

Cardiovascular disease in Chinese women: an emerging high risk population and implications for nursing practice

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Abstract

Background: Globally, cardiovascular disease (CVD) is the leading cause of death among women. In China, the burden of CVD is increasing at an alarming rate, yet the burden of this disease is underestimated and this is reflected in primary, secondary and tertiary prevention issues.

Aim: This paper seeks to document the issue of the increased rate of CVD among Chinese women, describe etiological factors and describe potential strategies to decrease the burden of disease.

Method: The Medline, CINAHL, Ovid, Science Direct and Government Reports were searched using the key words “heart disease”, “cardiovascular”, “ischemic heart disease”, “coronary”, “women”, and “Chin (China, Chinese)*”. Articles were selected if they described epidemiological factors and/or interventions to address heart disease in Chinese women.

Findings: Rapid industrialization and urbanization in China have extended the life expectancy of the population, particularly among women. Social, political and economic factors have caused lifestyle changes that have a direct bearing on health-related issues. Compared to previous epidemiological trends, heart disease has become the most common cause of death among Chinese women and the second most common among men. Paradoxically, prevention and management strategies are sparse in relation to the high prevalence. A number of modifiable risk factors have been identified as major contributors of CVD and should be a focus of primary, secondary and tertiary prevention.

Conclusion: CVD is already a leading cause of death and disability among Chinese women. The high prevalence of risk factors and low rate of awareness, treatment, and control, signal an urgent need for focusing on this issue in Chinese women. Strategies on an individual, community and government level are recommended. Involving

Chinese nurses in these strategies is essential.

Keywords: Cardiovascular disease, risk factors, women

Introduction

During the past decades, cardiovascular disease (CVD) has become a major cause of morbidity and mortality in women worldwide¹. Of the total 16.5 million CVD deaths annually, 8.6 million are in women². Death from heart attack and stroke are responsible for twice as many deaths in women as all cancers combined².

Although CVD risk is perceived to be low in Chinese women, the burden of disease is increasing rapidly. Heart disease and cerebrovascular disease are two of three leading causes of death, and account for around 40% of deaths from all causes since 1990³⁻⁴. During the mid 1990s, 20% of the 2.2 million middle-aged women worldwide who died of heart disease and stroke were Chinese⁵. According to American Heart Association report, the stroke incidence rates in Chinese women were 152 and 147 per 100,000 people in urban and rural areas respectively, only less than Russian Federation at 220 and Romania at 166 per 100,000 population⁶. It is likely that Chinese women will continue to experience disproportionately high mortality from CVD. According to the WHO report, by 2040, Chinese women are projected to be 49.5% of the population. Even if death rates remain constant, Chinese women will represent 54.6% of CVD deaths².

It is well documented that CVD is preventable among both men and women⁷. The identification of risk factors and effective control strategies have contributed to the fall in CVD mortality rates that has been observed in most industrialized countries including the United States of America, Finland, and Australia⁸. Globally, the risk of CVD is underestimated, contributing to the rise in disease burden. Many women are unaware that CVD is the principal cause of death of their gender. More worrisome, there is an apparent lack of awareness of CVD prevalence in women among healthcare professionals¹.

In parallel with other developing countries, Chinese authorities primarily focus on communicable diseases rather than chronic diseases, such as CVD⁹. This paper aims

to document cause and risk factors responsible for the high prevalence of CVD in Chinese women and to recommend a multifaceted strategy to combat these risks. Finally, implications for Chinese clinical and research nurses are discussed.

