Implementing a Healthy Cities Plan in China: The Impact of Focused Public Health Education on a Diabetes Epidemic

PHILIP SZMEDRA
Georgia Southwestern State University

LI ZHENZHONG
Georgia Southwestern State University

The world is experiencing a diabetes epidemic. The Alliance for Healthy Cities (AHC) initiated by The World Health Organization encourages local governments to include health issues in public policy planning. Changshu, Jiangsu Province, PRC, has applied diabetes prevention and control measures as part of its Healthy Cities initiative. In this work we evaluate survey data describing diabetes incidence over time collected by the Changshu Center for Disease Control and Prevention. The data include pre-AHC initiative statistics as well as post-adoption which allow an assessment of the effect of targeted methods of diabetes education as part of the AHC program. Results indicate that while diabetes incidence in Changshu increased between survey periods, the rate of increase was significantly slower than in the general Chinese population. AHC health policies may therefore be a way to concentrate public health education planning and implementation to better address the spread of diabetes in China and other regions of the developing world.

The Diabetes Epidemic

The number of adults living with diabetes mellitus (DM) globally has more than doubled since 1980. According to the World Health Organization (WHO) approximately 350 million people worldwide are living with DM (WHO, 2013). The increase in DM incidence has been predictable as the illness becomes more prevalent as populations age and many developed nations' populations are graying. But populations in the developing world, including young people, are developing the disease resulting in a virtual epidemic in some regions of the world.

Some Pacific Island nations have the highest incidences of DM globally including Nauru at 40% of the adult population, Samoa and American Samoa at 25%, and Fiji at 23% (Secretariat of the Pacific Community, 2003). However, in no other country are the numbers of
people living with DM more numerous than in China where approximately 92 million people were afflicted with the disease in 2010 with the number of Chinese diabetics expected to double by 2025 (Tongji Medical School, 2011).

As economic development progresses in China, and a previously rural and poor population becomes more urban and affluent, the lifestyle many young Chinese aspire to and adopt has become decidedly more Western. The negative health consequences of a diet rich in fat, sodium, and high caloric processed food are well known. Incidence rates of non-communicable diseases including heart disease, cancer, and DM have increased significantly in China during the past two decades (WHO, 2012). More resources, both financial and physical, have been devoted by the national and provincial governments to prevention and treatment with few success stories and little to demonstrate that the epidemic has abated or even turned a corner (WHO, 2012).

The city of Changshu, Jiangsu Province in southeastern China, is representative of a Chinese polity that is attempting to address the issue of non-communicable disease in general and diabetes in particular through its engagement with the Alliance for Health Cities (AHC) (Alliance for Healthy Cities, 2013). The WHO established the AHC in 2003 to cope with the adverse effects that an urban environment has on the health of people living in cities and peri-urban areas. The global population became majority urban in 2008 and is predicted to be 75% urban by 2050 (The Economist, July 28-August 3, 2012). The Healthy Cities program has as its aim to cope with health issues that have emerged with urbanization and the adoption non-traditional lifestyles. Various social and environmental changes are intertwined and affect the health of people in cities. Within the AHC mechanism, the WHO encourages local governments to incorporate health issues and health concerns into all aspects of public policy. In this paper we evaluate survey data describing DM incidence over time collected by the Changshu Center for Disease Control and Prevention in 1999 and 2010. The data include pre-AHC initiative statistics as well as data from a 2010 household health survey. We use these data to assess the effects of targeted methods of diabetes education implemented by the Changshu Ministry of Health as part of the AHC program.

A description of Changshu City

Changshu is located in the south-eastern part of eastern-China’s Jiangsu Province approximately one hundred kilometers northwest of Shanghai. The city is situated in the developed Yangtze River Delta and has a population approaching 2 million people. The region around Changshu
includes ten towns, with both provincial-level and national-level development zones (Jiangsu.net, 2013). In 2010, Changshu's GDP was approximately 145.2 billion yuan (US$23 billion). The government of China has designated Changshu as one of one hundred counties and cities classified as “Well-off society in an all around way”. Changshu has also been officially designated as one of China’s top ten “Innovative cities to impact China and its reform”, as well as recognized for its “balanced development of a regional economy” and "basic competitiveness of country-level economy”.

The government of China has also awarded the city the following honors and laurels: “Chinese famous historical and cultural city”; “National Sanitary City”; " Top Tourist City of China”; "National Garden City”; "State Model City of Environmental Protection“; and "International Garden City ". These recognitions and designations demonstrate that the standard of living and quality of life of the citizens of Changshu have improved greatly in recent years and the policies that led to those improvements are potential models for other small and medium sized cities in China (personal conversation, 2012).

