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Behavior as the Central Outcome in Health Care

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ABSTRACT: A predominant justification for health psychology and behavioral medicine is that behavior or environmental conditions affect a biological process. Thus, many investigators focus attention on the effects of behavior on cell pathology and blood chemistry. This article argues that behavioral outcomes are the most important consequences in studies of health care and medicine. These outcomes include longevity, health-related quality of life, and symptomatic complaints. Traditional measures in biomedical science often have limited reliability and validity. Their validity is demonstrated only through relationships with longevity, role performance, behavioral functioning, and symptomatic experience, and these correlations are often modest. A model is proposed to guide future investigations. Biological, environmental, and psychological variables are included in the model as predictors or mediators of behavioral health outcomes. Recognizing that health outcomes are behavioral directs intervention toward whatever method produces the most health benefit at the lowest cost.

Health psychology and behavioral medicine are among the most rapidly developing areas of psychological research and practice. Although no one model has dominated the field, the biomedical disease model has guided most thinking. According to this model, syndromes expressed as signs and symptoms are associated with lesions or some underlying pathology. This pathology is the focus of research and the target of treatment. Interventions are made to eradicate the lesion or prevent its pathogenesis. The lesion, however, is the central focus of examination.

Reviews of the emerging field of behavioral medicine and health psychology often emphasize the role of behavior in the onset, maintenance, and treatment of disease (Miller, 1983). Many of these reviews characterize the role of stress on bodily processes. Krantz, Grunberg, and Baum (1985) emphasized the links between behavior and health through basic physiological mechanisms. Their review concluded with an emphasis on new technologies for assessing physiologic, rather than behavioral, health outcomes. For example, they pointed to the availability of portable blood-withdrawal pumps, blood pressure monitors, and biochemical assessment tools. Rodin and Salovey (1989) underscored the importance of disease end points. They encouraged health psychologists to focus on placement in specific disease categories such as cancer or coronary heart disease. These reviews characterize the field as emphasizing the impact of behavior on identified lesions or specific disease states.

Progressive versions of the medical model acknowledge that the cause of illness might be environmental or the lesion psychosocial. Even the biopsychosocial model (Engle, 1976), however, concentrates on sickness and its causes. Attention is directed toward the psychological or environmental etiology and the physiological lesion (White, 1988). These models have directed measurement toward assessment of disease categories, characteristics of lesions, and disease risk factors.

In their efforts to be in the mainstream, many behavioral research investigators also focus their studies on the health outcomes measured by physicians and other health care providers. Typically, these are measures of blood chemistry, physical characteristics, and blood or tissue sensitivity to medication. In this article I argue that the only important indicators of health and wellness are behavioral. Thus, outcome measures in health and medicine should be anchored in their relations with behavior. In this context the definition of behavior is general, as offered by Atkinson, Atkinson, Smith, and Hilgard (1987) in their widely used introductory psychology textbook. They define behavior as "those activities of an organism that can be observed by another organism or by an experimenter's instruments" (p. 657). Included in behavior are verbal reports about subjective conscious experiences. In this article, I refer to biological measures as measures of physiological state. Biological measures and disease classifications are important precisely because they are predictors or mediators of behavioral outcomes.

In the following sections, I argue that there has been too much concentration on purely biological measures and that the importance of behavioral health outcomes has been undervalued.

Behavioral Health Outcomes

The conceptualization and measurement of health status has interested scholars for many decades. After the Eisenhower administration, a report of the President's Commission on National Goals, (1960) identified health status measurement as an important objective. In his influential book, *The Affluent Society,* John Kenneth Galbraith (1958) described the need to measure the effect of the health care system on quality of life. In recent years there have been many attempts to define and measure health status.

The movement toward behavioral measures is an old one. When Sullivan (1966) reviewed the literature on health measurement nearly a quarter of a century ago, he emphasized the importance of behavioral outcomes. Bolstered by the accomplishments of behavioral scientists,

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Sullivan developed a convincing argument that behavioral indicators such as absenteeism, bed-disability days, and institutional confinement were the most important consequences of disease and disability. Ability to perform activities at different ages could be compared with societal standards for these behaviors. Restrictions in usual activity were seen as prima facie evidence of deviation from well-being. Health conditions affect behavior, and in this article behavioral health outcomes are conceptualized as observable behavioral consequences of a health state. Arthritis, for example, may be associated with difficulty in walking, observable limping, or problems in using the hands. Even a minor illness, such as the common cold, might result in disruptions in daily activities, alterations in activity patterns, and decreased work capacity.