Social change and epidemiological transition

China is the largest developing country in the world and is facing rapid economic development fuelled by social and economic change. Between 1985 and 1999, the gross domestic product (GDP) per capita rose by 8% per year, the second fastest increase globally¹⁰. In 2005, China's economic growth rate was 9.9%, its GDP reached US\$2.26 trillion, and China became the 4th largest economy in the world¹¹. As a result of this rapid socioeconomic development, the average life expectancy and health status have changed dramatically. For Chinese women, life expectancy has increased 39.8 years to 73 years of age from 1949 to 2001 owing to the decline in childbirth mortality, malnutrition, and infectious disease⁴. Table 1 shows the trend of life expectancy in China from before the founding of People's Republic of China through to 2000. The increasing longevity provides longer periods of exposure to the risk factors of CVD, resulting in a greater probability of clinically manifested CVD events¹². CVD risk increases after menopause, which may be related to the substantial metabolic changes that occur as women transition from pre- to post-menopause¹³.

Table 2 illustrates the health transition trajectory in China. In 1957, diseases of the respiratory system, acute infectious diseases, and tuberculosis were the leading causes of mortality, accounting for 16.9%, 7.9%, and 7.5% of deaths, respectively. Meanwhile, heart disease and cerebrovascular disease were between diseases and ranked fifth and sixth by contributing to 6.6% and 5.5% of total deaths, respectively¹⁴. Table 3 shows that in 2005, chronic diseases were the main cause of death in women, as opposed to communicable diseases. Among them, CVD accounts for 41.9% and 35.7% of deaths in urban and rural areas respectively.

-----Insert Table 1 -----

-----Insert Table 2 -----

-----Insert Table 3 -----

Change of lifestyle

The results of the Sino-MONICA studies show significant variations of CVD rates and risk factor levels between populations, which are resultant of lifestyle changes and unrelated to genetics¹⁵. The studies also show the Chinese population has a lower genetic predisposition for CVD compared with other populations¹⁶⁻¹⁷. Rapid economic development, industrialization and urbanization, and lifestyle patterns have changed dramatically. More and more women adopt western lifestyles, including a high intake of dietary fat, less physical activity, smoking, and drinking. For example, Table 4 shows the overall increases in fat intake and consumption of animal protein and the decrease in consumption of cereals.

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Prevalence of CVD risk factors

The increasing rate of CVD is not surprising given the increasingly high prevalence of CVD risk factors in Chinese women. Gu et al¹⁸ demonstrated that between 12-35% of Chinese women aged 35 to 74 years had from one to more than three major CVD risk factors including dyslipidemia, hypertension, diabetes, cigarette smoking, and being overweight. The age-standardized prevalence of ≥ 1 , ≥ 2 , and ≥ 3 CVD risk factors was higher in American women than their Chinese counterparts, 93.1%, 73%, and 35.9% compared with 71.3%, 59.1% and 12.2%, respectively¹⁹.

Hypertension

Hypertension plays a major etiologic role in the development of cerebrovascular disease, ischemic heart disease, and cardiac and renal failure²⁰. A longitudinal study undertaken by Fang et al showed that hypertension was significantly related to risk of stroke in China²¹. The prevalence and absolute numbers of hypertension have increased dramatically during the past several decades. The estimated number of hypertension cases among Chinese adults has increased from 30 million in 1960 to 94

million in 1990 and 160 million at present²²⁻²³. Figure 1 shows the increased prevalence of hypertension in Chinese women.

Given the high incidence of hypertension, compared with western countries, the burden of stroke is much more common than coronary heart disease in China. Each year, 1.3 million Chinese people have a first stroke, four times the incidence of acute myocardial infarction²⁴. Despite this statistic, studies indicate that rates of awareness, treatment, and control of hypertension were unacceptably low^{22, 25}. The study undertaken by Antikainen et al showed at the 160/95 mmHg threshold, the highest proportion (92%) of controlled hypertensive female individuals were in New Zealand, while 70% were in Stanford, California, U.S.A, and 38% in Beijing, China. When the threshold of hypertension was lowered to 140/90 mmHg, 63% of female hypertension patients were adequately controlled in Ghent, Belgium, while 52% were in Stanford, and only 21% were in Beijing²⁶.

