MAXIMIZING HEALTH IMPACT THROUGH RESOURCE ALLOCATION

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Keywords: Gross national product, life expectancy, infant mortality, efficiency, managed care plans, holistic paradigm, surveillance report, burden-of-illness, production function, population genetics, time and travel costs, societal perspective, moral hazard problem, equity, externality, merit goods, market imperfections, preventive health care.

Contents

Summary

The twentieth century saw remarkable progress in global health care but important challenges remain to be addressed. Health care choices, however, are increasingly being constrained by harsh budgetary realities everywhere. This paper discusses the issues involving allocation of resources to maximize health impact. The problem of conceptualizing health is considered first, followed by a discussion of whose health is being measured. The different dimensions of health resources are then described and the optimum decision rules commonly used in health care resource allocation presented. The health impact of new medical technology is analyzed and the reasons for the inefficiency of market guided resource allocation are explained. The final section describes the role of government insurance in improving health care accessibility and of

public health programs in providing and promoting preventive health services and health education. The paper concludes by highlighting the need for public-private cooperation in resource allocation to address community health problems and recommends collaborative efforts by nations to tackle the global health problems arising from the new and emerging infectious diseases.

1. Introduction

The United States spent approximately 4000 U.S. dollars per capita on health care in 1997—more than the per capita gross national product (GNP) of 119 low-income and lower middle-income countries of the world in 1998, as cited in the *World Development Report, 1999/2000*. Ironically, three of the four most populated countries of the world—China, India, and Indonesia—are low-income countries with a per capita GNP of $760 or less. The United States, which has the world's third largest population, spends more on health care than any other nation, in terms of total and per capita health expenditure. Even so, on such important measures as life expectancy and infant mortality, the U.S. lags behind many other industrialized nations, which calls into question the comparative returns from its health care investment. The problem of how best to utilize limited resources to generate maximum health benefits did not enthrall health and medical care providers in the United States until recently. Economic considerations were often considered extraneous, irrelevant, and even unethical by physicians willing to do anything possible to benefit their patients.

Two major factors that have contributed to the reversal in this attitude are the fear about the explosive health care costs that U.S. experienced during the decade of the eighties and the broad recognition of society's inability to afford for all persons the full range of choices made possible by improvements in medical technology. In addition, practices and tools from corporate America are increasingly being applied to the health care sector, and a growing number of stakeholders interested in profits are seeking more accountability and efficiency in spending health care resources. Managed care plans with capitated payments are now familiar in the U.S. health sector. Their cost cutting strategies are often aimed at limiting hospital length of stay, requiring prior authorization for emergency room and specialty care, and restricting the provision of durable medical equipment. Although oversight by third-party payers and physicians' corresponding loss of control over their patients' care have raised much outcry among the public, managed care practice patterns continue to affect slowly and gradually the behavior of fee-for-service medical care providers.

For the less affluent countries of the world, the resource crunch has always been a stark reality for any kind of spending. Health care takes a back seat to poverty in many developing countries. Poverty eradication measures that accompany access to better education, clean air and water, sewage and refuse disposal, nutrition, and safer living conditions could result in much better quantity and quality of life for the vast majority of the poor who live in these countries. It is important in this context to isolate particular sets of goods and services that are known to affect the health status of individual people in different nations and restrict attention to the activities associated with their production and consumption. Despite national disparities in health outcomes, the twentieth century saw remarkable global progress on the health front. *The 1999 World*

Health Report cites Chile as an example of the magnitude of transformation in human health. Chilean women today have a life expectancy of 79 years—46 years more than in the early 1900s. Average life expectancy at birth has increased in most nations. Smallpox has been eradicated and there have been unparalleled declines in infant and maternal mortality rates.

Although much progress has been made, challenges remain. New diseases have emerged and old diseases, such as tuberculosis and malaria, thought to have been under control, have resurfaced. Acquired Immunodeficiency Syndrome (AIDS) is taking a heavy toll in many nations and in some southern African countries, AIDS has cut life expectancy by as much as 10 to 15 years, according to World Health Organization (WHO) estimates. Since its emergence, AIDS has orphaned millions of children worldwide and exacerbated their poverty. Such great health challenges in an era of budgetary constraints on the funding and delivery of health care have renewed interest in the optimum allocation of available health care resources.

This paper attempts to identify some important considerations facing decision-makers in the efficient use of health care resources. The discussion is mainly focused toward market-dominated industrialized countries where inefficient resource use in health care is primarily blamed on market imperfections or market failures. For many less-developed countries, organized market structures may be difficult to find in health care and other sectors. Inefficiencies in resource allocation in these economies may be related to the greater incidence of both missing and malfunctioning markets.

