The Move towards Obesity: the nutrition transition in China

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Section 1: Executive Summary

Our paper examines the current status of obesity in China and policy options that can be undertaken by the government to combat the effects of the growing obesity epidemic that has been reported. China's economic transition has had observable effects on the country's health status. As people trade in manual labor for office work, trade farming for fast-food, and trade in modern conveniences for traditional practices they are also trading in years of health and wellness. The obesity rates in Chinese children, teenagers, and adults are alarmingly high and growing. This paper aims to outline the complex details associated with combating a widespread problem like obesity in a country with many current changes underway such as China. While pointing to some potential areas of difficulty when addressing obesity issues, the paper makes recommendations for future action to be taken at the government level to combat further increases in obesity rates in China.

Section 2: Introduction

The World Health Organization's 2002 World Health Report ranked obesity as one of the "top 10 risks to human health worldwide." At the other end of the malnutrition scale, obesity is one of today's most blatantly visible – yet most neglected – public health problems. Paradoxically coexisting with under-nutrition, an escalating global epidemic of overweight and obesity – "globesity" – is taking over many parts of the world. If immediate action is not taken, millions will suffer from an array of serious health disorders. Obesity has very high costs for societies, as the resulting disabilities and diseases create huge burdens for families and health systems. The experience of developed countries clearly demonstrated that the cost of morbidity

and mortality associated with increasing obesity and related non-communicable diseased (NCDs) would be overwhelming for developing countries.

In China, studies have shown increases in overweight among children and teens, for example, 15% of children aged 2-6 and 8% of those 7-17 years are overweight. This increase in childhood overweight and obesity is 11 times the prevalence 15 years ago. In addition, 26.9% of men and 31.1% of women are overweight. For both, obesity poses a major risk for serious diet-related non-communicable diseases, including diabetes mellitus, cardiovascular disease, hypertension and stroke, and certain forms of cancer. Its health consequences range from increased risk of premature death to serious chronic conditions that reduce the overall quality of life.

In a country with limited resources to invest in health, not investing in the prevention of obesity could have an enormous impact in future government in treatment of NCDs.

Section 3: Important causes of obesity in China

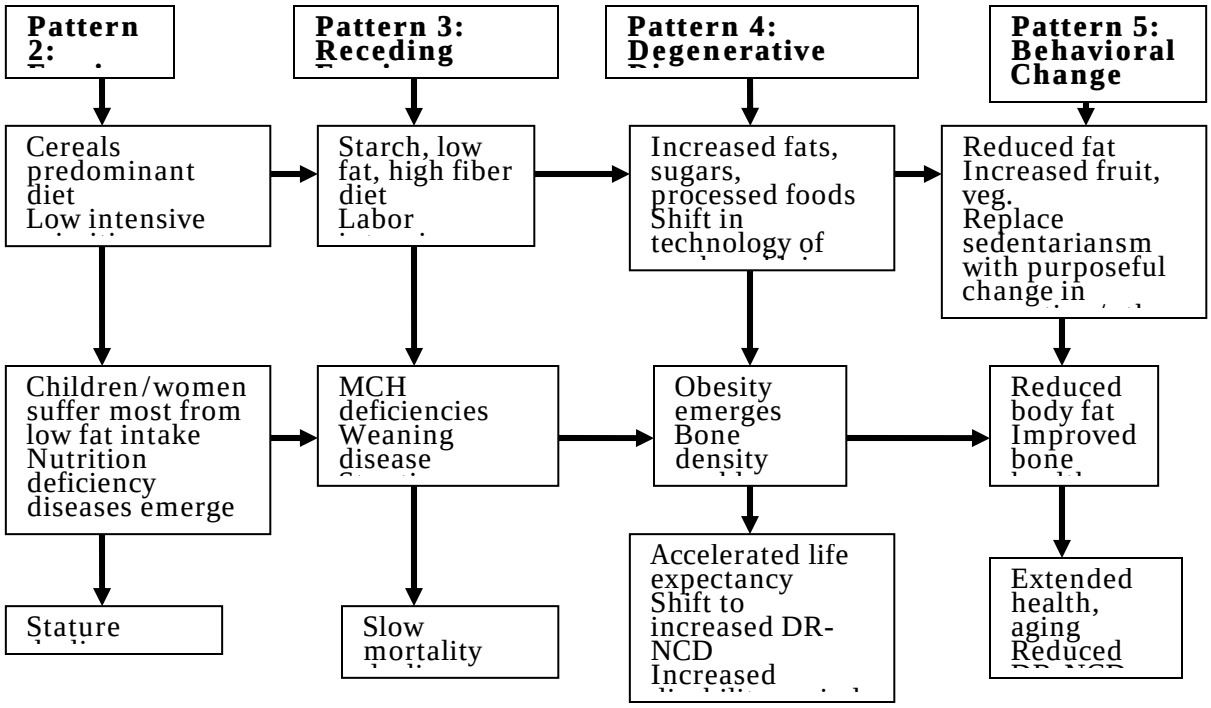
Nutrition Transition

In general, the spreading obesity pandemic has prompted many biological scientists to search for an explanation from our evolutionary past. One popular theory is that of the "thrifty gene", where human genes are believed to have evolved very little since the Late Paleolithic period (50,000 – 10,000 BC), when humans had to hunt and gather food to survive. The process of hunting and gathering consists of long periods of feast and famine punctuated by episodes of intense food searches. Thus, due to an inability to recognize when food would be available, our genes became "programmed" to store energy for times of famine in the form of fat. Although an advantageous feature in our evolutionary past, in today's social, environmental and economic

