

The Impending Cardiovascular Pandemic in China

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Cardiovascular diseases (CVD) are increasingly an urgent and major global public health problem. As the leading cause of death, disability, and health expenditures in the world, CVD claimed more than 17 million deaths in 2004, including 7.2 million from coronary heart disease (CHD) and 5.7 million from stroke.¹ More than 80% of the mortality from CVD occurs in low- and middle-income countries where dramatic increases in the prevalence of risk factors for atherosclerotic vascular disease, largely due to changes in diet, exercise, and tobacco use are occurring in the setting of increased urbanization of the population. Unfortunately, the health care systems and resources in these countries are not well developed and directed toward dealing with this growing health care burden.

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China, with a rapidly developing economy and the most populous nation in the world, experienced more than a doubling of CHD mortality from 1985 to 2005.² More than 230 million Chinese have some form of CVD, resulting in an annual toll of 2 million myocardial infarctions, 7 million strokes, and 3 million deaths. The prevalence of risk factors that can lead to future CVD events is staggering, as 200 million Chinese have either high blood pressure or high blood cholesterol, and 350 million are current smokers.³ The prevalence of diabetes, another major risk factor for CVD, has steadily increased among men and women in China and is now a substantial public health problem claiming more than 90 million adults with diabetes and nearly 150 million with prediabetes.⁴ Given these baseline data, information on the impact of ongoing demographic changes and future CVD risk factor trends is essential for China to mount effective programs to counteract the growing pandemic of CVD.

In this issue of *Circulation: Cardiovascular Quality and Outcomes*, Moran et al report the results from the CHD Policy-China, a Markov computer simulation model of CVD in adult Chinese.⁵ They used the International Collaborative Study of Cardiovascular Disease in Asia Study (InterASIA) along with data from other studies to estimate means and proportions of risk factors and CVD (coronary heart disease

and stroke) events. Their analysis predicts that an alarming increase in CVD events (>50%) will occur in China between 2010 and 2030, based on aging and growth of the population if the risk factor profile of the country remains at its current level. If the projected unfavorable trends in blood pressure, cholesterol, body mass index, and obesity are taken into consideration, it is predicted that an increase of more than 21 million CVD events and 8 million CVD deaths will occur. These unfavorable results will only be partially offset by the current trends of decreased tobacco smoking. However, as noted by Moran et al, this burgeoning epidemic can be averted if more intensive measures in prevention are implemented. The authors observe that a more aggressive tobacco control policy that would lower active smoking prevalence to 20% by 2020, the current prevalence in the United States, and to 10% by 2030 would reduce total mortality in Chinese men despite the unfavorable trends in other risk factors. Lowering systolic blood pressure by 3.6 mm Hg would reduce CVD and non-CVD mortality in both men and women even if total cholesterol and diabetes increased while smoking prevalence remained at year 2000 levels. These are striking examples of the impact of risk factor modification on CVD events.

This work provides a roadmap by which key strategies for CVD prevention may be undertaken in China. Based on the results of their modeling, the authors recommend that new risk reduction policies with screening for CVD risk factors along with increased risk factor prevention and treatment programs should be included with China's current health system reform. They observe that favorable results from a focus on blood pressure control and smoking cessation could have major benefits in reducing mortality even if other increasing CVD risk factor trends continue unabated.

Additional data presented in their work suggest that 30% to 40% of CVD events in both men and women could not be accounted for by increases in blood pressure, smoking, cholesterol, or diabetes. Others have called attention to the contribution of air pollution⁶ and other aspects of urbanization⁷ not covered in this analysis such as decreased physical activity, diet, and stress, which may account for part of the residual risk noted in this study. China has exhibited a remarkable ability to reduce air pollutants as exhibited during the 2008 Olympics when, in the city of Beijing, daily average measurements of sulfur dioxide, carbon monoxide, nitrogen dioxide, and particulate matter $\leq 10 \mu\text{m}$ were reduced by roughly 50%, compared with the same period of 2007. Further analysis of trends and activities in China may reveal additional observations that might be included in future public health programs and policies.

These observations and predictions and the challenges facing China are not unique. A similar rapid rise of CVD and associated risk factors is occurring in all low- and middle-income countries as they go through the epidemiological

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transition. The predictions in the present study call to question whether population or community based initiatives to prevent CVD in China can be successful. Arguably, the best example of such an intervention is the North Karelia study in Finland.⁸ The North Karelia Project was launched in 1972 in response to what was then one of the highest mortality rates from CVD in the world. Over 25 years, smoking among men fell from 52% to 31%. Major dietary changes resulted in marked reductions in saturated fat exemplified by reduction in the use of butter on bread from 90% to less than 7%. As a result of this community based CVD prevention program the annual CVD mortality rate for men below age 65 years has been reduced by 73%, with similar reductions in mortality among women. A major factor leading to the success of the North Karelia Program was community organization. Thus, effective strategies in low- and middle-income countries may involve not only major government initiatives in population-based prevention but also strong community efforts and collaboration to foster environments that promote and support cardiovascular health. In addition, experience in the United States and Western Europe has also demonstrated improved outcomes associated with the use of evidence-based guidelines for management of CVD and patients with high CVD risks.^{9,10} Likewise, guideline-related initiatives in prevention such as the BRIG project now underway in China have potential to contribute to similar improved CVD outcomes.¹¹ The World Heart Federation has outlined principles for national and regional guidelines for CVD prevention that outline essential concepts to assist with the development of guideline-related programs for CVD prevention.¹²

As the Institute of Medicine pointed out in its recent report, prevention and better control of CVD worldwide, particularly in low- and middle-income countries, requires coordinated global and local actions to provide sustained efforts, strong leadership, stakeholder collaborations, and substantial investment of financial, technical, and human resources.¹³

China now finds itself facing a major crisis with the predicted increase mortality and morbidity from CVD. With the largest population in the world, this poses a major challenge to the developing economy. Yet the crisis and its associated challenge bring tremendous opportunity. That opportunity is to institute programs in prevention such as those recommended by the authors of the article in this issue of *Circulation: Cardiovascular Quality and Outcomes*. In fact, China is moving in the right direction, as major prevention programs are being implemented that target raising public awareness, educating and empowering the population, and strengthening health care systems to better manage CVD risk factors, such as tobacco smoking and hypertension. Possibly such programs could be integrated into the recently announced health care reform by the central government which commits to provide universal affordable health care to

1.3 billion citizens.¹⁴ One hopes that China will meet this challenge and succeed. If so, they will serve as an example for the majority of countries in the world now facing the pandemic of CVD.

Disclosures

None.

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