The paper is organized into the following sections. Section 2 discusses the difficulties of conceptualizing health. The different approaches to viewing health are then considered in Section 3. Section 4 describes the various dimensions of resources. The decision rules commonly used to optimize allocation of resources in the health care area are discussed in section 5. Section 6 analyzes the health impact of medical technologies. Section 7 explains why market guided resource allocation in the health care sector may not result in efficiency. A rationale for the importance of government insurance and public health programs in improving aggregate health is presented in section 8. The final section presents conclusions.

2. Definitions and Models of Health

To maximize positive health outcomes through resource allocation, we must first define "health" and the means to measure it. Because there are many ways to define health, the challenge becomes choosing the best definition and measurement of health. The constitution of WHO defines health as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The association between physical health and mental and social well-being has been well recognized; however, the impact of mental ill health and societal alienation on the physical well-being of individual people and nations has received relatively little attention. Since medicine usually approaches health through pathology, the social health concept of the WHO definition is much less understood than is physical or mental health. Social health of the individual is defined by how the individual adjusts to social institutions and societal mores and how the society reacts to such adjustments. Any kind of divisive tension in a

society that works against inclusion of specific individuals or groups can cause ill health, disease, and death.

Although the WHO definition of health has been dubbed "unrealistic," measures of health and disease are being reviewed more frequently in terms of its holistic paradigms, which endeavor to include all aspects of health, functioning, and well-being.

Larson presents three other major models of conceptualizing health: the medical model, the wellness model, and the environmental model. The medical model, the most traditional of the three, defines health as the absence of disease, ill health, and disability. This is the basis of much medical care research, which seeks an understanding of a disease's etiology to provide medical relief for "dis-ease"—the discomfiture from illness. This model is also most relevant to medical service spending. The wellness model, which focuses on the linkage between mind and body, recognizes the importance of factors outside medical treatment, such as healthy habits, personal feelings about energy and comfort, and spiritual involvement, as significant health promoters. In the environmental model, health and life are observed largely as a matter of people's adaptation to the environment. Examples of incomplete adaptation that cause ill health include not only physical diseases such as asthma and allergy but also mental diseases such as depression, schizophrenia, and anxiety disorder. These alternative models of health measurement also have their own drawbacks, and the last two models in particular share some of the utopian holistic criteria of which the WHO definition has been accused.

Using the general definition of health as the presence or absence of disease, researchers can determine people's health status through data from self-reports, medical records, and direct observation. The National Health Interview Survey (NHIS) and the Behavioral Risk Factor Surveillance System Survey (BRFSS) are two major U.S. national surveys that gather information about the health status of civilian noninstitutionalized populations from self-reported data. Although the reliability of self-reported data is often questioned, self-reports of health have been shown to correlate highly with mortality. There can be problems with measuring health through medical reports and direct observation as well because of variations in medical practice and diagnostic labeling across geographic areas. Cross-validation of data from reports using different methods has been suggested as a means of ensuring reliability of findings about health status.

Many developed countries maintain national disease registries for assessing disease-specific incidence and mortality rates. Such information provides invaluable help in preparing national health reports. Epidemiologic data from surveillance reports are often combined with economic cost information to produce burden-of-illness estimates for specific diseases, which are then used in setting priorities for health care spending.

Most less developed countries, however, lack a public health information system that can adequately track disease. For example, even the population denominator needed to calculate incidence and prevalence of diseases cannot be realistically specified, and vital statistics such as birth and death rates are seldom recorded in Sub-Saharan Africa outside of South Africa. In areas that do not have a functional health infrastructure and

where most people do not have access to medical care, health statistics are frequently unreliable, and health care resource allocations usually follow an ad hoc formula or are guided by emergency requirements.

2.1 The Economic Model of Health

Economists often visualize health in the framework of a production function where a person's current health is a function of his or her past health, environment, medical care received, personal health behaviors, and other factors. Health care resources and chosen behavior are seen as investments that augment the "stock" of health. Health care per se may not be very valuable; rather, it is demanded mainly because of its expected contribution to an individual's health status. The direct effects of most health care (e.g. treatment received during hospital stays, vaccination, dentistry, chemotherapy) are often painful for recipients, and few would want to purchase these services in the absence of any expected health benefit. Because the level of satisfaction derived from acquiring goods and services other than health care is very much dependent on health status, in the absence of good health consumers feel a greater urgency to spend limited budgets on health care versus other consumer goods. Good health is also instrumental in making possible a longer working life, with a concomitant increase in the earning power of an individual.

