Public Policy and Managerial Impact Section

Purchasing Population Health: Aligning Financial Incentives to Improve Health Outcomes

David A. Kindig

Objective. To review the concept of population health, including its definition, measurement, and determinants, and to suggest an approach for aligning financial incentives toward this goal.

Data Source, Study Design, Data Extraction. Literature review, policy analysis

Principal Findings. The article presents the argument that a major reason for our slow progress toward health outcome improvement is that there is no operational definition of population health and that financial incentives are not aligned to this goal. Current attempts at process measures as indicators of quality or outcome are not adequate for the task. It is suggested that some measure of health-adjusted life expectancy be adopted for this purpose, and that integrated delivery systems and other agents responsible for nonmedical determinants be rewarded for improvement in this measure. This will require the development of an investment portfolio across the determinants of health based on relative marginal return to health, with horizontal integration strategies across sectoral boundaries. A 20-year three-phase development strategy is proposed, including components of research and acceptance, integrated health system implementation, and cross-sectoral integration.

Conclusions. The U.S. healthcare system is a $1 trillion industry without a definition of its product. Until population outcome measures are developed and rewarded for, we will not solve the twenty-first century challenge of maximizing health outcome improvement for the resources available.

Key Words. Population, health, outcomes, determinants, incentives

It has recently been stated by Assistant Secretary for Health Philip Lee that, in healthcare, we "get paid for what we do, not what we accomplish" (Lee 1995). Similarly, Fryback (1993) has noted that American healthcare is a $900 million industry without a clear measure or definition of its main product.

Sometimes this perspective is framed as criticism of healthcare providers, but most hospitals and physicians have only been responding rationally to the financial incentives for providing more services under fee-for-service financing. In a fee-for-service environment, providers are paid more for more services, and services are therefore the implicit output. On the other hand, in a managed care environment, capitation incentives are creating pressures for fewer hospital days and physician services, and lower unit prices, but do not yet require alternative measures of health output for their enrollees.

Ironically, perhaps, it is the growth in managed care plans that has led to the increased recent attention to issues of quality if not outcome. This call for action is timely, because at this point there is not practical proposal for paying for outcomes. Considerable progress has been made in quality improvement technology, with much current attention on the HEDIS methods developed by the National Commission on Quality Assurance (Iglehart 1996). So far, however, current HEDIS quality measures focus primarily on processes that do not necessarily lead to improved health outcomes. Better rates of mammograms or Pap smears or customer satisfaction do not necessarily ensure that these processes lead to outcome improvement through better diagnosis and therapy. In addition, they beg the questions of how important each component of the index is and can lead to emphasis only on those items that contribute to a good score, ignoring those of equal or more importance that are not included. In addition, the ultimate outcome measure, mortality, is often not included. Epstein has recently concluded that current measures "can help identify health plans that are either outstanding or seriously substandard but will never be comprehensive and will never to able to guarantee that important aspects of a health plan's quality of care has not deteriorated" (Epstein 1995). Finally, in focusing only on medical care inputs, current measures ignore the important contributions that nonmedical factors such as socioeconomic status, the environment, and public health make to health outcomes.

American health expenditures continue to be the highest in the world, but measures of outcome based on mortality are far from the highest; for 1992, infant mortality at 8.52 deaths per 1,000 live births ranks 22nd in the

---

Address correspondence and requests for reprints to David A. Kindig, M.D., Ph.D., Professor of Preventive Medicine and Director, Wisconsin Network for Health Policy Research, University of Wisconsin-Madison School of Medicine, 227 Bradley Memorial Hospital, 1300 University Avenue, Madison, WI 53706-1532. This article submitted to *Health Services Research* on December 20, 1996, was revised and accepted for publication on July 15, 1997.

world, male life expectancy at birth of 72.3 years ranks 24th in the world, and female life expectancy at birth of 79.1 years ranks 18th in the world (U.S. Department of Health and Human Services 1996). It is not unreasonable for purchasers and patients to wonder if they are getting optimal value for these significant resource outlays in healthcare. Within the United States, per capita health expenditures vary twofold across the states (Levit, Lazenby, Cowan, et al. 1995; Kindig and Libby 1994), with no conclusive relationship between higher state expenditure and outcome or quality.

The literature contains a beginning discussion about making a twenty-first century paradigm shift to redefine the product of the healthcare system toward outcomes and population health status (Ellwood 1988; Patrick and Erickson 1993; American Hospital Association 1993; Catholic Hospital Association 1992; Tarlov, Ware, Greenfield, et al. 1989), and for paying broadly integrated delivery systems through capitation for this outcome; this redefinition would create economic and other forces in these systems to produce health in the most cost-effective manner (Shortell 1992; Kindig 1993; Shortell, Gilles, Anderson, et al. 1996; Ellwood and Lundberg 1996). No specific proposals have been put forth, however, and the issues relating to the essential integration across the boundaries of other health-enhancing sectors such as education and the environment have not been developed. The purpose of this article is to suggest a population health framework for purchasing health outcomes, in which an aggregate measure of health for large populations or health plans could be used as a basis for financial incentives to drive the maintenance or improvement of the health of populations. It asserts that until health outcomes are defined as population health improvement, and until incentives reward both healthcare providers and other agents responsible for producing health for this outcome, progress toward this goal can neither be measured or managed.

AN AGGREGATE OUTCOME MEASURE: HEALTH-ADJUSTED LIFE EXPECTANCY?

