

On the Preservation of Health

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HEALTH IS INTRINSICALLY UNSTABLE AND IS SUBJECT to erosive forces across the life trajectory, from intrauterine life to old age. As a result, few individuals achieve idealized versions of the lifespan (ie, good health and functional status into very advanced years, with compression of morbidity toward the end of life).¹

Each person may be thought of as having, at birth, a certain quantum of health expectancy, determined by the characteristics of the individual genome and the biological quality of the intrauterine environment in which the fetus has developed. The quantum is affected over time as the biological, psychosocial, and behavioral characteristics of the individual interact with environmental, socioeconomic, and educational factors, and with the amount and quality of the health care received over the life course.

Programs aimed at reduction of risk through health promotion at the individual or population level have been effective to some degree, but such efforts are frequently post hoc in nature, addressing secondary or tertiary prevention needs. In addition, these efforts are disarticulated across the lifespan, with childhood and adolescent clinical and public health interventions discontinuous from those in the adult years. Furthermore, the latter often focus on behavioral and environmental health risks only after they have been unaddressed for long periods, with incipient, clinically silent disease already established. In fact, risk exposures tend to increase in number, chronicity, and cumulative importance over the life trajectory, resulting in gradual erosion of health status and of future health prospects.

A more consistent effort organized around health preservation as a framing paradigm, instituted early in life, and addressed to mitigating risk factors through a more syncytial and coherent life course approach is suggested by a number of factors. First, health risks are present throughout the life course and vary in nature over time, from intrauterine life to old age. Second, many clinical disorders that manifest in adult life represent late stages of long-standing occult disease, suggesting that earlier, even lifelong, application of preventive or moderating efforts might be more effective. Third, increasing evidence suggests that important causes of morbidity in adult life have their origins very early and, in some instances, may be to a significant degree

determined before birth or neonatally.² Fourth, health-related behaviors are acquired in more or less staccato fashion over the lifespan, and once-acquired, health-adverse behaviors are often difficult to disestablish, such as eating and physical activity patterns acquired in childhood, initiation of tobacco use, or exposure to illicit drugs in adolescence.

Despite an increase in life expectancy at birth of approximately 30 years during the past century in the United States,³ most individuals are subject to gradual impairment of health. These impairments often become overt in the middle years of life; chronic diseases are the most common proximate causes. With advancing age, the occurrence and continuation of chronic disease is common; 80% of community-dwelling US individuals older than 65 years have at least 1 identified chronic disease and 48% have 3 or more chronic diseases.⁴ The disorders that represent the chief causes of death largely reflect longstanding risk factors and many are characterized by long clinical latency and progress silently often for years before becoming clinically apparent. To a considerable extent, these disorders reflect the effect of health-adverse personal behaviors that are responsible for an estimated 40% of deaths in the United States.^{5,6}

The health effects of many of the major risk factors are avoidable or reversible to substantial degrees. Realization of the targets established in the most recent *Healthy People 2010* report⁷ is estimated to potentially increase healthy life expectancy by 5.8 to 8.1 years.⁸ Studies among the Seventh Day Adventist population have suggested that optimal health-related personal behaviors could add 10 years to average life expectancy.⁹ Other studies indicate sharp reductions in health risk with cessation of smoking and with the adoption of regular exercise patterns, even in old age.¹⁰ Appropriate clinical interventions in disease management have also been associated with improved health outcomes, such as myocardial infarction, depression, low birth weight, cataracts, and breast cancer.¹¹ Mitigation of social and economic factors that adversely impact health presents a more complex set of issues. Many of these factors are related to public policy, such as the availability of adequate housing, the nature and comprehensiveness of health insurance programs, remediation of toxic environments, and efforts to reduce poverty and thereby its health impacts.