Diseases and disabilities are important for two reasons. First, illness may cause a truncation of the life expectancy. In other words, those in specific disease categories may die prematurely. Death is a behavioral outcome. It can be defined as the point at which there is no observable behavior. Second, diseases and disabilities may cause behavioral dysfunctions as well as other symptoms. Biomedical studies typically refer to health outcomes in terms of mortality (death) and morbidity (dysfunction) and sometimes to symptoms.

Mortality remains the major outcome measure in most epidemiologic studies and clinical trials. In order to make informed decisions about the nation's health, Congress receives various reports of statistical indicators from the National Center for Health Statistics. These include the crude mortality rate, the infant mortality rate, and years of potential life lost. Although important, each of these measures ignores dysfunction while people are alive. The National Center for Health Statistics provides information on a variety of states of morbidity. For example, it considers disability, defined as a temporary or long-term reduction in a person's activity. Over the last 15 years, medical and health services researchers have developed new ways to assess health status quantitatively. These measures are often called *quality of life* measures. Because they are used exclusively to evaluate health status, the more descriptive *health-related quality of life* is preferred (Kaplan & Bush, 1982). Some approaches to the measurement of health-related quality of life combine measures of morbidity and mortality to express health outcomes in units analogous to years of life. The years-of-life figure, however, is adjusted for diminished quality of life associated with diseases or disabilities (Kaplan & Anderson, 1988).

Modern measures of health outcome consider future as well as current health status. Cancer, for example, may have very little impact on current functioning but may have a substantial impact on behavioral outcomes in the future. Today, a person with a malignant tumor in a leg may be functioning very much like a person with a leg muscle injury. However, the cancer patient is more likely to remain dysfunctional in the future. Comprehensive expressions of health status need to incorporate estimates of future behavioral dysfunction as well as to measure current status (Kaplan & Anderson, 1988).

The spectrum of medical care ranges from public health, preventive medicine, and environmental control through diagnosis to therapeutic intervention, convalescence, and rehabilitation. Many programs affect the probability of occurrence of future dysfunction rather than alter present functional status. In many aspects of preventive care, for example, the benefit of the treatment cannot be seen until many years after the intervention. A supportive family that instills proper health habits in its children, for example, may also promote better health in the future, even though the benefit may not be realized for years. The concept of health must consider not only the ability to function now but also the probability of future changes in function or probabilities of death. A person who is functional and asymptomatic today may harbor a disease with a poor prognosis. Thus, many individuals are at high risk of dying from heart disease even though they are perfectly functional today. Should we call them healthy? The term *severity of illness* should take into consideration both dysfunction and prognosis. Comprehensive models that combine morbidity, mortality, and prognosis have been described in the literature (Kaplan & Anderson, 1988). A behavioral conceptualization of health status can represent this prognosis by modeling disruptions in behavior that might occur in the future.

Many medical treatments may cause near-term dysfunction to prevent future dysfunction. For example, coronary artery bypass surgery causes severe dysfunction for a short period of time, yet the surgery is presumed to enhance function or decrease mortality at a later time. Patients may be incapacitated following myocardial infarction and restricted to coronary care units. Yet the treatment is designed to help them achieve better future outcomes. Pap smears and hysterectomies are performed in order to decrease the probability of future deaths due to cancer. Much of health care involves looking into the future to enhance behavioral outcomes over the life span. Therefore, it is essential to divide health into current and future components.

In appraising the importance of behavioral outcomes, we must ask why there is concern about diseases, injuries, and disabilities. The behavioral perspective suggests that the only reasons are the following: (a) Life expectancy may be shortened, (b) quality of life may be compromised either now or at some time prior to death, or (c) some combination of a and b. A disease that has no impact on either life expectancy or life quality would be unimportant. In fact, disease states gain their impor-

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tance precisely to the degree to which they correlate with decreased longevity or impaired health-related quality of life.

The importance of behavioral outcomes has not been disregarded by the traditional medical community. In fact, recognition of the centrality of behavioral outcomes has been emphasized in several articles and editorials recently featured in *The New England Journal of Medicine* (Ellwood, 1988; Greenfield, 1989; Shortell & McNerney, 1990). Despite the growing recognition of the importance of behavioral outcomes by the medical community (Advances in Health Status Assessment, 1987; Bergner, 1989; Institutes of Medicine, 1989; Quality of Life Assessment, 1988a, 1988b; Shumaker, Furberg, Czajkowski, & Schron, in press; Walker & Rosser, 1988), behavioral scientists manifest a paradoxical reluctance to follow this trend. Instead, the trend has been to focus on measures of biological process.

