

Tackling China's Noncommunicable Diseases: Shared Origins, Costly Consequences and the Need for Action

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INTRODUCTION

Noncommunicable diseases (NCDs) have become the leading causes of death worldwide. As a concerning example, China's NCD prevalence is accelerating. As elsewhere, hypertension, diabetes, heart diseases, stroke, and obesity are the major contributors to this increasing trend. A common set of preceding risk factors is responsible for these different conditions, including physical inactivity, unhealthy eating habits, altered patterns of sleep, environmental pollution, and tobacco and alcohol abuse. In part, these problems have been spurred by China's successful economic growth, rapid urbanization, and entry into the globalized economy. NCDs and their complications, in turn, place a high burden on both individuals and the healthcare system. In addition, this heavy load of chronic disease sabotages health equities and impedes human capital growth.

Highlighting the NCD threats to public health and the urgent need for solutions, a symposium entitled "Tackling China's Noncommunicable Diseases: Shared Origins, Costly Consequences, and the Need for Action" was held at the Stanford Center at Peking University on August 6, 2014. This symposium first introduced China's NCD profile and the development of its disease surveillance system. It then delineated China's previous responses to NCDs and resulting policy implications. Finally, the symposium highlighted the experiences of conducting research in China, explored innovative approaches, and reinforced the value of a planned collaborative initiative of Stanford University Prevention Research Center, the Wellness Living Laboratory (WELL).

The symposium brought together top-tier experts with different perspectives: Government leaders and academics, clinicians and social scientists, citizens of the United States and China, to consider a broader vision of population health and wellness.

The event was chaired by Prof. Randall Stafford from Stanford Prevention Research Center. Featured speakers included Prof. Li-Xin Jiang from China's National Center for Cardiovascular Disease, Prof. Lin-Hong Wang from China Center for Disease Control (CDC), Prof. Li-Jing Yan on behalf of Prof. Yang-Feng Wu from the George Institute for Global Health at Peking University Health Science Center and Prof. Sanjay Basu also from Stanford Prevention Research Center. To explicate the title: "Shared Origins, Costly Consequences, and the Need for Action," speakers presented their considerable hands-on experience, expertise, and insights.

THEME 1: CHINA'S CURRENT NONCOMMUNICABLE DISEASES PROFILE AND SURVEILLANCE SYSTEM

Worldwide, there has been a dramatic rise in NCDs. As both Prof. Basu and Prof. Wang stressed in their sessions, the vast majority of disease burden around the world is attributable to NCDs and their complications. Such high cost can be quantified by calculating disability-adjusted life year (DALY). After weighting the effect of age distribution, the loss of DALYs is higher in low- and middle-income countries than high-income countries.^[1]

Although the epidemic growth of NCDs is shared by many emerging economies, the rapid change in China is unprecedented. It represents a particularly extreme

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epidemiologic shift. Economic growth, urbanization, shifting patterns of work, decreasing physical activity, and unhealthy diet have all contributed to the swift growth of NCD prevalence. Many middle-income countries face a dual burden of rapidly increasing chronic disease rates while still battling persistent endemic infectious diseases. China, however, has been relatively successful in tackling infectious disease. Prof. Wang presented the data from Global Burden of Disease,^[2] showing that in 2010, 65% of the worldwide mortality is attributable to NCDs; whereas in China, the fraction is 85%. For China, cardiovascular diseases (CVDs) (38% of deaths), malignant neoplasms (26% of deaths), and cerebrovascular disease (21% of deaths) are the leading causes of death. Prof. Yan provided further elaboration. In 2013, there was one CVD death every 10 s in China accounting for 39% of all deaths, 9% higher than the global average (30%).^[3] According to China Health Statistics Yearbook 2013, both urban and rural areas experienced a similar epidemiological pattern. In urban areas, the crude death rate (CDR) of stroke increased from 710 per million population in 2000–1200 per million people in 2012 (69% of increase); CDR of coronary heart disease increased from 580 to 1320 (128% of increase). Rural areas follow the same pattern, CDR of stroke increased from 780 per million to 1360 (74% of increase), and coronary heart disease increased from 490 to 1200 (145% of increase).^[4]

Dr. Wang described the historical development of China's disease information system. The Death Cause Registry began in 1957 as the first national level surveillance system for people's health and was followed by National Mortality Surveillance System in 1978. The National Disease Surveillance Points System, established in 1990, has now expanded from 145 to 605 provincially representative surveillance locations to now cover a population of 270 million.

