Cardiovascular Health, Risk, and Disease: Primordial and Remedial Strategies

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Introduction

Cardiovascular health, risk, and disease serve well as an example of chronic diseases of global health concern for discussion of health promotion and its role in improving population health. Several considerations support this view (Labarthe & Dunbar, 2012). Cardiovascular disease occurs in every region of the world. Its two leading components, ischemic heart disease and cerebrovascular disease (CVD), or stroke, are estimated globally to rank first and second in number of deaths each year, first and third as causes of disability, and first and fourth as contributors to years of healthy life lost. Cardiovascular disease shares several determinants with the other major chronic diseases (cancer, chronic respiratory diseases, and diabetes). Cardiovascular conditions therefore share with other major chronic diseases the appropriateness of broad health promotion strategies.

A spectrum of cardiovascular health states together constitutes an important object of health promotion (US Department of Health and Human Services, 2003). The expression "cardiovascular health, risk, and disease" emphasizes this perspective, which is explicitly more comprehensive than "cardiovascular disease" alone. This spectrum represents a progression from health to disease. It represents a wide range of potential opportunities for intervention, from the broadest approaches of population-wide health promotion to the most disease-specific and individualized clinical practices.

The goals of health promotion as it addresses cardiovascular health, risk, and disease are derived directly from this cardiovascular health spectrum (Healthy people, 2010). True it is that policies, programs, and practices aimed at cardiovascular health promotion are most clearly applicable prior to manifest expression of cardiovascular disease. However, the goals of cardiovascular health promotion and disease prevention reach across the full spectrum of outcomes—from maintaining health to reversing risk to ameliorating the consequences of overt disease.

Several major determinants of cardiovascular health, risk, and disease provide focus and rationale for health promotion efforts. A vast body of evidence has been developed over decades of research and experience regarding these determinants. Firm knowledge of their causal roles, their amenability to modification, and the impact of effective interventions provide a solid scientific foundation for cardiovascular health promotion (Labarthe, 2011).

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Strategies of health promotion and disease prevention in the cardiovascular area are broadly of two kinds: primordial and remedial (Labarthe & Dunbar, 2012). They differ in their immediate goals as well as the points where they apply in the progression from health to disease. Primordial strategies are truest to the usual meaning of health promotion. They are intended to establish or sustain conditions of life so as to strengthen positive health assets, thereby averting development of risk in the first place. Remedial strategies, by contrast, are intended either to address already acquired risk or to remedy or limit the consequences of manifest disease.

Only through taking effective action can these strategies have practical impact. Past and present pleas, plans, and policies for action in cardiovascular health promotion attest to efforts to date and what they have contributed to improvements in population-level cardiovascular health (Labarthe, 2011). In every region of the world, greater investment in known effective interventions could achieve much greater impact than has been evident to date (Labarthe & Dunbar, 2012).

How the global challenges of cardiovascular health, risk, and disease might be addressed more effectively leads to the following question: What new directions toward this end might be anticipated in policy, practice, and research?

The Cardiovascular Health Spectrum

The major cardiovascular conditions, from a global health perspective, are the atherosclerotic and hypertensive diseases. These occur chiefly as either ischemic heart disease (IHD; also "coronary heart disease," CHD; also "heart attack") or CVD (also "stroke"). For each of these two conditions, a schematic figure illustrates the course of the typical individual case, as the status progresses from subclinical, or unapparent, disease to fatal outcome. Related circumstances progress as well, from latent to acute to post-event phases, as do time frames, from decades to seconds, in the development and outcome of the individual case (Figs. 17.1, 17.2) (Labarthe, 2011).
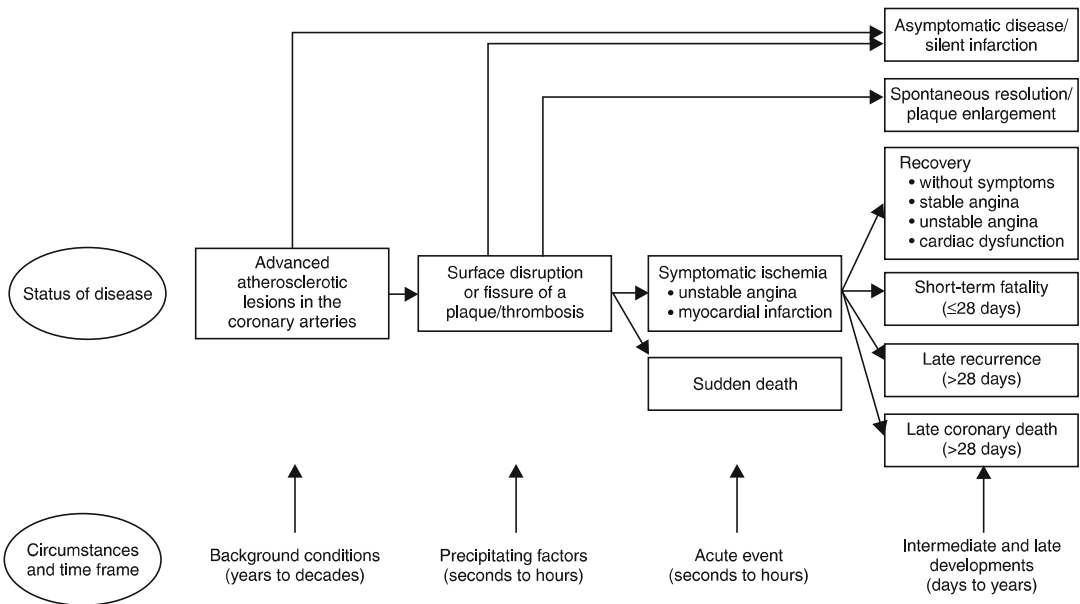