Defining Population Health. Population health, a term that is increasingly used, is ill-defined at present. It is often thought of as synonymous with or primarily concerned with public health, prevention, or primary care; it certainly encompasses these domains, but these are too narrow as a definition since much health improvement comes from secondary and tertiary care, as well as from the nonmedical determinants of health. Regarding health itself, Evans and Stoddart (1990) have attempted to clarify the distinction between the related concepts of disease, health, and function, and that of well-being. The population health perspective proposed here adopts the intermediate concept of health and function, or health-related quality of life as the definitional foundation. This is less broad than total well-being and does not encompass every aspect of community life such as indicated by Henderson (Henderson 1991) or the Fordham Index of Social Health (Fordham Institute 1996), but it attempts to include the broadest conception of physical, mental, and social function as health-related quality of life. As will be seen, it clearly is broader than medical care to include in proper balance the nonmedical determinants of health such as socioeconomic status, the environment, and public health.

Such a framework requires an operational measure of population health in order to determine and assess improvements. Since 1970, work in this field has concentrated on going beyond measures of mortality alone, given the general appreciation that there is more to health than simply years of life (Sullivan 1971; Albrecht 1994). Several categories of measures have been developed, from traditional mortality and morbidity, disease-specific measures, generic health profiles, and single summary measures. Whereas disease-specific measures and health profiles have utility at the patient care level, they are inadequate for comparing the health status of large populations because all relevant items cannot practically be included or given appropriate weights.

Of course, multiple types of population groups are involved in health outcomes and health improvement, from an individual physician's patient panel to everyone in a large geographic area such as a state or a nation. For the purpose of this argument, the population of interest is a large enrolled managed care plan (or possibly a similar-sized geographic area or community). Having an aggregate population health indicator would allow the critical comparison across such populations, which are large enough to minimize adverse selection and to allow for population-based intervention and the effect of social and community health determinants. In a compelling chapter titled "Social Proprioception" (Wolfson 1994), Wolfson makes the case for such a summary measure, which would be similar to other commonly used indicators like gross domestic product (GDP) and the consumer price index (CPI), and would focus attention on health rather than healthcare. It should be recalled that in 1979 Chen proposed a single measure called the gross national health product (Chen 1976; Chen 1979); it and others of the time were apparently too mathematically complex for common understanding and use. Such an aggregate measure is particularly important when integrating economic aspects into the analysis, since this requires the definition of a comparable unit of benefit, as well as of cost (Drummond, Stoddart, and Torrance 1987). This concept is not totally hypothetical; in 1989, the government of Quebec stated its primary goals for *Improving Health and Well Being* (Quebec Ministry of Health 1989) as adding years to life, adding health to life, and adding well-being to life. *Healthy People 2000,* the current health goals statement for the United States, states an objective of "increasing years of healthy life to at least 65 years in 2000" (U.S. Department of Health and Human Services [USHHS] 1991). A January 1998 *New York Times* story on racial inequity in health listed years of healthy life as the first measure to compare outcomes across racial groups (*New York Times* 1998).

Robine and colleagues have focused attention on the generic concept of "health-adjusted life expectancy" (HALE), which conceptualizes the length and quality of life combination as an estimate of the number of years that can be expected in a specified state of health (Robine and Ritchie 1991; Robine 1993). The need for an aggregate outcome measure that combines both mortality and a broad view of morbidity supports the generic HALE approach as the operational definition of population health. From a narrow perspective, the sum of the health of individuals is, of course, equal to that of the population under consideration. However, this is too narrow a concept because it lulls us into thinking that improving health outcomes can be accomplished only by focusing on individual medical care interventions, which is still the dominant model operating today. A population health framework adds two additional considerations beyond a sum of individual health-adjusted life expectancy. The first is a broad understanding of the determinants of health or HALE. This requires a broader perspective than simply providing medical care to the individual. Most of these nonmedical interventions, such as public health, education, and the environment, are introduced at the community or social level, but have a direct or indirect impact on the health of individuals.

The second additional population health consideration is from an economic or resource allocation perspective. If resources were not an issue, then any individual investment in medical care or other health determinant might be appropriate, but given that healthcare is financed to a considerable degree with public funds (46 percent), and that employer and individual cash outlays are constrained as well, it is necessary to look at the most cost-effective means of getting value in terms of health outcomes. This may mean that expenditures on some individuals or on alternative determinants of health will have a much higher return than others in terms of the health-adjusted life expectancy of the population. This idea is summarized by the statement by Evans and Stoddart that "a society that spends so much on health care that it cannot or will not spend adequately on other health enhancing activities may actually be reducing the health of its population" (Evans and Stoddart 1990). ***Health outcome for purposes of purchasing population health is therefore defined as the health-adjusted life expectancy (quantity and quality) of a group of individuals, in an economic framework that balances the relative marginal return from the multiple determinants of health.***

MEASURING HEALTH-ADJUSTED LIFE EXPECTANCY

Several approaches for an aggregate measure of health-adjusted life expectancy (HALE) are consistent with the foregoing definition of population health.

Quality-Adjusted Life Years (QALYs). The most well known method is that of the quality-adjusted life year (QALY), which places emphasis on the patient's valuation of health states, therefore going beyond disability to include a broad concept of morbidity. Following early work by Weinstein and Stason (1977) and by the research group at the Centre for Health Economics at the University of York, England, it was further elaborated by Torrance as "values that are assigned to each health state on a scale . . . from 1.0 to being healthy and 0 to being dead . . . the utility values . . . allow morbidity and mortality improvements to be combined into a single weighted measure, quality-adjusted life years (QALYs) gained" (Torrance 1986:12). Individual QALYs are calculated by multiplying the number of life years expected times the quality adjustment factor derived from patient valuation studies.