"However," she added, "only in the most recent 10 years have we established our NCD surveillance system along with the Behavioral Risk Factor Surveillance System (BRFSS)." The latter is comprised of questionnaire-based in-person surveys, physical measurements, and laboratory tests. The surveillance system adopted a three-tier quality control mechanism:

- National Center for NCD Control develops quality control protocols and supervises local quality control activities;
- Provincial CDC offices implement local quality control protocols and review 10% of questionnaires and 5% of physical measurements;
- Local CDC offices and other involved institutes conduct fieldwork, then report and submit related quality control materials to the provincial CDCs.

According to the BRFSS data, Wang and Yan both pointed out that besides the increasing burden of NCDs, China also faces significant challenges related to rapid population aging, severe air pollution, and food safety. Economic growth and urbanization are also reshaping people's lifestyles. Westernized eating habits, decreased physical activity, and altered sleeping patterns reflect such a transition. Yan

introduced the story of bicycle production and consumption: From 1990 to 2010, although the production of bicycles kept growing, domestic consumption decreased dramatically with production increasingly directed at foreign markets. Data from 2010 indicate the prominence of high-risk behaviors among the Chinese population: 47% of the male population were smokers, 81% of the population had salt intake above 5 g/day, 83% had cooking oil intake over 28 g/day, more than half of the population had vegetable and fruit intake less than 400 g/day, 17% consumed excessive alcohol (15 or more drinks per week for men, 8 or more for women; or 5 or more drinks on an occasion for men, or 4 for women), and only 12% engaged in regular physical exercise. Yan emphasized that tobacco use is of significant concern with high male smoking levels and increasing uptake among young women.^[5] Furthermore, 72% of the nonsmokers are regularly exposed to second-hand smoke (SHS). Concerningly, awareness of the link between SHS and lung cancer, CVDs, and asthma is shockingly low; only 25% of the population acknowledged that such risks were associated with smoking. Every year, more than 1.4 million in China people die from smoking- and SHS-related ailments.

THEME 2: CHINA'S PREVIOUS RESPONSES TO NONCOMMUNICABLE DISEASES AND POLICY IMPLICATIONS

China's success in controlling infectious diseases places it in a better position to focus on NCDs. Through China's incrementally strengthened surveillance systems, problems can be detected at much earlier stages. However, due to the enormous size and the geographical heterogeneity of the country, surveillance systems require more strict quality control and greater investment in maintenance. Considering all future challenges, the vulnerability of China's healthcare system may be the biggest impediment to tackling NCDs. At the symposium, policy makers and scholars addressed the policies developed in response to increasing NCD prevalence and growing high-risk behaviors.

In response to rapidly increasing NCD prevalence, the Chinese government has increased its commitment to NCD control mainly through general policy design and decentralized implementation. The first national guideline for NCD control: "National Plan on NCD Prevention and Treatment (2012–2015)" – was issued by 15 ministries and commissions. The plan provided three basic principles:

- Following the lead of the central government, all organizations should strengthen multi-sectoral collaboration and facilitate social participation;
- Focus on key priorities, tailor programs based on different localities, and emphasize outcome equity;
- Place prevention strategies at the core, decentralize implementation of policies and empower primary health care.^[4]

Another key policy cited by Wang was for tobacco control. The government initiated its "National Plan for Tobacco

Control (2012–2015)” to promote national nonsmoking laws, improve legal enforcement, and ban smoking in healthcare facilities, schools, and government sectors.

Yan highlighted five policy priorities targeting general NCD prevention, particularly CVD control [Table 1]. On the international scale, UN Secretary General Ban Ki-Moon at UN General Assembly 2011 introduced the “Whole of government and whole of society” approach to strengthen the healthcare system, encourage global collaboration, and promote translational research.^[6] Responding to that initiative, the Chinese government launched “The National Plan on NCD Prevention and Treatment (2012–2015).” At the national level, China has carried out a series of healthcare reforms since 2009, one of which focused on enhancing the basic public health system. As suggested by previous studies, primary care providers are capable of managing hypertension patients to control their blood pressure.^[7] Thus, such cost-effective, primary health care approaches should be widely adopted for national NCD prevention and intervention. Yan advocated two other policy priorities focused on CVD prevention: Tobacco control and population salt reduction. China has been committed to actions on tobacco control since 2005 by joining WHO Tobacco Control Framework. Recently, China also launched “The Tobacco Control Work Plan (2012–2015).” The population salt reduction policy is considered as low-cost yet of high marginal effect. As this strategy has successfully reduced blood pressure, it will eventually facilitate hypertension prevention and management. Finally, Yan emphasized the importance of promoting translational research, as it will motivate the practical application of scientific findings. She emphasized that to conduct high-quality translational research, adequate study design is imperative. Researchers should explore novel methods of data collection; as well as contemplate the sustainability of programs, expected outcomes, policy interpretations, behavioral changes, and instructions.

