ANNEX E

Prevention and Control of Chronic Non-communicable Disease in Twelve Pacific Rim Cities

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Introduction

Pacific Rim cities can be viewed as a critical bellwether for global public health: with the majority of the global population now living in cities, and the Asia Pacific one of the most populous and dynamic regions of the world, how the cities of this region confront chronic, non-communicable diseases (NCDs) of lifestyle and circumstance will strongly shape the future health of the region and beyond.

NCDs including cardiovascular diseases (CVD), diabetes, obesity, cancer and respiratory diseases account for 59% of the 57 million deaths annually and 46% of the global burden of disease (WHO 2008). CVD mortality in less economically advanced countries affects much younger people than in western countries[1] and leads to higher age-specific death and disability rates than high-income countries experienced at the peak of their CVD epidemics (*A Race against Time* p.iii). Yet many global health initiatives focus exclusively on infectious disease (e.g. the Millenium Development Goals do not include any NCD targets; Anderson and Chu 2007; IOM report 2009).

Recently, NCDs have garnered more policy attention. Noting that NCDs are "an under-appreciated cause of poverty and a barrier to economic development," the Joint Statement by the International Diabetes Federation, International Union Against Cancer and World Heart Federation (http://www.idf.org/node/1491) implores the international community to integrate NCD prevention into national health systems and the global development agenda. NCD prevention and control have become the focus of both a global alliance of research funding agencies ("The Global Alliance for Chronic Diseases." *Lancet* June 20, 2009) and a public-private partnership supporting centers of excellence in low-income and middle-income countries ("Combating chronic disease in

[1] Of the expected 9 million CVD deaths in China in 2030, over half will occur in the prime working ages 35-64 (*A Race against Time* p.iv).

developing countries," *Lancet* June 13, 2009, p.2004.) The World Health Organization (WHO) has endorsed a global strategy to address NCDs and their common preventable risk factors related to lifestyle (tobacco use, unhealthy diet and physical inactivity).

NCDs account for the largest burden of mortality and morbidity around the Pacific Rim. The staggering increase of NCDs over the past two decades threatens quality of life in addition to posing an unprecedented challenge to health care systems in the Asia Pacific, many of which are unprepared and in transition.

This paper presents information on chronic disease in 12 cities of the Pacific Rim: Beijing, Danang, Hangzhou, Hong Kong, Jakarta, Kuala Lumpur, San Bernadino, Seoul, Singapore, Sydney, Taipei, and Tokyo. These cities range from medium-sized ones like Danang (population about 753,000) and San Bernadino (county in California, US, population about 2 million),[2] to city-states (Singapore 5m) and autonomous regions (Hong Kong 7m), to some of the largest cities in the world -- Jakarta 9m, Seoul 10m, Beijing 17m, Tokyo 35m. We highlight the role that public health and health care systems for urban populations will need to evolve to address NCDs as the primary cause of preventable morbidity and premature mortality for both the poor and the non-poor in Pacific Rim cities. The aim is to provide a baseline assessment of chronic disease research, policy and programming to identify gaps and research needs for NCD control in the region.

The paper is organized as follows. The first section presents data on the prevalence and trends in NCDs and risk factors in each city and region, and reviews what evidence is available regarding the associated economic burden. The next section describes the primary policies and programs established to prevent and control NCDs in

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[2] That the US is a "Pacific nation" was affirmed by US President Obama in a recent speech in Tokyo: "The United States of America may have started as a series of ports and cities along the Atlantic, but for generations we also have been a nation of the Pacific….I am an American President who was born in Hawaii and lived in Indonesia as a boy…. the Pacific Rim has helped shape my view of the world….The fortunes of America and the Asia Pacific have become more closely linked than ever before….As America's first Pacific President, I promise you that this Pacific nation will strengthen and sustain our leadership in this vitally important part of the world" (http://www.ft.com/cms/s/0/9e985a46-d0c2-11de-af9c-00144feabdc0.html).

each city, reviewing successes and continuing challenges. In the conclusion, we discuss the implications of these data, including research and policy needs and how they are shaped by the broader structure of health system financing and delivery.

Morbidity and mortality attributable to NCDs

According to the WHO (2009) data on the distribution of years of life lost due to three broad categories (communicable disease, NCDs, and injuries) among the Pacific Rim countries we study, the percentage of years of life lost attributable to NCDs ranges from lows of 32% in Indonesia (2004) and 46% in Vietnam (2004), to as high as 76% in Japan and 78% in Singapore. The range of morbidity burden attributable to NCDs is still considerable, but narrower, when focusing on urban populations as we do. Age-standardized mortality rates for NCDs reveal a different pattern: those for Japan, Australia, or Singapore are among the lowest, and those of the lower-income countries along the Pacific Rim are among the highest (see Table XX). For example, age-standardized mortality rates (per 100 000 population) for CVD are 103 in Japan, compared to 279 in China, 295 in Vietnam, and 344 in Indonesia. For cancer, age-adjusted mortality rates are less dispersed – e.g. 113 in Singapore compared to 115 in Vietnam and 161 in South Korea.

Mortality from NCDs in select Pacific Rim cities

In China, mortality rates from NCDs have been increasing rapidly, especially in urban areas. In Hangzhou in 2002, the mortality rate of NCDs for urban residents was 357.11/100000. The standardized mortality rate for heart disease was 59.98/100000 in Hangzhou's urban population. (Corresponding national mortality rates per 100,000 in 2007 were 100.6 for CVD; 111.5 for stroke; 19.0 for diabetes; and 176.2 for cancer (in urban areas)).

In Hong Kong, death rates for leading causes of death in 2007 (no. of registered deaths per 100 000 population) were 177.8 for malignant neoplasms; 92.0 for CVD; 71.9; for pneumonia; 50.7 for cerebrovascular diseases; 30.3 for chronic lower respiratory diseases; 7.3 for diabetes; and 5.8 for chronic liver disease and cirrhosis. The Department of Health "NCD Prevention and Control Strategic Framework" reports that in 2006,

approximately 61% of total registered deaths in Hong Kong were attributed to four major preventable NCDs: cancer (32.3%), heart diseases (15.0%), stroke (8.8%) and chronic lower respiratory diseases (5.1%).