-----Insert Figure 1 here-----

Dyslipidemia

It is well known that the higher the level of serum cholesterol, the higher the risk of CVD in both men and women. Dyslipidemia is a modifiable risk factor that has a substantial impact on the outcomes of patients with CVD, especially for women²⁷. Decreasing total cholesterol levels by 10% can decrease the incidence of coronary heart disease by as much as 30%²⁸. Ford et al found the total cholesterol concentration in American women decreased slightly from 5.35 mmol/L in 1988 through 1994 to 5.29 mmol/L in 1999 through 2000²⁹. While Critchley et al's Beijing survey showed that total cholesterol in women aged 55 to 64 years increased from 4.7 to 5.9 mmol/L between 1984 and 1999, an absolute increase of 1.19 mmol/L³⁰. However, researchers found that among those who had a total cholesterol 200 mg/dl or who were on cholesterol-lowering medications, the proportion of women

who were aware, treated, and controlled was 3.4%, 1.9%, and 1.5% respectively, while for men 8.8% were aware, 7.5% were treated, and 3.5% were controlled³¹.

Diabetes

Diabetes is a powerful risk factor in women, regardless of age³². The risk of cardiovascular events in diabetic women is higher than that of both diabetic men and non-diabetic women³³. The risk of myocardial infarction (MI) is twice as high in women with diabetes as in non-diabetic women of the same age³². The incidence of CVD in diabetic women is two to six times that of non-diabetic women, whereas the incidence is only doubled in diabetic men³³. This difference may be due to a particularly deleterious effect of diabetes on lipids and blood pressure in women³⁴. Figure 2 shows the global epidemic of diabetes. The top three countries are India with a growth from 31.7 million to 91.4 million, China, from 20.8 million to 42.3 million, and U.S.A from 17.7 million to 30.3 million diabetic people in 2000 to 2030³⁵.

-----Insert Figure 2 here-----

Cigarette Smoking

Current smokers are those people using tobacco products at the time of a survey. Passive smokers are those exposed to another's tobacco smoke for at least 15 minutes daily on more than 1 day per week. There are variable mechanisms by which tobacco smoking impacts the cardiovascular system, such as producing acute increases in heart and blood pressure and platelet aggregation, causing endothelial cell damage, and accelerating atherosclerosis³⁶.

China is the world's largest producer and consumer of tobacco products and bears a large proportion of the global burden of smoking-related disease³⁷. Unlike the 25% of British women who are smokers³⁸, their Chinese counterparts contribute to a small portion of China's 350 million smokers. However more than 60% of female non-smokers are exposed to environmental tobacco smoke (ETS) in their homes,

workplaces and in public places³⁹. There is a debate regarding the causal role of passive smoking in heart disease⁴⁰. Surveys on the relationship between passive smoking and CVD show that ETS is a risk factor for an elevated prevalence of CVD in Chinese women⁴¹⁻⁴². In addition to the 50 million people who want to quit smoking, there is a growing smoking epidemic among young people³⁹. Therefore, enhanced knowledge of the health risks of smoking and trials of controlled measures designed to suit Chinese cultural and economic conditions are needed.

Physical inactivity

Physical inactivity not only doubles the risk of developing heart disease and increasing the risk of hypertension by 30%, but also doubles the risk of dying from CVD and stroke⁴³. Globally, both in western and eastern countries, more women than men were physically inactive⁴. A study on Chinese women showed that physical activity is related to serum lipid concentrations and insulin resistance, the grade of energy expenditure from exercise being positively related to antioxidant capacity and insulin sensitivity⁴⁵. In contrast to Chinese people's traditionally high level of physical activity, study results from the international collaborative study of CVD in Asia showed that in rural and urban China, 78.1% and 21.8% of residents, respectively, were physically active; 75.8% and 16.5%, respectively, participated in work-related activity; and 28.9% and 7.9% respectively, participated in leisure-time physical activity⁴⁶. In both rural and urban settings, women were less likely to be physical active and to participate in work-related and leisure-time physical activity than men⁴⁶.

