



Addressing Chronic Disease A White Paper for the Mailman School of Public Health

Introduction

The emergence of chronic disease in recent decades as the leading challenge facing the public health enterprise has been reflected in research and teaching activities throughout the Mailman School. More broadly, the increasing hyperendemicity of chronic disease and the continuing development of new knowledge of the pathogenesis, epidemiology, and malleability of these disorders have made interventions at both the individual and population levels increasingly urgent, feasible and effective. These features have also raised the collective profile of chronic diseases in the clinical community and on the agendas of Congress, US health agencies, the UN and many developing countries^{1,2}. These trends have been recognized at the Mailman School in the scholarly activities of the Departments and faculty as noted above, and our Task Force on non-communicable diseases has recommended that our efforts would benefit from a more robust and coordinated School-wide program focused on reduction of chronic disease incidence and prevalence. The Dean has made this a priority area, consonant with the School strategic plan of 2009, and recent conversations with a number of faculty have revealed agreement with the timeliness of a more vigorous, deliberately collaborative and interdisciplinary chronic disease program in the School.

Present contours and trends in chronic disease

Whether ranked by causes of death, DALYs lost, hospitalizations or costs, chronic diseases dominate the challenges facing the health systems of high-income and increasingly of low-income nations as well^{3,4}. A small cluster of categories, namely heart disease, cancer, stroke, diabetes mellitus and obstructive lung disease, account for the bulk of the problem as assessed by standard measures, especially mortality; these have important commonalities in fundamental causes, demographic distribution, risk factors⁵, lengthy presymptomatic progression, clinical course and, increasingly, because of the important causative roles of personal health-related behaviors, the need for engagement of the affected or potentially affected individual in prevention efforts. The dementias are also major causes of morbidity. Although the current knowledge base does not allow effective primary prevention, recent studies have pointed to a role for pharmacologic and behavioral interventions in slowing or preventing cognitive decline,⁶ and coexistent cerebral vascular disease has emerged as an important factor in the pathogenesis of Alzheimer dementia.^{7,8} Further development of a research/information base pointing to substantial opportunities for preventive interventions, including additional clarification of risk factors and, for most, markers of early disease or significant predisposing abnormalities, will suggest opportunities for interventions at early stages in the pathogenesis of dementing disease.

With regard to heart disease, cancer, stroke, diabetes and chronic obstructive lung disease, the gross characteristics noted above obscure more granular changes that have import for our understanding of pathogenesis and potential modes of intervention, such as the rapid changes in chronic disease patterns within nosologic categories that have become obvious in recent years and have both broadened perspectives in chronic disease dynamics and raised new research questions. Examples include the striking progressive shift over the past 50 years or so from valvular to coronary artery to myocardial disease with congestive heart failure as leading subsets of heart disease^{9,10}, or, similarly, the change in the nature of stroke, which has moved strikingly from hemorrhagic to embolic¹¹ as effective management of hypertension has become possible. In analogous fashion, the pattern of type 2 diabetes mellitus has moved to progressively younger segments of the population in association with rising trends in the prevalence and distribution of obesity, while new data indicate high rates of hyperglycemia in non-diabetic and non-obese old-old women¹². In the case of malignant disease, and at perhaps more fundamental levels, colon cancer has in recent years shown a tendency to migrate proximally in the colon¹³; the prevalence of gastric cancer has declined progressively for several decades; and multiple associations between infection and cancer have been identified. Such shifts clearly reflect multiple forces, and indicate the need for a more dynamic view of chronic disease biology, as well as environmental and individual factors in chronic disease patterns, and suggest new opportunities for the formulation of research questions and potential interventions.

Life course considerations and the biology of chronic disease

The growing awareness of the necessity of a life course approach to health preservation and health promotion has particular bearing on our approach to chronic disease¹⁴. Examples such as the association between low birth weight and childhood¹⁵, adolescent, and adult obesity as well as adult cardiovascular disease¹⁶ and diabetes;¹⁷ the importance of age-appropriate screening for precursors of important chronic diseases; and the need for interventions keyed to risk factor exposures, including critical points in the life cycle from intrauterine life to old age and that extend over multiple life eras, all point to the importance of developing collaborative systems focused especially on mitigation of risk factor exposures and also the detection of incipient or early disease in the interest of secondary or even primary prevention.