Trend Toward Biological Variables as Opposed to Behavioral Indexes

We are witnessing a trend toward the biologicalization of both behavioral and biomedical sciences. Reviews of the health psychology literature criticize studies that do not focus on some aspect of blood chemistry or those that do not use disease categories (Baum, Grunberg, & Singer, 1982). Measures of biological process are seen to be more pure, more reliable, and more valid than are behavioral indicators. Thus, an increasing number of studies assess health status through measures of blood cholesterol, blood pressure, or characteristics of the immune response, including natural killer-cell and *t*-cell activity. W. T. Kelvin created the doctrine that measurement is the prerequisite to science. For most of this century, scientists and clinicians followed the doctrine and attempted to use measures, even when the validity of the measures was unknown. Feinstein (1967) suggested that modern trends represent the "curse of Kelvin." The fact that there is a measure for some variable does not always mean that the measure is useful. Clinicians have been more attracted to blood pressure and cardiac output than to headache and anxiety. Clearly, the former are easier to quantify, but are they more meaningful?

It is important to emphasize that not all biological variables are measures of health status or health outcome. They are, however, predictive of some health outcomes. Elevated blood pressure, for example, is important because it predicts premature mortality or behavioral dysfunction resulting from coronary heart disease and from stroke. If blood pressure were unrelated to these behavioral outcomes, it would be a matter of little concern. There are many aspects of blood chemistry that bear no relation to clinical outcomes. Even common clinical tests, such as urine analysis, serum phosphorus, and alkaline phosphatase, have only weak and inconsistent relations to outcomes in all but the most extreme cases. Amberg, Schneiderman, Berry, and Zettner (1982), for example, demonstrated empirically that the alkaline phosphatase screening test provides essentially no information relevant to health outcome. Elevated blood cholesterol may be predictive of future bad outcomes, including early mortality from heart disease. However, other lipids in blood such as very low-density lipoproteins or chylomicrons may bear little relation to health outcomes in all but the most extreme cases. Modest elevation in these fractions of blood lipids may be of little concern.

Recently there has been a significant growth of interest in the relation between stress and measurable aspects of immune function. Temoshok, Soloman, and Jenkins (1989) cautioned scientists against overinterpreting these immunologic measures. Normal oscillations in most immune parameters are still poorly understood. Immunologists are uncertain about whether absolute numbers or percentages of cell subtypes are most meaningful. Most important, the immune system is a genuine system in which various components adjust to changes in one another, and some important aspects of the system may remain to be identified. Our understanding of the relation between immune parameters and health is still very sketchy.

Biological measures are also assumed to be more reliable than behavioral tests. Often however, the reliability of these measures is not assessed. When data are available, the results can be discouraging. Many investigators, fascinated by blood pressure as an outcome measure, have criticized behavioral measures for being nonphysiologic and unreliable. Yet the reliability of blood pressure is equally open to question because conventional sphygmomanometric measurements have poor test–retest coefficients. This leads to misclassification, incorrect diagnosis, and potentially damaging labeling (Hla, Vokaty, & Fuessner, 1986; Patterson, 1984). There are many sources of error in blood pressure measurement. These include misreading biases, time sampling problems (blood pressure changes minute to minute), and situational factors. For example, it has been demonstrated that some patients have specific arousal of blood pressure in the presence of physicians. The condition has now been given the diagnostic label *white coat hypertension* (Pickering et al., 1988). Low reliability is not limited to blood pressure. It also characterizes measures of blood cholesterol, glucose, and a large number of other biochemical assays.

One of the important appeals of biological measures is that they focus on objectively defined events. Behavioral outcomes are often not measured objectively. Observer bias common to behavioral measures may be less common with biological measures. However, at a conceptual level, behavioral outcomes can represent defined events such as exercise or role performance. Subjective events, such as pain or discomfort, are characterized in pain behaviors and through verbal behaviors. It is tempting to assume that biological measures are more valid and reliable because they have less observer bias. However, they may include several other sources of measurement error and they do not necessarily have evidence for validity.

To summarize, in order to avoid known problems with behavioral measures, researchers and clinicians have

been attracted to outcomes that can be measured with biochemical assays, mechanical devices, or auto-analyzer machines. Although these measures are not subject to the same errors as behavioral tests, they have their own sources of error and often have low reliability and questionable validity. Establishing the validity of biological measures requires a model that relates them to health status.

Are Medical Measures More Valid or Meaningful?

It is often assumed that the relation between the biologic variables and health outcomes is nearly perfect. However, there is a remarkable variability in behavioral health outcomes within fixed levels of many biological variables. There are numerous examples, of which only three will be considered: biologic measures of arthritis, blood pressure, and blood cholesterol. The arthritis example emphasizes current behavioral health outcomes, whereas the latter two focus on future behavioral outcomes and mortality.