In the EuroQual rating scale approach, for example, patients are asked to indicate their own health state by choosing from three responses in each of five categories; mobility, self-care, usual activities, pain/discomfort, and anxiety/depression (Kind, Gudex, Dolan, et al. 1994). This results in 243 possible combinations of health states, to which have been added unconsciousness and death. Individual valuations are determined using a visual thermometer scale, where an individual places his or her own health state on a 0 to 1 scale from "worst imaginable" to "best imaginable." The valuations can then be used in making adjustments of expected life years in different states for alternative treatments or programs (Williams 1986; Drummond, Torrance, and Mason 1993). The U.S. Panel on Cost Effectiveness in Health and Medicine has recommended the QALY as the measure of effect for the cost-effectiveness reference case (Gold, Siegel, Russell, et al. 1996).

Disability-Adjusted Life Years (DALYs). Another potential HALE measure is that of disability-adjustment life years (DALYs). Early efforts focused on such a combination of mortality and disability, primarily because of the existence and increased quality of survey data of disability measures. An early example of this approach was that of Katz et al., who used activity of daily living (ADL) data from a sample of noninstitutionalized people in Massachusetts to determine a measure of active life expectancy (Katz, Branch, Branson, et al. 1983). More recently, Murray has reported on the development of the DALY as a new indicator of the burden of disease (Murray 1994), which uses expert identification of weights for six classes of activity limitation, arbitrarily defined as more than 50 percent decrease in ability, combined with a "social value of time lived at various ages" component. A generic concern about disability approaches is that they appear to be "burden of disease"–influenced and do not take into account morbidity that does not lead to serious loss of physical function or that occurs outside the physiologic or medical model realm. On the other hand, these measures are constructed in large part using data that exist or are being collected in a growing number of population health surveys.

Years of Healthy Life. A third approach is that of Years of Healthy Life, from Patrick and Erickson (1993) and Erickson, Wilson, and Shannon (1995), who combine two questions already asked in the National Health Interview Survey, one from the disability/activity limitation category as well as one regarding general perception of health. These create a matrix of 30 combinations, to which utility values are assigned that range from 1.00 for persons without role limitation and in excellent health to 0.10 for persons limited in function and in poor health. These estimates are then applied to age cohorts to create a combination HALE that they call years of healthy life (YHL). The advantage of this measure is that it combines disability data with self-reported health status, creating a measure that is available from survey data and is a proxy for individual utility measurement for a population. It should be noted that these are estimations, at this point, and need empirical valuation. In December 1997, the Institute of Medicine convened a two-day meeting to review the methodological and ethical issues in the use of such aggregate summary measures (Institute of Medicine 1998).

A framework for purchasing population health would establish such measures as the outcomes desired for large populations or health plans; emphasis would shift from simply providing services to considering which medical and nonmedical services and programs improve health-adjusted life expectancy as efficiently as possible.

BALANCING THE MULTIPLE DETERMINANTS OF HEALTH

Reorienting the product of the healthcare system to an aggregate measure of population health status will be extremely challenging even within the medical or healthcare domain; this is increased considerably by our growing understanding of the role that nonmedical determinants play in producing health outcomes. Brook, McGlynn, and Cleary (1996:970) have recently written that "people that criticize the use of outcomes measures believe that most differences in outcome among patients receiving the same treatment are the result of factors not under the control of health care providers," and that conclusions about outcomes are therefore invalid. The first statement is true, but the conclusion is incorrect since it limits the concept of health to the medical care system.

Regarding the role of medical care, John Bunker and his colleagues have estimated that clinical preventive services have led to about 1½ years of additional life expectancy, while treatments for conditions such as cancer of the cervix and colon, heart disease, hypertension, diabetes, pneumonia, and influenza are estimated to have added 3 to 4½ years to life expectancy (Bunker, Frazier, and Mosteller 1994). Other investigators, primarily from a public health perspective, have challenged the extent to which medical care has been responsible for the gains in life expectancy in the last century (McKeown 1976; McKinlay, McKinlay, and Beaglehole 1989).

The point to be taken from this debate is not that one argument is right and the other wrong, for this is certainly not the case. Both medical care and other determinants of health have had and will continue to have important roles to play in producing improvements in mortality and morbidity. The marginal effectiveness of different interventions in producing our current levels of HALEs may be different from those required for future improvements. The challenge now in purchasing population health, in an era of limited resources, is to find that optimal balance of resource allocation across the known determinants of health that will produce the most maintenance or improvement for the most people with the resources available.

Much credit goes to the Population Health Group of the Canadian Institute for Advanced Research for recently bringing the issues of the determinants of health to broader attention with their book, *Why Are Some People Healthy and Others Not?* (Evans, Barer, and Marmor 1994), and for stimulating dialogue and inquiry on what biopsychosocial mechanisms might be responsible for health status improvement. Particularly compelling is the persistent finding that higher levels of socioeconomic status are directly associated with lower levels of mortality and morbidity, termed the "socioeconomic gradient" (Adler, Boyce, and Chesney 1994). The initial findings of Marmot and colleagues came from a unique data set called the Whitehall Survey of British civil servants. One striking finding was that age-adjusted mortality rates were 3½ times higher in the lowest-status manual grade than in the highest administrative grade, and that there was a gradient in mortality from the lowest to the highest. This gradient was evident for many causes of death, and still remained after risk factors were adjusted for (Marmot, Kogevinas, and Elston 1987). Recently, these investigators have suggested that workplace autonomy may play a role in explaining the gradient (Marmot, Bosma, Hemmingway, et al. 1997).