Obesity

Obesity is well recognized as a major risk factor for CVD both in men and women and about a fifth of the one billion overweight or obese people in the world are Chinese⁴⁷. The surveys conducted in large cities such as Beijing indicate 35.2% of men and 39.5% of women are overweight⁴⁸. China was once considered to have one of the leanest populations and it is true that compared with their American

counterparts, Chinese women have a relatively low average BMI and waist circumference (WC). However, studies have suggested that WHO/National Heart Lung and Blood Institute (NHLBI) overweight and central adiposity guidelines based on Western populations are not appropriate for Asian populations. Rather, the cutoff points recommended by International Obesity Task Force are more appropriate⁴⁹. The researchers indicate that a BMI of 24 and WC of 80 centimeters for Chinese women are more appropriate cutoffs for the designation of weight and central adiposity⁵⁰. There is a need for further investigation into specific BMI and WC cutoffs and their relationship to CVD in Chinese women.

Contributing risk factors

It has been shown that socioeconomic status, including education, occupation, income and marital status is inversely associated with cardiovascular mortality and morbidity⁵¹. Researchers found these associations were more consistent among women than men in China⁵². However, a seven year follow-up study revealed the opposite trend in that the deterioration of CVD risk factors mainly occurred in the most educated people⁵³. Also, parental or sibling CVD is a potential predictor of CVD. If a parent has CVD, their child has twice the risk, but if a sibling has CVD, this risk may in fact be even greater for an individual^{54, 55}.

Individual approach

Significant advances in our knowledge of interventions to prevent CVD have occurred since publication of the first female-specific recommendations for preventive cardiology in 1999³². Figure 3 illustrates a multifaceted strategy from individual, community, and relative authorities. Given tobacco smoking, physical inactivity, unhealthy diet, and accompanying obesity are responsible for at least 75% of CVD⁵⁶, the prevention of CVD traditionally depends on control of risk factors among individuals as a major component of any strategy.

Smoking and Physical activity

There is good evidence demonstrating cardiovascular hazards of smoking and passive smoking⁴⁰⁻⁴¹, as well as the prompt benefit that occurs with smoking cessation regardless of former smoking status and smoking related disease or symptoms⁵⁷. Women should be consistently encouraged not to smoke and to avoid environmental tobacco. WHO and AHA recommend women to accumulate a minimum of 30 minutes of moderate-intensive physical activity on most or preferably all days of the week⁷.

Diet

The traditional Chinese diet used to be rich in carbohydrates (about 60% of energy intake), fruits, and vegetables. A woman's diet plays a key role in her cardiovascular health. In the evidence-based guidelines of CVD prevention in women, 4 of the 8 clinical recommendations for lifestyle modifications were diet-related⁷. In terms of cardiovascular-healthy diets, essential aspects of good nutrition for women include diets rich in fiber, whole grains, fresh fruits, vegetables, fish, nuts, antioxidants, minerals, vegetable protein, marine and plant omega-3 fatty acids and vitamins of the B group⁵⁸. Two large cohort studies in Shanghai showed that soy and soy constituents were significantly and inversely associated with the risk of coronary heart disease and hypertension among Chinese women^{41, 59}.

Drug therapy

Medication and treatment adherence is a critical factor in cardiovascular disease, yet, cultural factors often impede concordance with treatment recommendations⁶⁰. Implementation of AHA western-based guidelines^{7, 32, 61-63} may benefit Chinese women but may differ culturally, medically, and economically. In light of the paucity of research, there is a heightened need to further investigations focusing on locally tailored preventive measures and treatment guidelines for CVD in Chinese women. The high usage of Traditional Chinese Medicine underscores the importance of consideration of drug interactions and tailoring of advice and information that is culturally appropriate and acceptable⁶⁴.