Cancer is the leading principal cause of death (27.7%) in Singapore, followed by ischaemic heart disease (19.8%) (Ministry of Health 2007). According to the WHO, age-standardized mortality rates in Singapore (in 2002 per 100,000 population) were 376.0 for NCDs overall; 171.4 for CVD; 127.5 for cancer; 45.0 for stroke; 16.3 for diabetes; and 15.5 for COPD.

San Bernadino (a city and county inland from Los Angeles, California, US) has a high burden of NCDs, compared to other Pacific Rim cities and to other counties in California. Three-year (2005 – 2007) average age-adjusted mortality per 100,000 population in San Bernadino was 175.8 for cancer (compared to 159.3 for the state of California [CA]); stroke 47.1 (CA 44); Alzheimer's 28.1 (24.0 CA); Coronary Heart Disease 197.2 (CA 145.2); and diabetes 30.7 (CA 21.9) (http://www.cdph.ca.gov/pubsforms/Pubs/OHIRProfiles2009.pdf). Data was not available for CVD, COPD, or for NCDs overall.

Disease Prevalence

NCDs are of growing importance as causes of morbidity in Vietnam, especially in cities. In the Pacific Rim city of focus in this case study, Danang, we know there has been an increase in the number of cancer patients among inpatients between 2005 and 2007. The incidence of cancer has increased nationally, with an estimated 30% of cases related to smoking, and another 35% are related to chemicals in food [66, 67]. The Vietnam National Health Survey (VNHS) 2001-2002 [3] estimates that the prevalence of hypertension (based on the WHO definition) in those aged 16 years and older is 15.1% in males and 13.5% in females, with urban residence and obesity significantly associated with higher rates of hypertension. These results are similar to findings from smaller studies in Vietnam [55, 56]. Only 28% of males and 42% of females with hypertension are diagnosed [3], with the proportion of diagnosed patients in urban and wealthy groups higher than that in rural and low-income groups. Cities also have the highest standardized prevalence of diabetes, at 4.4% in 2004 (compared to 2.7% nationally; Mui VT. Chuc

NQ, 2004 [61]; Binh TV, 2004 [60]).

In Jakarta, prevalence rates for specific NCDs per 100,000 population [not %???] were CVD 8.1; hypertension 28.9; tumor/cancer 7.4; stroke 12.5; diabetes 26; asthma 2.9; and mental illness 30.3. The corresponding national rates in Indonesia were CVD 7.2; hypertension 31.7; tumor/cancer 4.3; stroke 8.3; diabetes 11; asthma 3.5; and mental illness 4.6 (National Research on Basic Health, Riskesdas 2007).

The National Health and Morbidity Surveys provide some evidence on the increasing prevalence of diabetes and hypertension in Malaysia and its capital, Kuala Lumpur, between 1986 and 2006 [Personal communication (2009). Division of Disease Control, Ministry of Health Malaysia] Among residents of Kuala Lumpur 18 years old or older, the prevalence of diabetes was estimated to be 12.6% in 2006, with an additional 6.1% of the population having impaired fasting glucose (Malaysian Third National Health and Morbidity Survey 2006). According to the same survey, the prevalence of hypertension in Kuala Lumpur (as defined by ≥140/90 mmHg) was 22.5% in 2006.

China has also registered a significant increase in prevalence of NCDs, especially in urban areas. In 2003, national prevalence (per 100,000) of NCDs overall was 123.3; for stroke, 6.6; diabetes 5.6; COPD 7.5; CVD 4.6; and 11.15% of those age 15 and above reported being sad, annoyed or depressed. In Hangzhou, prevalence rates for men and women were CVD 12.55% and 13.68%; cancer 2.42% and 3.08%; stroke 3.9% and 2%; diabetes 7.71% and 6.27%, respectively. The standardized prevalence rates of type 2 diabetes in rural and urban areas of Hangzhou municipality were 1.38% and 1.87% in 2003, respectively. The chronic bronchitis prevalence rate was 0.54% in 2006, and that for mental disorders was 1.47%.

In Hong Kong, the prevalence rates of major chronic health conditions in 2004 were as follows: Hypertension: 27.2%; High blood cholesterol: 8.4%; Diabetes: 3.8%; Asthma: 1.9%; Coronary heart disease: 1.6%; COPD: 1.4%; Cancer: 1.3%; Stroke: 1.1%. The prevalence of major doctor-diagnosed mental health problems in Hong Kong were as follows: Anxiety disorder: 2.0%; Depression: 1.5%; Schizophrenia: 0.2%; and Dementia: 0.3% (Population Health Statistics (2003/2004) by Department of Health at http://www.chp.gov.hk/epidemiology.asp?lang=en&id=363&pid=362&ppid=134).

In Singapore the prevalence of specific NCDs is as follows: stroke about 3.65% (>49, age and sex-standardized), incidence of 1.8/1000 patient-years (Venketasubramanian et. al 2008); diabetes: 8.2% (among 18-69 year olds; NHS 2004; COPD: 2.3% in 2003 (Tan 2003); and depression: 5.6% (depression population weighted lifetime & 4.9% - recent prevalence (20-59)/ 3.1% (>60); NMHS 2004).

In the US, we focus for comparison on California, and the city of San Bernadino. According to the California Health Interview Survey (CHIS 2005 - 2007 Adult, Adolescent, Child Public Use File [http://www.chis.ucla.edu/default.asp] Los Angeles, CA: UCLA Center for Health Policy Research, January 2007), the self-reported prevalence of CVD among adults in San Bernadino was 6500 per 100,000, higher than the state average (4677 per 100,000). Similarly, prevalence among adults of any cancer was 8200 (CA 6292); stroke 2600 (CA 1662); diabetes 9200 (CA 5033); pre-diabetes 1400 (CA 787); and mental illness 50,500 (CA 32,932). Among all ages, the self-reported prevalence of asthma was 14,900 (CA 13,268).

Risk factor prevalence

In Jakarta and elsewhere in Indonesia, male smoking rates are high. Among Indonesians 15 years old or older, 63.2% of males and 4.5% of females smoke daily; 13.5% of students (13-15 years) currently use any form of tobacco, with average consumption 12 cigarettes per day. Lack of sufficient fruit and vegetable consumption is 4.5% in Jakarta. Excessive alcohol consumption is estimated at 4.0% in Jakarta (4.6% nationally). The proportion of Indonesians in Jakarta who do not get regular physical exercise is estimated to be 54.7% (compared to 48.2% for Indonesia as a whole; Indonesia Report Card: Status of Tobacco Use and Its Control; National Research on Basic Health, Riskesdas 2007).