Numerous studies have shown the positive correlation between income or wealth and individual health status, but the complexity of the causal relationship is increasingly being recognized in current research.

Production of health at a broader level involves many of the same variables that affect individual health production. Problems appear, however, when a few members are asked to make resource allocation decisions that affect the health of all members in a group. The task of defining "aggregate health" becomes a formidable challenge to these decision-makers because of the complexities associated with appropriately valuing and comparing the health of different persons in the group.

3. Global, National, and Personal Approaches to Health

When considering the health impact of resource allocation, the next question must be about the level of disaggregation to maximize this impact. Should we take a broad macroeconomic approach to health, such as looking at health at the global or national level, or should we limit our attention to personal health of individuals? Ideally, it is better to include a global component in assessments of health impact, although the overwhelming concern of decision-makers at a narrow level involves the health of population directly falling under their jurisdiction.

Economists often make a distinction between a natural and an efficient unit of labor. A worker who is twice as productive as another worker will be valued as two workers in an efficiency unit. If the same logic is applied to the health sector, the value of a human life in a developed country could be given more weight than that in less developed countries. Consideration of allocating resources to maximize global health impact must raise ethical and political questions beyond economics. Yet, because the world has

become more interactive and interdependent due to the ease of international trade and travel restrictions, the transnational transfer of health risks poses a real danger to nations' health. For example, since 1995, nearly half of all measles cases reported in the United States have been introduced from other countries, and the mosquito vector for diseases such as viral encephalitis and dengue have recently been introduced to the United States through tires imported from Asia. Imports of food products from other countries may pose a serious health threat to nations because of food-borne illnesses associated with microbial pathogens. The ease and frequency of global travel have also increased the worldwide risk for the spread of (HIV)/AIDS. Because of the increased interdependence of health across nations, it is impossible to remain indifferent to the health problems that afflict the vast majority of people in the world.

Even if we discount a philanthropic attitude toward the health of global neighbors and adopt a more limited national approach towards health care, there are questions regarding how age, gender, race, education, income, and other factors should be weighed in determining an aggregate health index for a country. Controversies exist not only about the appropriate health weights to be accorded these individual categories but also about whether such distinctions ought to be allowed in the first place.

3.1. Age-Based Health Weight

The age distribution of the beneficiaries is often a focal issue in the prioritization of health care spending. At the population level, omission of age as an analytic variable may seriously impair the effectiveness of resource allocation. For example, when data from clinical trials based on younger people are inappropriately extrapolated to the whole population, the attractiveness of medical interventions in terms of life years saved may be substantially overestimated.

For most developed countries, a higher life expectancy and lower fertility rates are resulting in an aging population. The United Nations (U.N.) proclaimed 1999 as the International Year of Older Persons. In 1998, 12.7% of the U.S. population was elderly (aged 65 years and older), and it is estimated that this will increase to 20% by 2030.

It is assumed that as populations age, there will be more chronic health problems such as heart disease, cancer, stroke, Alzheimer's disease, and arthritis. In general, older people use health care more than younger people, and a considerable proportion of health care costs are incurred in the last year of life. For example, each year 27% to 30% of U.S. Medicare payments to the elderly are made for the 5% to 6% of Medicare beneficiaries who die in that year. The elderly also account for most of the expenditures made in the Medicaid public insurance program for the poor. Although poor families with children account for 72% of Medicaid recipients, they are responsible for only 29% of Medicaid expenditures; 59% of Medicaid expenditures are incurred for rendering services to the elderly and the disabled.

Assuming that rationing of health care resources does give the maximum value to the dollar, and given the statistics just presented, should we treat the health of the young and the elderly alike? Should childhood diseases such as measles and malnutrition be given higher priority than cardiovascular disease and tuberculosis, which mainly affect

adults? If we consider age-specific life expectancy, adults in the upper age brackets are likely to be given short shrift. On the other hand, investment in this age group may appear more productive in terms of immediate economic returns, thereby compounding the difficulty of valuing age.

Given society's scarce health resources, it may be less meaningful to add a few years of life to a very old and infirm person. However, the medical futility of some end-of-life care has not swayed patients and their relatives from seeking such care in private markets even when the national health service systems such as that in Britain have explicitly considered lowering the priority for treating the terminally ill. Public opinion in the United States is believed to mostly accept the withholding of life-prolonging medical care from some critically ill older patients though few will support categorical withholding of such care on the basis of age alone.