Additional evidence exists regarding the association of level of education and income with health. A significant recent study in the United States by Pappas, Queens, Haddon, et al. (1993) reanalyzed data from 1960 and extended it to 1986. They showed that the mortality rates were lower, but that the decreases were greatest in the more educated groups. This indicates not only that the gradient persists, but that it got steeper over time. Currently, a debate is taking place mainly in the pages of the *British Medical Journal* regarding the evidence that it may be the range of income in a country instead of the absolute level that is associated with changes in health (Wilkinson 1992; Judge 1995; Wilkinson 1995); this has been supported by data from Kaplan across the American states (Kaplan, Pamuk, Lynch, et al. 1996).

Similar evidence exists for factors such as social support, the physical environment, genetic endowment, and individual behavior. The Centers for Disease Control and Prevention has recently estimated that approximately 50 percent of the 2 million annual deaths are from nongenetic factors such as tobacco, diet, alcohol, drugs, firearms, and accidents (McGinnis and Foege 1993).

Many attempts have been made to extend these bivariate findings and, depending on the specific groups that are studied and the sources of data, it has been found that medical care, income, education, and smoking all have significant relationships to health status (Zweifel and Breyer 1997). In addition, interactions that also have importance may exist between individual and social factors such as those implied in the social capital framework of Putnam (1993). Recently, Kawachi and colleagues have suggested that the hypothesized effect of income inequality may operate through a social capital mechanism (Kawachi, Kennedy, Lochner, et al. 1997).

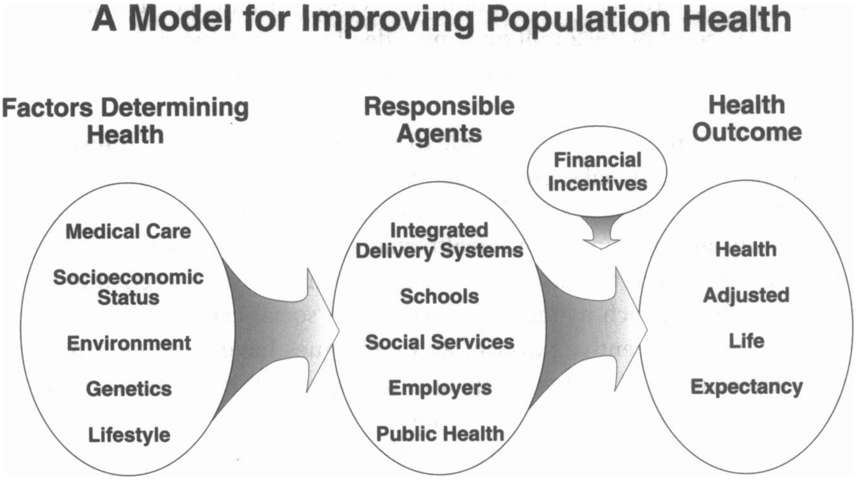
Even when healthcare providers acknowledge the role of nonmedical factors in producing health-adjusted life expectancy, they often point out that their practices and organizations have limited responsibility for factors outside of the medical or healthcare domain. It is important to recognize these boundaries, and to avoid incentives that do not take into account the appropriate role of different agents (providers, integrated systems, other related sectors, public health, the individual) in producing health.

Figure 1 illustrates a way to think about the relationships between determinants of health, responsible agents, and financial and nonfinancial incentives for producing health outcomes. The left-hand panel contains the determinants of health, oversimplified into medical care, socioeconomic status, environment, genetics, and the individual; the dotted lines separating them indicate that these categories have some overlap. The middle panels represent the agents through which the determinants are translated into health outcomes. The right-hand panel indicates the HALE outcome that is desired, with the financial and nonfinancial incentives necessary for the agents to turn determinant factors into HALEs.

A REALISTIC DEVELOPMENT PLAN AND CHALLENGES FOR IMPLEMENTATION

The task of purchasing population health seems daunting, but it is possible to move forward in several stages of development and implementation over the next two decades.

Figure 1: Relationships in Purchasing Population Health



Phase 1 (1998–2002). Research and Debate

Over the next five years research and demonstration efforts should begin to build the empirical and experiential base that implementation of this concept requires. This period will be dominated by federal deficit reduction and medical system consolidation, but modest private and public resources devoted to applied analytic efforts, such as those listed here, would pay handsome dividends for future efforts. Such research priorities:

1. Development of standard measures of population health for application in large populations should be refined, with particular attention given to those measures of health-adjusted life expectancy that show the greatest validity, sensitivity, and efficiency for this purpose. Methods for accommodating denominator changes from population migration will be needed as well.
2. The relative cost-effectiveness of the multiple determinants of health needs to be established so that a cross-sectional health production function can be determined.
3. Issues of subpopulation need and distribution of HALE need to be fully explored. We do not talk often of "need" in American health policy or health economics, but Williams and Culyer in Great Britain have argued for need for health being defined as "capacity to benefit" from health investment (Williams 1974; Culyer 1995). Different populations will need different amounts and types of investment for health improvement. Differential population "ameliorability" interventions as conceptualized by Fielding need to be fully explored and understood (Fielding 1995).
4. The issues of latency (Hertzman, Frank, and Evans 1994) and discounting (Drummond, Stoddart, and Torrance 1987; Gold, Siegel, Russell, et al. 1996) also need to be taken into consideration, since different interventions within and across sectors will have their impact over different time periods (immunization versus hip replacement versus education versus environmental cleanup).
5. Ethical concerns, such as protecting disadvantaged populations (Harris 1987; Bell and Mendus 1988; Williams 1992; Singer et al. 1995), the distribution of benefit over few versus many (Olsen 1994), and the process of social valuation of HALEs (Williams 1988), need to be explored.
6. The responsibility for data gathering and reporting by provider, purchaser (employer coalition, Medicare), or public agent (public

health department, state insurance commissioner) needs to be explored (Roos and Shapiro 1995). For whomever has this responsibility, ongoing efforts to detect intentional "gaming" or unintended consequences of the new incentives in a timely fashion will be necessary. Methods will need to be developed to track changes in the denominator, as persons move across plans or geographic areas.