**Demographics**

In 2010 the average life expectancy of a Changshu citizen was 80.4 years reflecting the improvements in living standards that have occurred since the Chinese economy adopted market-based principles under the leadership of Deng Xiaoping beginning in 1978 and more emphatically in 1991. The relative prosperity that has resulted from these revolutionary economic changes has increased the lifespan of the average Chinese. In some regions in China these lifestyle improvements have had a more marked effect than in others. In Changshu, approximately 23% of the city’s population was 60 years of age and older which is more than double the average proportion of the population over the age of 60 in urban China (personal conversation, 2012).

As in many of the improving economies in the developing world the shift from rural to urban living in China has had a significant impact on public health. A more sedentary lifestyle, increased consumption of high caloric processed food with high fat, sodium, and sugar content, increased consumption of beef and pork and less of fish, and increased levels of tobacco consumption especially in males, has led to a population that is increasingly afflicted with illnesses that had been the exclusive plight of Western industrialized nations. Illnesses such as heart disease, hypertension, cancer, and DM have become major public health concerns. Collectively known as non-communicable diseases
Healthy Cities Plan

(NCDs), these illnesses are the cause of 75 percent of all deaths in Changshu city and in Jiangsu province (personal conversation, 2012).

**Diabetes Mellitus**

DM afflicts approximately 92 million people in China (BBC, 2010). That number is expected to increase as affluence finds its way to greater segments of the population as more of the 900 million Chinese that currently reside in rural regions and in relative poverty make their way to the cities. Developing effective and appropriate treatment and prevention protocols by Ministries of Health requires an accurate assessment of disease prevalence. To that end the city of Changshu conducted surveys of its residents in 1999 and 2010.

**Methodology**

Using multi-stage, stratified, and cluster sampling methods, the city of Changshu was divided into four geographic regions: east, south, west, north, and sub-divided within region according to economic situation. Towns within each geographic region were surveyed using simple stochastic sampling methods. Sample subjects within each region were chosen randomly. The population of interest was those individuals over the age of 35 as DM has historically been much less prevalent in the relatively young. That dictum, however, has been changing in recent years as more young people are developing the disease. The total number of sample subjects was 3,452 in 1999 (male 1,502, female 1,950) and 4,634 in 2010 (male 1,883, female 2,751).

**Prevalence of DM in Changshu**

Using a pre-tested questionnaire, the sample subjects were asked if they had knowledge of DM, if they had been diagnosed with DM, and if diagnosed, if they were being treated for DM. Each sample subject was tested for the level of fasting plasma glucose using the glucose oxidase method. The diagnostic criteria used to determine DM presence in a sample subject coincided with 1999 WHO criteria. A diagnosis of DM was defined by either of the two following situations:

- a subject’s fasting plasma glucose level (12 hours) $\geq 7.0$ ml/L ($126$ mg/dL);
- or a subject’s fasting plasma glucose level (12 hours) $< 7.0$ ml/L ($126$ mg/dL) but with an earlier diagnosis of DM as well as having taken or is taking insulin or any oral hypoglycemic drug in the past thirty days.
Prevalence rate of DM in the investigations

Table 1. Prevalence rates of DM in Changshu in 1999 and 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td># Subjects</td>
<td>Prev Rate (%)</td>
<td># Sample</td>
</tr>
<tr>
<td>1999</td>
<td>1502</td>
<td>3.13</td>
<td>1950</td>
</tr>
<tr>
<td>2010</td>
<td>1883</td>
<td>4.14</td>
<td>2751</td>
</tr>
</tbody>
</table>

As table 1 reports, in 1999 the prevalence rate of DM in the total aggregated sampled population was 3.10%. In 2010 the rate was 4.19%. Student T statistics for differences in the sample means indicated that the increase in DM prevalence in 2010 was significantly different from the earlier investigation at the 99% level of confidence (aggregate t-statistic = -11.129). When aggregate statistics were separated according to gender, both the increase in male incidence over the eleven year period and in female incidence were again significantly different at the 99% confidence level (male comparison t statistic = -10.539; female comparison t statistic = -7.207).

Table 2. Comparison of gender and age prevalence of DM in Changshu in 1999 and 2010 (%).

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male Prevalence rate</th>
<th>Female Prevalence rate</th>
<th>Total Prevalence rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-44</td>
<td>0.90</td>
<td>2.66</td>
<td>0.84</td>
</tr>
<tr>
<td>45-54</td>
<td>3.12</td>
<td>3.51</td>
<td>2.38</td>
</tr>
<tr>
<td>55-64</td>
<td>5.03</td>
<td>4.28</td>
<td>4.19</td>
</tr>
<tr>
<td>Over 65</td>
<td>4.66</td>
<td>5.57</td>
<td>7.40</td>
</tr>
<tr>
<td>Total</td>
<td>3.13</td>
<td>4.14</td>
<td>3.08</td>
</tr>
</tbody>
</table>

