



# CAN BROWN RICE BLUNT AN EPIDEMIC?

## Obesity in China portends diabetes disaster

Like a runaway train, type 2 diabetes is speeding through many rapidly developing countries, including China. Could a seemingly simple change in diet—from white rice to brown rice—slow the spread of this disease?

Researchers at the Harvard School of Public Health (HSPH) hope so. They will soon launch a small study in Shanghai to see whether whole grain rice might alleviate the symptoms of a condition known as metabolic syndrome, and possibly prevent it. The syndrome, marked by higher blood pressure, blood sugars, and blood fats, is often a precursor to full-blown diabetes.

HSPH Professor of Nutrition and Epidemiology Frank Hu and his collaborators in China will recruit 150 people with metabolic syndrome to eat brown rice instead of white for six months. The researchers will see whether this switch can lower blood sugar in people with high readings.

“We hope our results will help us design a much larger study, so we can test whether this kind of dietary change has a measurable impact,” explains Hu. “At HSPH, our focus is on primary prevention, and on

changing people’s risk factors for disease. We’re hoping our research will directly affect policies in China related to nutrition and food production and distribution.”

The HSPH researchers plan similar studies in India, Nigeria, and Tanzania, where diets are also high in refined carbohydrates. There is more at stake than stemming the diabetes onslaught, however. In these countries, as in China, looms a triple threat: not only of diabetes, but also of related cardiovascular disease, both of which stem from an obesity epidemic.

### **SMALL CHANGE, BIG IMPACT?**

China consumes more white rice than anywhere else: more than 127 million metric tons last year. It would be a huge cultural leap for the Chinese to accept brown rice, which they associate with poverty, notes Donna Spiegelman, a professor of epidemiology and biostatistics who helped design the pilot study. Polished white rice is a symbol of affluence.

“Can we find appealing ways to prepare and serve brown rice to this population? It’s a big issue,”

*continued*

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Frank Hu  
HSPH Professor of Nutrition  
and Epidemiology

Spiegelman says. In taste tests, most volunteers expressed a willingness to accept the change, at least for the length of the study.

Brown rice is superior to white rice when it comes to fiber content, minerals, vitamins, and phytochemicals such as beta-carotene. Milling and polishing brown rice removes most vitamins and minerals. Although these can be added back to white rice, milling strips away most of its fiber, which helps deter diabetes by slowing the rush of sugar (glucose) into the bloodstream. Fiber also helps people eat less and gain less weight by causing a feeling of fullness.

### CHINA AT A CROSSROADS

Diabetes already affects nearly 8 percent of Chinese adults in major cities, Hu says. The incidence in rural areas—about 5 percent—is also climbing. By comparison, in the United States, diabetes prevalence as of 2006 was at 7.7 percent for ages 20 and older, up from 5 percent in 1994, according to a study published in February of 2009 in *Diabetes Care*. Another 5 percent of undiagnosed cases existed, this study projected. Undiagnosed cases abound in every country, partly because early-stage diabetes is often symptom-free.

China stands at a crossroads, Hu says: Its 1.3 billion people need to leap into action to prevent diabetes, its precursor obesity, and related chronic diseases. He adds: “If these problems keep increasing at current rates, the burden of these diseases and their complications is going to be tremendous.”

“It’s going to get much worse almost surely,” concurs Walter Willett, chair of the HSPH Department of Nutrition and the Fredrick John



Stare Professor of Epidemiology and Nutrition. Asian populations already tend to be more susceptible to diabetes than Caucasians are, he says. And all people stand to suffer if they maintain an unhealthy diet, gain weight, and become sedentary, as have many Chinese, who in recent decades have grown fond of Western-style pasta, dairy products, and red meat.

### SHIFTS IN DIET, LIFESTYLES

The Chinese have seen dramatic shifts in eating patterns and lifestyles in the last 30 years, due largely to rapid economic development and urbanization, Hu says. “The transition from working in fields to working at desks or in factories means that people move around less,” he explains. “In the past, people rode bicycles to do shopping. Now more and more people have cars.”

And whereas fast food restaurants didn’t exist 30 years ago, they are now common in major cities, Hu adds. Sweetened beverages, including soft drinks, are a major source of sugar and calories.

Another big change is the jump in consumption of saturated fat from animal products. “The Asian diet is already high in carbohydrates,” Hu says, “but the combination of highly refined carbohydrates plus sugary drinks, less fiber, and saturated fat has created an unhealthy pattern—one conducive to obesity and diabetes once you add in a sedentary lifestyle.”

“Until fairly recently, most people in China did not have all they wanted to eat. They lived more on the side of hunger,” Willett says. “When you go from limited food availability to having all you can eat, people tend to overdo it.”