Drawing on answers to these questions, the goal of discussion and debate for this phase should be some level of public acceptance of this new purchasing population health paradigm, in which financial incentives will be tied to demonstrated outcomes instead of to inputs or processes as is currently done. Early beginnings of such considerations are occurring in the public and private sectors as "value or performance purchasing"; these discussions and demonstrations need to be expanded as rapidly as feasible (U.S. DHHS 1998).

Phase 2 (2003-2010). Fully Integrated Medical Delivery Systems

The first step is to move to fully integrated (seamless) medical care systems that go beyond hospital and physician integration to include prevention, primary care, long-term care, and health education. Financial incentives need to put at risk and reward those systems for HALE improvement that are under their control; the Medicare Social HMO demonstrations are beginning efforts in this regard (Newcomer, Harrington, and Friedlob 1990). Some are also under way already at the community level, including some of the Health Communities projects of the HealthCare Forum, the Kellogg Community Care Demonstrations, and a number of local initiatives, often in the public health and prevention domain. The renewed dialogue and interaction between medicine and public health is also an important development (Reiser 1996; Lasker 1997). Unfortunately, at present, most of these efforts are wonderful in design, but remain marginalized as demonstrations with uncertain financial futures. Consider what would occur if, in this period, 20 percent of integrated systems' capitation was withheld by the regional purchasing coalition or by Medicare, and was placed into a competitive pool for return to the systems that showed the most improvement in the health-adjusted life expectancy of their populations. These organizations would quickly apply their knowledge of the determinants of health creatively in proposing alternative investments, in both the clinical (Berwick 1994) and nonclinical domains, in order to regain the dollars withheld. Phase 2 is within our reach by 2010, and serious efforts should begin within the next five years.

Phase 3 (2011–2020). Integrating the Determinants of Health

Demonstrations to bring medical care and social services closer together have been proposed and are being experimented with in England, with joint commissioning taking place between medical care and social services (Wistow 1995); in some Canadian provinces, such as Prince Edward Island, where all resources from health, education, and social services are being administered from a common fund and structure (Lomas, Rachlis, and Kumar 1996); and in Sweden, where a public health committee of cabinet ministers has recently been developed to integrate policy across health, education, labor, and housing to focus on a coordinated intersectoral health status improvement policy.

But the fuller integration in the United States of the largely private medical care systems and the largely public other determinants will await forms of integration across these sectors that have not yet developed either in theory or practice (Conrad and Dowling 1990). Lessons from other countries need to be explored for relevance, but undoubtedly new models will be required (Goldsmith 1994; Conrad and Shortell 1996). In all likelihood such models will involve "virtual" rather than "ownership" vertical integration strategies, with networking and collaborative relationships to ensure appropriate boundaries and resource allocation. Shortell has called for a community health management system, which will begin the focus on "community-wide health care needs through alliances, coalitions, linkages, and partnerships in the public health and community and social service agencies" Shortell, Gilles, Andersen 1996). The development of such integration models and the assessment of sectoral responsibility will be high priorities for the initial decade of the twenty-first century, with guidance and inspiration coming from a reinvented public health sector and from the Healthy Communities and Healthy Cities movements (Drummond and Stoddart 1995; Tengs, Adams, Pliskin, et al. 1995). It is almost certain that such a cross-sectional relative marginal return framework will confirm the value of many medical interventions, will raise some and lower others, and will identify some—or many—nonmedical interventions that will produce more future marginal return than some—or many—medical interventions.

Potential candidates for early implementation activity are the Medicare and Medicaid programs as well as programs in progressive states such as Oregon (Oregon Progress Board 1994; Health Care Financing Administration 1996), that have already identified a set of specific objectives that cut across a number of sectors. In addition, the environmental policy area may have lessons for building costs of future outcomes into current prices and for developing a public-private integrated approach.

CONCLUSIONS

Berwick (1988) has ascribed the lack of a practical evaluation of quality assurance partly to the "tyranny of outcome," which a purchasing population health framework might encourage. He cautions that the efficacy of many healthcare practices is unknown, that unidimensional measurement strategies may miss underlying multiple and independent attributes of health, that process characteristics such as respect and caring have value, and that evaluation can detect flaws in design or process even if a defective product has not yet been produced "downstream." Smith indicates a series of "unintended consequences" from managing to performance indicators (such as tunnel vision, suboptimization, and gaming), and suggests strategies for dealing with them (Smith 1995). Similarly, Palmer has indicated that issues such as patient preferences, unknown risk factors, sample size, time for outcomes to be observed, and error in patient-reported outcomes pose difficulties for outcome measurements, and indicates her preference for guideline-related performance measurement processes (Palmer 1995).

Such concerns and process considerations must be accommodated in any new financing framework. But in the absence of an ultimate outcome standard such as health-adjusted life expectancy, a tyranny of process can and does become an end in itself. More than a few organizations have invested much in time and resources to managerial processes such as corporate restructuring and quality improvement, with little demonstrated benefit to patients in terms of health outcomes. It could appear in contemporary America that purchasers are not interested in outcomes at all, only price reductions, and that these ideas are more relevant to other countries under less political pressure. The challenge of this argument is that price reductions are not enough and will be self-defeating, as we move into the next phase of managed care, described by Goldsmith as oriented to value (Goldsmith 1995). Americans are unusually results-oriented, and the growth of large enrolled population denominators provides potential advantages not enjoyed in other nations that are still operating primarily on an individual patient basis—if we can only get the numerator right.

