FOCUS: YALE SCHOOL OF MEDICINE BICENTENNIAL

Tobacco-Related Disease Burden and Preventive Initiatives in China

Global Health and the Chronic Diseases: Perspective, Policy and Practice

Bolin Niu

Yale School of Medicine Class of 2012

The burden of chronic diseases in global health is a surging area of research. The Global Health Initiative at the National Heart, Lung, and Blood Institute brings together investigators from developing countries with those from the developed world to study these diseases. In China, approximately 83 percent of all deaths in 2000 were attributed to chronic illnesses, which are the research focuses of the Chinese center of the Global Health Initiative. Tobacco use as well as passive smoking are modifiable risk factors in a large number of such chronic conditions. The prevalence of smoking in China is extensive and has inseparable ties to the economy, with tobacco taxes making up a large portion of government revenue in poorer provinces. Methods of smoking prevention have been piloted in some Chinese schools, which have mitigated the increase in smoking rate but have not resulted in a primary preventive effect. Efforts by the Yale Global Health Initiative and the Yale-China Association are bringing researchers together to address chronic disease in China as Yale School of Medicine enters its 200th year.

INTRODUCTION

In 2005, an estimated 35 million people worldwide died from heart disease, stroke, cancer, and other chronic diseases [1]. Eighty percent of these deaths occurred in low-income and middle-income countries [1]. The World Health Organization (WHO†) projects the leading causes of death (percentage of total deaths) in the year 2030 in low-income countries will include ischemic heart disease (13.4 percent), HIV/AIDS (13.2 percent), and cerebrovascular disease (8.2 percent) [2]. In middle-income countries, the top three causes of death are projected as cerebrovas-
cular disease (14.4 percent), ischemic heart disease (12.7 percent), and chronic obstructive pulmonary disease (COPD) (12.0 percent) [2]. While infectious diseases are still prevalent, a large portion of deaths result from chronic diseases. As people survive infectious diseases, they go on to develop chronic diseases. Thus, the impetus exists for global health research to move in the direction of chronic illnesses.

GLOBAL HEALTH INITIATIVE AT THE NATIONAL HEART, LUNG, AND BLOOD INSTITUTE

As Yale School of Medicine enters its 200th year, its global health focus is shifting dramatically away from one primarily involving infectious diseases to one interested in preventing chronic illnesses. As part of the Bicentennial Lecture Series at the Yale School of Medicine, Dr. Elizabeth G. Nabel, professor at Harvard Medical School and president of Brigham and Women’s/Faulkner Hospitals, delivered a talk entitled “Global Health and the Chronic Diseases: Perspective, Policy and Practice” in November 2010 at The Anlyan Center. Dr. Nabel, former director of the National Heart, Lung, and Blood Institute (NHLBI) at the National Institutes of Health, has made tremendous contributions toward the understanding of molecular genetics of cardiovascular diseases by identifying cell cycle and growth factor proteins that regulate vascularization.

Global health groups in Canada and Britain have identified 20 policy and research priorities in the fight against chronic non-communicable diseases, including raising public awareness, modifying risk factors, and engaging business and community [3]. To accomplish this, the NHLBI has established the Global Health Initiative, which collaborates with overseas partners in nine centers of excellence. Their goal is to research disease factors, as Dr. Nabel does, produce trainees, and mentor investigators. Awards were announced in June 2009 for the nine centers with a goal to produce master-level trainees from low- and middle-income countries that can begin mentoring junior investigators.

Each center of excellence has a local group that partners with an institute in the United States. For instance, the Beijing branch of the George Institute for International Health has partnered with the Duke Global Health Institute to oversee five hubs of activity throughout China. As the largest developing nation in the world, China has shown major changes in disease pattern in the last few decades. Non-communicable diseases constituted 58.2 percent of all deaths in China from 1973 to 1975 [4], a number that jumped to 82.9 percent by 2000 [4]. Population health in China has transitioned epidemiologically from a preponderance of infectious diseases and maternal and perinatal illnesses to one of chronic diseases. One important mission of the centers of excellence is to identify potential modifiable behaviors in a population that lead to chronic diseases. In her lecture, Dr. Nabel pointed to tobacco as a significant risk factor for a large number of chronic conditions in China, including lung cancer, coronary artery disease, hypertension, and COPD.

SMOKING PREVALENCE AND ECONOMICS IN CHINA

One in three smokers in the world is a Chinese man [5]. The total smoker number was 350 million in China in 2002, increased by 30 million from 1996, while the rate of quitting only increased to 11.5 percent in 2002 from 9.4 percent in 1996 [6]. The increase in rate of cessation and concurrent increase in total smokers indicate a large number of individuals have begun to smoke in recent years. The average age of initiation has become younger, from 23 to 19, in the past two decades [7]. Due to the high prevalence of tobacco use, passive smoking is ubiquitous as well. Passive exposure to tobacco smoke affects 52.2 percent of the Chinese population, with 67 percent of passive smokers reporting exposure in public places [4].