The sources of chronic diseases lie ultimately in a complex of demographic, socioeconomic, geographic, environmental, psychological and political forces; their more immediate biologic origins and progression reflect a different but linked set of determinants and pathways that are expressed in individuals but unevenly distributed in populations. Studies in recent years have made clear the importance of framing many of these issues in pathogenesis from an intergenerational^{18,19}, and life course perspective and of considering the (often long) delayed impacts of early adverse exposures or events as well as the additive effects of multiple risk factors appearing in asynchronous fashion over long time frames. An additional life course perspective is lent by the long presymptomatic progression typical of chronic diseases, often lasting decades after the initial pathogenic events. For example, atherosclerosis, often advanced, has been found in asymptomatic, presumably healthy young American combat casualties in Korea and Vietnam²⁰, and precursor atherosclerotic lesions have been found in the coronary and carotid arteries and aortas of children in the Bogalusa Heart Study²¹. Similarly, studies of

carcinogenesis have shown that the clinically silent interval from initial mutational changes to precancerous lesions and then to frank malignant change is often to be measured in decades. Chronic obstructive lung disease follows analogous time lines. These characteristics indicate the need for interventions to be keyed to an important degree to disease biology and to the earliest germane biological events and to be maintained over time.

Malleability of chronic disease

Multiple lines of evidence have shown that, contrary to earlier thought, chronic diseases are not inevitable or immutable once established, but that incidence, prevalence and progression are susceptible to interventions at critical points and at multiple levels. The availability of effective control of elevated blood pressure, for example, has reduced the incidence of stroke, especially the hemorrhagic variety, and policy interventions bearing on smoking, together with effective clinical management, including long-term treatment of abnormalities of plasma lipid concentrations and other risk factors, have reduced the incidence and mortality rates of acute myocardial infarction and other outcomes closely related to atherosclerosis and smoking. Similarly, widespread screening has begun to affect the prevalence of colon cancer through resection of precancerous polyps, and the association of diabetes with obesity has pointed toward the possibility of blunting or even ultimately reversing rising rates of type 2 diabetes in young people. Many other examples of secondary or even primary prevention of chronic disease could be cited. These disorders are vulnerable to interventions, and development of more effective next generation preventive strategies should be a high priority for academic public health as well as the clinical community.

Health Preservation and Prevention

Disease prevention has been pursued for millennia, with increasing effectiveness, particularly with regard to infectious disease, in the past hundred years or so. The concept of prevention that has emerged from that background has reflected its infectious disease-specific origins, i.e. has focused on unitary causes, has capitalized on immune mechanisms of the host or on vectors or vehicles of infection, and has not generally required active measures by the individual at risk. Further, acute infections are stochastic, reflecting the accidental meeting of infectious agent and host. Each of these characteristics, however, fits poorly with those of chronic diseases, which are ubiquitous rather than stochastic, based in genomic and environmental risk factors, often multiple, rather than unitary causes, progress during lengthy, clinically silent phases²² that often last years or even decades, are often tightly bound to individual behaviors, and in most instances require involvement of the at-risk individual to reduce the likelihood of significant disease, in addition to environmental and community interventions.