environment where food is more readily available and modern conveniences allow, if not encourage, individuals to be sedentary, our genes are arguably doing us a disservice by contributing to the growing overweight and obesity pandemic observed around the world (Chakrvarthy, 2004).

Alternatively, others argue that socioeconomic factors alone, including heightened incomes, greater urbanization, and a reduction in the availability and consumption of complex carbohydrates, as well as an increase in fats and sugars, and a simultaneous shift towards less physical work, are responsible for the growing overweight and obesity trend (World Health Organization, 2004). Further, the economic and accompanying socio-cultural transformation has created a dependence on automated transportation and technology, which has contributed to the *nutrition transition*.

In this paper we will employ Barry M. Popkin's definition of the *nutrition transition*, which can be described as large shifts in societal factors, especially in the composition of diet, are then reflected in nutrition-based outcomes including body size and composition (Popkin, 1994). Popkin argues that socio-historically the *nutrition transition* has incorporated five sweeping patterns and that these macro-level changes have and continue to occur simultaneously with demographic and epidemiologic outcomes and vary greatly by the nature and pace of food pattern changes.



This adaptation of Barry Popkin's model, suggests that countries follow an e*conomic and nutritional progression* from a state of famine to a state of receding famine, followed closely by the development of degenerative disease, and finally the development or introduction of behavioral change including diet modification and increased recreational activity. It should be noted that not all countries follow this linear pattern nor do all pass through each of the various patterns. Nevertheless, Popkin's model provides a useful framework for understanding and analyzing the nutritional progression of countries throughout the world.

Nutrition Transition and Economic Development in China

In the half-century since Chinese cultural revolution, the country was transformed from once facing famine and extreme food shortages to one where the food supply addressed basic needs; nutritionally balanced food intake (cereals, vegetables, animal foods) as well as energy

intake increased. This shift in the composition of diet and corresponding body composition has been accompanied by many positive changes. Infectious diseases and hunger, important causes of death in the 1950s, no longer affect most of the population. Urbanization, economic growth, technological changes for work, leisure and food processing[1], and mass media growth account for China's movement to Popkin's Pattern 4 of the nutrition transition. This pattern is characterized by an abundant food supply, a decrease in activity levels[2], and the development of degenerative disease. With these changes, China is simultaneously facing the challenges of malnutrition and overnutrition.

Notorious morbidity patterns have emerged in China, accompanying greater inactivity and dietary change. The country is facing rapidly increasing mortality from NCDs at a time when infectious and parasitic diseases are declining as causes of mortality. China has followed the classic East Asian shift from infectious diseases and malnutrition to diseases related to hypertension, coronary heart disease (CHD), stroke, and a subset of cancers (Popkin, 2001).

China represents one of the more rapidly developing countries in the world. In the past two decades, since the one-party communist government opened China's economy to Western goods and investment, the annual growth rate of the GNP was more than 8%, the highest rate in recent world history (Du, Lu, Zhai, and Popkin, 2002).[3] During this movement toward a market economy, China achieved remarkable economic progress, which was accompanied by social and cultural change. For instance, population started working on manufacturing jobs and more

[1] As China modernizes and technology becomes more affordable, people bring appliances that make cooking and chores more convenient into their homes. These tasks become simpler and require less energy to accomplish, limiting the physical activity associated with daily chore completion (Leppman, 2005).
[2] Research based on China's Health and Nutrition Survey has shown that Chinese children rarely engage in physical activity outside of school and have a greater risk for decreasing their activity rates as television becomes more popular and accessible to Chinese youth (Tudor-Locke, 2003).

recently in service related jobs, which meant moving to urban areas where the most of their jobs were located.

The rate of urbanization has been astonishing: the urban population with permanent residence status increased from 191.4 million (19.4% of the total population) in 1980 to 301.9 million (26.4%) in 1990, and up to 455.9 million (36.9%) in 2000. In the last two decades the number of rural-urban migrants increased from merely two million in the mid-1980s to 70 million in the mid-1990s, and, in spite of high unemployment in urban areas caused by redundancies from SOEs, the number of rural migrant laborers continued to grow to 94 million in 2002 (Ping, 2003).