Fig. 17.1 Time course of the typical coronary event. Reprinted with permission from the author, Labarthe (2011)
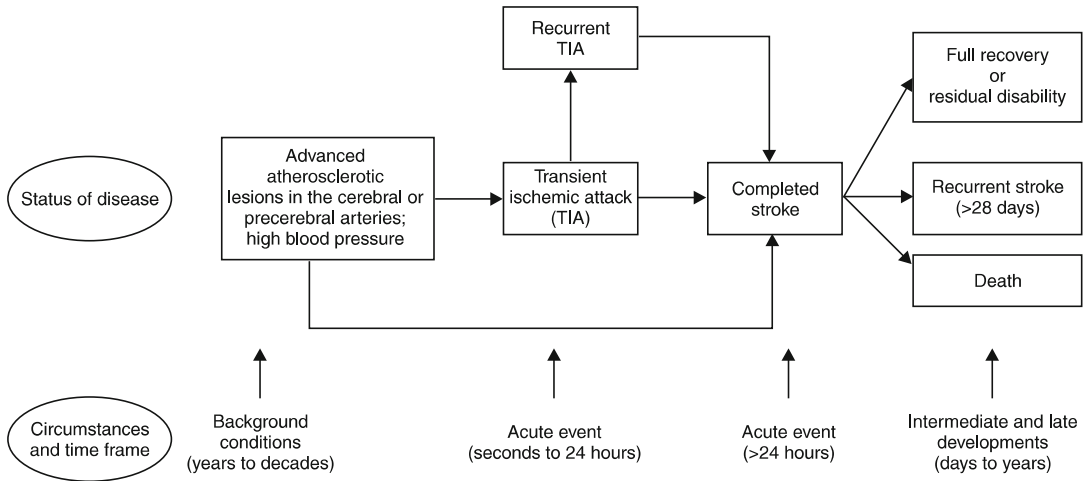
Fig. 17.2 Time course of the typical cerebrovascular event. Reprinted with permission from the author, Labarthe (2011)

Depicted in these figures are the late consequences of processes denoted as "background conditions" present over "years to decades." The figures largely represent the domain of clinical intervention and preventive cardiology. Epidemiologic indicators of IHD and CVD are predominantly numbers and rates of death from the far right, or downstream, end of the spectrum. Even these data are absent, incomplete, or unreliable in many parts of the world, especially in low-income countries. However, this fragmentary information is at present the best available basis for estimating the burden of disease and suggesting of trends, favorable or unfavorable, in the course of these conditions (Gaziano, Reddy, Paccaud, Horton, & Chaturvedi, 2006).

Across a whole population, from childhood to late adulthood, a spectrum of cardiovascular states is implied, from low risk to increased risk to presence of cardiovascular disease. This latter state may be represented by either an acute event (heart attack or stroke) or persistent chronic cardiovascular disease among those who survive. It is useful for a comprehensive approach to population health to recognize each of these states because distinct approaches to health promotion or disease prevention are applicable in each case (US Department of Health and Human Services, 2003).

More elaborate schemes to represent the cardiovascular health spectrum draw on evidence from high-income countries. There, population health data are far more extensive, including surveillance, through continuous probability sampling of the national population. Data of this kind, coupled with knowledge from decades of epidemiologic research and intervention experience, afford a more comprehensive picture of the fundamental process of cardiovascular health, risk, and disease. Figure 17.3, for example, presents a public health action framework for cardiovascular health promotion and disease prevention developed for the United States (US Department of Health and Human Services, 2003). Though this framework is an abstraction based largely on Western experience, it is believed to be valid in principle for cardiovascular health, risk, and disease anywhere in the world.