Community Approaches

Studies show that community-based intervention plays an important role in both primary and secondary prevention of CVD. The community intervention conducted in Guzhen reveals that community-based comprehensive prevention of cardiovascular disease improves the awareness, attitudes, and behaviors, in community groups and reduces morbidity and mortality of cerebral apoplexy⁶⁵. Similar findings resulted from a nine-year community-based intervention in China's three most modern cities, Beijing, Shanghai, and Changsha, where stroke is highly prevalent⁶⁶. Community health providers should focus on educating women about initiating and maintaining a healthy lifestyle as a cornerstone of primary and secondary prevention.

Policy and regulatory strategies

Chronic diseases account for an estimated 80% of deaths and 70% of disability-adjusted life-years lost in China⁶⁷. Rates of death from them in middle-aged people are higher in China than in some high income countries⁶⁸. The decision makers of health policy and guidelines must confront these major challenges and take actions to avert the increasing burden of CVD in Chinese women.

As many western countries have banned smoking in all workplaces and public areas, it should also be introduced to China as early as possible. Labeling of ingredients in manufactured foods should be mandatory. The food industry should provide and consumers could select foods that are low in fat, sugar, and salt. Responsible advertising and media depictions of diet and other lifestyle factors should be mandated.

Most Chinese patients self-fund their own medical treatment. Chinese women, who are conditioned to defer their own needs to those of their family's, are often reluctant to seek out care for themselves unless an emergency arises. One positive reform within the health system would be to give greater priority to the prevention and control of CVD in women, making the drugs and equipment for primary and

secondary prevention accessible and affordable, especially in the rural areas.

Further, in light of the paucity of Chinese women-specific studies, there is an urgent call for long-term domestic and international collaborative research and intervention programs. For example, by studying the knowledge and attitude of CVD among health providers, the public, and women themselves, we can identify specific knowledge deficiencies and vulnerable populations. Launching a campaign, like American Heart Association's "Go red for women campaign" widely in China, would raise awareness of the urgent situation of CVD in women. Also, development of tailored, cultural, economic interventions of CVD risk factors will require more women participation in research programs.

-----Insert Figure 3 here-----

Implications for nursing practice

CVD is already a leading cause of death and disability in Chinese women. Awareness-raising and education is the first key to reduction of CVD. Like other eastern countries, women often defer their own needs in favor of the needs of others, namely their families. Lower perceived susceptibility, higher perceived benefit of Chinese herbs and lower perceived benefit of Western medications are also barriers to changing the CVD burden⁶⁰. Bearing these Chinese cultural factors in nurses' minds, the effort of such education programs should be targeted at the general public, other healthcare providers, and women, especially those with CVD risk factors. The structured health education program by a diabetic nurse has shown significant improvements in controlling cardiovascular risk factors in Chinese Type 2 diabetic patients⁶⁹. This outcome indicated that regular reinforcement through an intervention program should be part of care provided by nurses as it represents a "critical moment" when women come to the clinic or hospital.

Secondly, it is well known that distinct gender and ethnic differences exist in terms of presentation of symptoms, validity of diagnostic tests, drug side effects, and

complications⁷⁰⁻⁷¹. With respect to CVD risk factors, Chinese women have higher rates of diabetes and hypertension but are less frequently smokers. They have a higher incidence of stroke and less frequent coronary heart disease. In light of the paucity of Chinese women-specific research, it is important to undertake further nurse-lead research programs in order to stem a higher CVD burden. Strategies that advance the educational preparation of Chinese nurses to the Masters and Doctoral level will also likely fuel the development of culturally appropriate interventions.

Conclusion

As a consequence of rapid economic development, urbanization, and change of lifestyle, CVD has become the main killer of Chinese women. Sadly, preventive and educational programs have not kept pace with this growth. Stroke and heart disease account for about 40% of the annual mortality in Chinese women, well ahead of the 20% caused by all forms of cancer. During the past decades the incidence in most western countries halved, but the statistics do not follow the same downward trajectory for Chinese women. The main driving force is the change of lifestyle, including unhealthy diet, inactivity, smoking, and obesity. Given these factors are responsible for 75% of the incidence of CVD, strategies involving individuals, communities, and government authorities should be targeted as primary and secondary prevention against the CVD epidemic in this risk group. China has successfully reduced the mortality rate of childbirth, malnutrition and infectious disease in Chinese women. The time is coming to bridge the gap between knowledge and daily practice and to promote cardiovascular health in women.

