

CHRONIC DISEASE, CHANGING DIETS AND SUSTAINABILITY

The Globalization of Western-style Eating and Its Implications





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This Discussion Paper was researched and written by Judy Bankman, a former research intern and consultant at Brighter Green. She holds a Master of Public Health from the College of Global Public Health at New York University and currently works in public health in north central Oregon, where she focuses on maternal and child wellness and chronic disease prevention. Her writing has been published by Civil Eats, Food Tank, and The New Food Economy. She would like to thank to Mia MacDonald, Caroline Wimberly, and Lauren Berger of Brighter Green.

Judy Bankman can be contacted at: judybankman@gmail.com.

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Written and researched by: Judy Bankman

Research assistance: Elektra Alivisatos and Emily Lavieri-Scull

Design and layout: Emily Lavieri-Scull

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EXECUTIVE SUMMARY

Due to the widespread adoption of diets higher in sugar, animal fat, and salt, low- and middle-income countries (LMICs) are undergoing the nutrition transition at an unprecedented speed. *Chronic Disease, Changing Diets, and Sustainability* analyzes the factors that are influencing this trend and argues that the “Western-style” diet—replete with salt, sugar, cheap vegetable oil, and animal fat—is inextricably linked to the fast-rising increase in non-communicable diseases (NCDs) in LMICs. The paper offers policy recommendations to address the urgent challenges this reality poses, along with five detailed case studies for Mexico, China, South Africa, India, and Brazil.

Many factors are contributing to the shift in how billions of the world’s people eat and the food environment in which they do so: from trade liberalization and rural–urban migration to the growing omnipresence of “big food” brands such as KFC, McDonald’s, and Coca-Cola. In addition, the methods of agriculture used to produce the mainstays of the Western diet (i.e., livestock, corn, and soybeans) have led to massive soil erosion, deforestation, loss of biodiversity, and greenhouse gas emissions. As a result, discussion of the critical intersections of diet, health, and the environment has gained momentum in recent years.

This policy paper was written to add to and accelerate that discussion, and to offer concrete proposals for action by engaging policymakers, public health professionals, educators, and individuals concerned about the relationship among dietary changes, public

health, and sustainability in the global South (developing world). It was also written as a resource to spark further analysis and to generate innovative solutions to the issues presented within academia and among non-governmental organizations (NGOs), public health professionals, and concerned individuals. Governments of LMICs that have witnessed the influence of “Big Food”—defined by researchers Carlos A. Monteiro and Geoffrey Cannon as “ultra-processed products made by transnational food corporations”—may find these suggestions useful, as may governments of countries that still retain largely plant-based diets and traditional eating cultures.

Citizens of LMICs in both rural and urban regions also may benefit from these policy recommendations. Ultimately, the paper aims to raise awareness of this crucial set of issues in order to protect public health, promote environmental sustainability, and enable healthcare systems to meet the changing needs of the populations they serve.

We also encourage readers to take action in their own spheres of influence, by, for example, engaging in relevant research or by advocating for or putting in place policies that would support sustainable agriculture, challenge the growth of factory farming or limit marketing by “Big Food.” Creating sustainable, equitable, and humane food systems, from production to consumption, is arguably one of the most pressing issues of the twenty-first century. This will only be possible with the cooperation of all. ♦

INTRODUCTION

During the last several decades, many countries have seen a spike in obesity rates and in chronic conditions such as cardiovascular disease and diabetes. Although various factors contribute to this trend, one major factor is the influence of the diet that is “standard” in most industrialized countries: high in animal fat, sugar, and salt, with steadily increasing portion sizes and ready-made, processed meals. The export to the global South of this “Western” diet, which is most closely associated with the United States, is a key contributing factor in increased rates of diet-related non-communicable diseases (NCDs).

These chronic conditions disproportionately affect low- and middle-income countries (LMICs), as many are currently experiencing a rapid rise in incomes and an equally quick transition from traditional plant-based diets to eating like most people do in industrialized regions. Food insecurity results when nutritious and safe food is not available for consumption, and this, along with poor maternal nutrition, have been associated with a higher risk of obesity and metabolic syndrome later in life. This makes the younger generations in LMICs particularly vulnerable to obesity and its accompanying NCDs.