In addition, living in the city has many consequences on lifestyle: people don't produce their own food any more, they reduce the consumption of fresh vegetables increasing the consumption of processed food, and they spend most of the time in jobs that require minimal physical activity. In sum, Chinese population exercise less and have less time to cook healthy food, which in turn increases the consumption of cheap fast food. Moreover, the rate of service related jobs, which require even less physical activity than manufacturing jobs, is increasing in all high-income developing countries. Technology has also contributed to obesity rates by decreasing the amount of physical effort that all kinds of jobs require. For instance, spatial mismatch between jobs and residences, which increases commuting time has significantly contribute to higher rates of obesity.

Thus, we argue that the nutrition transition in China is inevitable with the advent of technology, industrialization, and globalization. As a result of this process, the introduction of less healthy Western products and behaviors in conjunction with the loss of traditional foods, customs, and ways of life, has caused negative health outcomes, most notably overweight and

obesity (WHO, 2005). These results are costly, debilitating, and in the case of chronic disease, deadly. Thus, without having solved the problem of malnutrition or even infectious disease, many developing countries in the nutrition transition are now grappling with overweight and obesity as well (Navarro, 2005).

Nutrition Transition and the One-Child Policy

China has a particularity that imprints the difference in this nutrition transition: the one child policy. In 1979 China adopted the one-child policy, which has variations depending on the geographical area or other concerns, allowing newly formed families to have only one child. At first, the policy was implemented in both urban and rural areas, but it rapidly became a policy that was only enforced in the cities. Consequently, most urban families formed in the 1980s are one-child families. For example, in Beijing and Shanghai, 86% and 91%, respectively, of all babies born in 1985 had no siblings.

The fact that families had only one child affected the upbringing on the children. This generation of Chinese only children is known as “little emperors”. According to Falbo and Poston, there’s concern that the “little emperors” are overindulged with food, resulting in fussy eating habits as well as overeating. This could be happening because parents who pledge to have solely one child are given a certificate that entitles them to certain benefits, commonly extra income, which could be used by parents to indulge their only children. But the results of their own study partially confirm the hypothesis: they find that only children are physically larger than their classmates in two provinces (Hunan and Beijing). The results suggest that the benefits derived from possessing the one child certificate could well be providing better nutrition and

overall health care for only children. The result is not very strong, because the physical size difference was found in only one of the two dimensions studied (height and weight).

Section 4: Obesity trends in China

China's vast landmass, roughly the size of the United States, separates different localities allowing unique local customs and eating habits to develop over centuries. In addition, the diets typical of those living in the highly developed cities on the east coast contrast greatly with consumption patterns of the Chinese living in the rural areas. As China has modernized and advanced economically, Beijing has become the fattest city in China with 22.4 percent of adults classified as obese and 37.1 considered overweight. These urban dwellers are spending less of their income on food expenses but they are consuming those who are in the top 10 percent of income levels spend only 40 percent of that income on food (Leppman, 2005, p.79). Rural residents tend to grow the food that they eat, so they only spend income purchasing food they do not naturally produce. As a result, they purchase much less food, but the proportion of their income spent on food is higher because their incomes are significantly lower than the incomes of the urban residents. The poorest rural families are estimated to spend around 60 percent of the household income on food (Leppman, 2005, p.77). Even after producing foods locally and purchasing additional foods, rural families are still experiencing malnutrition because they cannot afford certain categories of foods.

In spite of the fact that the government made great progress in solving the malnutrition problem, the prevalence is still high: 35% of pre-school children are stunted and 8% of adults are undernourished. Malnutrition affects approximately 20-30% of the Chinese population, but this rate rises to 50% of the population in the impoverished provinces of Western China.

Malnutrition affects people living in rural populations differently than it affects people living in urban populations. This is because the Chinese government currently provides two separate types of social security systems: one for urban residents and one for rural residents. In rural areas, the government provides help to only certain groups of people including the disabled, the elderly and orphans. These groups are entitled to food, clothes, medical care, shelter and burial costs. In urban areas, the government operates a pension system, which assumes that urban residents are employed by the government or state-owned companies (Lam, 2005). These disparate systems for addressing social welfare and nutrition/food issues in China lead to the high levels of inequality between malnourishment rates.

In urban areas, many of those who are malnourished are actually migrant workers, which is primarily because they do not receive social security and food resources to help with their nutrition needs. In rural areas, some of the major reasons for high malnutrition rates are due to a rural social security system that only aids a select group of the population as well as lack of arable land to provide adequate agricultural production for rural communities (Professor Wen Tiejun of Renmin University, March 2, 2006). Thus it is clear that difference between urban and rural social security systems affects malnutrition rates, as does the income inequality between the rich and the poor. As a result certain populations within China have high malnutrition rates such as in the rural Western provinces and among migrant workers. This happens simultaneously with high occurrences of obesity in mainly wealthy, urban communities.