3.2. Gender-Based Health Weight

In low income countries, particularly in Asia and Africa, the gender discrimination in food consumption and schooling that begins in early childhood partly explain the relatively poorer health and education levels of mothers there. The labor market earnings of male children are expected to be higher than those of female children, and girls may cost the family more in terms of having to pay a marriage dowry. The general resource allocation question then is whether all children should receive the same share of total resources or whether more should be provided to those who started with smaller initial endowments (compensatory distribution) or more be offered to children who show the best prospects of gaining the most from such allocation (reinforcing distribution).

The distinct gender inequities in access and control of resources in these countries resulted in women being less capable of making independent decisions on sexual and reproductive health and engaging in health-seeking behaviors. Family planning programs and extra funding for women's reproductive health and education may not only reduce maternal mortality and morbidity but also be instrumental in helping reduce the infant mortality rate. Decreasing the fertility rate could contribute to reductions in infant mortality because more attention could be paid and more resources provided to the children who are born, and the nutritional status of mother and children may be better in a smaller family. Societies accustomed to according women a lower status ought to consider ways to advance women's health issues. Still, calculation of how to weight gender for allocation of health resources in these countries is a difficult task.

3.3. Health-Weight for Races

Black–White differences in health status and the excess burden of mortality and morbidity for the African American population in the United States have been widely documented. In many other developed countries, the prevalence of ill health is higher among ethnic minorities. Research in population genetics has shown some differences in gene frequencies, as evidenced by specific polymorphic markers restricted to populations of common ancestry. But it has been pointed out that there is no scientific basis for human race taxonomy and that the disparities in health status and outcomes

between racial and ethnic groups are mostly due to socioeconomic differences rather than biological factors. For example, a disproportionate number of Black women in the United States are diagnosed with advanced breast cancer, and it is believed that detection at such a late stage is the result of inadequate access by minorities to mammography screenings that might have detected the cancer at an earlier stage. Even if minorities have full insurance coverage, it is possible that physicians might be biased against recommending costly medical procedures for them. Consequently, much of the public health efforts in the United States have targeted minority groups so as to bridge the gap in health care across races.

Health care resource allocation to serve the majority may not consider the unequal burden of disease within a diverse population. For example, most managed care organizations in the United States attempt to constrain costs because of the belief that there is much unnecessary care and people tend to overutilize medical resources when their out-of-pocket costs are low. For many racial and ethnic groups, however, there may have been consistent underutilization of medical resources in the past, and more health care may need to be allocated to them now to redress the imbalance.

At the extreme, each individual's health may be viewed as unique. The task of properly balancing different factors to derive a workable concept of aggregate health is indeed very complex. Stakeholders who set the priorities at different levels handle the operational aspect of this problem. At the international level, the main actors responsible for decision making include the World Bank, WHO, and UNICEF (United Nations Children's Fund). Donor agencies may push their own agendas, which may affect developed and developing countries differently. For example, Eastern Europe and Africa may get special attention because of their relatively higher burden of specific diseases.

The ubiquitous problem of poverty cuts across age, gender, and race in many of the poor, less developed countries. Although income-based health weights that accord more importance to the health of the wealthy people were never explicitly considered in health resource allocation, an efficiency criterion based on market-based prices would implicitly introduce such weighting when the prevailing income distribution is extremely skewed. Recent governmental efforts to improve aggregate health have, therefore, actively targeted income redistribution and poverty amelioration programs in many countries.

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Biographical Sketch

Sajal Chattopadhyay is a senior service fellow at the Division of Cancer Prevention and Control at CDC. His area of specialization is health economics. He has worked on a wide range of topics in this area including economics of nursing home care in Connecticut, determinants of health expenditures in the U.S., and sources of health insurance in the U.S. and their implications for public health programs. He has previously published in the *Journal of Public Health Management and Practice*, *Health Economics*, *Eastern Economic Journal*, and *Journal of Real Estate Finance and Economics*. Currently, he is working on the economic issues related to cancer prevention and control in the U.S. Examples of his recent work include the cost effectiveness of new pap screening technologies, direct costs of treatment for nonmelanoma skin cancer, and economic barriers to preventive cancer screenings, besides cost and efficiency analyses of the National Breast and Cervical Cancer Early Detection Program. Prior to joining CDC, the author served as a faculty at the Department of Economics, University of Connecticut.