Arthritis

Clinical outcomes in studies of rheumatology have been difficult to evaluate (Deyo, 1988). Clinical measures often include joint tenderness, grip strength, and joint circumference. Some studies have shown that the reliability of these measures is often poor (Buchanan, 1982). Fries (1983) questioned the validity and reliability of a variety of traditional outcome measures, ranging from laboratory measures of erythrocyte sedimentation rate (ESR), latex fixation titer, and hemoglobin. It has been shown that rheumatoid arthritis patients may develop serological abnormalities that are poorly correlated with joint inflammation (McCarty, 1986). In addition, Fries suggested that traditional clinical measures such as grip strength, walking time, and patient global assessment are merely surrogates for the true outcomes in arthritis, which he argued are disability, physical discomfort, and financial loss. An elevated ESR means little to a patient who feels fine and can conduct his or her life without pain. The ESR characterizes current inflammation but does not give information about future dysfunction. Conversely, a patient with disabling arthritis pain is not well when the ESR is normal. Clinical tests are useful only when they identify treatment to remedy current dysfunction or predict future problems. Fries asserted that pain and functional outcomes are meaningful to the patients and that clinical measures are of less importance. As a result, a growing number of rheumatologists are focusing attention on behavioral or functional health outcomes (Anderson, Firschein, & Meenan, 1989).

Blood Pressure

Elevated blood pressure is a serious problem in the United States and in most other developed countries. Following the Hypertension Detection and Follow-up Program (HDFP), elevated blood pressure came to be defined as systolic pressure exceeding 140 mmHg or diastolic pressure (DBP) exceeding 90 mmHg. Using these guidelines, it has been estimated that as many 58 million adults (about 30% of the adult population) have hypertension (Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, 1985). Investigators are concerned about elevated blood pressure because of its relation to future behavioral health outcomes. Several major epidemiologic studies have documented the relation between elevated blood pressure and both morbidity and mortality (National Heart, Lung and Blood Institute, 1984). In addition, evidence from the HDFP (1979) has demonstrated that reductions in blood pressure result in reductions in deaths due to heart disease. People are often not concerned about high blood pressure because it may produce no symptoms or current behavioral dysfunction. High blood pressure does have a bad prognosis, with affected individuals being at risk for behavioral dysfunction or death later in life. However, the relation between blood pressure and both mortality and morbidity are far from uniform. Severe elevated blood pressure is a severe risk for mortality, whereas blood pressure in the mild hypertension range (DBP = 90–104 mmHg) is a less significant risk (Rocella, Bowler, & Horan, 1987). Indeed, most of those with mild hypertension, even those untreated, have normal life expectancies with no complications.

Although high blood pressure is associated with risks, the treatment of high blood pressure may cause some problems. Significant numbers of patients experience dizziness, tiredness, and impotence when treated with medications (Breckenridge, 1988). Thus, the treatment of high blood pressure can cause undesirable health outcomes. Treatment, like hypertension, is a factor that may influence behavioral health outcomes, sometimes in the negative direction. Studies that measure only blood pressure and neglect these behavioral side effects will overestimate the net benefit. Conversely, too much focus on side effects might lead to an incorrect judgment that the treatment should be avoided. There may be considerable advantage in translating the side effects and benefits into common behavioral units and weighing them against one another in the treatment decision process (Kaplan & Atkins, 1989). The role of the clinician is to balance carefully the benefits and consequences of treatment (Aderman & Madhavan, 1981).

In summary, blood pressure is an important risk factor for heart disease and stroke. Systematic efforts to reduce blood pressure are advisable and effective. Yet, blood pressure is not a health outcome. It gains its importance through validity studies that demonstrate the association between blood pressure and behavioral outcomes including mortality, dysfunction, and symptomatic disturbances. Blood pressure is important because it provides probabilistic information about behavioral outcomes.

Cholesterol

The United States is currently experiencing a massive societal response to the presence of cholesterol in the diet. Numerous commercial products are promoted because

they have no cholesterol. The term *hypercholesterolemia* suggests an increased concentration of cholesterol in blood. Total cholesterol values above 200 mg/dl are now considered to be diagnostic (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 1988). Several epidemiologic studies have identified elevated blood cholesterol as a risk factor for cardiovascular disease mortality (Kannel, Castelli, Gordon, & McNamara, 1971). Yet the connection between dietary cholesterol and serum cholesterol has been less clearly established. Studies in metabolic wards and selected experimental studies do demonstrate that dietary manipulation can reduce serum cholesterol in the short run, although longer term changes have not been clearly documented. Furthermore, although there have been ecological correlations between estimated total fat consumption and total heart disease mortality across cultures, correlations within countries have not been systematically observed (Kaplan, 1985). A variety of explanations can be suggested for these "nonfindings." For example, measurement error in both dietary cholesterol and serum cholesterol may account for the null results (Jacobs, Anderson, & Blackburn, 1979). But the availability of an explanation for a nonfinding is not a demonstration that a significant association exists (Kaplan, 1988). Thus, the relation between dietary cholesterol and serum cholesterol is somewhat ambiguous.