The prevalence of obesity is expanding across the globe, with more than 10 percent of the world’s

FIVE COUNTRY CASE STUDIES

In Mexico, China, South Africa, India, and Brazil, incomes are rising, urbanization is continuing, a transition to Western dietary habits is underway, and in each country, researchers have documented high rates of NCDs. The five case studies included in this paper illuminate these countries' distinct experiences of the nutrition transition and the responses of their respective governments.⁴ They also provide cautionary examples of how an increase in NCDs almost always accompanies a changing food environment. In 2014, NCDs accounted for 77 percent of deaths in Mexico and a staggering 87 percent of deaths in China.⁵ Almost one-third of the population of Brazil suffers from cardiovascular disease.⁶ And even though India still labors under a heavy burden of infectious diseases, more than 60 million Indians have been diagnosed with diabetes.^{7,8} Similarly, in South Africa, infectious disease accounted for 48 percent of mortality in 2014, yet one-quarter of South Africans are obese.^{9,10} ♦

population now considered obese: just over 600 million adults, plus more than 100 million children. One dire result is premature mortality. In 2015, four million deaths were caused by excess weight from heart disease, diabetes, kidney disease, and other factors. The research, published in the *New England Journal of Medicine*, concluded that poor diets and the accessibility of inexpensive, nutrient-poor packaged foods were a key component of rising global rates of obesity, more so than a reduction in physical activity, which is also an increasingly common fact of daily life for millions of people around the world.¹

Many factors contribute to the adoption of a more Westernized diet in LMICs. Rising GDP (gross domestic product), urbanization, foreign direct investment, trade liberalization, and corporate advertising in emerging markets make energy-rich, nutrient-poor foods more accessible. Technological advances, including changes in transportation, also have contributed to sedentary lifestyles that put individuals at greater risk for NCDs.²

The introduction of transnational fast-food and processed-food companies, or “Big Food,” to LMICs not only contributes to NCDs, but also leads to changes in eating habits and culture. Snacking has become more common, as have premade meals and eating on the go. Meanwhile, people are eating communal meals less often and knowledge of cooking is diminishing. Animal products are readily available and increasingly affordable, and have begun to dominate formerly plant-based diets. In LMICs, cultural homogenization by “Big Food” threatens the existence of entire food systems in addition to public health. “We have more processed food, more

energy-dense food, more intense marketing of food products, and these products are more available and more accessible,” says Dr. Ashkan Afshin, lead researcher for the 2017 research on global obesity rates that appeared in the *New England Journal of Medicine*.³

Reversing the rising incidence of diet-based chronic disease in the global South will not be easy, and will require policy changes on many levels. These include health education campaigns by local governments, nationwide regulation of corporate marketing, and policies that support sustainable farming practices instead of industrial agriculture. Some countries have enacted legislation to combat NCDs, such as the South African government’s cap on the amount of sodium in packaged food and Mexico’s tax on sugar-sweetened beverages.^{11,12} Integral to changing policies to support more equitable and sustainable diets and methods of food production will be a more extensive questioning of the current dynamics of the global food system, including which actors the system favors and which it neglects.

NCDs: A GLOBAL PICTURE

In the last two to three decades, rates of obesity, diabetes, and heart disease have increased significantly worldwide. Obesity has doubled globally since 1980, with a 39 percent prevalence of overweight and 13 percent prevalence of obesity among adults in 2014.¹³ The world’s highest obesity rates occur in the South Pacific islands, with American Samoa, Nauru, and Cook Islands having surpassed Mexico in this unfortunate category.¹⁴ The U.S. Centers for Disease Control and Prevention (CDC)

defines “overweight” as a body mass index (BMI) of 25 to less than 30, and “obesity” as a BMI of 30 or higher.¹⁵

Diabetes affects 415 million people worldwide, according to the International Diabetes Federation.¹⁶ Eighty percent of diabetes cases occur in LMICs. The World Health Organization (WHO) reports that deaths from diabetes increased from 1.9 percent in 2000 to 2.7 percent of deaths worldwide in 2012.¹⁷ Type 2 diabetes, the most common form, is characterized by insulin resistance (i.e., the body cannot use insulin efficiently and as a result cannot absorb glucose, which leads to elevated blood sugar levels). In Type 1 diabetes, which is less common, the body does not produce insulin.¹⁸