Purchasing population health has significant potential for stimulating improvement in health outcomes per dollar invested, through an approach basically technical in nature, such as capitation or diagnosis-related groups, and analogous to the development of a new purchasing standard such as the miles per gallon on a new car or the speed of a computer chip. Such an approach is more consistent with the way Americans innovate (Lipset 1996) than is dramatic social or political change (Broder and Johnson 1996). It will be new, not in its concept or even demonstration, but in that it will be firmly built into basic financial and organizational structures that transcend fad or ideology. At the system and purchaser level it will unleash scores of natural experiments and innovations to identify those interventions across medical and health interventions that produce units of improvement at the lowest marginal cost. As these become proven in terms of relative cost-effectiveness, they will be incorporated more widely into professional practice, as Palmer suggests, but the incentive for improvement will continue to produce new ideas and approaches in the remaining areas of uncertainty.

The search for a useful measure of population health status has deep intellectual roots and continues today, as evidenced by the work cited here. Despite the multidisciplinary research and administrative challenges outlined here, bringing such measurement techniques for rewarding cost-effective improvement in population health outcome into alignment with financial incentives is the best opportunity we have for achieving value for American patients and purchasers as we enter the twenty-first century.

ACKNOWLEDGMENTS

I wish to thank Harold Wise, Martin Cherkasky, and Victor Sidel at Montefiore Hospital and Medical Center, Bronx, New York for early encouragement and direction; to Denny Fryback, Colleen McHorney, Nancy Dunham, Jay Noren, John Mullahy, Barbara Wolfe, and Donn D'Alessio at the University of Wisconsin for colleagueship and review of these ideas; and to Alan Williams, Trevor Sheldon, and Alan Maynard of the Centre for Health Economics at the University of York, England, and Robert Evans, Morris Barer, and Clyde Hertzman at the Population Health Program at the University of British Columbia, for stimulation and the addition of many new dimensions to my knowledge and perspective. A more complete statement of this argument appears in *Purchasing Population Health: Paying for Results,* University of Michigan Press, Ann Arbor, 1997.

REFERENCES

Adler, N. E., T. Boyce, and M. Chesney. 1994. "Socioeconomic Status and Health: The Challenge of the Gradient." *American Psychologist* 49 (1): 15-24.

Albrecht, G. L. 1994. *Quality of Life in Health Care: Advances in Medical Sociology.* Greenwich, CT: JAI Press.

American Hospital Association. 1993. *Transforming Health Care Delivery: Toward Community Care Networks.* Chicago: AHA.

Bell, J. M., and S. Mendus. 1988. *Philosophy and Medical Welfare.* Cambridge: Cambridge University Press.

Berwick, D. M. 1994. "Eleven Worthy Aims for Clinical Leadership of Health System Reform." *Journal of the American Medical Association* 272 (10): 797-802.

———. 1988. "Toward an Applied Technology for Quality Measurement in Health Care." *Medical Decision Making* 8 (4): 253-58.

Broder, D. S., and H. Johnson. 1996. *The System.* New York: Little Brown.

Brook, R., E. McGlynn, and P. Cleary. 1996. "Measuring the Quality of Care." *The New England Journal of Medicine* 335 (13): 966-70.

Bunker, J., H. Frazier, and F. Mosteller. 1994. "Improving Health: Measuring the Effects of Medical Care." *Milbank Quarterly* 74 (summer): 225-59.

Catholic Hospital Association. 1992. *Setting Relationships Right: A Proposal for Systemic Healthcare Reform.* St. Louis, MO: CHA.

Chen, W. K. 1976. "A Comprehensive Population Health Index Based on Mortality and Disability Data." *Social Indicators Research* 3: 257-71.

———. 1979. "The Gross National Health Product: A Proposed Population Health Index." *Public Health Reports* 94 (2): 119-23.

Conrad, D., and W. Dowling. 1990. "Vertical Integration in Health Services: Theory and Managerial Implications." *Health Care Management Review* 15 (4): 9-22.

Conrad, D., and S. Shortell. 1996. "Integrated Health Systems: Promise and Performance." *Frontiers of Health Services Management* 13 (1): 3-40.

Culyer, A. J. 1995. "Need: The Idea Won't Do, But We Still Need It." *Social Science and Medicine* 40 (6): 727-30.

Drummond, M., G. Torrance, and J. Mason. 1993. "Cost-Effectiveness League Tables: More Harm Than Good?" *Social Science and Medicine* 37 (1): 33-40.

Drummond, M., G. Stoddart, and G. Torrance. 1987. *Methods for Economic Evaluation of Health Programmes.* Oxford: Oxford Medical Publications.

Drummond, M., and G. Stoddart. 1995. "Assessment of Health Producing Measures Across Different Sectors." *Health Policy* 33 (3): 219-31.

Ellwood, P. M. 1988. "Outcomes Management: A Technology of Patient Experience." *The New England Journal of Medicine* 318 (23): 1549-56.

Ellwood, P., and G. Lundberg. 1996. "Managed Care: A Work in Progress." *Journal of the American Medical Association* 276 (13): 1083-86.

Epstein, A. 1995. "Performance Reports on Quality: Prototypes, Problems, and Prospects." *The New England Journal of Medicine* 333 (1): 57-61.

Erickson, P., R. Wilson, and I. Shannon. 1995. *Years of Healthy Life.* NCHS Healthy People Statistical Notes #7, Rockville, MD: U.S. Public Health Service. April.

Evans, R., and G. Stoddart. 1990. "Consuming Health Care, Producing Health." *Social Science and Medicine* 31 (12): 1347–63.