Smoking in China is tied intimately to the economics behind cigarette consumption. China is the largest tobacco grower in the world [5]. Domestic tobacco production and cigarette consumption have steadily in-
increased in recent years. Consumption of tobacco increased to 2 trillion cigarettes in 2006, and 99.2 percent of domestically produced cigarettes are consumed in China, leaving only 0.8 percent to be exported [8]. Although tobacco has the lowest economic return as a cash crop, hefty tobacco taxes made up 7.4 percent of the government’s total revenue in 2003 [9]. The tobacco industry is a major source of revenue for local governments, especially in the mid-west provinces, where the tobacco contribution was 40 percent to 80 percent of overall government revenue [9].

DISEASE BURDEN FROM SMOKING IN CHINA

Smoking is a risk factor for many diseases prevalent in China, including hypertension, coronary artery disease, lung cancer, and COPD. A large, prospective cohort study of 169,871 Chinese adults showed significant association between pack-years of smoking and death from any cause [10]. Leading causes of death in descending order were cancer, cardiovascular disease, and respiratory disease [10]. An estimated 673,000 deaths were attributable to smoking in China in 2005 [10].

Furthermore, passive smoking poses risks for non-smokers and children. Due to the large difference in numbers of males and females who smoke, passive smoking disproportionately affects women. Nearly 230,000 years of healthy life was lost in China in 2002 due to lung cancer caused by passive smoking [11]. Women bear 80 percent of the total disease burden from passive smoking [11]. A population-based cross-sectional study in Beijing investigated cardiovascular disease in females who have never smoked, 39.5 percent of whom were exposed to secondhand smoke at home or work [12]. After adjusting for 13 other risk factors and environmental factors, significant risk (odds ratio 1.31 to 2.18) was associated with coronary artery disease, ischemic stroke, and peripheral arterial disease due to passive smoking [12]. The amount of airborne nicotine was compared among categories of establishments. While schools and hospitals had lower concentrations, restaurants, internet cafes, and karaoke bars had the highest airborne nicotine concentrations [13].

SMOKING CESSATION AND PREVENTION IN CHINA

The Chinese Congress approved the Framework Convention of Tobacco Control in 2005, which formally declared the country’s intention to enforce tobacco control [14]. Due to the preponderance of male smokers in China, smoking intervention or prevention programs mainly target males. Furthermore, the decline in the age of initiation means the most critical time is the senior year of high school [7]. Prevention methods derive from many models in developed countries that have also struggled with tobacco use. For instance, a randomized trial using a modified version of Project SMART (Self Management And Resistance Training) [15] was implemented in elementary schools in Wuhan, China [16]. Students were taught anti-tobacco policies and national smoking statistics; they also made public commitments with classmates to abstain from smoking. The goal of the program is to establish a social norm among students that smoking is unacceptable. However, the curriculum did not demonstrate a primary preventive effect, even though fewer infrequent smokers progressed to become habitual smokers [16].

Many developed countries have studied smoking cessation methods, with individualized advice from physicians and pharmacotherapy over multiple sessions being the most effective [17]. The proportion of all physicians in China who smoke is lower than the public but remains a significant 23 percent overall (41 percent of male and 1 percent of female physicians) [18]. Reportedly, 37 percent of current physician smokers have smoked in the presence of their patients, and fewer than 7 percent set quit dates or use pharmacotherapy when helping smokers quit [18].

At Yale, Dr. Hong Wang, assistant professor at the Division of Global Health of
Yale School of Public Health, has investigated the social impact of tobacco in rural China. His research team found that smokers in rural China forego other important expenditures in order to pay for cigarettes [19]. In China, the tradition of providing the best education for one’s children has stood for centuries. Surprisingly, families of heavy smokers are trading off educational expenditure. Spending on tobacco also negatively affects human capital investment (health), future farming productivity (farming equipment), and financial security (savings) [19]. In short, efforts to bring about smoking cessation are much needed in China.

**YALE GLOBAL HEALTH INITIATIVE**

As Yale School of Medicine enters its 200th year, global health is becoming a major worldwide concern. In the United States, President Barack Obama requested support from Congress for a new global health strategy in 2009, coinciding with the launch of the Yale Global Health Initiative. The initiative aims to unite efforts across campus and address student and faculty interests in global health across various nations.