In Kuala Lumpur in 2006, the prevalence of selected risk factors of NCDs among adults were also relatively high, compared to the rest of Malaysia and similar to several other Pacific Rim cities: although only 15.7% of adults smoke, 54.9% are physically inactive, 32.2% are overweight (BMI $\geq$25 kg/m^2 & <30 kg/m^2); 14.4% are obese (BMI $\geq$30 kg/m^2); and 16.6% have hypercholesterolemia (personal communication 2009 from Division of Disease Control, Ministry of Health Malaysia, based on micro data from the

First Malaysia NCD Surveillance 2005/2006). Kuala Lumpur residents are estimated to be slightly more overweight and physically inactive than the rest of Malaysia's population.

In China in 2003, among adults age 15 and older, 26% smoked and 8.2% abused alcohol. According to data from 2002 for adults 18 and over, the prevalence of hypertension was 18.8%; overweight 22.8%, and obesity 7.1%. In Hangzhou, survey data reveals that the percentage of smoking males was 22.5% among 1796 males aged 30-50 years. Another study showed that percentage of smokers overall was 57.64% among males and 2.71% among females. The prevalence rate of hypertension among1452 residents aged 20-70 years was 29.13% in 2005. The hypertensive prevalence rate of rural areas (19.53%) was significantly lower than that of urban residents (38.50%). Overweight and obesity accounted for 27% and 6.9% among Hangzhou urban residents, respectively.

In Hong Kong, the prevalence of major behavioral risk factors (as of April 2008) was as follows: daily smoking: 14.4%; low level of physical activity (IPAQ classification): 22.7%; inadequate daily fruit and vegetable intake: 78%; binge drinking (in the past month): 9.2%; using World Health Organization classification for adult Asians for BMI, overweight (BMI 23.0 - <25.0) 17.1% and obese (BMI =or>25.0) 22.2%. An April 2006 figure estimates only 7.1% Hong Kong residents had no stress in their lives. (Hong Kong Center for Health Protection, http://www.chp.gov.hk/behavioral.asp?lang=en&id=280&pid=10&ppid=).

In Seoul, cancer, cerebrovascular disease and heart disease are the top three causes of death. Smoking prevalence is lower, but alcohol drinking higher, than the corresponding national rates. A gradient of educational differentials in mortality were observed among both sexes, with higher mortality rates related to lower educational attainment in most causes of death. However, positive associations were identified between education levels and mortality rates with respect to ischaemic heart disease among older males and breast cancer among older females.

Trends in risk factors in Singapore reveal the complicated patterns underlying the epidemic of NCDs in Pacific Rim cities and its policy response. Since 1998, several risk factors improved: the prevalence of daily smokers declined (from 15% in 1998 to 12.6%

in 2007 among adults age 18-69); prevalence rates declined for hypertension (from 27.3% to 20.1%) and high cholesterol (25.4% to 18.7%) between 1998 and 2004; and the percent of Singaporeans eating more than two servings of fruit and vegetables a day increased (e.g., from 5.8% eating more than 2 servings of vegetables a day in 1998, to 42.8% in 2004). But physical inactivity has risen sharply (from 16.8% in 1998 to 48.1% in 2004); prevalence of overweight and obesity has increased (from 6.0% in 1998 to 6.9% in 2004); and more Singaporeans report being frequent drinkers of alcohol (2.6% to 7.0%; Singapore National Health Surveys 1998 and 2004).

According to the California Health Interview Survey (CHIS 2005 - 2007), tobacco use among teens and adults in San Bernadino is significant; self-reported current smokers are 15,100 per 100,000 (for the state of California, the rate was 11,567 per 100,000). The rates per 100,000 for other risk factors also indicate why NCD prevention and control is a growing priority: hypertension 27,900 (CA 17,980); stress 8,900 (CA 6,273); obesity and overweight 55,700 (CA 43,357); alcohol abuse as measured by binge drinking in the last year, 29,700 (CA 21,869); poor nutrition as measured by eating fast food two or more times in the last week, 42,500 (CA 34,380); and lack of physical activity 16,200 (CA 10,330).

Economic burden of disease from NCDs

The economic burden associated with tobacco use is more widely available for our Pacific Rim economies than for other risk factors or NCDs. In Hong Kong in 1998, the annual value of direct medical costs, long term care and productivity loss was estimated to reach US$ 532 million for active smoking and US$ 156 million for passive smoking; passive smoking accounted for 23% of the total costs. Adding the value of smoking-attributable lives lost brought the annual cost to US$ 9.4 billion (McGee 2006). In Singapore, smoking-related diseases cost the economy an estimated 800 million S$ per year (data from workplace health promotion program).

In several cases, only national-level estimates were available. In Indonesia, the economic loss due to tobacco-caused premature mortality, morbidity and disability was estimated to be at least US$ 13.84 billion (Rp 125 trillion), or about 4.7 times larger than the tobacco tax revenues of US$ 2.94 billion (Rp 32.65 trillion; Indonesia Report Card:

Status of Tobacco Use and Its Control). Lost annual income is estimated to be US$115 for individuals and for family members who use tobacco (Kosen 1998). According to estimates from 1998, the economic burden of smoking in Korea (for the population over the age of 35) totaled US$ 2.96 billion, with the vast majority of those costs (2.67b) from premature death (Kang et al. Economic burden of smoking in Korea. *Tob.Control.* 2003; (12)37-44.] In Japan, the burden of disease attributable to tobacco amounted to 10% of the total years of life lost and 7% of total DALYs (Shibuya, 2001).[3]

The estimates that are available of the economic burden associated with selected other NCDs around the Pacific Rim highlight the enormity of the challenge. In China, 131.39 million DALYs were lost in 2002, and the estimated direct expenditure for specific NCDs (in billion RMB Yuan) was cancer 28.45, stroke 39.27, CVD 58.79, COPD 25.98, diabetes 17.59, and hypertension 38.38. In Hong Kong, annual total direct medical costs of type 2 Diabetes Mellitus per patient were US$ 1,492-1,716. Costs of Type 2 DM have a significant impact on the local healthcare budget, contributing in 2004 up to 3.9% of the total healthcare expenditure in Hong Kong and 6.4% of the Hospital Authority's expenditures on health (Chan et al. 2007).