In addition to this malnutrition caused by a lack of resources, there are also new cases of malnutrition in areas where it could be prevented by maintaining traditional food habits. Even though rural parents often lack the money to buy nutritionally sufficient foods for their families, there are still methods for improving their nutritional status other than providing them with more

income. For example, Chinese mothers put their children at risk for malnutrition when they stop breast-feeding because breast milk contains many vitamins and minerals that would otherwise need to be provided through a variety of foods in a diet. The mother's decision not to breast feed in some cases might be influenced by newly available food sources. One survey among rural parents found that they in rural areas parents were feeding children syrup, malt, orange juice, or coke because it was inexpensive and dependable (China Daily, 2005). If mothers are educated about the healthy nutrients contained only in mother's milk, perhaps they would continue to breast-feed or breast-feed longer providing these children with the vitamins and minerals their bodies need to grow. Malnutrition in these children is a combined result of income level, accessibility to healthy foods, and information about nutrition. All of these factors are similarly the cause of obesity in many children and adults in other areas of the country.

Using the same causes identified above that lead to malnutrition one can explain the opposite outcome, increases in overweight and obesity among children and teens. Childhood overweight and obesity have are eleven times more prevalent than they were fifteen years ago. Today in China, 15% of children aged 2-6 and 8% of those 7-17 years are overweight. In addition, 26.9% of men and 31.1% of women are overweight. China is quickly relinquishing its traditional diet, which includes cereals and vegetables with few animal products that are inherently low in fat. These dietary changes are marked by an increased intake of fat, sugar and processed foods, and decreased cereals. In 1996, over a third of all Chinese adults and 60.1% of those in urban areas consumed over 30% of their energy in the form of fat as edible oil, in addition to other animal fats. Moreover, there has been a rapid increase in food consumption away from home. Energy consumption at restaurants and "stalls" in China increased from 0.4% in 1989 to over 7.4% in 1997. The mere presence of commercial eating-places necessarily

correlates with the growth of the economy, once again proving the link between diet and economic evolution. Traditional foods that used to be grown and consumed fresh are being replaced by these commercial styled eateries as incomes rise, and the availability of healthy foods declines.

Differences in urban and rural consumption patterns also reflect economic pressures and taste preferences. The economic pressure to consume based on price is more common in rural areas where the citizens tend to have lower incomes and less disposable wealth, but is also seen in low-income urban populations like migrant workers. Soybeans for example, are a basic source of protein that is inexpensive but are not favored by wealthier Chinese. The price of soybeans is so low that they have no prestige, and the high-income groups in the urban areas are less likely to consume them than poorer rural Chinese. The consumption patterns of the wealthiest 10 percent can provide evidence of future trends and the foods that people will consume more as their economic status increases. As incomes rise the amount of meat eaten increases and the same is true for sugar, candy, melons and fruits, fresh milk, and yogurt (Leppman, 2005).

These examples reflect the changes in preferences in the wealthy populations, and how diets can become healthier (if yogurt and milk consumption increase) but might also lead to future health problems (if meat and candy consumption increases). People in the rural areas are also changing their food preferences, possibly as a reaction to the changes in food prices. They are choosing to eat fewer meats, and shifting their demand for wheat back to rice (Leppman, 2005). This trend towards more simplified food sources is worrisome especially when combined with the evidence of malnutrition in poor families because they lack a variety of foods.

The consumption patterns observed in the wealthy Chinese explain some of the causes behind the growing number of the obese. As the income rises for this population they choose to consume foods that contribute to their increasing weight problems. High income levels do not guarantee that people will be eating nutritionally balanced and healthy meals. Personal food preferences tend to increase consumption of meats high in fat and candy which is full of empty calories. Making more nutritionally dense foods available to the wealthy is not enough to influence their consumption patterns. Both the wealthy and poor can benefit from nutritional information and educational campaigns. Programs to increase the variety and nutritional value of foods consumed by the poor also need to be addressed as well.

In addition to improving dietary intake, attention must be paid to the levels of physical activity that citizens participate in on a daily basis. Current studies have shown that Chinese children participate in daily chores and physical activity outside of school at lower rates than children in other industrializing countries (Tudor-Locke, 2003). This trend is also at risk of becoming worse as televisions enter more households and more children increase hours of sedentary leisure amusement (Tudor-Locke, 2003). The activity levels of children in China today are worrisome because this group is increasingly at risk for obesity at younger ages, and at higher levels. Problems such as this lack of exercise and activity should be addressed early on so as to prevent the worsening of the condition as the children grow older.

Not only are China's children suffering from lower activity levels, but the adults are also demonstrating lower levels of activity that increase their risk for overweight, obesity and other associated diseases like cardiovascular diseases. An international study of cardiovascular disease in Asia monitored the physical activity levels of Chinese adults ages 35 to 74 years old and compared the rates of activity between men and women, as well as rural and urban dwellers

(Muntner, 2005). This study found that while 78.1% of rural residents participated in 30 minutes or more of moderate to vigorous physical activity each day, only 21.7% of urban residents achieved this level of daily activity (Muntner, 2005). When the data was analyzed to examine physical activity in a leisure setting the results were just as disparate; 28.9% of the rural residents spent leisure time being active and only 7.9% of urban residents spent their leisure time doing physical activity. This study of physical activity levels in China found that in this age group (35-74) there were significant differences in the activity levels between the urban and rural residents.

