a two-year moving average.

<sup>b</sup> Estimated (see text).

Source: "Rising Soviet Infant Mortality", by Christopher Davis and Murray Peshbach, Intercom, July 1980.



## EXHIBIT 7

MORTALITY OF MEN BY SOCIAL CLASS  
 ENGLAND AND WALES  
 1911-1971<sup>1</sup>

Period	Social Class				
	I	II	III	IV	V
1910-12 <sup>2</sup>	88	94	96	93	142
1921-23 <sup>2</sup>	82	94	95	101	125
1930-32 <sup>3</sup>	90	94	97	102	111
1949-53 <sup>3</sup>	98	86	101	94	118
1959-63 <sup>3</sup>	76	81	100	103	143
1970-72 <sup>3</sup>	77	81	104	114	137

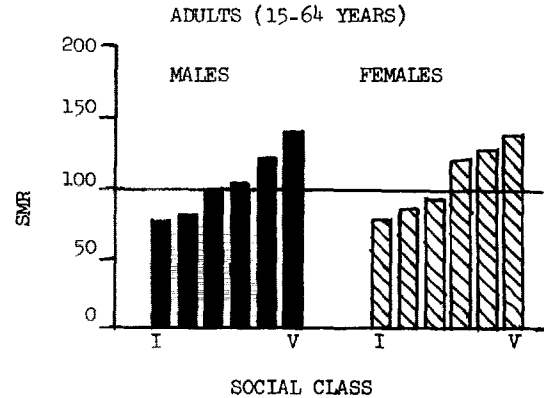
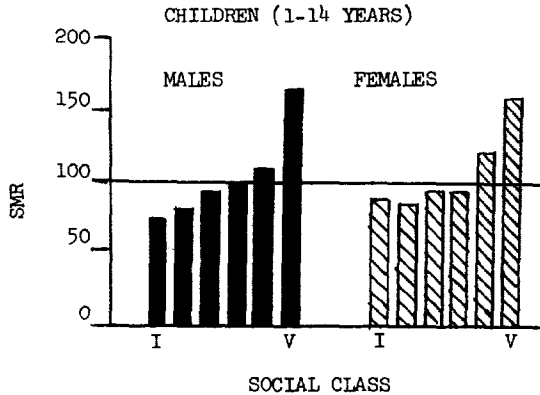
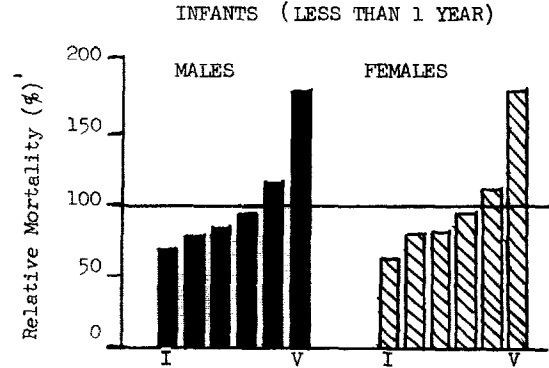
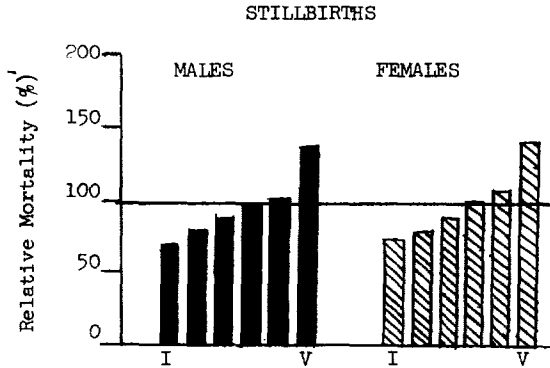
<sup>1</sup>Data usually cover men aged 15 or 20 to 64 or 65, and are as published, taking no account of classificatory and other changes.

<sup>2</sup>CMFs

<sup>3</sup>SMRs

Source: Office of Population Censuses and Surveys, Occupational Mortality, 1970-72

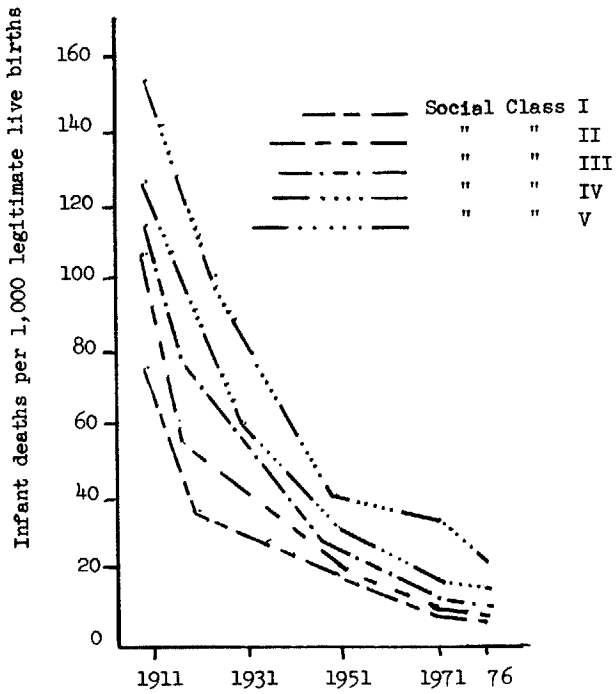
MORTALITY BY SOCIAL CLASS AND AGE



<sup>1</sup> Ratios of rates for the social class to the rates for all males (females).

EXHIBIT 9

SOCIAL CLASS TRENDS  
IN INFANT MORTALITY<sup>1</sup>  
1911-76



<sup>1</sup>Deaths per 1,000 live births