In Singapore, NCDs were estimated to be the cause of 79.9% of all years of life lost in 2002. The economic burden associated with asthma was US$ 34 [per patient? per capita??] per annum (2002 – Jason Chea, National Healthcare Group), while costs associated with mental health are estimated to be 3-4% of GDP (WHO estimates for developed countries). The mean cost for inpatient treatment of stroke was S$7,547 (Hospital Costs for Stroke Care in Singapore).

Sydney is the capital of the state of New South Wales (NSW) in Australia. In NSW, an average household can expect to lose AU$ 47,200 in financial costs when a member of that household is diagnosed with cancer (including nearly AU$ 9,000 in out-of-pocket costs). The total lifetime financial cost of cancer for people diagnosed with cancer in 2005 in NSW is $3.9 billion – equivalent to 1.3% of gross state product (A report by

[3] The 2003 Australian Burden of Disease Study indicates that tobacco smoking was second only to overweight as a leading cause of burden of disease in Australia. It was estimated that tobacco smoking was responsible for about 8% of the total burden of disease and injury for all Australians (9.5% of total for males and 6.1% of total for females) (AIHW 2006).

Access Economics Pty Ltd for the Cancer Council of NSW, Cost of Cancer in NSW, 2007).

Some studies have pointed to the large economic burden associated with NCDs in the US Pacific Rim cities as well. For example, loss of income to the economy attributable to obesity has been estimated at US$ 203 per capita in 2006 for San Bernadino (and $225 per capita for California), and the lost productivity due to physical inactivity as $97 per capita ($336 per capita for California; http://www.publichealthadvocacy.org/PDFs/Economic_Costs_Table.pdf). The same study estimates that the medical care costs associated with physical inactivity are $264 per capita in San Bernadino ($219 for CA), and the medical expenditures due to obesity were $188 per person ($351 per person in the state as a whole).

NCD Prevention and Control Policies

Most of the studied cities had adopted national or local strategies and programs to prevent and control NCDs within the last decade. Since 2000, Singapore has had a multi-pronged management framework for chronic disease, developed through the Ministry of Health. The Japanese Ministry of Health, Labor and Welfare also launched its National Health Promotion Movement in 2000. In June 2002, the Vietnamese Prime Minister signed government resolution number 77/2002/QD-TTg to approve the "National Program on Prevention and Control of NCDs for the period 2002-2010." Similar programs aiming to decrease morbidity and mortality from NCDs were launched in Indonesia in 2006 and Hong Kong in 2008.

In most cases it is unclear what specific events triggered the formation of national and municipal plans for NCD prevention and control. For Singapore, apparent triggers included the increasing mortality rate due to chronic diseases (83% of all deaths in 2002, http://www.who.int/chp/chronic_disease_report/en/) and the associated need for consistent, coordinated, evidence-based treatment to improve health as well as save medical costs. Japan's national strategy has been closely linked to the rapid pace of population aging. Japan has established long-term care insurance and has put in place a 10-year strategy to reduce the use of long-term care by promoting physical and intellectual activities for the elderly. The "Healthy Japan 21" program is based on health

promotion, encouraging citizens to follow healthy lifestyles and endeavoring to motivate them to take responsibility for their own health and quality of life.

Organizational structure

The institutional arrangement for overseeing the NCD prevention and control policies and programs differs considerably across jurisdictions. Sometimes new responsibilities are added to the mandates of existing agencies, or re-prioritization leads to increased emphasis on NCDs within existing public health organizations. In Japan, the national plan is spearheaded and financed through the Ministry of Health, Labor and Welfare, although some policies and programs also involve other ministries and the cabinet. In Taiwan, the Bureau of Health Promotion of the Department of Health (BHP/DOH) is responsible for the prevention and control of NCDs.

In many cases, new divisions or sections within health ministries have been created to target NCD control. Singapore's Ministry of Health created an autonomous but state-funded Health Promotion Board (HPB) in April 2001. In Indonesia in 2006 the Minister of Health's Decree No. 331 (Strategic Plan of the Ministry of Health 2005-2009) established the Directorate of NCDs under the Directorate for General Disease Control and Environmental Health. This Directorate of NCDs began operations in 2007 with a focus on controlling cancer, chronic and degenerative conditions, heart and circulatory system disorders, diabetes and other metabolic conditions, and preventing accidents and injuries in Indonesia. Jakarta's programs operate those of the national strategy to work together with communities and households to control risk factors to reduce morbidity, disability and deaths caused by NCDs. In Malaysia, the Disease Control Division of the Ministry of Health (which was created in 1992) includes a designated section on NCDs. Its main areas of focus are health promotion, early diagnosis and prompt treatment of NCDs like CVD, cancer and diabetes.

NCD control strategies often fall under the purview of more than one government agency. The China CDC and the MOH both have strategies and aims for NCD control and improvement of risk factors, such as better nutrition and decreasing tobacco use (such as through decrees limiting or forbidding smoking in public places). Various governmental and professional agencies administer these programs, mostly financed by

central and local governments. An ambitious program with a detailed list of specific targets, "Healthy China 2020," was announced in 2009 alongside a health system reform plan that involved coordination among 16 different government agencies and was posted for public comment in fall 2008.

Hong Kong's "NCD Prevention and Control Strategic Framework," published by the Department of Health in October 2008, sets the scope, vision, goals, and strategic direction for NCD prevention and control in Hong Kong. In preparing the framework, the Department of Health held an Expert Group meeting with over 40 participants from various disciplines and sectors. A Tobacco Control Office has been established to enhance and coordinate efforts on tobacco control. The Hong Kong Hospital Authority has also played an active role in health promotion and disease prevention.

In some cases, specific NCD programs fall under the jurisdiction of different government organizations. In Vietnam, for instance, the National Institute for Cardiovascular Disease manages the program on prevention and control of CVD; the National Institute of Oncology (National Cancer Hospital) manages the program on prevention and control of cancer; the National Institute of Endocrinology and the National Institute of Psychiatry each manage the separate national programs on diabetes and mental illness, respectively.