GETTING IN SHAPE Chinese students jog during a chilly morning in Beijing. China is actively promoting exercise among urban children in a bid to control the increase in childhood obesity, mainly resulting from overeating and lack of physical exercise.

<b>A BROWN &amp; WHITE ISSUE*</b>	
<b>Cooked long-grain brown rice</b>	<b>Cooked glutinous white rice</b>
<b>DIETARY FIBER</b>	
14%	7%
<b>MANGANESE</b>	
88%	23%
<b>IRON</b>	
5%	1%
<b>MAGNESIUM</b>	
21%	2%
<b>SELENIUM</b>	
27%	14%
<b>VITAMIN B1, THIAMINE</b>	
12%	2%
<b>VITAMIN B3, NIACIN</b>	
15%	3%
* % Minimum Daily Requirement	
<i>Source: U.S. Department of Agriculture</i>	

Rice bowl, rice: Kent Dayton/HSPH Children, © Reuters

Overweight has surpassed underweight, especially in the cities, Hu says. But weight as reflected in a person's body mass index (BMI), the ratio of body fat to height, fails to tell the whole story.

A BMI of 25 or greater is overweight; 30 or greater is obese. But given the same BMI as some other populations, Asians have a much higher percentage of both body fat and abdominal obesity, the underlying problems in diabetes, Hu points out. "Even though the average BMI in China is less than 25," he says, the danger of developing diabetes and other metabolic diseases has already emerged.

"For any given BMI and waist circumference [a measure of abdominal obesity], the absolute risk of diabetes

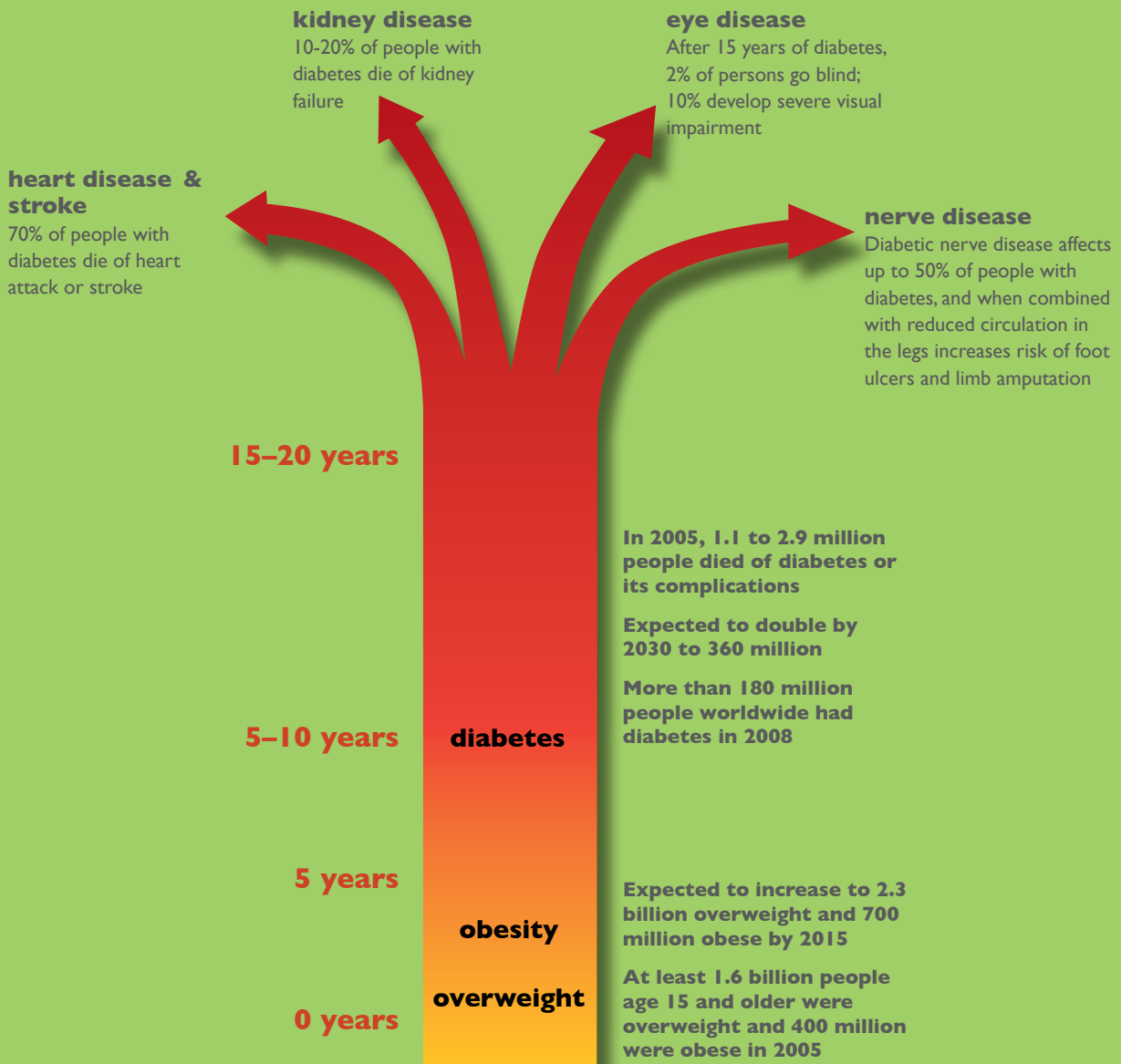
or hypertension is two- to five-fold higher for Asians than for Caucasians," because of Asians' greater genetic susceptibility to diabetes, Hu says. For them, even a small increase in body fat can trigger a steep rise in diabetes risk.