These features suggest that, with regard to chronic disease, a framework centered on health preservation would be a useful extension of the prevention paradigm²³. In this formulation, health preservation is a framework for organizing preventive efforts oriented to specific diseases, risk factors or exposures by joining them to a life course perspective. Health prospects and health itself are seen as subject to irregular but progressive erosion over the life course as risk factors appear and affect health in the near term (e.g. low birth weight and neonatal disease or childhood obesity) or in the intermediate

or long term future (e.g. low birth weight and adolescent obesity and diabetes or low birth weight and the metabolic syndrome in the adult years). In addition, since chronic diseases in general not only do not have unitary causes, but to an important degree result from the combined effects of multiple risk factors and often have risk factors in common, the health preservation formulation may offer opportunities to frame research questions and interventions from novel perspectives. Finally, it is sometimes inappropriate to speak of prevention of chronic diseases; while true primary prevention is possible in some instances through population-based approaches (fluoridation of water supplies, deterrence of smoking through taxation) or may be approached by clinical interventions (colon polyp resection in prevention of colon cancer, effective management of hypertension, i.e. secondary prevention), risk mitigation and lengthening of the subclinical course of ongoing disease by slowing of pathogenesis are often the most realistic goals in light of present knowledge.

This argument suggests that the time is ripe for a reframing of our public health approach to chronic diseases. Once we settle on the central import of health preservation over the life course, three key observations emerge. First, an approach to health preservation must, of necessity, be concerned with where we can intervene to mitigate maximally the consequences of early life exposures. This suggests interventions early in the life course, and early and sustained interventions in the trajectory of risk behaviors and diseases in populations. Both of these efforts stand to shift the curves of diseases in populations effectively and efficiently, maximizing the impact of public health efforts. Second, a focus on health preservation also moves us away from a disease-centered approach to one that is concerned with identifying foundational risk factors and mechanisms that are common across a range of chronic non-communicable diseases²⁴. Third, a shift toward health preservation inevitably suggests a focus on healthier aging, and an opportunity to maximize health and well being into the latter years of the lifespan, potentially coincident with the clinical manifestation of some chronic diseases, but aimed to mitigate their impact on function and on compression of morbidity.

Why now? What next? What goals?

Addressing chronic disease challenges at the Mailman School of Public Health in light of new knowledge of the complexity of multilevel forces driving pathogenesis, should be characterized by highly intersectoral, interdisciplinary, collaborative, expanding scholarship.

Scholarship and the production of new professionals are the primary products of academic institutions. Ernest Boyer, former president of the Carnegie Foundation for the Advancement of Teaching, has eloquently laid out four basic varieties of scholarship²⁵:

Scholarship of discovery – encompassing traditional research activities. Boyer notes, “the scholarship of discovery at its best contributes not only to the stock of human knowledge but also to the intellectual climate of a college or university,” that is, to a heightened atmosphere of inquiry and innovation that generates and supports intellectual energy.

Scholarship of integration – locating and connecting new knowledge in existing frameworks, or, as Boyer adds, “making connections across the disciplines, placing the specialties in larger context, illuminating data in a revealing way, and often educating non-specialists too.”

Scholarship of application – applying knowledge in innovative programs that promote the emergence of new understanding flowing from the act of application, and that facilitate moving toward engagement, the responsible application of knowledge to consequential problems, particularly the needs of the larger world. This speaks to the larger societal responsibilities of the health professions, to public health or medicine as aspects of citizenship.

Scholarship of teaching – transmitting as a scholarly act the capacity for learning. Boyer says, “The work of the professor becomes consequential only as it is understood by others.....when defined as scholarship, teaching both educates and entices future scholars. It means not only transmitting knowledge, but transforming and extending it as well.” Teaching, according to Aristotle, is the highest form of understanding. Boyer says, “inspired teaching keeps the flame of scholarship alive.”

Importantly, these constructs help to modify the particular identification of scholarship with research that has been dominant in recent years and formulating scholarship in this way may help in visualizing new kinds of collaborative efforts and opportunities for work around chronic disease prevention.