Overarching NCD prevention and control strategies can also develop from collaboration among many diverse stakeholders. In Australia starting in 2001, for example, the National Public Health Partnership Group and National Strategies Coordination Working Group, in conjunction with the National Health Priority Action Council and with the support of the Australian Health Ministers' Advisory Council, put forward a strategic framework for preventing chronic diseases.

City-specific strategies

Except for the city-state of Singapore, there is an interesting question of national versus city-specific NCD policies. In many cities (such as Danang, San Bernadino, or Sydney), local authorities primarily implement guidelines established by national authorities. Some cities have begun to articulate their own NCD prevention and control strategies, even in the absence of national strategies. For example, although in Malaysia

no specific targets have been set for NCD control, the Kuala Lumpur Federal Territory Health Department has a NCD subunit under the Disease Control Unit, with activities mainly focused on public health awareness and health promotion campaigns regarding NCDs.

Several factors appear correlated with the probability of a city adopting a tailored strategy for NCD control: the similarity or difference in epidemiology of burden of disease compared to the rest of the country; population size relative to the rest of the country (including the scope of human and institutional resources available for crafting and implementing a city-specific strategy); and the political jurisdiction (e.g. as a capital city or a special administrative zone).

Hangzhou, like many other cities in the PRC, has developed strategies for population health improvement that give emphasis to prevention and control of NCDs, with local government, bureaus of health and China CDC offices as the key players. In 2003, the Hangzhou health bureau published a policy about reinforcing community-integrated prevention and treatment. The policy clarifies that community health centers should be the primary force for preventing and treating NCDs. In 2004, the Hangzhou CDC developed prevention and treatment programs for hypertension, diabetes, malignant cancers and other NCDs, and trained relevant health professionals. Measuring blood pressure, limiting salt intake, and obesity interventions are the priority programs for adults. Through grass-roots health care organizations, attempts are made to personalize diet and physical activity recommendations for patients with diabetes.

The Department of Health in Seoul established two strategies and ten programs for NCDs for 2007-2010. One is the prevention and management project, which encompasses education and information about physical exercise; promotion of moderation in drink and quitting smoking; early detection through regular health examinations; building databases and networks for management of NCDs in the community; and support for vulnerable groups in paying their medical bills. A second project in Seoul is "preparing the environment for prevention of NCDs," which includes education about nutrition and healthy diets and reducing environmental pollution.

In some Pacific Rim cities, subsets of districts or wards implement more aggressive NCD control policies than elsewhere in the municipality or country. Several wards in

Tokyo prohibit smoking while walking in public places, for example, while more general tobacco control efforts apply nationally (e.g. banning tobacco advertisements from all media, requiring health warning labels on cigarette packages; and since 2008, having a build-in age verifier device in all vending machines).

Overall objectives and strategies

The overarching goals of most of the NCD control policies are similar, and consistent with the WHO recommendation of an integrated approach that addresses underlying risk factors. Most strategies focus on a number of preventable conditions which share commonalities in their aetiology and major modifiable risk factors. Within this broad framework, however, different Pacific Rim cities have developed emphases specific to their distinctive epidemiological and social circumstances and institutional contexts.

The aim of the Singapore Chronic Disease Management Program, launched in 2006, is to shift the focus away from sub-optimal, episodic, or reactive care of symptoms, towards a paradigm of life-long holistic care that emphasizes prevention and health maintenance. The chronic conditions currently focused on are hypertension, high blood cholesterol, diabetes, stroke, asthma, chronic obstructive pulmonary disease, schizophrenia, and major depression. This strategy relies on 4 basic policies: emphasizing the importance of primary prevention; creating a supportive environment for the enhancement of health; actively setting goals and assessing results; and promoting effective, well-coordinated activities by the various implementing bodies.

In Hong Kong, six strategic directions have been identified: supporting new and strengthening existing health promotion and NCD prevention initiatives or activities that are in line with the overall strategy; generating an effective information base and system to guide action across the disease pathway; strengthening partnerships and fostering engagement of all relevant stakeholders; building the capacity and capability to combat NCDs; ensuring a health sector that is responsive to the NCD challenges; and strengthening health-promoting legislation.

Sydney follows the Australian national NCD framework, which is intended to provide the basis for a comprehensive, evidence-based, public health response to priority

diseases and health issues. The framework underlines the importance of a life course approach and harnessing the contributions of different groups in society (http://www.dh.gov.hk/english/pub_rec/pub_rec_ar/pdf/ncd/chap_3.pdf).

Defining specific targets

Several NCD control strategies around the Pacific Rim include specific targets that combine regular surveillance with programs designed to change behaviors. Tokyo is implementing Japan's National Health Promotion Movement, for example, which includes 70 specific targets to be reached by 2010. Five examples are increasing the percentage of people who regularly exercise to more than 63%; decreasing the prevalence of people who feel stressed to 49% or less; increasing to 100% the fraction of people who know about the harmful side effects of smoking; decreasing hyperlipidemia among males to less than 5.2% and among females to less than 8.7%; and increasing to 100% the percentage of patients with diabetes who adhere to treatment. In addition, the Health Promotion Law, enforced since May 2003, established legal foundations for facilitating greater health promotion efforts by citizens (Sakurai Hideya 2003).

Seoul's strategies and programs for NCDs operate under the Korean national Health Plan for 2006-2010, developed by the Ministry for Health, Welfare and Family Affairs. The national plan articulates numerous specific health goals for prevention and control of NCDs, such as reducing smoking among males from 61.8% in 2002 to 30% by 2010; reducing the number of excessive drinkers; increasing exercise, nutrition, and cancer screening; and improving treatment for specific NCDs such as mental health conditions. Through such measures, the 5-year plan aims to extend the 'healthy life span' for males from 64.8 to 69.7 and for females from 70.8 to 74.2, as well as reduce disparities in health among Koreans of different socioeconomic status. Data for monitoring progress towards targets comes from the Korea National Health and Nutrition Examination Survey (administered every three years since 1998) and the Community Health Survey (annually since 2008). Moreover, each year the Korea CDC develops an 'Annual Guideline for the Chronic Disease Management Project' to update guidelines for national and community-based chronic disease prevention, including standardized evaluation criteria to measure results.

Designating numeric targets for improvement is not exclusive to higher-income Pacific Rim cities. Danang in Vietnam, for example, is implementing the national cancer control strategy; its goals for 2006-2010 include reducing the incidence of tobacco-related cancers by 30%; vaccinating all newborns against Hepatitis B; and reducing the mortality rate for cancers of the breast, cervix, oral cavity, rectum and skin by promoting screening, early detection, and timely treatment.