Stallones (1983) criticized the diet–heart-disease connection, suggesting that there is no zero-order relation between diet and mortality. The problems with the cholesterol interventions have been reviewed in several earlier articles (Fries, Green, & Levine, 1989; Kaplan, 1984, 1985). These positions are regarded as controversial, but they are related to the current issue.

The reason that cholesterol is important is that elevated cholesterol is a risk factor for behavioral health outcomes. If it were not, why would one care? The important point is that the outcome itself must be considered. The role of the investigator is to determine the relation between modifiable habits (dietary patterns) and outcomes as mediated through the channel of serum cholesterol. Serum cholesterol can serve as a target for modification, but one must be assured that modifying serum cholesterol improves outcome and does not adversely affect health status.

Deaths in General Versus Deaths From Specific Causes

Some investigators, recognizing the problems with measures of disease process, turn their attention toward the ultimate medical outcome—death. As noted earlier in this review, vital status is considered to be a behavioral outcome. However, the behavioral approach differs from the traditional medical model in its emphasis on life–death status without reference to medical cause of death. The emphasis is on observable outcome rather than on disease category.

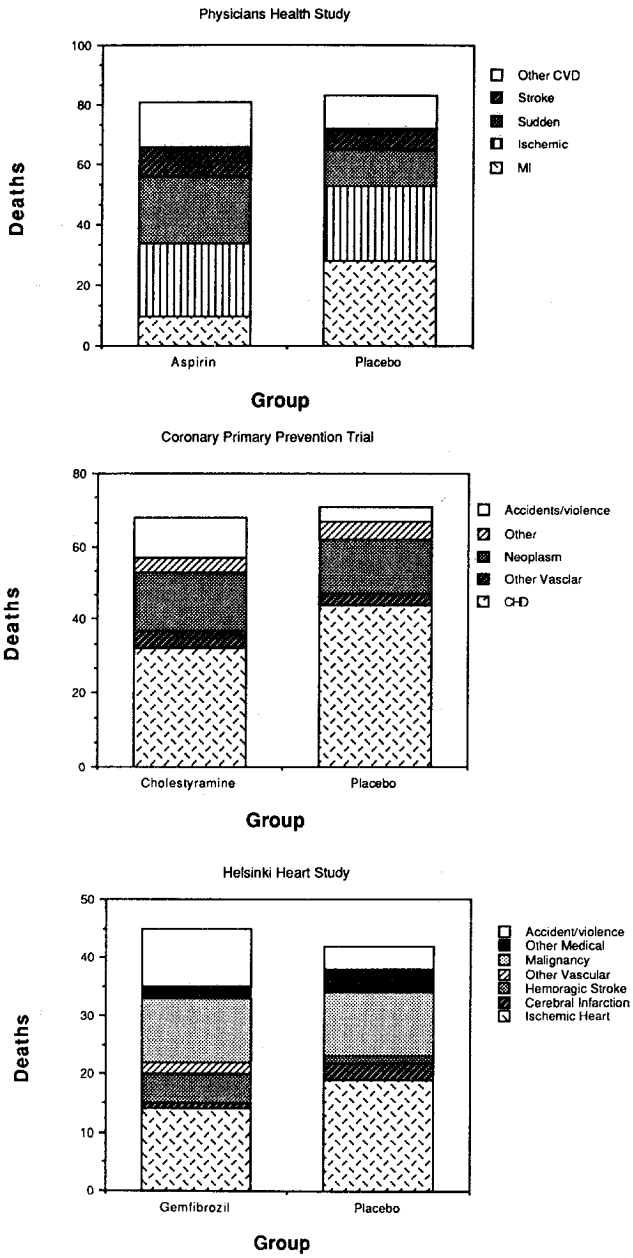
Many medical studies confuse outcome with placement in disease categories. Results from several recent clinical trials illustrate this point. In one widely cited study (Steering Committee of the Physicians' Health Study Research Group (1988, 1989)), physician subjects were assigned to take aspirin (325 mg/day) or placebo in order to prevent myocardial infarctions. The ultimate aim, of course, was to reduce the number of deaths associated with heart disease. Indeed, there was a significant reduction in deaths from myocardial infarctions over an eight-year follow-up period. This result was highly publicized and even earned aspirin the description of a "miracle drug" on the cover of *Newsweek* magazine (Clark, Gosnell, Hager, Carroll, & Gordon, 1988). Yet closer inspection of the data reveals that there was no advantage of aspirin for the crucial behavioral outcome—life or death. The top panel of Figure 1 shows deaths from all cardiovascular categories in the Physician's Health Study. This stacking histogram reveals that reductions in death from myocardial infarction were compensated for by increases in death from other cardiovascular causes. There was a trend toward more hemorrhagic strokes among those taking aspirin, and there was the suggestion that aspirin may cause these strokes because it reduces blood clotting. Overall, aspirin did not reduce the number of deaths but changed the distribution among categories (Kaplan, 1989b).