What does this framework contribute to understanding the role of cardiovascular health promotion? The upper three panels pertain to the cardiovascular health spectrum, first in terms of "the present reality" (middle panel), then a contrasting "vision of the future" (upper panel), and in between an array of "intervention approaches" considered instrumental in moving from the challenges of the present to a more salutary future.
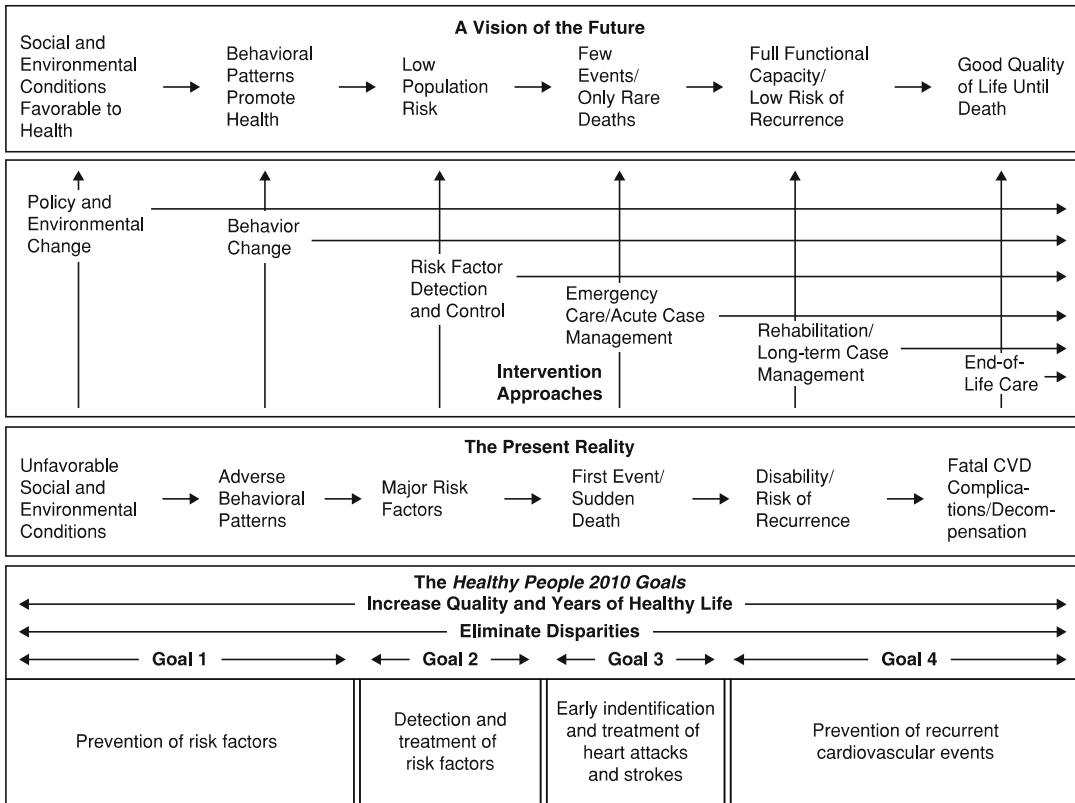
A Vision of the Future

| Social and Environmental Conditions Favorable to Health | → | Behavioral Patterns Promote Health | → | Low Population Risk | → | Few Events/ Only Rare Deaths | → | Full Functional Capacity/ Low Risk of Recurrence | → | Good Quality of Life Until Death |

Policy and Environmental Change

Behavior Change

Risk Factor Detection and Control

Emergency Care/Acute Case Management

Intervention Approaches

Rehabilitation/ Long-term Case Management

End-of- Life Care

The Present Reality

| Unfavorable Social and Environmental Conditions | → | Adverse Behavioral Patterns | → | Major Risk Factors | → | First Event/ Sudden Death | → | Disability/ Risk of Recurrence | → | Fatal CVD Complica- tions/Decom- pensation |

The *Healthy People 2010 Goals*
Increase Quality and Years of Healthy Life
Eliminate Disparities

← Goal 1 →	← Goal 2 →	← Goal 3 →	← Goal 4 →
Prevention of risk factors	Detection and treatment of risk factors	Early indentification and treatment of heart attacks and strokes	Prevention of recurrent cardiovascular events

Fig. 17.3 A public health action framework to prevent heart disease and stroke. Adapted from the US Department of Health and Human Services (2003)

"The present reality" begins from the broadest conditions of society, as it illustrates the progression from unfavorable conditions through adverse population-level behavioral patterns to development of major risk factors, cardiovascular events, and their aftermath, with ultimate cardiovascular death. In "a vision of the future," rival realities are presented. This future is seen as attainable through the intervention approaches that correspond to each pair of alternatives—between the future and the status quo. Policy and environmental change, for example, is the path from unfavorable to favorable social and environmental conditions (vertical arrow). Notably, this approach may have consequences for other phases of the cardiovascular spectrum as well (horizontal arrow).

The main contributions of health promotion are at the level of social and environmental conditions, where the most far-reaching determinants of health are addressed. Effective action here can have consequences not only for cardiovascular health but also for prevention of the other major chronic diseases as well. Attention to the lower panels of the framework will further underscore the unique contributions of health promotion, in relation to four distinct goals of heart disease and stroke prevention.

Goals of Cardiovascular Health Promotion and Disease Prevention

The *Public Health Action Plan* with its framework, above, was created as a guide to cardiovascular health promotion and disease prevention strategies for the United States, through 2020 and beyond (US Department of Health and Human Services, 2003). Goals for cardiovascular health could be cited from a variety of sources—national, regional, or global (Labarthe, 2011). This framework incorporates the goal for heart disease and stroke prevention published by the

US Department of Health and Human Services in the year 2000 to serve for the decade, to 2010; it was subsequently retained for the decade to 2020 as well (Healthy people, 2010; US Department of Health and Human Services, 2000):

> To improve cardiovascular health and quality of life through prevention, detection and treatment of risk factors, early identification and treatment of heart attacks and strokes, and prevention of recurrent cardiovascular events.