### THE DREADED PIPELINE

The biggest danger in the way Chinese live now lies in the pipeline effect. Obesity can lead to type 2 diabetes in just 5 to 10 years. In turn, diabetes can cause heart, eye, and kidney disease within 5 to 25 years. Dementia can also set in as diabetes takes a toll on the brain's vascular network, Willett says.

In China, more than half of diabetes cases are undiagnosed, Hu estimates. When a diagnosis comes late, complications often have already

## A PIPELINE OF DISEASE—AND ESCALATING COSTS



Source: World Health Organization

In addition to its human toll in pain, suffering, and disability, the worldwide cost to treat diabetes and its complications in 2007 was more than \$232 billion, according to International Diabetes Foundation estimates. That figure will hit \$302 billion by 2025.

In the United States, care for people diagnosed with the disease costs about 2.3 times that for others. According to the American Diabetes Association, total costs were about \$174 billion in 2007, including \$116 billion in medical costs—up 32 percent from 2002—and \$58 billion in lost productivity. Medical costs included:

- \$27 billion for diabetes care
- \$58 billion for chronic-disease-related complications
- \$31 billion for excess general medical costs.

## A PREVENTABLE EPIDEMIC

Type 2 diabetes is highly preventable. In a 2001 paper published in the *New England Journal of Medicine*, Hu, Willett, and colleagues attribute 91 percent of cases among 85,000 women in the Nurses' Health Study to lifestyle choices. Nearly all cases can be avoided, they say, provided that people:

- Do not smoke
- Maintain a BMI of less than 25
- Exercise moderately to vigorously at least 30 minutes per day
- Eat a prudent diet. Avoid trans fats and consume a high ratio of polyunsaturated to saturated fats. Choose foods high in cereal fiber, with a low "glycemic load" (the body converts such foods to glucose slowly, preventing blood glucose levels from spiking)
- If drinking alcohol, do so in moderation (half a drink per day on average).



In contrast, type 1 diabetes, which primarily strikes children and young adults independent of their weight, cannot be prevented by lifestyle changes because it is caused by a fundamentally different mechanism. Only about 5 percent of all diabetes cases are type 1.

developed. Treatment becomes more complicated, and far more costly.

"People with renal [kidney] complications eventually need dialysis, but many Chinese can't afford that," Hu says. "Many have already developed retinopathy, a form of eye disease that progresses rapidly if diabetes control is poor."

In one study of 1,600 adults ages 50 to 70 in Beijing and Shanghai, almost half had metabolic syndrome. The study, led by Hu's long-term collaborator Xu Lin, a professor of nutrition at Shanghai Institute of Nutritional Science, also found that almost 20 percent of adults in Beijing had diabetes, most of them never

before diagnosed. Even in rural areas around Shanghai, 6 percent turned out to be diabetic.

### ETHICAL QUANDARIES

One consequence of diabetes worldwide is that "It's going to generate huge social disparities and ethical issues," Willett predicts. "Those who can afford it will push for dialysis and transplant services," he says, "but it's just not conceivable that China could ever build enough dialysis and transplant facilities." Who will live and who will die? The Chinese face harsh choices.

"Obesity and diabetes will be the public health challenge of the century around the globe," Willett says. "Latinos have at least as high a risk as

Asians. The risk is rising in the Middle East and Africa, too."

If the numbers are staggering, consider the costs. According to the World Health Organization, China ranks second to India in total diabetes cases. (The United States is third.) WHO estimates that, between 2006 and 2015, China will lose \$558 billion in income due to diabetes, heart disease, and stroke.

Warns Willett: "No health system can afford it."

*Larry Hand is associate editor of the Review.*