Evans, R., M. Barer, and T. Marmor, eds. 1994. *Why Are Some People Healthy and Others Not? The Determinants of Health of Populations.* New York: Aldine De Gruyter.

Fielding, J. 1995. "Determinants of Health." Draft presented to the Canadian Institute for Advanced Research Population Health Program, Ottawa, ON, 15 January.

Fordham Institute. 1996. *1996 Index of Social health: Monitoring the Social Well Being of the Nation.* Tarrytown, NY: Fordham Institute for Innovation in Social Policy.

Fryback, D. 1993. "QALYs, HYEs, and the Loss of Innocence." *Medical Decision Making* 13 (4): 271–72.

Gold, M., J. Siegel, L. Russell, and others. 1996. *Cost Effectiveness in Health and Medicine.* New York: Oxford.

Goldsmith, J. 1994. "The Illusive Logic of Integration." *Healthcare Forum Journal* (September–October): 26–31.

———. 1995. "Managed Care Comes of Age." *Healthcare Forum Journal* (September–October): 14–24.

Harris, J. 1987. "QALYfying the Value of Life." *Journal of Medical Ethics* 13 (3): 117–23.

Health Care Financing Administration. 1996. "Medicare Beneficiary Health Status Registry and Beneficiary Centered Purchasing." HCFA draft communication, Washington, DC.

Henderson, H. 1991. *Paradigms in Progress: Life Beyond Economics.* Indianapolis, IN: Knowledge Systems.

Hertzman, C., J. Frank, and R. Evans. 1994. "Heterogeneities in Health Status." In *Why Are Some People Healthy and Others Not: The Determinants of Health of Populations,* edited by R. Evans, M. Barer, and T. Marmor. Ch. 3. New York: Aldine De Gruyter.

Iglehart, J. 1996. "The National Committee for Quality Assurance." *The New England Journal of Medicine* 335 (13): 995–99.

Institute of Medicine. 1998. *Summarizing Population Health: Directions for the Development and Application of Population Metrics.* Reports of the Committee on Summary Measures of Population Health. Washington, DC: National Academy of Science Press.

Judge, K. 1995. "Income Distribution and Life Expectancy: A Critical Appraisal." *British Medical Journal* 311, no. 7015 (11 November): 1282–85.

Kaplan, G. A., E. Pamuk, J. Lynch, and others. 1996. "Inequality in Income and Mortality in the United States: An Analysis of Mortality and Potential Pathways." *British Medical Journal* 312, no. 7037 (20 April): 999–1003.

Katz, S., L. Branch, M. Branson, and others. 1983. "Active Life Expectancy." *The New England Journal of Medicine* 309 (20): 1218–24.

Kawachi, I., B. Kennedy, K. Lochner, and D. Prothrow-Stith. 1997. "Social Capital, Income Inequality, and Mortality." *American Journal Public Health* 87 (9): 1491–98.

Kind, P., C. Gudex, P. Dolan, and others. 1994. In *Practical and Methodological Experience with the Development of the EuroQuol,* edited by G. L. Albrecht. pp. 219–53. Greenwich, CT: JAI Press.

Kindig, D. 1993. "The Health Care System Should Produce Health." *Physician Executive* 19 (4): 79–80.

Kindig, D., and D. Libby. 1994. "Setting State Health Spending Targets." *Health Affairs* 13 (spring, II): 288–89.

Lasker, R. 1997. *Medicine and Public Health: The Power of Collaboration.* New York: New York Academy of Medicine.

Lee, P. 1995. Speech at the University of Wisconsin School of Medicine, Madison. October.

Levit, J., H. Lazenby, H. Cowan, C. L. McDonnell, J. Sivarajun, D. Stiler, C. Won, C. Donham, A. Long, and M. Stewart. 1995. "State Health Expenditure Accounts: Building Blocks for State Health Spending Analysis." *Health Care Financing Review* 17 (1): 201–54.

Lipset, S. M. 1996. *American Exceptionalism: A Double Edged Sword.* New York: Norton.

Lomas, J., M. Rachlis, and S. Kumar. 1996. "Block Funding for Human Services in Prince Edward Island: A Case Study of an Incentive for Cross Sectoral Reallocations." Final Report to Health Canada, Ottawa, ON, March.

Marmot, M., H. Bosma, H. Hemmingway, E. Brunner, and S. Stansfield. 1997. "Contributions of Job Control and Other Risk Factors to Social Variations in Coronary Heart Disease Incidence." *Lancet* 350 (26 July): 235–39.

Marmot, M., M. Kogevinas, and M. Elston. 1987. "Social Economic Status and Disease." *Annual Review of Public Health* 8: 111–35.

McGinnis, J. M., and W. H. Foege. 1993. "Actual Causes of Death in the United States." *Journal of the American Medical Association* 270 (18): 2207–12.

McKeown, T. 1976. *The Role of Medicine.* London: Nuffield Provincial Hospital Trust.

McKinlay, J. B., S. McKinlay, and R. Beaglehole. 1989. "Review of the Evidence Concerning the Impact of Medical Measures on the Recent Morbidity and Mortality in the United States." *International Journal of Health Services* 19 (2): 181–208.

Murray, C. J. L. 1994. "Quantifying the Burden of Disease: The Technical Basis for Disability-Adjusted Life Years." *Bulletin of the World Health Organization* 72 (3): 429–45.

Newcomer, R., C. Harrington, and A. Friedlob. 1990. "Social Health Maintenance Organizations: Assessing Their Initial Experience." *Health Services Research* 25 (3): 425–54.

New York Times. "Black Americans Trailing Whites in Health," 16 January 1998. A16.

Olsen, J. A. 1994. "Persons vs. Years: Two Ways of Eliciting Implicit Weights." *Health Economics* 3 (1): 39–46.