Currently, cardiovascular disease (CVD) is the number-one cause of death internationally.¹⁹ Like diabetes, 80 percent of CVD deaths occur in LMICs.²⁰ Obesity and diabetes are both risk factors for CVD. In China, CVD is responsible for 38 percent of deaths.²¹ In Brazil, CVD causes 31 percent of deaths,²² and in India, 24 percent.²³ Consumption of processed meats is associated with higher risks of both coronary heart disease (CHD) and diabetes.²⁴ Researchers at the Harvard University School of Public Health analyzed data from long-term studies of

healthcare professionals and found that a daily serving of two slices of bacon was linked to a 51 percent rise in the risk of adult-onset diabetes.²⁵

Increases in chronic diseases have paralleled a shift to the standard Western diet all over the globe. Developing countries now consume more animal products, refined sugar, and processed foods than previously. India is the world’s top milk consumer, with demand growing by seven to eight percent per year.²⁶ In China, meat consumption has quadrupled since 1980.²⁷ Now, the Chinese eat 28 percent of the world’s meat, about 63 kg (139 lb) of meat per person per year, which is projected to increase another 30 kg (66 lb) by 2030 if current trends persist.²⁸ In Mexico, Coca-Cola is extremely popular. In 2011, Mexicans drank more than 700 8-oz Coke products per person, then the highest consumption rate in the world.²⁹ (The top national consumer is now Chile.)

The number of calories from animal products in the food supply of many LMICs—including China, India, Mexico, South Africa, and Brazil—has increased over the last several decades.³⁰ Palm oil, a highly saturated fat used in many processed foods, has become the primary cooking oil in many developing countries. India is currently the

A GROWING BODY OF RESEARCH

Though still relatively new, research on the link between the Western-style diet and resulting NCDs has gained momentum in recent years. Discussion of these issues can be found in articles in academic journals *Public Health Nutrition*, *Biomedical Central*, *Nature*, and *Public Library of Science*, in reports published by NGOs including the Food Climate Research Network (FCRN), the Overseas Development Institute (ODI), and the World Resources Institute (WRI).

The open-access journal Public Library of Science (PLoS) has published a variety of studies that deal with the topic of transnational food corporations affecting food consumption. In 2012, PLoS Medicine published a series on “Big Food”—which PLoS defined as “the multinational food and beverage industry with huge and concentrated market power”—and global health, which exposed the powerful marketing techniques of the global food industry and advocated for food sovereignty and the rejection of government partnerships

with “Big Food.”³⁶ (According to the organization La Via Campesina, food sovereignty is defined as the “right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems.”)

In 2004, *Public Health Nutrition* published a study examining how foreign direct investment heralded the nutrition transition in developing countries by enabling increased consumption of processed foods.³⁷ In 2012, *Nutrition Reviews* published “Global nutrition transition and pandemic of obesity in developing countries,” by Barry Popkin, Distinguished Professor of Global Nutrition at the University of North Carolina’s Gillings School of Public Health. Popkin developed the concept of the nutrition transition, which refers to the shift from infectious diseases associated with under-nutrition to the non-communicable diseases associated with over-nutrition. In his study, he argued

that dietary changes including increased consumption of processed foods, animal products, and sugar-sweetened beverages, coupled with a sedentary lifestyle, have led to obesity in LMICs.³⁸

In his research, Popkin also explains how undernutrition in utero can cause metabolic and hormonal changes that lead to obesity risks later in life.³⁹ Popkin cites the important 1976 study by Ravelli et al., which found an increased risk for obesity among young men whose mothers experienced the Dutch famine in 1944–45.⁴⁰

Biomedical Central (BMC) has published literature on diabetes susceptibility in Turkey, Vietnam, Sri Lanka, and Pakistan; obesity in China and South Africa; and diabetes and cardiovascular disease in Kenya.^{41,42,43,44} *Social Science and Medicine* and the *Journal of Immigrant and Minority Health* have published studies linking childhood obesity with proximity to the U.S., through migrant networks and immigration.^{45,46} Several Mexican journals, such as *Salud Pública de México*, also have reported on obesity rates in Mexico.⁴⁷