The center portion of Figure 1 shows a similar result for the Coronary Primary Prevention Trial (Lipid Research Clinics Coronary Prevention Trial Results, 1984). In this study, a group of about 1,900 men at risk for coronary heart disease was given cholestyramine, a resin that binds bial acids and lowers serum cholesterol, whereas another group of about 1,900 men was given a placebo. Among the 3,800 male participants, 38 (2%) in the control group and 30 (1.6%) in the experimental group died of heart disease. The study is widely cited as the crucial evidence for cholesterol reduction. In addition, data from the study have been used to argue that a 1% reduction in cholesterol results in a 2% reduction in mortality. This has come to be known in health promotion campaigns as the *1% to 2% rule.* The exact calculation of this 1% to 2% rule, so often cited in public statements, is difficult to follow. Forming a ratio of these small percentages of deaths and subtracting from 1.0 gives the estimate of about a 21% reduction in mortality (1.0 − [.0157/.022]). This combined with an observed 12% reduction in cholesterol yields the 1% to 2% rule.

This important study represents the scientific basis for the current campaign toward cholesterol reduction. The stacking histogram does suggest a significant reduction in heart disease deaths among those randomly assigned to cholestyramine. Yet the entire height of the bars in the stacking histogram shows that there was no advantage of treatment for total mortality. According to the behavioral conceptualization, the treatment had no benefit. Reductions in death from heart disease were compensated for by increases in death from other causes.

The lower portion of Figure 1 shows similar results from the Helsinki Heart Study, which evaluated a similar drug called gemfibrozil (Frick et al., 1987). In the Helsinki

Figure 1
Total Mortality in Three Clinical Trials: Physicians Health Trial (Top), Coronary Primary Prevention Trial (Center), and Helsinki Heart Study (Bottom)



Note. CVD = cardiovascular disease; sudden = sudden death; MI = myocardial infarction; CHD = coronary heart disease.

study, 2,051 men were randomly assigned to take gemfibrozil twice daily, whereas another 2,030 men were given a placebo. After six years, 19 of the men in the placebo group had died of ischemic heart disease, whereas only 14 of those in the drug-treated group had died. This significant difference led the authors to conclude that gemfibrozil caused a 26% reduction in ischemic heart disease deaths. The 26% is calculated as follows: In the drug group, 0.68% (14/2,051) died, whereas in the placebo group 0.93% (19/2,030) died of ischemic heart disease. The actual difference is about one fourth of one percent. However, the ratio (.0068/.0093) subtracted from 1.0 yields about a 26% reduction. Furthermore, the total number of deaths in the Gemfibrozil group was actually higher than those in the placebo group (45 vs. 42).

Some argue that cholesterol-lowering drugs should still be regarded as efficacious because there is no biological model that would explain why decreased cholesterol should lead to increased deaths in nondisease categories. However, the finding that cholesterol lowering does not reduce total mortality has now been reported in several different studies (Fries et al., 1989). The burden of proving benefit rests with the treatment advocates. Those who adopt the traditional disease-specific view might be satisfied with reductions in cardiovascular deaths. However, the more comprehensive behavioral model requires a reduction in total mortality. Adoption of this model might stimulate new research designed to explain the increased deaths in nondisease categories.