For purposes of the *Action Plan* and framework, the distinction between prevention of risk factors on the one hand and their detection and treatment on the other was critical. This would permit specific alignment between intervention approaches and their targets, especially distinguishing the main focus of health promotion—prevention of risk factors—from other intervention approaches.

From this perspective, strategies of prevention can be understood as having four distinct but complementary goals, shown in the bottom panel of Fig. 17.3. The overarching goals of Healthy People 2010 were to increase quality and years of healthy life and to eliminate health disparities (US Department of Health and Human Services, 2000). Any of the intervention approaches would be expected to contribute toward achievement of those goals. But for each of the four goals of cardiovascular health promotion and disease prevention, a distinct subset of approaches applies. For example, the goal of prevention of risk factors can only be attained through policy and environmental change and population-wide behavior change—tools of health promotion.

Documents abound that present goals for improving cardiovascular health, either explicitly or, among more recent examples, implicitly within the rubric of chronic diseases, or NCDs (Labarthe, 2011). The scope of these goal statements sometimes spans the full spectrum addressed in the *Action Plan* but is often restricted to one or another of these four goals. Three examples serve to illustrate commonalities and differences among statements of this kind:

- The World Health Organization (WHO) 2004 *Global Strategy on Diet, Physical Activity, and Health* called for development of comprehensive regional and national strategies to address all aspects of nutrition and physical activity. Elements of the strategies should include a life course perspective, a priority of reaching low-income populations, sensitivity to variations in prevailing patterns of diet and activity, and inclusion of evaluation, monitoring, and surveillance. Rapid reductions in the incidence of NCDs were to be expected following implementation of effective interventions. This strategy focuses on population-wide behavior change that would serve the goal of prevention of risk factors as well as further downstream benefits.

- The World Bank project, *Disease Control Priorities in Developing Countries*, was updated in 2006 after first being published in 1993 (Gaziano et al., 2006; Pearson et al., 1993). A broad range of conditions of major public health concern in developing countries is addressed in both editions. Most relevant here is the conclusion that "Population-wide efforts now to reduce risk factors through multiple economic and educational policies and programs will reap savings later in medical and other direct costs as well as indirectly in terms of improved quality of life and economic productivity" (Gaziano et al., 2006). Here the focus was the goal of reducing risks already established in the populations of the developing countries.

- The Impact Goal for 2020 adopted by the American Heart Association (AHA)—the leading voluntary health agency in the United States in the cardiovascular arena—is as follows: "By 2020, to improve cardiovascular health of all Americans by 20 %, while reducing deaths from cardiovascular diseases and stroke by 20 %" (Lloyd-Jones et al., 2010). This shift in AHA's focus from cardiovascular death and disability to cardiovascular health has been called "a quiet revolution," for its potential impact in preserving and promoting cardiovascular health (Labarthe, 2012). It has entailed, for example, definition of cardiovascular health and specification of metrics by which to evaluate it at both individual and population levels (Fig. 17.4). For each metric, quantitative criteria are specified, separately for ages below 20 and 20 years and older.

"By 2020, to improve the cardiovascular health of all Americans by 20%, while reducing deaths from cardiovascular diseases and stroke by 20%."

Cardiovascular health metrics

Tobacco
Diet
Physical activity
Body mass index
Blood pressure
Blood cholesterol
Blood glucose

Fig. 17.4 The American Heart Association 2020 impact goal and the defining cardiovascular health metrics

Three levels, "ideal," "intermediate," and "poor," of cardiovascular health are distinguished, among persons free of clinically recognized cardiovascular disease. This 2020 goal implies population change from poor to intermediate and from intermediate to ideal cardiovascular health—and, potentially, to promote and preserve ideal cardiovascular health from the beginning. All of these activities relate to Goals 1 and 2 of the *Action Plan* (US Department of Health and Human Services, 2003).

Major Determinants of Cardiovascular Health, Risk, and Disease

What determines individual and population levels of cardiovascular health, risk, and disease? Until recently, "traditional" or "conventional" risk factors alone were cited in the discussion of cardiovascular disease prevention. Each of several factors, well documented through decades of epidemiologic research, could be described in terms of both its contribution to cardiovascular risk and the underlying determinants of the specific risk factor itself.