Public health literature also has documented the formidable healthcare costs of NCDs in developing countries. In Brazil, healthcare costs for NCDs are predicted to double between 2010 and 2015.⁴⁸ According to WHO, the Western Pacific region, which comprises 37 developed and developing countries, spent about 16 percent of its total hospital expenditures on diabetes.⁴⁹ Furthermore, a low-income Indian family with a diabetic adult may spend 25 percent of its income on diabetes care; a comparable family in the U.S. may spend only 10 percent (still a considerable cost).⁵⁰

Finally, in recent years, more literature has acknowledged the link between chronic disease and the shape and scale of current food systems. In 2015, Popkin and director of the City University of London's Center for Food Policy, Corinna Hawkes, published an article arguing that the United Nations' Sustainable Development Goals (SDGs) cannot address NCDs effectively without

major changes in a global food system replete with commodity crops (e.g. corn, soybeans, and to a lesser degree, meat) and designed principally to address under-nutrition.⁵¹ Popkin and Hawkes note that in the period after World War II, public health professionals and policymakers aimed to increase consumption of calories and protein. However, they explain, this period was followed quickly by the era of policies that supported globalization and free trade, in which large food manufacturers began processing food on a large scale.

In today's world of overconsumption and diet-related NCDs, Popkin and Hawkes advocate for a "restructuring of global level governance of agriculture, food, nutrition, and health." In 2014, *Nature* published the article, "Global diets link environmental sustainability and human health," which directly addressed the environmental costs of the industrialized food system.⁵² The authors propose that vegetarian, pescetarian, and Mediterranean diets (see box) could help decrease rates of NCDs as well as agriculture-related greenhouse gas emissions (GHGs) and species extinction.⁵³

A growing number of non-governmental research and policy institutions have published literature on the food system's direct impact on the environment and on the concept of sustainable diets. In April 2014, the Food Climate Research Network (FCRN) released "What is a sustainable healthy diet?", a discussion paper that offered dietary recommendations that incorporate the environmental impact of food choices.⁵⁴ The paper allocates a long section to the place of meat in a sustainable diet and advocates for reducing meat consumption. The Overseas Development Institute (ODI) published a report in April 2014 that addressed the dietary and environmental consequences of industrial agriculture.⁵⁵ Similarly, the World Resources Institute (WRI) has released an eleven-part working paper series, "Creating a Sustainable Food Future," which devotes one section to dietary shifts, specifically reducing overconsumption of animal-based protein.⁵⁶ ♦

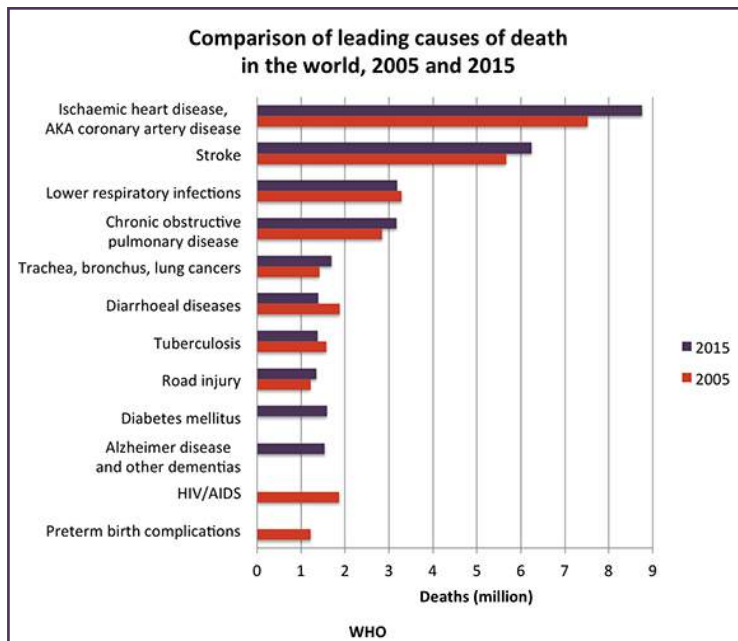
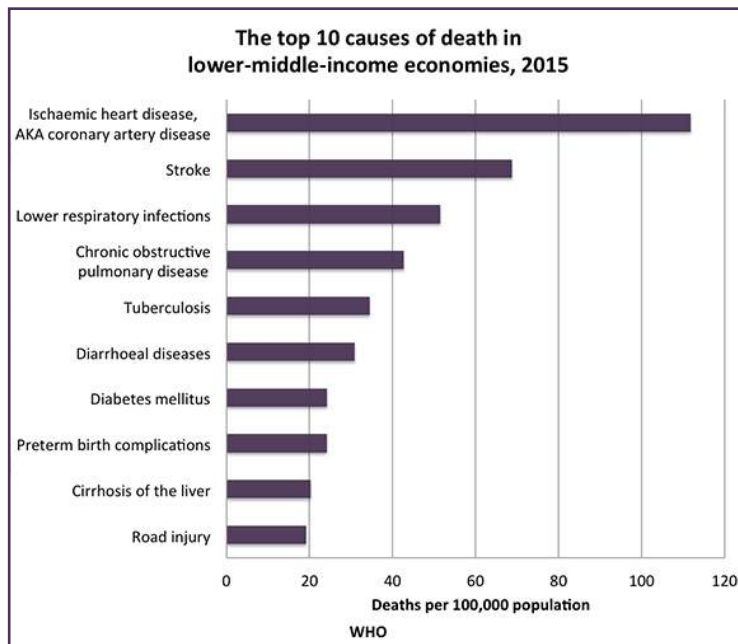
largest national consumer of palm oil.³¹ At the same time, fast-food restaurants have become commonplace in many LMICs that previously did not have regular access to American-style fried, high-fat, salty food.