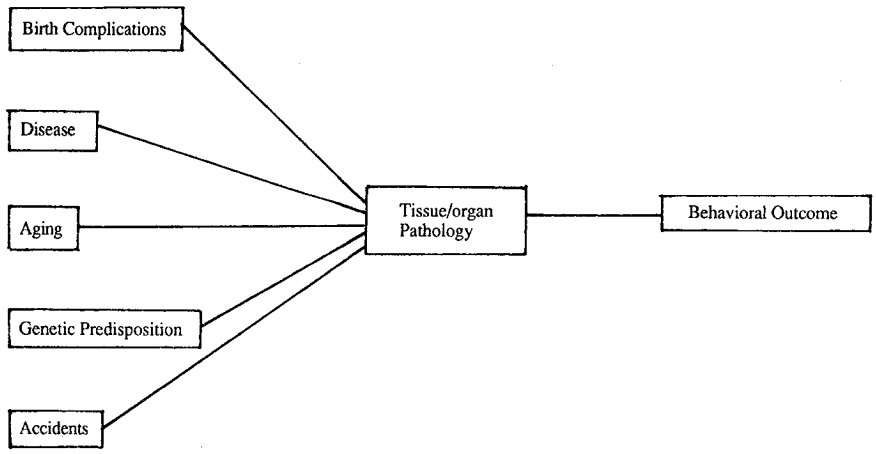
In all three of these important clinical trials, there was a highly publicized benefit of treatment. However, the benefit only occurs for a specific disease category. There was no benefit of treatment with regard to the important life–death outcome (see total height of columns in each section of Figure 1). Investigators and the lay press often focus on improvements in a specific cause of death. Yet families of the deceased may be more concerned that the subject is dead than they are about the specific cause of demise. Focus on specific categories can obscure the most important behavioral outcomes. Research directed toward specific disease categories or aspects of a biological process may not capture global concerns about health. That task requires a comprehensive behavioral model.

Model of Health Outcomes

A model of behavioral health outcomes is presented in Figure 2. In the center of the figure is tissue or organ pathology, which makes up most of the study of medicine and results in most of the serious illnesses. These illnesses might be caused by multiple sources, including inherited birth problems, various diseases, the aging process, defects in the genetic program, and accidents. Each of these problems may be caused by biochemical or structural problems. The sources listed in Figure 2 are selected examples and are not intended to be exhaustive. Investigators are concerned about these biological problems because they may eventually affect behavior. If a disease or condition had an impact on a tissue or organ system but had no effect on life expectancy, no effect on function, no effect on appearance or symptoms, would it be of concern?

Most models in health psychology and behavioral medicine have a biological measure on the right side (implying that biology is the outcome). It is often emphasized

Figure 2
Relation Between Biological Events, Physiology, and Behavioral Health Outcomes



that behavior is important because it can affect biological process. For example, diet can affect serum cholesterol and stress can affect natural killer cells. Figure 2 suggests a different focus. Both biological and environmental events gain their importance because they affect behavior.

Can a Behavioral Conceptualization Influence Research and Practice?

Focus on biological rather than behavioral outcomes has led many investigators down the wrong path. For example, elevated levels of protein in urine suggest that the kidneys are misfiltering and removing some proteins that the body needs. Many years ago, when physicians measured high levels of protein in urine, they advised their patients to eat less protein. That advice led to poorer health outcomes because the body was already protein deprived. Ultimately, identifying the manipulations that led to better behavioral health outcomes led to more effective treatments. Another example involves the diagnosis and treatment of back pain. Legal definitions of disability sometimes require a physical diagnosis, and the medical evaluation often identifies a structural problem. This leads to the incorrect conclusion that the prognosis is poor. Thus, the medical model reinforces dysfunction, even though rehabilitation is common. A comprehensive view of health can reveal when new treatment approaches are needed, whereas focus on specific processes might misdirect treatment.

The traditional approach leads to a focus on risk factors rather than on health outcomes. Yet, modification of risk factors may not necessarily improve health. For example, many epidemiologic studies have failed to find a relation between coffee consumption and death due to heart disease. Several very thorough evaluations have shown that those who drink coffee have the same life expectancies as those who abstain (Wilson, Garrison, Kannel, McGee, & Costelli, 1989). On the other hand, some investigators have reported that coffee increases low density lippoprotein cholesterol or blood pressure (Thelle, Heyden, & Fodor, 1987). Because cholesterol and blood pressure are risk factors for heart disease, people are advised to give up the coffee they enjoy. The logic behind this advice might be challenged, however, as coffee does not increase the risk of heart disease or other behavioral health outcomes.