This approach is reflected in Table 17.1, which lists the main headings under which the most prominent determinants are reviewed in corresponding chapters in a recent text, *Epidemiology and Prevention of Cardiovascular Diseases: A Global Challenge* (Labarthe, 2011). The concept

Table 17.1 Determinants of cardiovascular health, risk, and disease

Dietary imbalance
Physical inactivity
Obesity
Adverse blood lipid profile
High blood pressure
Diabetes
Smoking and other tobacco exposure
Other personal factors
Social environment
Physical environment
Heredity and family history

Note 1: Social determinants of health represent the broadest conditions of life in which the foregoing factors are themselves determined
Note 2: The social–ecological framework represents the multilevel relationships among all determinants of health

behind this list is that patterns of diet and physical activity are fundamental behavioral factors; obesity is a consequence of dietary imbalance and physical inactivity; adverse blood lipid profile, high blood pressure, and diabetes are in turn consequences of dietary and activity patterns through and beyond obesity as an intermediary; tobacco use and exposure act separately from these; and other factors (including genetic and other hereditary influences) operate largely to foster or exacerbate these foregoing factors. This representation is incomplete, as noted, and requires addition of the concepts of social determinants of health and the social–ecological framework better to reflect the substantial influence of social and environmental conditions

(Committee on Assuring the Health of the Public in the 21st Century, 2003; World Health Organization, 2006).

Elevated prominence of "cardiovascular health" has another effect on a current view of determinants. The AHA metrics (Fig. 17.4) are now characterized as "health behaviors" and "health factors," no longer "risk behaviors" and "risk factors" as before (Lloyd-Jones et al., 2010). In parallel, a concept of "positive cardiovascular health" is emerging in which positive psychological assets may operate independently from recognized adverse characteristics to promote health, reduce disease incidence, and accelerate recovery from acute events (Boehm & Kubzansky, 2012). Together, these developments add further to the recognized importance of health promotion, and prevention of cardiovascular risk in the first place, as major strategic opportunities in cardiovascular health.

Strategies of Cardiovascular Health Promotion and Disease Prevention

The goals for cardiovascular health promotion and disease prevention derived from the Healthy People process and depicted in Fig. 17.3 suggest two broad strategies of intervention. One addresses prevention of risk factors and, by implication, promotion of health in order to achieve this goal (Goal 1). The other addresses already acquired risk or manifest disease, through detection and treatment of risk factors, early identification and treatment of heart attacks and strokes, and prevention of recurrent cardiovascular events (Goals 2–4) (US Department of Health and Human Services, 2000, 2003).

The first strategy can readily be seen as "primordial," in the sense of this term as introduced by Strasser (1978). This approach was proposed as a means of "preserving entire risk-factor-free societies from the penetration of risk factor epidemics." The second strategy, by contrast, is "remedial." It works to reduce risk, increase survival of acute events when they do occur, and improve function and prognosis for those who survive.

Table 17.2 Dimensions of health promotion and disease prevention

Strategy
- Primordial/remedial (population-wide/high risk; primary/secondary/tertiary)
- Health promotion/disease prevention

Approach
- Policy and environmental change/behavior change/risk factor detection and control/emergency care and acute case management/rehabilitation and long-term case management/end-of-life care
- Lifestyle change/pharmacotherapy
- Single/multifactor intervention

Setting
- Community/worksite/school/health care facility/religious organization

This second strategy conforms closely to the dual "high-risk" and "mass" or "population-wide" strategies articulated by Rose (1981). It also subsumes the approaches long associated with preventive cardiology: "primary," "secondary," and "tertiary" prevention. The first of these is to reduce the risk to avert an initial cardiovascular event; the second would seek to avert recurrent events; the third would improve function through rehabilitation following a prior acute event. (It should be noted that Goal 3, addressing the acute event, is not clearly identified with any of these terms.) Some ambiguity in usage (e.g., "primary prevention of hypertension" vs. "primary prevention of CHD"), as well as unnecessary complexity, favors the simpler distinction between primordial and remedial strategies.

Other dimensions of cardiovascular health promotion and disease prevention are also described, such as those listed in Table 17.2 (Labarthe, 2011). First, the primordial and remedial strategies are seen to correspond with the distinction between health promotion and disease prevention. Second, approaches can be described in various terms, such as those in Fig. 17.3; lifestyle or behavioral change versus pharmacotherapy; or single- versus multifactor intervention. Third, multiple settings for implementing interventions may be identified. Still, other descriptors could be added. Those shown here are intended to point to a wide range of intervention

opportunities at the practical level, where action happens. The broad distinction between primordial and remedial strategies, and health promotion and disease prevention, appears useful as an overarching concept in planning for public health action (Labarthe & Dunbar, 2012).

Taking Action: Pleas, Plans, and Policies

These strategic concepts, like the guidelines and recommendations often promulgated by authoritative bodies, can contribute to improving population health only with effective action to implement them. As strategies have been articulated in the cardiovascular arena, calls to action have accompanied them.

Pleas for implementation of accepted strategies have been published for more than a half-century, perhaps first in a notice to doctors and patients regarding preventive measures they could undertake (White et al., 1959). By the early 1980s, these calls rose to the level of WHO recommendations to Member States regarding prevention of CHD (World Health Organization Expert Committee, 1982). Beginning in 1992, the International Heart Health Society has periodically issued Declarations exhorting governments, nongovernment organizations, and multiple sectors of society to take action based on the knowledge of potentially effective policy initiatives. These were compiled in 2005 as a "platform document" to foster action for cardiovascular health throughout the world (International Heart Health Society, 2005).