Globally, more people are dying from NCDs than from infectious diseases.³² Between 2000 and 2015, rates of death by heart disease, stroke, and diabetes have increased, while rates of death by tuberculosis, premature birth, diarrheal diseases, and HIV/AIDS have decreased, according to the WHO.³³ WHO also reported that in 2015, NCDs accounted for 70 percent of all deaths; over three-quarters of these deaths, about 31 million people, occurred in LMICs.³⁴ These

startling statistics reveal that NCDs are not just a problem for wealthy countries; rather, they increasingly affect developing countries.

Sadly, many LMICs face rising rates of NCDs, often caused by *over-nutrition*, alongside high rates of diseases caused by inadequate or *under-nutrition*: a phenomenon known as the “double burden of malnutrition.” The “double burden” remains an enormous challenge, since it requires quick adaptation by public health workers and, increasingly, entire healthcare systems.

While LMICs still experience high death rates from infectious diseases, the top two leading causes of death



in 2015 were heart disease and stroke (see graph at left). Between 2005 and 2015, WHO data show that the number of deaths from heart disease, stroke, and diabetes had increased, while the number of deaths from tuberculosis, prematurity, and lower respiratory infections had decreased. Mortality from HIV/AIDS remained relatively constant (see graph).³⁵

RURAL AND URBAN FOOD SCAPES

The latter half of the twentieth century and the first decades of the twenty-first have witnessed a major migration of people across the globe from rural areas to urban centers. In 2014, about 54 percent of the world’s population lived in urban areas compared

to 30 percent in 1950.⁵⁹ Life in an urban environment can provide tangible, positive benefits, such as better access to healthcare and transportation, improved sanitation, and work opportunities, but it also carries diet-related health risks. Because large food producers tend to sell a majority of their products in cities, urban dwellers generally have diets higher in animal products, fats, and sweeteners than rural residents.⁶⁰ These are the very ingredients contributing to development of NCDs. In urban settings, too, traditional plant-based foods grown and eaten in rural areas sometimes come to be avoided in favor of newly available, tasty, energy-dense foods.⁶¹

THREE DIETS AND THE CHALLENGE OF SUSTAINABILITY

In their November 2014 article for *Nature*, David Tilman and Michael Clark define vegetarian, pescetarian, and Mediterranean diets as follows: “A vegetarian diet consists of grains, vegetables, fruits, sugars, oils, eggs and dairy, and generally not more than one serving per month of meat or seafood. A pescetarian diet is a vegetarian diet that includes seafood. A Mediterranean diet is rich in vegetables, fruit and seafood and includes grains, sugars, oils, eggs, dairy and moderate amounts

of poultry, pork, lamb and beef.”⁵⁷ The FAO defines sustainable diets as “diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources”⁵⁸ ♦

Also, many people in urban centers lack a place or access to the fuel needed to cook inside their homes, and so eat meals outside of the house. Both traditional and more modern forms of “street food” tend to be fried and often contain meat and few (if any) vegetables. Furthermore, urban life, replete with computers, television, and cellphones, tends to be more sedentary than rural, agrarian life.⁶² This lifestyle change also contributes to the incidence of NCDs.