Prevention and control programs for specific NCDs

Starting from a common premise, the specific NCD programs adopted in Pacific Rim cities nevertheless vary considerably in scope, activities, and results, as might be expected from such a diverse range of municipalities.

As early as 1986, Singapore launched the National Smoking Control Program and established a National Smoking Control Coordinating Committee. The aim was to make non-smoking a social norm and reduce smoking prevalence in Singapore by preventing smoking initiation among youths, promoting smoking cessation among smokers, and protecting non-smokers by eliminating exposure to passive smoking. The strategy was multi-pronged, including legislation,[4] tobacco taxation, health education, and smoking cessation services, as well as inter-sectoral collaboration and community mobilization. Smoking is prohibited in all public places (including public transport, cinemas, bus shelters, pubs, bars, and discos); tobacco advertisement in the media and public is prohibited; and graphic health warning labels on cigarette packs are mandatory.

To address other risk factors and NCDs, Singapore's Health Promotion Board offers comprehensive workplace health promotion programs and a School Health Program that covers health screening, immunization, dental care, and health education. It also works with partners from schools, workplaces, healthcare industry and community to promote healthy lifestyles through joint events, exhibitions, workshops, talks and support group sessions.[5] And since 2006, the Singapore Chronic Disease Management Program

[4] The first Singapore laws concerning smoking were passed in the early 1970s and have been periodically revised to incorporate proven international best practices. There are two major legislation instruments: the Prohibition on Smoking in Certain Places Act (1971) and the Control of Advertisement and Sale of Tobacco (1991) Act.

[5] Since 1992, there has been an annual "National Healthy Lifestyle Campaign," focusing on a particular area of concern each year. The priority themes have been Nutrition, Physical Activity, Mental Health, and

supports the promulgation of disease treatment protocols and provision of training for general practitioners and nurse educators in the community to support general practitioners in the health education of their patients. Trained "wellness coordinators" also help the elderly actively manage their conditions. Singapore's Medisave scheme has also been liberalized to include payment of outpatient treatment for these conditions.

In Hong Kong, 'Health Plan' (2006-2010) project has established policies for decreasing the smoking rate and supporting nutrition for Hong Kong's poorest families. The Men's Health Program and the Cervical Screening Program have been launched to promote health of men and regular use of cervical smears to prevent cervical cancer in women respectively. There is no specific territory-wide program implemented for other specific chronic diseases. However, there are programs and services provided by the Department of Health or the Hospital Authority targeting specific populations, usually cluster-based. For example, in a cluster of the Hospital Authority, a telephone nursing service targets patients who are suffering from chronic diseases that are not well controlled. Nurses make regular calls to the target population, and patients can call back if they have questions about their conditions. The Department of Health also organizes centers to screen older people for chronic diseases.

In Taipei as in other parts of Taiwan, several NCD-specific policies set the scope, vision, goals, and strategic direction for NCD prevention and control: the National Five-Year Cancer Control Plan; the Tobacco Hazard Control Plan; the Chronic Renal Disease Prevention Plan; the Five-Year National Oral/Dental Health Care Project; and the Five-Year Oral/Dental Care Project for the mentally and physically impaired (http://www.bhp.doh.gov.tw/). There are several NCD programs implemented by the government and NGOs, including ones focusing on tobacco smoking, betel quid chewing, cancer prevention and control, community-based "three-in-one" (blood pressure, blood glucose and blood cholesterol) screening and integrated screening care service models.

Sydney is implementing the national and state-level programs designed to address issues of population ageing. The New South Wales *Health Ageing Framework* outlines

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Smoking. During the 2007 National Healthy Lifestyle Campaign, for instance, HPB collaborated with the Institute of Mental Health, Singapore Association for Mental Health, SAGE Counseling Center and the Gerontological Society and managed to reach 160,000 people with its "Healthy Mind, Happy Life" message through talks, workshops, forums, seminars, fairs and exhibitions.

six key areas for action, relating to attitudes towards ageing and older people, participation in community life, making one's own decisions, creating supportive neighborhoods and communities, and making the best use of resources for accommodation, care, and support.

Evidence of results and implementation challenges

Documenting favorable results from NCD control strategies has in many cases been challenging. Although some programs have good evidence of effectiveness (and cost-effectiveness) – give examples/citations!! – many others have less clear association with reducing the incidence and prevalence of NCDs and underlying risk factors. For example, the mid-term evaluation of "Healthy Japan 21" shows that progress has been made, but significant challenges persist. Age-adjusted mortality rates for CVD and stroke have declined, but obesity is just as prevalent among women as before, and among men obesity is increasing. The prevalence of diabetes and hyperlipidemia is increasing, while rates of physical activity are decreasing.

In Singapore, comprehensive legislation for smoking control has proven to be a powerful and effective tool[6] in combination with tobacco taxation. Increasing retail prices of cigarettes since 1972 have coincided with decreasing per capita consumption over the same period. Before 2003, cigarettes had been taxed by weight, but since July 2003 cigarettes are taxed by the stick. The average retail price of a pack of 20 cigarettes is S$ 11.30, 67% of which is tax. When Singapore ratified the WHO Framework Convention on Tobacco Control (FCTC) in December 2003, it was already exceeding the requirements pertaining to tobacco sponsorship, promotion and advertising. The daily-smokers prevalence (aged 18-69 years) in Singapore has declined to one of the lowest in the world – from 20% in 1984 to 12.6% in 2004. However, while the crude prevalence of smoking overall and among males has decreased, it dramatically increased among females from 1992 to 2004, particularly among those aged 18-29 years – a disturbing trend common in many developed countries.

[6] Singapore's proactive stance is illustrated by its banning of cigarette vending machines before they could be introduced, simply by looking at experiences of other countries. And by introducing legislation early, Singapore prevented the tobacco industry from ever becoming important event sponsors.

Singapore's strategic NCD framework has garnered active support from the media and has had some success engaging providers and patients.[7] However, numerous challenges remain. Lack of sharing of medical records has led to duplicate laboratory and radiological investigations. Sporadic, unplanned, and uncoordinated efforts on patient education represent a significant lost opportunity. Other obstacles to the framework's ambitious goals include lack of disease management understanding among GPs and lack of sufficient existing evidence on disease management programs.