The Institute of Medicine, in a 2010 report on cardiovascular health promotion in developing countries, stated: "The accelerating rates of unrecognized and inadequately addressed CVD [cardiovascular diseases] and related chronic diseases in both men and women in low and middle income countries are cause for immediate action" (Institute of Medicine, 2010). Most recently, the United Nations' High-Level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases proposed 23

new commitments to efforts in NCD prevention and called on WHO to present options for meaningful action, by the end of 2012; a report on progress achieved, in 2013; and a comprehensive assessment of progress in 2014 (United Nations General Assembly, 2011).

Calls to action call for plans of action designed to apply chosen strategies and approaches. Examples of action plans found from the Americas, Europe, and South Asia are described elsewhere in some detail, including a case study of the (US) *Public Health Action Plan to Prevent Heart Disease and Stroke*, the source of Fig. 17.3 (Labarthe, 2011; US Department of Health and Human Services, 2003).

A well-known classic action plan for cardiovascular health promotion and disease prevention is the North Karelia Project in Eastern Finland, which began in 1972. The aim was to reduce blood pressure and cholesterol levels and achieve smoking cessation population-wide through a comprehensive program of policy change, population-wide behavior change, and change in the health care system. The exceptionally high rate of coronary mortality that stimulated the project was reduced substantially, to an even greater degree than predicted from the actual risk factor reductions that were achieved (Vartiainen et al., 1994).

Beyond the demonstrated impact on population health in North Karelia, this project established a model for policy development that has been replicated in many other countries, principally in central and eastern Europe. The concept was to take action within a subregion of a country, demonstrate its feasibility and impact, and elevate the effective policies to the national level, as was accomplished in Finland. This has been the model for the Country-wide Integrated Noncommunicable Diseases Intervention (CINDI) Program of WHO, which illustrates the successful merging of cardiovascular with other chronic disease initiatives (Grabowsky, Farquhar, Sunnarborg, & Bales, 1997).

Recent (though late) recognition of the contribution of cardiovascular conditions to the global burden of disease, especially in low- and

middle-income countries, has stimulated wide discussion of the opportunities and challenges confronting effective health promotion efforts for these conditions, whether or not including the other NCDs. A more concerted approach to policy development is now in progress, in part as an outgrowth of events since 2000, reviewed in some detail in 2012 (Labarthe, 2012).

The United Nations Millennium Development Declaration, adopted in September 2000, presented a set of Millennium Development Goals (MDGs) that addressed global health issues—but only in relation to HIV/AIDS, malaria, and "other diseases" (United Nations General Assembly, 2000). The lack of any reference to cardiovascular and other chronic conditions produced an outcry of global proportions. Several prominent publications addressed this issue, collectively presenting arguments in support of global efforts in cardiovascular health promotion and disease prevention and in NCD prevention and control.

Two outcomes of special significance were publication of a 2010 report from the Institute of Medicine, cited above, *Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health*, and the convening in September 2011 of the United Nations General Assembly (UNGA) to focus on NCD prevention (Institute of Medicine, 2010; United Nations General Assembly 2011).

The Institute of Medicine report is noteworthy, in part, because it proposed integration of cardiovascular health promotion into global health activities at two levels. First, its 12 recommendations referred in all but 2 cases to NCDs together, not cardiovascular disease alone—despite its clearly explicit focus on cardiovascular health. Second, it called attention to models of organization and implementation in the arena of HIV/AIDS and the potential value for cardiovascular health promotion of emulating or joining in those efforts. This argument bears most directly on risk factor detection and treatment and on long-term case management, in terms of Fig. 17.3 above, but it may have relevance to earlier stage health promotion as well (Institute of Medicine, 2010).

In addition, the Institute of Medicine report recommended a new approach to implementation, in which the Global Alliance for Chronic Diseases would conduct (Institute of Medicine, 2010):

> … case studies of the CVD financing needs of five to seven countries representing different geographic regions, stages of the CVD epidemic, and stages of development. Several scenarios for different prevention and treatment efforts, training and capacity building efforts, and demographic trends should be evaluated. These initial case studies should establish an analytical framework with the goal of expanding beyond the initial pilot countries.

This proposal suggests a nodal center, at the national level, in each region of the world where models of policy development, implementation, and evaluation could catalyze work throughout the region.

The UNGA Meeting and its Declaration, noted above, have given a new level of prominence to cardiovascular and other chronic diseases, with a highly demanding charge to WHO as an outcome. The Declaration calls for reduction of risk factors and creation of health-promoting environments; strengthening of national policies and health systems; international cooperation including collaborative partnerships; research and development; monitoring and evaluation; and follow-up (United Nations General Assembly, 2011).

Meanwhile, WHO activities continue, to implement its *Global Strategy for the Prevention and Control of Noncommunicable Diseases*. A global status report in 2011 pointed to major forces behind the global expanse of the NCDs, stating that (World Health Organization, 2011):

> … the epidemic of these diseases is being driven by powerful forces now touching every region of the world: demographic ageing, rapid unplanned urbanization, and the globalization of unhealthy lifestyles. While many chronic conditions develop slowly, changes in lifestyles and behaviours are occurring with a stunning speed and sweep.