Table 2 demonstrates the increase in DM prevalence in the total population at every age category except those over the age of 65 although men 65 and over showed a significant increase. Most prominent is the increase in DM in men over 65 as well as in younger men between 35 and 44. It is difficult to impart causality on this increase without the benefit of in-depth sociological and perhaps psychological investigations which were not part of the Changshu Ministry of Health objectives in conducting the survey. But we can offer some hypotheses based on what is known about DM incidence and spread. DM typically becomes more
common as a population ages because of physiological factors associated with the aging process itself including the decreased ability of the body to manufacture and utilize insulin and the resultant increased levels of glucose in the blood. High levels of glucose lead to the characteristic manifestations of diabetes including neuropathy (nerve damage typically in the hands and feet among diabetics) which can lead to gangrenous infections and subsequent amputation, and retinopathy (damage to the retina of the eye) which can result in blindness. Decreased incidence of DM in the female and total sample population 65 years of age and over was notable but not statistically significant.

Increased DM incidence in the relatively young male population may be most directly associated with the adoption of more Western lifestyles and diets and away from simpler traditional Chinese rural diets and practices. The consumption of more processed food, sugars, and fat may be more attractive to the young male Chinese than females but proof of this requires more targeted research.

Although the data indicate a significant increase in the numbers of individuals living with DM in Changshu between 1999 and 2010 the increase was less than in the Chinese population over the same period. In a study conducted by the Tongji Medical School of Huazhong University of Science and Technology in 2008, the incidence of DM in the general Chinese population was 9.7%. The same study reported DM incidence in the general population had increased from 2.5% in 1994 to 5.5% in 2002 (Tongji Medical School, 2011). An almost doubling of the DM incidence rate in the general population from 5.5% in 2002 to 9.7% in 2008 demonstrates the severity of the problem of DM in China. The results of that study also highlight the effectiveness of the Healthy Cities initiative in moderating the rate of increase of DM in Changshu. Health officials in Changshu attribute this positive situation to the application of the WHO Healthy Cities measures beginning in 2003 to increase awareness in residents of the causes and health effects of DM and to an aggressive effort of improving health education programs and DM screening. The next portion of this paper speaks to those measures.

**Diabetes prevention and control measures in Changshu**

The Changshu Ministry of Health has introduced lecturer groups made up of medical professionals to provide information and education to both rural and urban residents. Teams made up of medical doctors and nurses as well as clinical researchers provide health education seminars and screenings at regularly held community events and health fairs. These events demonstrate to citizens that health is something that must be actively pursued by positive actions and that the individual is key to
controlling his future health trajectory. Demonstrating that good health and the avoidance of lifestyle illnesses are the responsibility of each individual through conscious actions rather than simply chance, the Healthy Cities program promotes individual empowerment and is the first step towards internalizing health responsibility. This is the Healthy Cities message: that all requirements for economic growth can be in place but lacking a healthy population cripples growth in its infancy. A healthy population is the essential foundation upon which to build sustainable economic growth.

The Changshu Ministry of Health developed standard guidelines for its public health cadre entitled “Basic Knowledge and Skill of People’s Health Literacy” described in short as “The 66 Principles of Health” which provided the content of public health forums. In addition, brochures describing DM management and care as well as avoiding the disease through lifestyle changes were distributed during neighborhood visits. Although this sort of top down transmittal of public health information has in many countries been found to be not as effective as other more novel approaches, the Ministry continues to believe that these traditional methods are the best way to inform the public of healthy lifestyles.

In order to better inform public health policy formation, the Ministry of Health posed questions that measured the public health knowledge of citizens in the Changshu region. The objective was to gauge the familiarity of citizens to the ten major chronic illnesses that afflict people in the region and would most likely threaten the health of citizens in the future. The questionnaire entitled “500 questions of public knowledge for Chronic non-communicable disease prevention and control” and put together by the Suzhou Center For Disease Prevention And Control† demonstrated a very low level of information about the ten most important chronic illnesses facing people in the region.

The survey also demonstrated different knowledge rates among the most common chronic diseases. Knowledge rates of hypertension, DM, and cerebrovascular disease (CVD) were higher than were knowledge rates of cholelithiasis (gall bladder disease), gout, and coronary heart disease. This finding implies that the Changshu Ministry of Health had achieved some recent success with its traveling health cadre program in informing the general population of hypertension, DM, and CVD.

Further, findings in this portion of the survey indicated that the most sophisticated knowledge of these chronic illnesses lay with health professionals. That is, medical doctors, nurses, medical researchers,

---

†Suzhou lies 40 km to the east of Changshu and is the region’s commercial and financial hub.
Healthy Cities Plan

237

teachers, and other health cadre had the most sophisticated level of knowledge regarding these chronic illnesses. While this information may seem obvious to a Western observer it is important to understand that the medical education system in China is not as comprehensive as in other industrialized countries. A lack of information regarding any specific disease is common among medical practitioners even among illnesses that are common in the population. Determining that medical professionals had the greatest level of knowledge of the listed chronic illnesses allows the Ministry to target peasants, students, factory, and other types of workers as the focus of their educational effort.