Collaboration has been a characteristic of public health scholarship, especially in research, for many years. The rising rates of non-communicable diseases globally, the characteristics of chronic disease in terms of multiple fundamental as well as derivative causes, the necessity of multilevel interventions, and the increasing importance of new communication technologies, of advances in social marketing, of engagement of both the individual and the community at risk, of the corporate community, municipal and national government and NGOs, necessitate innovative thinking inside the public health enterprise itself. The addition of new knowledge of chronic disease pathogenesis and course, shared risk factors and newly effective capacities of the clinical enterprise to modify risk as well as the course of chronic diseases offer opportunities to find synergies that would lever the capacities of both in reduction of chronic disease incidence and prevalence. The dimensions of the chronic disease problem are such that creating new and effective partnerships will be essential if we are to capitalize on new knowledge and formulations of disease dynamics and vulnerabilities at population as well as individual scales. In addition, the highly focused nature of funding streams in research and program support will push us to conceptualize new kinds of partnerships and research structures. These innovations will have to extend widely within the University as well as outside it.

Where then should we go as a School? We suggest that the Mailman School is well positioned to be a leader in all four forms of scholarship, but must do so through a concerted engagement to maximize our impact in these areas. Our overall goal must be to contribute to the lowering of chronic disease across populations, consonant with the School’s larger mission to address key public health challenges of our time. To do so, clearly we must encourage faculty research as well as integrate our efforts to heighten and broaden student appreciation of the topic. But, and perhaps harder, we also need to encourage integration of new conceptualizations across disciplinary boundaries as well as innovative translational science that takes hard earned knowledge to scale, implementing interventions in populations that can substantially modify the disease burden and improve population health. Pragmatically, we recommend the following steps.

A. Establish an ongoing, active school-wide discourse on chronic disease as a means of raising the profile of the topic at the Mailman School ,engaging more researchers and other scholars and developing a vigorous program of productive and innovative interdisciplinary scholarship .

B. Create opportunities for faculty across disciplines and departments to come together to develop and pursue innovative high-risk, potentially high-yield projects that address chronic disease incidence, prevalence and health preservation, especially through addressing shared risk factors relevant to multiple diseases or single interventions that modify multiple causal factors .

C. Recruit faculty whose academic work addresses important issues in chronic disease, who can engage others around the topic, and who can help lead large scale interdisciplinary efforts to tackle chronic disease prevention through a health preservation perspective in the School.

We believe these efforts would best be framed by articulating a series of goals and leading challenges relating to actions we can take toward reducing the prevalence of chronic diseases. These are outlined in the attached Appendix.

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APPENDIX

Addressing Chronic Disease at the Mailman School of Public Health

Goals and Leading Challenges

In the following formulation an effort has been made to identify major goals the attainment of which would move us toward the removal of critical barriers to solving important problems in chronic disease, especially major reductions in prevalence. Each goal is followed by a short list of leading challenges intended to indicate actions toward achievement of the goal.

Goal 1. Develop a life course health preservation orientation (Relevant Seminars: 1,2,3,4)

Challenge A. Define and measure health and prevention impacts more effectively

Challenge B. Identify key points in the life course when health measurements will most effectively guide study and interventions

Goal 2. Address health-related behaviors more effectively (Relevant Seminars : 5,6,7)

Challenge A. Define and measure health literacy more effectively

Challenge B. Include the educational system and the communications industry more effectively

Goal 3. Create new , more effective interdisciplinary and intersectoral collaborations in scholarship and practice (Relevant Seminars: 8,9)

Challenge A. Identify critically important actors/ partners

Challenge B. Select key problems most likely to yield to new and/or expanded partnering efforts

Goal 4. Create better systems for understanding and addressing global dynamics in chronic disease (Relevant Seminar: 10)

Challenge A. Establish criteria for prioritizing global health issues

Challenge B. Develop systems for coordinating public, private and international actors in global health

N.B. The foregoing formulation is related to the areas of emphasis in "Addressing Chronic Disease: a White Paper for the Mailman School of Public Health," viz Present Contours and Trends in Chronic Disease; Life Course Considerations and the Biology of Chronic Disease; Malleability of Chronic Disease; and Prevention vs Health Preservation. In addition, it articulates with important requirements for implementation outlined in the White Paper, viz Scholarship, Collaboration, Faculty discourse and interdisciplinary planning, and targeted Recruiting.