The principal interventions considered by WHO to be cost-effective and ready for

immediate implementation are the following "best buys," at the population level:

Protecting people from tobacco smoke and banning smoking in public places

Warning about the dangers of tobacco use

Enforcing bans on tobacco advertising, promotion, and sponsorship

Raising taxes on tobacco

Restricting access to retailed alcohol

Enforcing bans on alcohol advertising

Raising taxes on alcohol

Reducing salt intake and salt content of food

Replacing trans fat in food with polyunsaturated fat

Promoting public awareness about diet and physical activity, including through mass media

And at the individual, health care level:

Counseling and multidrug therapy ("a regimen of aspirin, statin, and blood pressure-lowering agents in people at high cardiovascular risk"), including glycemic control for diabetes for people ≥30 years old with a 10-year risk of fatal or nonfatal cardiovascular events ≥30 %; [and] Aspirin therapy for acute myocardial infarction.

Each of these interventions is expected to have substantial impact in cardiovascular health promotion and disease prevention. Together they offer an agenda for action that is hoped to be sufficient to offset and overcome the adverse social and environmental conditions that foster continued growth of this epidemic.

Finally, through the practical experience of programs at community, regional, or national levels, as well as decades of epidemiologic and other research, a number of points in support of cardiovascular health promotion and disease prevention have become established and can be summarized as follows (Labarthe, 2011):

- Experience with multifactor primary prevention has accrued from a large number of studies in the United States and much of the world. What can be learned from this body of work is the cornerstone of the case for prevention. Widespread interest in community approaches suggests increasing readiness over the past decade to take further action. Lessons of experience indicate foremost a need to implement the most promising and comprehensive interventions, in multiple populations, on a large enough scale and with sufficient duration to permit rigorous evaluation. This would offer the greatest opportunity to identify intervention approaches with potential for widespread dissemination and adaptation to local needs and resources.

- The fact of global occurrence of CVD on an epidemic level calls for application of current knowledge on a corresponding scale. The burden of risk is global in extent, and every region of the world is experiencing CVD on an epidemic scale. Distributions of particular risk factors vary among populations as do, therefore, their relative and respective population-attributable fractions for CHD and stroke. But the same factors are accountable everywhere.

- At a macroeconomic level, CVD and other chronic diseases demand a level of attention and urgency of action that have been seriously underappreciated until quite recently. The economic and social impact of lost productivity, especially—but not exclusively—in low- and middle-income countries would seem to compel action, the cost of continued inaction being unacceptable from the perspective of public health accountability. On the basis of cost-effectiveness analysis, substantial progress could be made by implementing presently affordable preventive measures.

- Modeling contributes importantly to explanation, description, and prediction of past, present, and future occurrence of CVD and other chronic diseases. Extending beyond the sometimes quite limited observations available, modeling offers insights that can influence decision making about health policy in positive ways. For example, reduction of population-wide risk factors has contributed to approximately half of the gain in CHD mortality in high-income countries in recent decades. This strategy is projected to make continuing major contributions in low- and middle-income countries in the future. Wider interest in modeling can also stimulate strengthening of data sources for future analyses.

- The visions expressed in several published statements from responsible organizations

represent judgments that go beyond systematic review of evidence on a specific intervention. They reflect not only a sense of what such evidence says, but what it means in terms of societal interests and values. That such belief in the potential for CVD prevention is expressed strongly by many authoritative sources contributes significantly to the case for prevention.

- That counterarguments that continue to be raised regarding the case for CVD prevention should not be surprising, given competing interests, priorities, or interpretations of the evidence. Weighed against the elements of the argument in favor of CVD prevention, however, they are not persuasive to many in positions of accountability for the public's health.

New Directions

Past efforts are not without their successes but have been far from sufficient to meet the global challenge. In contrast, current directions and future possibilities are worthy of consideration. Salient themes in this review include the increased prominence of NCDs, including cardiovascular disease, in the global health arena; the fundamental importance of primordial as well as remedial strategies of prevention; and a shift toward positive concepts of cardiovascular health, beginning with recognition of the progression from cardiovascular health to risk to disease—both in the individual life course and in population health.

Briefly, these themes might be considered to suggest the following implications for policy, practice, and research:

- Policy: Balance is needed between investments in immediate- and long-term impacts. To concentrate only on remedial strategies is to consign future generations to a life course like those occurring today, with no improvement in prognosis. Without primordial prevention, the chronic disease burdens of nations will only grow, as the forces cited by WHO continue unabated.
- Practice: The major determinants of cardiovascular health, risk, and disease—and their

underlying influences—are amenable to modification and control to different degrees. It is imaginable that practical measures designed to improve patterns of diet and physical activity can be effective within definable populations, even while the deeper underlying forces continue to operate. Demonstration of successes in selected target populations may serve to mobilize greater political will and investment in a new phase of increasing momentum behind health promotion.

- Research: Evaluation of policies and practices in the sphere of cardiovascular health promotion and NCD prevention should include specific metrics such as those adopted for cardiovascular health, possibly expanded to encompass relevant measures for other NCDs, and broader indicators of positive population health assets. Fuller appreciation of the impact of interventions could result, again mobilizing new interest and investment.