Although processed and fast foods may be less ubiquitous in rural areas, rural residents also face obstacles to consuming a diverse array of foods and are not immune to poor diets and obesity. For example, in Latin America, the Middle East, and North Africa, rural women have higher obesity rates than their urban counterparts.⁶³ In South Africa, cultural norms in rural areas often encourage weight gain because it signifies wealth and prosperity.⁶⁴

Yet, rural regions of the global South still experience the highest levels of food insecurity, and insufficient calorie intake is still dismayingly common. The reasons for this are many, from trade liberalization rendering domestic agriculture unprofitable to the loss of the rural workforce to urban jobs.⁶⁵ Calorie deprivation increased in rural India from 1983 through 2000.⁶⁶ And the majority

of rural households in the Limpopo province of South Africa were food insecure in 2011.⁶⁷

The migration of workers from rural areas to urban centers in China has left behind millions of family members who cannot fully meet their food needs.⁶⁸ In



Supermarket in Beijing, China

China in particular, specialization of agriculture in rural areas has led to less diversity in the food supply and therefore greater food insecurity.⁶⁹ The complex interaction between migration, food insecurity, and diet-related chronic disease in rural areas poses another urgent challenge for policymakers and public health professionals across the global South.

“BIG FOOD”: CORPORATE POWER AND MARKETING

Large, transnational food corporations, or “Big Food,” have entered numerous markets in LMICs and are providing growing numbers of consumers with energy-dense, processed foods. In 2011 for example, Yum! Brands, the parent company of KFC, attributed half of its \$1.8 billion profit for the year to Chinese customers.⁷⁷ India, Indonesia, and Vietnam contributed another five percent.⁷⁸ Similarly, in 2012, 22 percent of McDonald’s revenue and 18 percent of its operating income came from its outlets in Asia, Africa, and the Middle East.⁷⁹ Through marketing

campaigns and foreign direct investment, transnational food companies have attracted popularity among citizens of LMICs with often well-branded, increasingly accessible and identifiable Western-style food products.

Although it can be argued that many people in the U.S. and other countries in the global North eat fast food because of convenience and brand loyalty, many consumers in the global South also associate American fast food with modernity and inclusion in a global culture: two concepts relatively new to most citizens of developing countries.¹⁰⁰

“Big Food” enters new markets when the “saturation point” is reached in markets where they already are

active, or when processed foods provide 60 percent of a country’s total calories, according to Carlos Monteiro, head of the University of São Paulo’s Centre for Epidemiological Studies in Health and Nutrition.¹⁰¹ The U.S., Canada, and the U.K. reached this level several decades ago. It is no wonder, then, that transnational food and beverage companies like KFC, McDonald’s, and Coca-Cola, among many others, are targeting countries in the global South.

“Big Food” also engages in a variety of different strategies to make its food desirable in developing countries. In South Africa, for example, transnational food companies have ensured their

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Fast food menu from Brazil

INDUSTRIAL AGRICULTURE AND THE ENVIRONMENT

“Because it directly links and negatively affects human and environmental health, the global dietary transition is one of the great challenges facing humanity.”—David Tilman and Michael Clark, *Nature*, 2014

The intersection of changing diets and chronic disease is a complex one and cannot be examined without exploring the role of agriculture and its industrialization. (Though industrialized animal agriculture is discussed primarily in this paper, free-ranging animals, especially cattle, also produce significant greenhouse gas emissions.)⁷⁰ If we view Earth as the living ecosystem that it is, we must acknowledge the parallel between chronic disease as an issue of public health and climate change as an issue of Earth’s wellbeing. As widespread adoption of the Western-style diet drives negative public health outcomes, the methods of agriculture used to produce the staples of this way of eating also drive environmental degradation.