Oregon Progress Board. 1994. *Oregon Benchmarks: Standards for Measuring Statewide Progress and Institutional Performance.* Portland: State of Oregon, December.

Palmer, H. 1995. "Securing Health Care Quality for Medicine." *Health Affairs* 14 (4): 89–100.

Pappas, G., S. Queens, M. Hadden, and others. 1993. "The Increasing Disparity in Mortality Between Socioeconomic Groups in the United States, 1960 and 1964." *The New England Journal of Medicine* 329 (2): 103–109.

Patrick, D., and P. Erickson. 1993. *Health Status and Health Policy: Allocating Resources to Health Care.* New York: Oxford University Press.

Putnam, R. D. 1993. "The Prosperous Community: Social Capital and Public Life." *The American Prospect* 13 (spring): 35–42.

Quebec Ministry of Health. 1989. *Orientations: Improving Health and Well Being in the Quebec Province.* Montreal: Quebec Ministry of Health.

Reiser, S. 1996. "Medicine and Public Health: Pursuing a Common Destiny." *Journal of the American Medical Association* 276 (17): 1429–30.

Robine, J. M. 1993. "Distinguishing Health Expectancies and Health Adjusted Life Expectancies from Quality Adjusted Life Years." *American Journal of Public Health* 83 (6): 797–98.

Robine, J. M., and K. Ritchie. 1991. "Healthy Life Expectancy: Evaluation of Global Indicator of Change in Population Health." *British Medical Journal* 302, no. 6774 (23 February): 457–60.

Roos, N. P., and E. Shapiro. 1995. "Health and Health Care: Experience with a Population-Based Health Information System. *Medical Care* 33 (12, Supplement).

Rosser, R. M., and P. Kind. 1978. "A Scale of Valuations of States of Illness: Is There a Social Consensus?" *International Journal of Epidemiology* 7 (4): 347–58.

Shortell, S., R. Gilles, D. Anderson, K. Erickson, and J. Mitchell. 1996. *Remaking Health Care in America.* San Francisco: Jossey Bass.

Shortell, S. 1992. "A Model for State Health Reform." *Health Affairs* 11 (spring): 108–27.

Singer, P., J. McKie, H. Kuhse, and J. Richardson. 1995. "Double Jeopardy and the Use of QALYs in Health Care Allocation." *Journal of Medical Ethics* 21 (3): 144–50.

Smith, Peter. 1995. "On the Unintended Consequences of Publishing Performance Data in the Public Sector." *International Journal of Public Administration* 18 (4): 277–310.

Sullivan, D. F. 1971. "A Single Index of Mortality and Morbidity." *HSMHA Reports* 86: 347–54.

Tarlov, A., J. Ware, S. Greenfield, E. Nelson, E. Perrin, and M. Zubkoff. 1989. "The Medical Outcomes Study: An Application of the Methods for Monitoring the Results of Medical Care." *Journal of the American Medical Association* 262 (7): 925–30.

Tengs, T., M. Adams, J. Pliskin, D. Safron, J. Siegel, M. Weinstein, and J. Graham. 1995. "Five Hundred Life-Saving Interventions and Their Cost Effectiveness." *Risk Analysis* 15 (3): 369–90.

Torrance, G. W. 1986. "Measurement of Health State Utilities for Economic Appraisal." *Journal of Health Economics* 5 (1): 1–30.

U.S. Department of Health and Human Services. 1991. *Healthy People 2000: National Health Promotion and Disease Prevention Objectives.* Pub. No. PHS 91-50212. Washington, DC: Government Printing Office.

———. 1996. *Health United States* 1995. Pub. No. 96-1232. Hyattsville, MD: USDHHS, May.

———. 1998. *Theory and Reality of Value-Based Purchasing: Lessons from the Pioneers.* Pub. No. AHCPR 98-0004, Rockville, MD: Agency for Health Care Policy and Research.

Weinstein, M., and W. Stason. 1977. "Foundations of Cost-Effectiveness Analysis for Health and Medical Practices." *The New England Journal of Medicine* 296 (13): 716–21.

Wilkinson, R. G. 1992. "Income Distribution and Life Expectancy." *British Medical Journal* 304, no. 6820 (11 November): 165–68.

———. 1995. "A Reply to Ken Judge: Mistaken Criticisms Ignore Overwhelming Evidence." *British Medical Journal* 311, no. 7015 (11 November): 1285–87.

Williams, A. 1974. " 'Need' as a Demand Concept (with Special Reference to Health)." In *Economic Policies and Social Goals*, edited by A. Culyer. London: Martin Robertson.

———. 1986. "Economics of Coronary Artery Bypass Grafting." *British Medical Journal* 291, no. 6491 (3 August): 326–29.

———. 1988. "Ethics and Efficiency in the Provision of Health Care." In *Philosophy and Medical Welfare*, edited by J. Bell and S. Mendus. pp. 111–26. Cambridge: Cambridge University Press.

———. 1992. "Cost-Effectiveness Analysis: Is It Ethical?" *Journal of Medical Ethics* 18 (1): 7–11.

Wistow, G. 1995. "Paying for Long-Term Care: The Shifting Boundary Between Health and Social Care." *Community Care Management and Planning* 3 (3): 81–88.

Wolfson, M. 1994. "Social Proprioception: Measurement, Data, and Information from a Population Health Perspective." In *Why Are Some People Healthy and Others Not? The Determinants of Health of Populations*, edited by R. Evans, M. Barer, and T. Marmor. Ch. 11, pp. 287–316. New York: Aldine De Gruyter.

Zweifel, P., and F. Breyer. 1997. *Health Economics*. New York: Oxford. Ch. 4.