If the Global Alliance for Chronic Diseases were to take up the recommendation of the 2010 Institute of Medicine report on cardiovascular health promotion, a model national policy framework and action plan within each global region could result (Global Alliance for Chronic Disease, 2011; Institute of Medicine 2010). A plan based on the foregoing suggestions could become a catalyst for each region and offer considerable promise of much-needed progress.

References

Boehm, J. K., & Kubzansky, L. D. (2012). The heart's content: The association between positive psychological well-being and cardiovascular health. *Psychol Bull*. doi:10.1037/a0027448.

Committee on Assuring the Health of the Public in the 21st Century. (2003). *The future of the public's health in the 21st century. Board on Health Promotion and Disease Prevention, Institute of Medicine*. Washington: The National Academies Press.

Gaziano, T. A., Reddy, K. S., Paccaud, F., Horton, S., & Chaturvedi, V. (2006). Cardiovascular disease. In D. T. Jamison, J. G. Breman, A. R. Measham, G. Alleyne, M. Claeson, D. B. Evans, et al. (Eds.), *Disease control priorities in developing countries* (2nd ed., pp. 645–662). Washington, DC: International Bank for Reconstruction and Development/World Bank.

Global Alliance for Chronic Disease. (2011) Fact sheet on global alliance for chronic diseases. Retrieved October 22, 2011 from www.ga-cd.org/who.php.

Grabowsky, T. A., Farquhar, J. W., Sunnarborg, K. R., & Bales, V. S. (1997). *Worldwide efforts to improve heart health: A follow-up to the catalonia declaration: Selected program descriptions*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Healthy people 2020: Improving the health of Americans. (2010). Retrieved March 20, 2011 from http://healthy-people.gov/2020/about/topicsobjectives2020.

Institute of Medicine. (2010). *Promoting cardiovascular health in the developing world: A critical challenge to achieve global health*. Washington, DC: National Academies Press.

International Heart Health Society. (2005) International action on cardiovascular disease: A platform for success based on International Cardiovascular Disease Declarations. Retrieved January 21, 2008 from www.internationalhearthealth.org.

Labarthe, D. R. (2011). *Epidemiology and prevention of cardiovascular diseases: A global challenge*. Sudbury, MA: Jones & Bartlett.

Labarthe, D. R. (2012). From cardiovascular disease to cardiovascular health: A quiet revolution? *Circulation. Cardiovascular Quality and Outcomes, 5*, e86–e92.

Labarthe, D. R., & Dunbar, S. B. (2012). Global cardiovascular health promotion and disease prevention: 2011 and beyond. *Circulation, 125*, 2667–2676.

Lloyd-Jones, D. M., Hong, Y., Labarthe, D., Mozaffarian, D., Appel, L. J., Van Horn, L., et al. (2010). Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic impact goal through 2020 and beyond. *Circulation, 121*, 586–613.

Pearson, T. A., Jamison, D. T., & Trejo-Gutierrez, J. (1993). Cardiovascular disease. In D. T. Jamison, W. H. Mosley, A. R. Measham, & J. L. Bobadilla (Eds.), *Disease control priorities in developing countries* (pp. 577–594). Oxford, UK: Oxford University Press.

Rose, G. (1981). Strategy of prevention: lessons from cardiovascular disease. *British Medical Journal, 282*, 1847–1851.

Strasser, T. (1978). Reflections on cardiovascular diseases. *Interdisciplinary Science Reviews, 3*, 225–230.

United Nations General Assembly. (2000) Resolution adopted by the General Assembly: United Nations Millennium Declaration. New York, NY: United Nations; 18 September, 2000. A/RES/55/2.

United Nations General Assembly. (2011) Political declaration of the high-level meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases. New York, NY: United Nations; 16 September 2011. A/66/L.1.

US Department of Health and Human Services. (2000). *Healthy people 2010: With understanding and improving health and objectives for improving health* (2nd ed.). Washington, DC: US Government Printing Office.

US Department of Health and Human Services. (2003) A public health action plan to prevent heart disease and stroke. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention.

Vartiainen, E., Puska, P., Jousilahti, P., Korhonen, H. J., Tuomilehto, J., & Nissinen, A. (1994). Twenty-year trends in coronary risk factors in North Karelia and in other areas of Finland. *International Journal of Epidemiology, 23*, 495–504.

White, P. D., Wright, I. S., Sprague, H. B., Katz, L. N., Stamler, J., Levine, S. L., et al. (1959). *A statement on Arteriosclerosis: Main cause of "heart attacks" and "strokes"*. New York, NY: National Health Education Committee Inc.

World Health Organization. (2006) Commission on social determinants of health. Geneva (Switzerland): World Health Organization. WHO/EPI/EQH/01/2006.

World Health Organization. (2011) Global status report on noncommunicable diseases 2010: Description of the global burden of NCDs, their risk factors and determinants. Geneva, Switzerland: World Health Organization; April 2011.

World Health Organization Expert Committee. (1982) Prevention of coronary heart disease (Technical Report Series 679). Geneva, Switzerland: World Health Organization.