Additionally, these results show that the activity in rural areas is not solely work-related, that many Chinese in rural areas also incorporate more physical activity into leisure than do the urban dwellers. Changes in the leisure activities of urban residents can make a meaningful impact on their overall physical activity rates even if their work is no longer manual-labor based. Development of more activities for urban Chinese to increase their leisure physical activity levels can help improve their overall physical fitness levels and hopefully improve their general health.

Section 5: Government Policies

Given China's current health agenda, and the urgency of certain problems, such as the lack of a universal insurance and the disparities in the provision of health programs among the rural and urban areas, combined with the burden that migration brings to the cities, obesity is not considered a priority in the agenda of the government[4]. But this does not mean that China lacks nutritional programs. Contrary, in the last few years, there's been a turn towards a more preventive approach in public health, and, because obesity is associated with many non-communicable diseases, this turn has strengthened nutritional policies.

[4] This was confirmed during interview with CDC.

Two major sets of activities led to **new national guidelines** in China. One was the development of the ***Dietary Guidelines for Chinese Residents*** and the ***Chinese Pagoda***, based on principles of nutrition science and the present nutrition situation of China. A second was the much broader ***National Plan of Action for Nutrition***. These have laid the basis for initial shifts toward concern about NCDs and related dietary behaviors The Chinese Nutrition Society and the leading national organization, the Institute of Nutrition and Food Hygiene at the Chinese Academy of Preventative Medicine (INFH-CAPM), developed eight principles to delineate a good diet using the Pagoda as a symbol (comparable to the American Food Guide Pyramid).

Small activities have begun to disseminate these guidelines. To date, activities have been focused in limited locations and on increased **training and re-education of public health workers** at Anti-epidemic Stations throughout the country. In 1949, Mao proposed the health care strategy of "prevention is the first task of health care workers, and health services should be available to residents at all socio-economic levels" (Zhai Feal, 2002).

Thus, Anti-epidemic Stations were formed at different levels and charged with collecting information of epidemics and spreading knowledge to prevent and control diseases. As of 2002, the INFH has trained more than 30,000 workers and a **nutrition network has been established**.

Retraining with new principles is underway, but it is narrow and unorganized. **Nutrition education publications** (e.g. *Dietary Guidelines for Chinese Residents, Food Guide Pagoda, How to Get Best Nutrition from Foods*) are available in many media: books, pamphlets, cartoons and movies. However, no systematic national education program has been launched.

On the other hand, there are still dual burden households, and China's governing bodies must initiate policy and guidelines that address both over and undernutrition. This was accomplished in a second major action toward nutrition policy in China in 1997 by the highest

governing body in the country, the State Council. The ***National Plan of Action for Nutrition*** in China was a joint effort by the INFH-CAPM, State Council, Ministry of Heath, and Ministry of Agriculture. The goals were: 1) to ensure adequate food supply and alleviate hunger, food shortages, protein-energy malnutrition, and micronutrient deficiencies and 2) to improve nutritional status, prevent NCDs through guidance and promotion of healthy lifestyles (Zhai Feal, 2002).

Many national research and training activities have provided infrastructure and data to support the Guidelines and Plan for Action. A series of national surveys has been developed. A regional training program on food and nutrition planning is funded by the Netherlands and Chinese governments and technically supported by the University of the Philippines.

A related program focuses on **leaders in other sectors** (agriculture, economic, education, health, science, and technology) of the central and provincial governments. Training has been provided to at least one leader in 12 of 31 Chinese mainland provinces. As of 2002, training of nutrition workers was occurring at county and town levels.

Systematic national prevention programs are underway in three areas: hypertension, Type II diabetes, and cancer. The Ministry of Health issued a national plan to prevent and control diabetes and cardiovascular diseases in 1996. The *National Guideline for the Prevention and Control of Hypertension* was established in 1998. The prevention and control of malignant tumors was most recently addressed in the Five-Year Development Plan (2000-2005). All signs point toward the government giving much more attention to prevent and control NCDs in the future.

A series of **joint agriculture-nutrition commissions** were launched after the recognition of the large decline of soy intake, the rapid increase in pork consumption and low vegetable

consumption among Chinese residents. The Ministry of Agriculture has created some initiatives to enhance soy production and consumption in conjunction with the Ministry of Commerce, which is responsible for establishment of price controls.

In an effort to **increase urban vegetable consumption**, the Ministry of Agriculture and the Ministry of Commerce have used price adjustments and subsidies, and the sizes of these subsidies grow annually. There has been a focus on plant breeding and seed dissemination in northern areas where vegetable production is low, especially in winter. Researchers have visited many rural regions to introduce methods to plant new kinds of vegetables in home gardens. These efforts appear to have impacted production and consumption of vegetables.

In 1995 the government attempted to **promote physical activity**. Various physical competitions are now held at different levels, and increasing numbers of people are taking part. China's Ministry of Education has asked schools to reduce teaching time and increase physical activity time. They have also changed the examination system to decrease the study pressure on students – the university entrance exam was shortened from seven to three sections. Parents, however, still support more homework and less physical activity. It is felt the government's efforts to induce change in the schools are ineffective to date.