Implementing Healthy Cities with a Chinese Face

After establishing baseline levels of chronic disease in the population, the Ministry of Health issued a white paper in 2009 entitled “The Changshu testing program for public knowledge of chronic non-communicable diseases prevention and control”. The document required all health care institutions in the Changshu region to incorporate the material contained in the pamphlet entitled “500 questions to determine public knowledge of chronic non-communicable diseases prevention and control”, with actual situations encountered by health care professionals to insure that methods that were thought to increase awareness of chronic disease prevention, management, and control were being applied in actual clinical settings. The following directives were included in every health care institution’s educational mandate:

1. Focus on the development of a healthy city through the modernization of rural health and peasant health care services;
2. Print and distribute circulars that address health issues especially chronic lifestyle illnesses including DM, CVD, and hypertension;
3. Provide the pamphlet “500 questions to determine public knowledge of chronic non-communicable diseases prevention and control” to government organizations, enterprises, institutions and schools as the principal content reference for lifestyle and chronic disease;
4. Conduct special training in disease management for patients with chronic disease;
5. Organize activities promoting chronic disease awareness in government organizations, enterprises, institutions and schools;
6. Use various methods of publicity to exploit different media types; and,
7. Include the basic learning aspects of “500 questions to determine public knowledge of chronic non-communicable diseases prevention and control” into publicity circulars.

As an example of exploiting various media to promote Healthy Cities through improved levels of public health, the city of Changshu held what was titled “A ceremony for promoting public health lifestyles” in December, 2011. Through broadcast media the vice mayor of Changshu promoted public awareness of healthy lifestyles by encouraging the adoption of a rational diet, engaging in moderate exercise, and quitting smoking. He also encouraged rational limits to alcohol consumption and to striking a “psychological balance” to life and living. The Ministry of Health awarded prizes to “healthy families”; those that demonstrated their commitment to practicing healthy ways of living. Attendees also received small gifts including health-related books as well as cruets and measuring spoons to accurately measure food portions. Theatrical skits promoting healthy lifestyles were performed. Changshu talk radio programs invited experts from municipal hospitals to speak about chronic diseases such as hypertension, DM, and cancer, and interact with callers. Further, the Ministry organized alternative methods of promoting awareness such as free screening and counseling for DM to coincide with World Diabetes Day each November 14th.

This emphasis on education and teaching directed at various demographic segments of the population through alternative methods improved the knowledge base to the degree that chronic disease rates including that of DM grew at a slower rate than in the Chinese population as a whole.

**Moderating celebrations at the development party**

Ministries of Health throughout the developing and developed world have had little success in stemming the epidemic of DM in their populations. With economic development comes an inevitable morbidity and mortality transition from communicable disease to non-communicable disease that is linked to improving lifestyles and standards of living. Health Ministries are much more effective and competent in dealing with illnesses that can be treated with a specific medication or vaccine. Illness associated with improving standards of living such as heart disease, CVD, and DM are much more difficult to confront. There is no specific disease vector; no carrier to control, no water to be treated, no bed nets to be distributed, no inoculations to be administered. Lifestyle disease prevention efforts by Health Ministries are akin to being the dullard at the development party. Admonishing a
people to not enjoy the fruits of economic progress including more appealing food and less physical labor for the sake of their long term health seems, and has proven to be, a non-starter with people that have been waiting for generations to be admitted to the celebration. Yet public health is a pillar of the development paradigm. A sick population impedes the ability of a country to sustain economic growth and has been shown to negatively affect GDP (Szmedra and Sharma, 2007).

The way in which the Ministry of Health in Changshu has applied the Healthy Cities Initiative in its DM prevention and control programs since 2003 has led to DM incidence in the regional population to grow at a slower rate than in the Chinese population as a whole. The effort by the Ministry to offer more than simply top down guidelines for living a healthy life, including health screening fairs, small gifts to assist people in implementing day to day health conscientiousness, and Community Theater, have successfully brought individual and public health to the fore as a pillar of sustainable economic growth. If DM and other lifestyle illnesses are to be contained new approaches are required. The Healthy Cities Initiative, as it has been implemented in Changshu, has demonstrated an ability to check the growth of DM in the Changshu region. Similar Healthy Cities applications are being implemented in other Chinese cities based on the Changshu model. If results in other regions of China are similar in terms of arresting the increase in DM as they have been in Changshu, then the Chinese Ministry of Health will have an effective template from which to build other innovative DM management and control programs, as will other developing and developed nations.

References


BBC, “China faces diabetes epidemic”, March 25, 2010

The Economist, July 28-Aug 3, 2012