There is scant published data evaluating Hong Kong's numerous NCD programs. Hong Kong's fragmented primary, secondary and tertiary care (with primary care dominated by the private sector while secondary and tertiary care are dominated by the public sector) has yet to establish linkages that would be important for integrated NCD prevention and control.

In Hangzhou, 45 community health centers and 205 community medical service stations cover 95% of residents. Studies suggest that medical records are reasonably complete for more than 70% residents, a clear improvement from previously. Residents 60 years of age and older now receive regular physical exams. By late 2006, 99,300 hypertensive patients and 19,100 diabetes patients were followed up and managed, mostly in their local communities. After a year of such management, blood pressure was kept in the normal range for 62% of hypertensive patients; the rate of smoking decreased 6.8% among hypertensive patients; the rate of alcohol consumption declined 1.3%; and the share of patients attaining low salt diets was 47.6%.

However, there remains a dearth of studies on the relative effectiveness and cost-effectiveness of various approaches to NCD prevention and control in China's urban areas, and efforts to promote evidence-based policymaking continue. To date a key barrier in Hangzhou, as in many other localities in China, has been the relatively low level of government financial support for health. The April 2009 announcement of national reforms promises significant increases in government financing for public health and social health insurance, financed from both central and provincial governments. It remains to be seen how significantly this will impact NCD prevention and control.

[7] Examples include offering patients the possibility of using Medisave to reduce out of pocket expenses and seeing GPs instead of hospital specialists, as well as providing patients with educational material for self-monitoring chronic disease (Chea 2001, Yong and Yee 2007, Lim 2008)

NCD programs in Seoul confront many of the same barriers as elsewhere in Korea. The government has responsibility for public health services but still plays a modest role in disease prevention and health promotion, and has a limited role as a provider of curative services. Basically the government has adopted a laissez faire policy toward regulating private suppliers, the dominant providers in Korea's delivery system. Medical institutions in Seoul (and Korea) are not clearly differentiated. Hospitals operate extended outpatient departments and many clinics provide inpatient treatments, particularly in surgery and obstetrics. Demographic shifts, such as the rapid increase in the elderly population and a decrease in the birth rate, have been even more acute in Seoul. One area of some progress has been tobacco control. A foundation for sustainable health promotion has been established by earmarking the income from tobacco taxes for antismoking efforts consistent with the Framework Convention on Tobacco Control.

Sydney and other cities in Australia have made initial attempts to organize and pay more efficiently for the management of chronic conditions, but there are few evaluations and no clear evidence of success. Some have argued that more progress would be made if the private healthcare sector were more actively brought into the policy review process (http://www.mja.com.au/public/issues/179_05_010903/gro10737_fm.html).

Additional challenges for NCD programs around the Pacific Rim include high out-pocket costs for medical services (e.g. in Korea) or limited insurance coverage (such as in the US), and pressure from unfavorable trends in the broader social determinants of health, especially evident during the recent economic crisis. For example, many elements of the health system and broader social and economic context in US cities contribute to the challenge of preventing and controlling NCDs. According to the California Health Interview Survey (CHIS 2005 - 2007), almost 14% of residents of San Bernadino report not having a usual source of medical care (a place to go regularly when sick); a slightly higher number report being uninsured. Another 13-14% are covered under Medicaid, the state and federal program for specific vulnerable populations. More than a third of San Bernadino residents are not employed (either looking for work or not, as students or retirees), and more than a third report that they are not able to afford enough [quality] food for their families.

The challenges appear even more formidable for regions of low per capita income. In Vietnam, for example, the burden from NCDs is increasing rapidly, especially in urban areas, but NCD prevention and control programs have not yet expanded to provincial, district and commune levels. There is limited coordination of activities or involvement of non-health sectors and communities. Training activities for health workers on NCDs have been only carried out in specific areas covered by designated programs. Treatment appears to garner more attention and resources than prevention. Vietnam needs a more systematic surveillance system for both diseases and risk factors and a comprehensive plan for NCD health education.

Discussion

The epidemic of chronic NCDs around the Pacific Rim is clearly evident in the 12 cities studied. NCDs are rapidly becoming the leading cause of morbidity and mortality even in the low income cities of the Pacific Rim.

Responses differ among health systems, with the most aggressive policies and programs evident in systems where the burden of NCDs is the largest and of longest standing. Several regions have begun exemplary programs. Singapore's anti-smoking efforts have been impressive. Other Asia-Pacific programs have been cited by the WHO as models. For example, a WHO report urges members states to "establish financing mechanisms to channel sustainable funding to NCD prevention and control initiatives, such as through earmarking tobacco and alcohol taxes for health promotion, as was done in Australia by the Victorian Health Promotion Foundation (VicHealth) and in the Republic of Korea, and was initiated in Malaysia, Mongolia and Tonga" (Report to WHO Regional Office for the Western Pacific 2008). (California could be added to that list.)

However, compared to the depth and breadth of the challenge to population health, most responses do not appear to be well coordinated or well funded, or adequately informed by evidence. In particular, the burden of NCDs on the poor in the context of rapid urbanization is not well documented or recognized in policy. Challenges to implementation abound. Evaluations of the success of NCD control and prevention programs are limited.

Another lesson that emerges from this review is that no discussion of NCD prevention and control can be divorced from the broader incentive structures governing health system financing and delivery. For example, Singapore's health system has several distinctive features that also shape its approach to NCDs. With health care primarily financed through Medisave (since 1984), the system is based on the assumption that encouraging the individual to act economically will help to avoid sharp increases in health expenditures and wasteful overuse. Incentives were set for individuals to use up to S$300 a year out of Medisave for chronic disease outpatient treatment. Medishield (since 1990) assists if treatment costs exceed the amount saved, and a minimum health provision (Medifund) is guaranteed for persons unable to save (since 1993). Eldershield (since 2002) is Singapore's severe disability insurance scheme. In assessing Singapore's framework for NCD control it is important to recognize that about S$ 22 million of the Medishield 2007 disbursements benefited elderly patients and the mentally ill, and in 2008 Medifund financing was increased further to help meet the challenges of an aging society.