In the wake of this initiative, global health electives at Yale School of Medicine have expanded to include Social, Political and Economic Determinants of Global Health and Introduction to Research Methods in Global Health, which prepares students for further fieldwork. With China’s global role expanding rapidly, a popular option for medical students pursuing a fifth year includes Teaching Medical English in China, which is a combined effort through the Yale-China Association and the Yale School of Medicine to allow Yale medical students to spend a year teaching medical English at Xiangya Hospital in Changsha, China. While teaching English, students often choose to take a clinical elective or conduct research at Xiangya at the same time. The relationship between Yale and Xiangya Hospital also includes exchange of faculty and students between the two institutions.

The Yale-China Association, a non-profit organization founded in 1901, has teamed with Yale School of Medicine to establish the Hospital and Medical Program to develop hospital-based residency training at Xiangya-affiliated hospitals with the support of a group of Yale faculty members. In addition, Yale has taken part in the 10,000 Women program funded by the Goldman Sachs Foundation to equip female Chinese healthcare managers with knowledge to excel in their field. The program is a partnership between the Tsinghua University School of Economics and Management and Yale School of Public Health.

Thus, as global health emerges as a field of immense interest, Yale has established numerous ties with institutions abroad to bring local individuals into this important conversation. This lays a strong foundation for continued progress in global health improvement in Yale School of Medicine’s next century.

**REFERENCES**

1. Strong K, Mathers C, Epping-Jordan J, Beaglehole R. Preventing chronic disease: a priority for global health. Int J Epidemiol. 2006;35(2):492-4.
2. Mathers CD, Loncar D. Projections of Global Mortality and Burden of Disease from 2002 to 2030. PLoS Med. 2006;3(11):e442.
3. Daar AS, Singer PA, Leah Persad D, Pramming SK, Matthews DR, Beaglehole R, et al. Grand challenges in chronic non-communicable diseases. Nature. 2007;450(7169):494-6.
4. Yang G, Kong L, Zhao W, Wan X, Zhai Y, Chen LC, et al. Emergence of chronic non-communicable diseases in China. Lancet. 2008;372(9650):1697-705.
5. WHO report on the global tobacco epidemic, 2008: the MPOWER package/World Health Organization. Geneva: World Health Organization; 2008.
6. Yang GH, Ma JM, Liu N, Zhou LN. Smoking and passive smoking in Chinese, 2002. Zhonghua Liu Xing Bing Xue Za Zhi. 2005;26(2):77-83.
7. Yang G, Fan L, Tan J, Qi G, Zhang Y, Samet JM, et al. Smoking in China. JAMA. 1999;282(13):1247-53.
8. Huang X. Tobacco Economic in 2007. China Tobacco 3; 2008. p. 59.
9. Wang H. Tobacco control in China: the dilemma between economic development and health improvement. Salud Publica Mex. 2006;48(Suppl 1):s140-7.
10. Gu D, Kelly TN, Wu X, Chen J, Samet JM, Huang JF, et al. Mortality attributable to smoking in China. N Engl J Med. 2009;360(2):150-9.
11. Gan Q, Smith KR, Hammond SK, Hu T-w. Disease burden of adult lung cancer and ischaemic heart disease from passive tobacco smoking in China. Tob Control. 2007;16(6):417-22.

12. He Y, Lam TH, Jiang B, Wang J, Sai X, Fan L, et al. Passive Smoking and Risk of Peripheral Arterial Disease and Ischemic Stroke in Chinese Women Who Never Smoked. Circulation. 2008;118(15):1535-40.

13. Stillman F, Navas-Acien A, Ma J, Ma S, Avila-Tang E, Breyssse P, et al. Second-hand tobacco smoke in public places in urban and rural China. Tob Control. 2007;16(4):229-34.

14. Pan Z, Hu D. Multilevel analysis of individual and community predictors of smoking prevalence and frequency in China: 1991-2004. J Public Health Policy. 2008;29(1):72-85.

15. Graham JW, Anderson Johnson C, Hansen WB, Flay BR, Gee M. Drug use prevention programs, gender, and ethnicity: Evaluation of three seventh-grade project SMART cohorts. Prev Med. 1990;19(3):305-13.

16. Chou C-P, Li Y, Unger JB, Xia J, Sun P, Guo Q, et al. A randomized intervention of smoking for adolescents in urban Wuhan, China. Prev Med. 2006;42(4):280-5.

17. Kottke TE, Battista RN, DeFriese GH, Brekke ML. Attributes of Successful Smoking Cessation Interventions in Medical Practice. JAMA. 1988;259(19):2882-9.

18. Jiang Y, Ong MK, Tong EK, Yang Y, Nan Y, Gan Q, et al. Chinese physicians and their smoking knowledge, attitudes, and practices. Am J Prev Med. 2007;33(1):15-22.

19. Wang H, Sindelar JL, Busch SH. The impact of tobacco expenditure on household consumption patterns in rural China. Soc Sci Med. 2006;62(6):1414-26.