One of the nutritional policies that may have significantly impacted the consumption patterns of Chinese citizens was the **subsidization of food production**. The Chinese government can learn a great deal from the results of the programs instituted in the early 1990s that began in an effort to improve the nutritional status of the population (Leppman, 2005). By subsidizing the production of foods that were rare and expensive, they made them accessible to a greater number of people in the population. Foods like animal meats, fruit, fish and eggs were all subsidized, and the proportion consumed as a part of diets increased accordingly. China must be concerned about

the growing obesity problems that resulted from the increased supply and decreased price of these foods that are high in nutrients and fats. However, the government should be wary of responding by limiting production or raising the price because these foods are so essential to ensuring citizens have a proper diet. One result of the vast inequalities in China is that it makes it more difficult to institute a broad unilateral policy. For the wealthy these foods are inexpensive, allowing them to over-consume and gain weight. However, the story is very different for the people with low incomes who could not otherwise afford these foods if the prices were higher. This policy is a historical example of how subsidies can influence consumption patterns, and these policies decisions are still examined by the Chinese government today.

The Chinese government unveiled new agricultural subsidy policies in 2004 that seek to have a dual effect of raising the income levels of rural farmers and also increasing production levels of subsidized foods (Gale 2005). While subsidies mainly used in an economic facet, we encourage the Chinese government to investigate the potential effects they will have on consumption and health. In this 2004 plan $193 million is ear-marked to spend on high-quality grain and soybean seeds to be planted (Gale, 2005). This will likely increase the production of high-quality grains and soybeans which are both beneficial to health outcomes because they provide energy and basic nutrients and can be incorporated into a daily diet. Subsidy policies like these can be examined and if successful, replicated to increase the production and availability of healthy, nutrient-rich foods that will provide accessible food sources for the Chinese population. This policy is a historical example of a choice that the Chinese government made that has continuing consequences today.

Section 6: Policy Recommendations

Rapid changes in diet and lifestyle have occurred with the introduction of globalization, urbanization, and economic development in China, leading the coexistence of large pockets of both undernutrition and overnutrition, affecting the health and nutrition status of its population and jeopardizing the availability of public sources to the health sector. In fact, according to the WHO, the growing epidemic of chronic diseases, like diabetes and high blood pressure are affecting developed and developing countries around the world and are related to the dietary and lifestyle changes (World Health Organization, 2003). Thus, obesity and other noncommunicable diseases are becoming increasingly significant causes of disability and premature death, placing additional burdens on the national budgets (World Health Organization, 2003).

In order to reduce and prevent, the further spread of overweight and obesity in China, we think that encouraging people to reduce their risk factors and adopt healthier lifestyles, although it is undoubtedly beneficial, cannot end an epidemic. *Obesogenic* environments, reinforced by culture changes associated with globalization, make the adoption of healthy lifestyles increasingly difficult. Adverse dietary trends can be reversed if the obesogenic environment is challenged through price manipulation, public education, and clear food labeling (Chopra, 2002). Currently, these broad policy recommendations are being tested in a few select, pattern 5 countries including Sweden, Norway, Finland, South Korea, and parts of Brazil.

In fact, effective weight management for individuals and groups at risk of developing obesity involves a range of long-term strategies. These include prevention, weight maintenance, management of co-morbidities and weight loss. They should be part of an integrated, multi-sectoral, population-based approach, which includes environmental support for healthy diets and regular physical activity. Most notably, three strategies are being tested:

Education

This policy recommendation involves providing opportunities for physical activity, such as engaging in daily moderate physical activity for at least 30 minutes; promoting *healthy behaviors* to encourage, motivate and enable individuals to lose weight by: eating more fruit and vegetables, as well as nuts and whole grains, cutting the amount of fatty, sugary foods in the diet, and moving from saturated animal-based fats to unsaturated vegetable-oil based fats; as well as promoting research and improvements in food labeling. In addition, education could also involve providing comprehensive health and nutrition courses for school children that teach the importance of healthy eating and a healthy lifestyle. Adults should also be provided with education surrounding the negative effects of inactivity and a high fat, high calorie diet. Ensuring that individuals are provided with factual information regarding healthy diets and physical activity versus unhealthy diets and inactivity will allow the Chinese people to make informed decisions regarding their behaviors. The goal of this policy would be to change Chinese cultural norms as well as make a lasting impact on personal preferences towards food and activity.

Taxes

Taxation and subsidies can serve as a useful method to control quickly increasing obesity rates in China. High-calorie, less nutritious foods are likely to have a much more elastic demand curve. As a result, as the price of these less nutritious foods increases, the demand for these foods will decrease. Additionally, foods that are more nutritious and healthier can be subsidized so that the general population can afford these items. Implementation of taxation and subsidies

are attractive solutions because they will yield quicker results than merely educating the people and working to change cultural norms and personal preferences, which can be a long and difficult process. By taxing certain foods, the Chinese government will immediately reduce consumption of high-calorie, low-nutrition foods. By taxing these foods, the government would be able to generate additional revenue that could potentially be used to support obesity-related illness health care costs or subsidize foods for low-income malnourished citizens. Lastly, this would be a policy that could easily be measured by monitoring the consumption of taxed and subsidized foods as well as examining the increases in government revenue.