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Patterns of health erosion are not evenly distributed in the US population. Sharp disparities in life expectancy and in health across the life trajectory characterize racial and ethnic minorities in the United States, as well as those who are socioeconomically disadvantaged, groups that overlap substantially. For example, black individuals in the United States have higher rates of obesity, diabetes mellitus, and hypertension,^{3,12,13} higher death rates from cancer,¹⁴ and shorter life expectancy than white individuals (72.3 vs 77.7 years in 2000).³ Furthermore, a number of important behavioral and environmental risk factors disproportionately affect disadvantaged subsets of the population, such as unhealthy diets, substance abuse, and health-adverse environments.^{15,16}

The potential utility of a life course approach to protection of the health quantum is suggested by overall risk tending to build by accretion rather than substitution. Risks incurred even very early may have serious health effects that appear only much later. For example, small body size at birth, a marker of an adverse intrauterine environment, has emerged as a putative risk factor for death from cardiovascular disease in adult life in men and for all-cause mortality in women.¹⁷ Infant growth rates substantially below normal and small body size at age 1 year may predict coronary heart disease in adult life even more strongly than low birth weight.¹⁸ The development of the metabolic syndrome in late life has been associated with low rates of fetal and infant growth.¹⁹ Other studies have suggested that early postnatal growth acceleration, particularly in the first 2 weeks of life, may program later cardiovascular risk, insulin resistance, and obesity.²

The emergence of indicators of important chronic disease in childhood is indicated by a number of studies. Fatty streaks and fibrous plaques have been identified in the aortas and coronary arteries of children and young adults.²⁰ Coronary artery disease has been documented in young US combat fatalities in Korea and Vietnam.^{21,22} In the Bogalusa Heart Study,²³ such lesions not only appeared early but increased significantly as children aged and were related to the number of risk factors present, including obesity, high systolic blood pressure, serum triglyceride concentration, and low-density lipoprotein levels. These risk factors tended to cluster in individuals and, importantly, to persist into adulthood. Such studies suggest that heart disease prevention should begin in childhood²⁴ and should include efforts in health education, with special attention to diet and exercise patterns.

Additional risk factors and clinically apparent morbidities emerge in adolescence and youth, including initiation of tobacco use, exposure to sexually transmitted diseases including human immunodeficiency virus (HIV), and initiation of substance abuse with associated risks of transmission of HIV and hepatitis C. These risks are added to patterns of poor nutrition and inadequate exercise that often persist from childhood, with resultant obesity and associated type 2 diabetes mellitus. Violence is an additional risk at this time

of life, especially for disadvantaged youth, as is suicide, linked largely to situational pressures and depression.²⁵

In adult life, the primary health erosive forces are often superimposed on preexisting and ongoing risk factors and include the emergence of important silent or symptomatic disease, particularly cancer, ischemic heart disease, hypertension, diabetes mellitus, and glaucoma. In older age groups, erosion of health accelerates as multiple diseases reach clinical expression, as exposures to adverse social circumstances are added, including narrowing of social networks, and as chronic feelings of stress, depression, and loss of autonomy further compromise well-being and functionality.²⁶ In addition, opportunities and capacity for physical activity decrease due to social isolation, physical limitations, and inadequate opportunities in the environment for walking or other forms of exercise.

The health preservation perspective implies the application of risk mitigation, screening, and remediation over the life course in a manner that engages the individual and his or her clinical caregivers, as well as the public health and policy enterprises. Attention to environmental risks, prevention programs related to drug use, needle exchange programs, and extensive efforts in health education in schools are examples of public health elements that should be to a greater extent interlaced with those of the clinical community. Substantial federal investment in the electronic medical record would help with the important business of linking the efforts of clinical and public health communities. Socioeconomically linked differentials in health and life expectancy indicate the need for public policies that more effectively address problems in access to health care, especially for the uninsured, as well as programs designed specifically to clarify and address the causes and consequences of health disparities affecting racial and ethnic minorities. For example, reducing the risk of low birth weight requires maternal awareness of health needs in pregnancy and enhanced access to adequate prenatal care, including for disadvantaged women overcoming barriers posed by the Medicaid enrollment process or eligibility issues.

The health preservation paradigm emphasizes the chronicity of risks to health, the importance of ongoing interventions attuned to varying health pressures as they emerge over the life trajectory, and the need for more closely articulated preventive, clinical, public health, and policy programs. Through development of a more coherent view of health under chronic pressure, it may be possible to construct a sense of increasing alliance among the various elements of the health equation, and also to form a sense of partnership between the individual and his or her health.

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