Treatment of factors suspected of causing undesirable behavioral outcomes is usually advisable. Yet change in these risk factors does not assure that the behavioral goal will be achieved. One recent example is the treatment of cardiac arrhythmias. Research had demonstrated that adults who had suffered a heart attack were at risk for sudden death if they experienced asymptomatic cardiac arrhythmias (Bigger, Fleiss, Kleiger, Miller, & Rolnitzky, 1984). Drugs were available to suppress these cardiac arrhythmias, and these products were used often. In what many thought was a demonstration of the obvious, the National Institutes of Health initiated a major clinical study involving 1,455 post myocardial infarction patients in a variety of major medical centers (Cardiac Arrhythmia Suppression Trial [CAST] Investigators, 1989). The patients were randomly assigned to take anti-arrhythmic medication or placebos. All of the participants had been screened and demonstrated to experience suppression of their arrhythmia in response to the medication. Over an average of 10 months of follow-up, however, those assigned to the active drug had a significantly higher rate of death from arrhythmia than those assigned to the placebo. In addition, those in the active medication group had a higher overall death rate. If the investigators had only measured the response of the heart rhythm to anti-arrhythmic drugs, they would have concluded that the drug produced a benefit. Following the patients through the behavioral outcome (mortality) inspired them to stop the trial early and declare the medications unsafe.

The important point is that physiologic and biochemical measures do not necessarily have meaning. They gain their meaning through systematic correlations with health outcome. Attention directed at behavioral health outcomes can clarify the importance of biological processes.

Pathways to Health Outcomes

In this article I have argued that the only important outcomes in health and illness are behavioral. Clearly, these outcomes are deserving of one's attention. People expend tremendous resources in order to achieve better health status. In fact, in the United States, more is spent on health care than on food (Kaplan, 1989a). How might one realize the best return on one's investments in terms of health outcomes?

There are at least two ways to achieve better health outcomes. The first is through the modification of mediators of the behavioral outcomes. This is accomplished by identifying tissue pathology and seeking its remedy. Thus, those with diabetes experience poor health outcomes because of a problem in insulin production or insulin action. By supplying more insulin or by tuning up insulin receptors, better health outcomes may be achieved. Those with tumors may experience better health outcomes with the tumors excised. There is nothing wrong with the medical model. In fact, direct treatment of pathology (lesions) remains one of the best methods for improving health outcomes. The traditional practice of medicine and surgery should be viewed as a set of methods designed to improve behavioral outcomes.

Another pathway for improving health outcomes involves modification of behavior, independent of the disease pathway. For example, patients with chronic obstructive pulmonary disease may face a situation in which there are no known medical or surgical remedies. However, behavior modification programs may enhance functioning independent of improvement in disease state (Atkins, Kaplan, Reinsch, Lofback, & Timms, 1984; Kaplan & Atkins, 1988). Pain treatment may also benefit from this conceptualization. Substantial evidence now suggests that pain and suffering are distinct. Pain behavior can continue after the injury that initiated the pain has healed. Several studies have shown that behavior modification can alter behavioral health outcomes for those with back pain, even though it does not affect back physiology in measurable ways (Fordyce, 1988). Health outcomes are behavioral, and one way to improve them is to modify behavior.

The behavioral conceptualization does not disregard the traditional medical model. Indeed, medicines and surgeries are excellent methods for improving behavioral health outcomes. However, the behavioral model is broader. Medicines, surgeries, and behavioral interventions are complementary methods for enhancing behavioral health outcomes. Often one alternative is superior in terms of efficacy or efficiency. For example, hernias can be surgically repaired and it would be inappropriate to use behavioral treatment to modify outcomes related to these problems. On the other hand, several disabilities do not respond to medicines or surgeries. For these, behavioral interventions may be the best alternative for producing a health benefit. Using behavioral outcomes as the target of care allows different alternatives to compete. Ultimately, treatments should be favored if they produce the most benefit at the lowest cost.

Summary

Physicians have long recognized that disease categories provide minimal information about the impact of illness upon patient experiences (Ellwood, 1988). A diagnosis is important because it may identify a course of treatment. Yet within specific diagnoses, patients differ considerably in how they are affected. Multiple sclerosis, for example, may have essentially no impact on behavioral dysfunction or it could have devastating implications. The impact of the disease on the daily life of the patient may be more important than naming the condition. A recent editorial in the *Journal of the American Medical Association* concluded that physicians need to learn to "treat the patient, not the disease" (Riesenberg & Glass, 1989, p. 943).

There are only two health outcomes that are of importance. First, there is life expectancy. Second, there is function or quality of life during the years that people are alive. Biological and physical events are mediators of these behavioral outcomes. Individuals are concerned about cancer, high blood pressure, high cholesterol, or other problems because they may shorten the life expectancy or make life less desirable prior to death. There is a growing consensus that these behavioral outcomes are central in studies of health care and medicine. Yet refinement of these measures requires active participation of behavioral scientists. Although behavioral outcomes are gaining a stronger foothold in medical research, psychologists and behavioral scientists have shown minimal interest. A behavioral conceptualization of health outcomes may suggest important new directions for research and practice.

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