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Table 1 the trend of life expectancy in China⁴

Life Expectancy (Year)				
Year	Data Source	Total	Male	Female
Before 1949	...	35.0
1957	70 Cities, 1 County and 126 Townships in 11 Provinces	57.0
1973-75	Retrospective Survey on Tumor Death in China	...	63.6	66.3
1981	The 3rd National Population Census	67.9	66.4	69.3
1990	The 4th National Population Census	68.6	66.8	70.5
2000	The 5th National Population Census	71.4	69.6	73.3

Table 2 Health transition in China⁴

	2000	1957
1 st	Disease of the heart	Disease of respiratory system
2 nd	Malignant neoplasms	Acute infectious disease
3 rd	Cerebrovascular disease	Tuberculosis
4 th	Pneumonia and influenza	Digestive disease
5 th	Infectious disease	Disease of the Heart
6 th	Accidents	Cerebrovascular disease
7 th	COPD	Malignant neoplasms

Table 3 Ten main causes contributed to Chinese women's death in 2005⁴

Death Rate of 10 Main Diseases in Certain Region in 2005(Female)						
Rank	City			County		
	Cause	Death Rate 1/10000 0	%	Cause	Death Rate 1/10000 0	%
1	Cerebrovascular Disease	105.19	21.82	Diseases of the Respiratory System	128.53	26.60
2	Heart Disease	96.88	20.09	Cerebrovascular Disease	106.11	21.95
3	Malignant Neoplasms	88.51	18.36	Malignant Neoplasms	76.99	15.93
4	Diseases of the Respiratory System	61.85	12.83	Heart Disease	66.46	13.75
5	Injury & Poisoning	33.22	6.90	Injury & Poisoning	31.36	6.49
6	Endocrine, Nutritional & Metabolic Diseases	15.77	3.27	Diseases of the Digestive System	11.56	2.39
7	Diseases of the Digestive System	13.46	2.79	Endocrine, Nutritional & Metabolic Diseases	7.45	1.54
8	Disease of the Genitourinary System	8.21	1.70	Disease of the Genitourinary System	6.73	1.39
9	Mental Disorders	5.55	1.15	Mental Disorders	2.62	0.54
10	Disease of the Nervous System	4.66	0.97	Pulmonary Tuberculosis	1.78	0.37
	Total		89.88	Total		90.95

Table 4 Comparison of dietary constitution from 1982 to 2002⁴

	Total			Urban residents			Rural residents		
	1982	1992	2002	1982	1992	2002	1982	1992	2002
Energy from cereals (%)	71.2	66.8	57.9	65.0	57.4	48.5	74.6	71.7	61.5
Energy from animal (%)	7.9	9.3	12.6	12.4	15.2	17.6	4.2	6.2	10.7
Energy from fat (%)	18.4	22.0	29.6	25.0	28.4	35.0	14.3	18.6	27.5

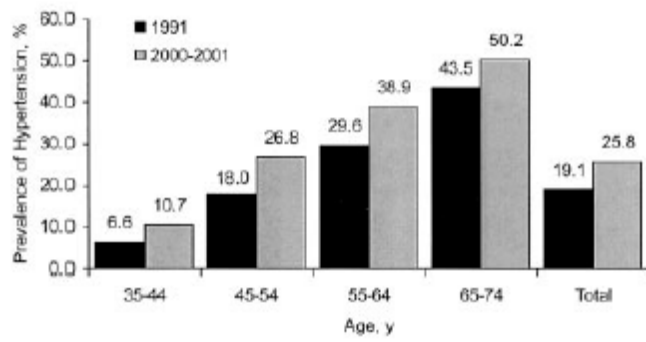


Figure 1 Prevalence of hypertension among Chinese women, aged 35 to 74 years, in the 1991 Chinese National Survey and 2000-2001 InterASIA²².