Taxation and subsidies could be modified depending on different regions of the country. In the poor rural areas taxation may not need to be implemented as heavily as in certain urban areas since these areas suffer more significantly from malnutrition rather than obesity. Additionally, the government could develop different taxation policies for different urban communities depending on where low-income and high-income individuals reside.

Regulation

Regulation policies could also be implemented to control obesity in China. This policy method would be particularly useful in urban areas where there are a large number of fast food restaurants that are frequently patronized by citizens with higher levels of disposable income. Regulation policies could involve nutrition regulations as well as marketing regulations. Nutrition regulations would ensure that food items sold at restaurants do not exceed certain fat and calorie levels. Additional nutrition regulations could be stipulated to include that meals sold at restaurants must meet some minimal requirement for a balanced meal. Lastly, nutrition

regulation policy might involve providing nutrition information about food sold in fast food restaurants. This information could help people make healthy meal choices when dining out.

Another regulation policy that could work in conjunction with nutrition regulation to control obesity would be marketing regulation. The Chinese government could regulate food marketing that targets children. The goal would be to decrease childhood obesity rates, which eventually impacts adult obesity rates. Examples of marketing regulation could include elimination of commercials promoting unhealthy food that targets children.

Regulation policies would be particularly effective in urban areas where the majority of marketing campaigns as well as fast food restaurants are located. This method would allow the government to have direct control over the fat and calorie intake of the urban population.

Section 7: Conclusions: Evaluation and Future Recommendations

In China, public health strategies aimed at addressing overweight and obesity issues are lacking. Price policy strategies are one feasible option in the fight to address the dual nutritional burden. Recently, China's Ministries of Finance and Agriculture have taken critical initial steps to ensure food security and prevent malnutrition as well as DR-NCDs through subsidies that promote soy production and enhance vegetable intake. These initiatives are having an impact on nutritional quality in both rural and urban populations.

Additionally, the taxation of energy dense foods may bring even more assistance to addressing the obesity epidemic, both in terms of prevention *and* reduction of China's positive energy balance (i.e. over consumption). Consumption of pork, fast food and edible oils are linearly associated with China's expanding urban waistline. Additionally, these foods are likely to contribute to the ensuing transition of the rural population to a high fat diet as previously

mentioned. In the case of Scandinavian countries, aggressive state policies related to taxation and import tariffs, as well as consumer education, are believed to have had an effect on dietary choices and public health (Huynen and Martens, 2005). As China determines whether to implement stronger taxation policies to curb obesity, thethe relative success of taxation approaches in China needs to be examined in detail from both a political and economic point of view, especially in light of their relatively recent entrance into the global economy.

Lastly, education policy in the form of mass media promotion of Chinese traditional cooking methods focusing on vegetables and grains may help to reverse the obesity epidemic in both urban and rural areas. While the government has initiated many nutrition programs to support this mission, the information needs to be disseminated efficiently and effectively. However, it is clear that if China is going to implement policies that will have an immediate impact on obesity rates, education policies alone will not be sufficient. Changing behaviors is a long-term solution that will likely produce results after China's obesity problem has grown to epidemic proportions. Thus in order for education policies to be most effective, China must coordinate these efforts with taxation and regulation policies. By implementing this joint approach, China will be able to quickly decrease the amount of harmful foods that the Chinese people consumer while simultaneously working to promote positive eating and physical activity behaviors.

While China's booming economy has financially prepared the health care system to support its growth, the nation has yet to develop broader infrastructure-related policies that address the core of the overweight and obesity pandemic – the expansion and adoption of the *obesogenic* environment. As a result, China must seek to find a balance between controlling the food intake of the people through taxation and regulation policies while also providing needed

information and education about the importance of nutrition and physical activity. In the short-term, taxation and regulation policies will work effectively to prevent the obese and those at risk of obesity from gaining access to certain types of food. If demand for these types of foods decreases, education policy will educate the Chinese people about the importance of maintaining a healthy lifestyle which will have a direct impact on the long-run outcomes of individuals and thus society. If China successfully implements this three-pronged approach to curb obesity, they will be able to not only address the current problems, but will also be able to look ahead and help prevent further obesity problems in the future.

Section 8: Bibliography

Chakravarthy M, Booth F. Eating, exercise and "thrifty" genotypes: Connecting the dots toward an evolutionary understanding of modern chronic diseases. The Journal of Applied Physiology 2004;96:3-10.