THEME 3: CONDUCTING RESEARCH IN CHINA AND INNOVATIVE APPROACHES

Following up the idea of promoting translational research, a well-understood research atmosphere is the prerequisite. To lay the ground knowledge of this, Prof. Jiang shared her insights on pros and cons of conducting large clinical research in China [Table 2].

While China’s advantages establish a strong potential for conducting quality research, disadvantages in China have to do with implementation, particularly inadequate research procedures. With a heterogeneous population of 1.4 billion, China is riding the tide of dramatic economic growth and urbanization. In the wake of rising economic prosperity, however, newly emerging problems are created. Regarding healthcare and chronic disease, many needed studies and evaluations have not yet been conducted, creating significant future research opportunities. Since most NCDs in China are

Table 1: Policy priorities of NCD/CVD control

Policy priorities
The whole of government and whole of society approach
Healthcare reforms focusing on strengthening primary care
Tobacco control
Population salt reduction
Promote translational research

NCD: Noncommunicable disease; CVD: Cardiovascular disease.

Table 2: Pros and cons of conducting research in China

Advantages	Disadvantages
China’s large population enables large sample sizes	The Chinese approval process is complex and in lack of transparency
Newly emerged problems require urgent attention and solution	The illogical guidance is draining limited resources
Patients have a higher chance of developing NCD-related complications	The inconsistent management system leads to costly administration
The quantity and quality of data have been advanced	Data quality cannot be guaranteed

NCD: Noncommunicable disease.

inadequately managed, Chinese patients have high rates of disease progression, complications, and other adverse events. This problem creates a scientific advantage: The testing of interventions is more efficient because high rates of disease progression translate into greater statistical power in clinical trials. Compared to other low- and middle-income countries, China’s advancements of electronic healthcare records and population data collection also facilitate the conduct of high-quality trials. For long-established centers like NCCD, the years of experience in conducting large-scale clinical trials has led to a broad and solid network. For NCCD, this network with other pivotal sectors includes government institutes, local public health providers, and a vast array of collaborating hospitals.

Even though, China’s clinical research advantages suggest great potential for future studies, the nation’s research limitations are considerable. The regulatory approval process is prolonged and lacks of transparency, making it complicated for academics to initiate applications. Illogical guidelines add extra costs and complexity to research itself. For example, outcomes in the severe adverse events reporting system are insufficiently classified; the use of imported drugs for research and the export of blood samples to overseas institutes is cumbersome and difficult, adding further to operating expenses. Moreover, inconsistent management systems among different authorities and organizations result in enormous waste of resources. Finally, quality assurance cannot be guaranteed at local research sites. Hence for good clinical trials, intense oversight and supervision is required to avoid data misrepresentation and fraud.

To illustrate that this limitation can be overcome, Jiang gave an example of a successful high-quality research design in China: “The Clopidogrel and Metoprolol in Myocardial Infarction Trial.” Involving the collaboration of 1250

hospitals, this study recruited more than 45,000 participants. The results from this study have been incorporated into medication guidelines developed by American Heart Association and American College of Cardiology. The article itself has been cited over 2000 times in the worldwide medical literature. The methodology adopted in this study is worth disseminating not only within China, but also to other middle-income countries.^[8]

Regarding international experiences within the developing world, China has pursued the development of pragmatic and effective models that other countries can replicate. China could also learn innovative approaches from its peers. Many studies conducted in developing countries share similar limitations associated with the early stages of developing adequate research infrastructure. For instance, common problems include missing data or incomplete data collection, dubious data credibility, difficulty in data source validation, etc. Prof. Basu stated in his talk, “Accurate prediction of NCD trend, prevalence, and outcomes are severely restricted by data limitations.” Given this impediment, Basu proposed exploiting available and credible data that provides information about the known precursors along a disease pathway. For instance, based on the medical literature, there are several daily commodities that are explicitly related to NCD incidence, such as tobacco, alcohol, food high in sodium, food with unhealthy fats, and high sugar containing products. Basu introduced his obesity and type 2 diabetes model: A micro-simulation constructed to predict how taxation of sugar-sweetened beverage (SSB) in India will affect individuals’ caloric intake, blood glucose level, population overweight/obesity prevalence, and finally type 2 diabetes incidence. By incorporating data of sugary beverage consumption, price and price variations, prevalence of overweight/obesity and type 2 diabetes, individual body mass index (BMI) and other socioeconomic indicators, Basu’s model found that increasing taxation on SSBs by 20% would reduce overweight/obesity prevalence by 3%, type 2 diabetes by 1.6%, a finding that applied to both urban and rural areas in India.^[9] At the symposium, Basu also briefly introduced two other economic-epidemiologic models, his “the body weight model” and “CVD model.”^[10,11] In the end, he pointed out that such methodologies could be adopted in China since China has relatively rich data resources regarding patterns of consumption. Besides CDC surveillance data, there are public datasets such as China Health and Nutrition Survey, China Health and Retirement Longitudinal Study, etc. By combining such datasets with information on numerous risk factors and socioeconomic indicators, researchers can predict NCD prevalence, evaluate government policies for nutrition and physical activity, and plan strategies to reduce the negative consequence of NCDs, especially their adverse clinical events.