Another example of how health system features shape NCD policies comes from Australia, where the division of responsibilities in health creates the potential for cost-shifting between different levels of government and gives rise to frequent claims of blame-shifting and "buck-passing." To illustrate, it is often argued that the division of responsibility, whereby the states and territories run public hospitals and the Commonwealth runs the aged care system, allows the Commonwealth to under-fund aged care in the knowledge that the states will fund the costs of those waiting in public hospital beds for access to the aged care sector. According to one estimate [please provide citation], this costs Australian taxpayers an extra $580 million per year.

Since NCDs originate from a complicated set of social determinants and cannot be addressed by the health sector working in isolation, the success of policies and programs are deeply shaped by the broader context of fiscal federalism, decentralized decision-making, and uneven economic development, especially in large low- and middle-income countries like Vietnam, Indonesia, and China. Indonesia in the late 1990s decentralized health policy along with all other sectors except security, defense, finance, and foreign policy. Decentralization has enhanced local community involvement in planning and

implementation, but has also exacerbated inequalities across regions. China's cities similarly must cope with rapid urbanization and large internal migrant populations with limited cross-subsidization of poorer cities from wealthier ones. Moreover, the system is sensitive to the priority allocated by the top local and national leadership to population health and health care system reform. Issues that rise to the top of the political agenda receive considerable attention and support for program implementation – such as control of infectious disease outbreaks like SARS in 2003 or H1N1 influenza in 2009, or national health reforms in 2009 to address the problem of "*kan bing nan, kan bing gui*" (health care being expensive and difficult to access). However, policy and programs languish if top leaders are not engaged. It remains to be seen whether NCD prevention and control will emerge as a top priority for China's population health strategy and be implemented effectively across the PRC's diverse localities, as envisioned in "Healthy China 2020."

Stakeholder participation, from research to action

As a collaboration of researchers from leading Pacific Rim universities, we in particular note the vital link between research and action for NCD prevention and control. Around the Pacific Rim, researchers and other stakeholders outside of government have played a role in achieving progress on this important public health threat. For example, researchers on tobacco control at the University of Indonesia, Indonesian Public Health Association, and Demographic Institute played an important advocacy role leading to policy change: increases in the tax on tobacco; policies for protection from second-hand tobacco smoke; banning tobacco advertising; promoting health warnings; and forcing the government to ratify the Framework Convention on Tobacco Control. Many NGOs, including hospitals and clinics, also contribute to research and action on NCD risk factor control in Indonesia.

Only a few jurisdictions have organized forums for researchers and policy makers to interact and jointly discuss and prioritize research needs, as well as for captains of industry, commerce and civil society to interact with public health policy and research groups on establishing research needs. In Australia, for example, the beyond blue Victorian Center of Excellence (bbVCoE) encompasses the whole population accessing the health system across the spectrum from primary care to specialist mental health. The

bbVCoE focuses on development of research into depression, anxiety and related disorders across the lifespan and across specific issues such as culturally and linguistically diverse communities (http://www.beyondblue.org.au/index.aspx?link_id=6.731&print=true). But in other places such as Malaysia, except for academic and scientific forums, there is little effort to bring together academia, scientists and policy makers on the issue of NCD control.

Collaborative learning

Around the cities of the Pacific Rim, we think it is possible to identify research gaps and opportunities for policy improvement that would benefit from comparative and collaborative approaches. Our overview highlights four important points:

First, although there is ample evidence to conclude the NCDs are the primary public health challenge facing residents of Pacific Rim cities, there is inconsistent health risk behavior data available especially for youth. This lack of data thwarts our knowledge of the determinants of NCDs and hampers our ability to develop effective policy responses. Therefore any well-designed strategy to enhance prevention and control of NCDs in the region should include empirical investigation of the role of rapid social, economic and cultural change on health risk behaviors, including substance use, poor diet, sedentary behavior, mental health, and health practices and outcomes.

Second, to overcome NCDs threats, it is necessary to strengthen health systems. In all health systems, health workers command a significant share of health budgets, in some cases more than 75%. However, in many developing countries, the health workforce is used for communicable disease control and not so much for NCDs. In all countries, but perhaps especially in the lower-income countries of the region, reducing the morbidity and mortality associated with NCDs will require a particular focus on preparing the health workforce for this task. For example, the Vietnamese national program on diabetes, supported financially by the World Diabetes Foundation, has implemented pilot research on improving the quality of treatment for diabetes in Vietnam through training doctors and nurses at district and commune levels, and health education about diabetes prevention, control, and management. This Vietnamese experience is one example of how the health workforce in the region needs to be prepared to cope with the

increasing burden of NCDs. A contrasting example comes from Australia, where the ageing of the population and the increase in chronic illnesses are placing increasing demands on an ageing health workforce that is already over-worked and poorly distributed. The National Health Workforce Strategic Framework recommends facilitating workplace innovation to make better use of available health workforce skills; more responsive education and training arrangements; consolidated national accreditation and registration regimes; improving funding-related incentives for workplace change; better focused and more streamlined projections of future workforce requirements; explicit consideration of rural and remote workforce issues; and addressing the workforce requirements for people with special needs, including Indigenous communities, people with mental illness and disabilities, and people in aged care.

Third, monitoring and evaluation should integrate studies of economic efficiency and cost-effectiveness of alternative strategies. Some Pacific Rim cities have implemented economic evaluations to understand burden of disease (such as for tobacco) or to assess specific programs. However, there is a dearth of rigorous studies on several key issues: the most cost-effective workplace-based and public health strategies to prevent NCDs; how payment incentives and organization impact effectiveness of programs; what factors enhance patient self-management of NCDs; and how the health care delivery system should be "re-engineered" to provide quality care that is coordinated and cost-effective rather than focused on high-margin services and acute episodes.

Fourth, there is considerable room to strengthen links from research to action. Research collaborations should focus on providing measurable health improvements for specific populations, by drawing on expertise and experience from across the region. For example, one project of the AWI public health research group aims to reduce CVD deaths and disability using multi-institution collaborative improvement methods. A collaborative (as these methods in aggregate have been termed) brings together groups of practitioners from different healthcare organizations to improve an aspect of the quality of their service. Collaborative programs, particularly the "Breakthrough" methodology, are helping to spread best practice across organizational and national borders (Ovretveit J et al. 2002). A series of breakthrough collaboratives among key stakeholders in Pacific

Rim cities could play an important role in bridging research and practice to improve population health in this key region of the world.

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