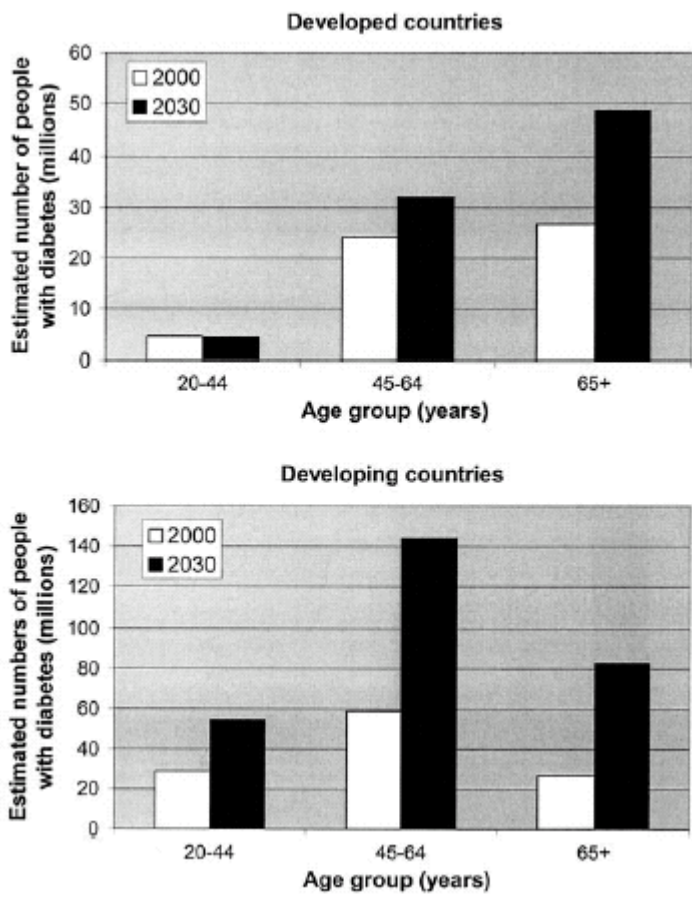


Figure 2 Estimated numbers of adults with DM³⁵

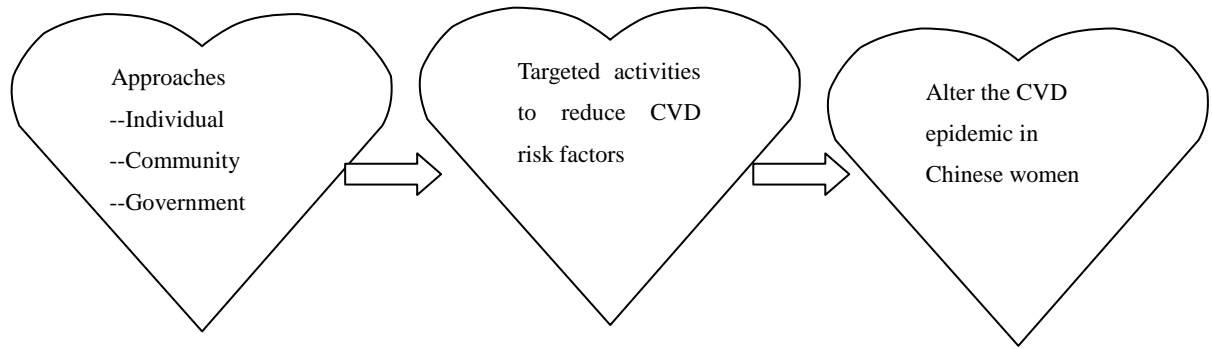


Figure 3 Multifaceted strategies in reducing the CVD in Chinese women