To summarize the insights of other speakers, symposium chair Prof. Stafford from Stanford University Prevention Research Center recapped the urgent needs of NCD control in China. He further advocated innovative approaches to

conducting wellness studies in the future. By quoting Alma Ata Declaration’s definition of health as “A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity,”^[12] Stafford suggested researchers should move research strategies upstream to prevent the precursors of future diseases and disability. He pointed out “Although many approaches have already been implemented to confront China’s epidemic of NCD trend, new and multi-component strategies are still needed.” Stafford illustrated that potential strategies should include the following features: Integration across all NCDs that share common risk factors and behavioral causes, integration across disease pathways so that reduction of environmental and behavioral risk factors is linked to disease treatment and efforts to reduce disease progression, “Whole Person Approach,” moving strategies upstream, and well-planned adoption of health IT [Table 3]. He also stated that these strategies are well-aligned with the goals of the WELL Initiative of the Stanford Prevention Research Center. While WELL will pioneer new research strategies, it will face the challenges as many other studies. Its focus on multidisciplinary and multicultural collaboration will not only generate novel scientific findings, but also enlarge the pool of research methodologies aiming to overcome existing challenges.

CLOSURE OF THE SYMPOSIUM, NEW ERA OF BATTLING NONCOMMUNICABLE DISEASES

The symposium collected thoughts and ideas from different perspectives that are needed to effectively tackle NCDs. To accomplish this, we must confront the challenges raised by other contributing factors, ensure broad government support, facilitate social participation, and encourage cross-disciplinary collaborations among researchers. Furthermore, given the work done in China and other international experiences, there is immense potential value in adopting

Table 3: Innovative strategies for conducting research

Integration across all NCDs	An integrated general prevention strategy for all NCDs focusing on the protective effect of physical activity and other beneficial behaviors should be considered rather than disease-focused prevention programs
Integration along disease development pathway	Follow the disease’s pathway, fully integrate public health sectors into clinical health care delivery at all levels
“Whole person approach”	Focus on outcomes that recognize “health is more than the absence of disease” by incorporating measures of human function, capacity, quality-of-life, human and social capital, etc.
Moving upstream	Not only prevent adverse disease events, but also the shared risk factors of different diseases and maximize wellness and function capacity of each population member
Information technology	Take advantage from the rapid penetration of information and communication technology, develop innovative strategies for solution-oriented research that follows large population and uses nested clinical trials to determine best practices

NCDs: Noncommunicable diseases.

new data sources and innovative analytical methodologies. As there is no short-term solution to control China's current NCD condition, continuity and sustainability will be the two key factors in reversing China's NCD epidemic. Insights learned from China will be critical to other middle-income and emerging economies. Even developed nations desire new approaches to their entrenched issues of obesity, diabetes, and other chronic diseases.

Facing the challenges yet tremendous opportunities, Chinese researchers, policy makers, and other involved sectors should be integrated in pursuing pioneering novel approaches. On this path, China is not alone. At the symposium, Stafford advocated for evidence-based, mutually benefited international collaboration. By learning from previous experiences in other countries, researchers would be able to localize and tailor the strategies to include unique Chinese characteristics. In turn, China's experience of battling NCDs and enhancing population wellness will establish models critical to both developing and developed nations. To fulfill this accomplishment, researchers in China should equip themselves with more than just knowledge. Jiang stated in the end of her talk: "As a Chinese researcher, regardless of your prestigious academic background and advanced expertise, a complete understanding of the current situation, and realizing your responsibility are the most crucial prerequisite qualities for a good researcher." Beyond those, a good Chinese researcher should also have the vision, the passion, and the conscience in conducting research. One should be willing to expose him/herself to reality, holding the right attitude and establishing international collaboration with a "Chinese Heart." Ultimately, by combining domestic resources and existing infrastructure, by incorporating government incentives and motivations, and by adapting instructive international experiences and collaborations, China will turn to a brand new page of NCD control and population wellness.

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