Luo Juhua and Frank B. Hu. Time trends for childhood obesity in China from 1989 to 1997. http://www.hsph.harvard.edu/takemi/RP182.pdf

Campbell, T. Colin. Energy Balance: Interpretation of Data from Rural China. http://www.news.cornell.edu/releases/Nov98/thermogenesis_paper.html

Bell Collin, Keyuo Ge and Barry Popkin. 2002. The road to obesity of the path to prevention: motorized transportation and obesity in China. http://www.obesityresearch.org/cgi/reprint/10/4/277

Weyer, Elizabeth. Malnutrition and obesity: China's emerging health crisis. http://www.worldfoodprize.org/Youthinstitute/2005%20YI/05proceedings/Mediapolis%20High%20School.pdf

Soowon Kim, Soojae Moon and Barry Popkin. 2000. The nutrition transition in South Korea", The American Journal of Clinical Nutrition, 2000, 71, 44-53

Wang Y., B Popkin and F Say. 1998. The nutritional status and dietary pattern of Chinese adolescents, 1991 and 1993" European Journal of Clinical Nutrition, 1998, 52, 908-916 http://www.nature.com/cgi-taf/DynaPage.taf?file=/ejcn/journal/v52/n12/full/1600664a.html&filetype=pdf

Yuofa Wang, Carlos Monteiro, Barry Popkin. 2002. Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China and Russia. *The American Journal of Clinical Nutrition*. #75,971-977 http://www.ajcn.org/cgi/reprint/75/6/971

Toni Falbo; Dudley L. Poston, Jr. 1993.The Academic, Personality, and Physical Outcomes of Only Children in China. *Child Development.* Feb, Vol. 64, No. 1, pp. 18-35 http://links.jstor.org/sici?sici=0009-3920%28199302%2964%3A1%3C18%3ATAPAPO%3E2.0.CO%3B2-W

T Hesketh, JD Qu and A. Tomkins (2003): "Health effects of family size: cross sectional survey in Chinese adolescents", Arch. Dis Child, 2003, 88, 467-481

Xu, Fei; Yin, Xiao-Mei; Zhang, Min; Leslie, Eva; Ware, Robert; Owen, Neville (2005): "Family average income and body mass index above the healthy weight range among urban and rural residents in regional Mainland China", Public Health Nutrition, Volume 8, Number 1, February 2005, pp. 47-51(5)

Du S., Lu B., Zhai F., Popkin B.M.(2002): "A new stage of the nutrition transition in China" Public Health Nutrition, Volume 5, Special Issue 1a, February 2002, pp. 169-174(6)

Leppman, Elizabeth J. 2005. Changing Rice Bowl: Economic Development and Diet in China.

Hong Kong University Press 2005.

China Daily, October 8, 2005. http://www.china.org.cn/english/2005/Oct/144368.htm

"Affluent people Face Weighty Problem." China Daily May 20, 2004. Academic Universe. Lexis-Nexis. http://web.lexis-nexis.com/universe

World Health Organization. Obesity and Overweight: Global strategy on diet, physical activity and health. 2004.

Popkin B. The nutrition transition in low income countries: an emerging crisis. Nutrition Review 1994;52:285-98.

Du S, Lu B, Zhai F, Popkin BM. A new stage of the nutrition transition in China. Public Health Nutrition 2002;5(1A):169-74.

Navarro, Lygia. Globalization and health: An interview with Juli Frenk. 2005.

Chopra Meal. A global response to a global problem: the epidemic of overnutrition. Bulletin of the World Health Organization 2002;80(12):952-8.

World Health Organization. Diet, nutrition and the prevention of chronic diseases: Report of a joint WHO/FAO expert consultation. WHO report series 916. 2003. Geneva, World Health Organization.

Huynen M, Martens P, Hilderink HBM. The health impacts of globalization: A conceptual framework. Globalization and Health 2005;1(14).

Huang Ping and Frank N. Pieke "China migration country study". Paper presented at the Regional Conference on Migration, Development and Pro-Poor Policy Choices in Asia, 22–24 June 2003 in Dhaka, Bangladesh.

Popkin, Barry M, Horton, Susan, Kim, Soowon, Mahal, Ajay, Shuigao, Jin. Trends in diet, nutritional status, and die-related noncommunicable diseases in China and India: The economic costs of the nutrition transition. Nutrition Reviews, Dec 2001.

Zhai Feal. What is China doing in policy making to push back the negative aspects of the nutrition transition? Public Health Nutrition 2002;5(1A):269-73.

Tudor-Locke C, Ainsworth BE, Adair LS, Du S, and Popkin BM. 2003. Physical Activity and Inactivity in Chinese School-Aged Youth: the China Health and Nutrition Survey. International Journal of Obesity 2003: 27, 1093-1099.

Mutner P, Gu D, Wildman RP, Chen J, Qan W, Whelton PK, He J. 2005. Prevalence of Physical Activity Among Chinese Adults: Results From the International Collaborative Study of Cardiovascular Disease in Asia. American Journal of Public Health. 2005 Vol. 95, No. 9, 1631-1636.

Gale F, Lohmar B, and Tuan F. February 2005. China's New Farm Subsidies. Economic Research Service Outlook Report No. WRS0501.