To address the public health and environmental impacts of the nutrition transition, changes must be made on both the supply and demand side of the food system. In other words, not only must consumer habits change, but supply chains must change, too, to achieve environmental sustainability. Indeed, the entire food system must be included in the discussion of diet and NCDs to ensure comprehensive solutions are reached.

Our food system as a whole (i.e., farming, transportation, and packing, among other facets) contributes 20 to 30 percent of anthropogenic greenhouse gas emissions (GHGs).⁷¹ According to the FAO, the global livestock sector accounts for 14.5 percent of

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anthropogenic GHGs.⁷² Carbon dioxide is released via soil tilling and the transport of livestock and feed grains, such as corn and soy. It is also released by treating livestock-feed grains with nitrogen-based fertilizers and petroleum-based pesticides.⁷³

Methane gas, although it is lower in concentration in Earth's atmosphere than CO₂, is much more efficient in trapping heat. Methane emissions result mainly through the belching and flatulence of ruminant livestock, as well as storage of manure.⁷⁴ Nitrous oxide, another major greenhouse gas, is also released primarily through animal waste.⁷⁵ According to the World Resources Institute, global emissions from agriculture increased by eight percent from 1990 to 2010, with population growth and dietary change being the greatest drivers.⁷⁶

According to the Environmental Working Group (EWG), lamb and beef have the highest rates of greenhouse gas emissions at 39.2 kg (86 lb) and 27 kg (60 lb) of CO₂ equivalent per kilogram of food consumed.⁷⁷ The third largest culprit is cheese, although its emissions per kilogram are less than half those of beef. Pork, farmed salmon, turkey, and chicken follow close behind.⁷⁸ Soybeans grown to feed livestock also contribute to climate change and mass deforestation and loss of other kinds of vegetation, including in Brazil's Cerrado, the most biologically diverse grassland in the world.⁷⁹ Every year, 6,100 square miles of the Cerrado are destroyed to make room for cattle, soy, and sugarcane.⁸⁰

In addition to livestock, the palm oil industry is a major contributor to environmental degradation. Palm oil, derived from the fruit of the oil palm tree, can be found in myriad consumer products, from toiletries to cookies. The major consumers of palm oil are China, India, and Indonesia, all of which have also seen a rise in the number of processed foods on the market and increased incidence of diet-related NCDs.⁸¹ Production of palm oil has nearly doubled since 2000, largely because of its high yield, low (albeit questionable) labor costs, and low concentration of trans fats.⁸²

Eighty-five percent of palm oil is grown in Malaysia and Indonesia, which has resulted in mass defor-

estation in both countries.⁸³ As a result, many rain-forest species, including orangutans and pygmy elephants, have become endangered.⁸⁴ When ecosystems are disrupted in this manner, not only are habitats lost or despoiled and species threatened, but large quantities of CO₂ are released into the atmosphere. The soils that support many palm oil plantations are rich in peat, which hold eighteen to twenty-eight times more carbon than the forests above them.⁸⁵ The palm oil industry drains these soils to make way for palm plantations, thereby releasing long-held carbon into the atmosphere. This makes the palm oil industry another major contributor to climate change. (Although palm oil production is generally seen as unrelated to the livestock sector, the kernel of the palm plant and other by-products are used as feed for cattle in some countries.)

The Union of Concerned Scientists published its palm oil fact sheet, "Palm Oil and the Environment," in 2013. It details the environmental dangers of this relatively new industry. In March 2016, the Roundtable on Sustainable Palm Oil (RSPO), suspended the Malaysian company IOI for violating the roundtable's principles. Since then, IOI has lost major customers, including Dunkin' Donuts, Nestlé, McDonald's, and Unilever.⁸⁶

The RSPO's suspension of IOI and its resulting loss of customers is an example of a supply chain disruption, or a change that alters the methods of production. In 2014, the Climate and Land Use Alliance released the paper "Disrupting the Global Commodity Business," which enumerates several other recent incidences of supply chain disruptions along with "disruptive innovations" with the potential to shift business practices.⁸⁷ More changes from within the supply chain are necessary to combat the environmental degradation caused by agriculture. Although consumer demand plays a role (e.g. "vote with your fork"), a response from affected communities, lawmakers, and industry is necessary to ensure that products that enter the food supply are not implicated in harmful environmental practices.

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China, Brazil, and the United States are the top three producers of greenhouse gases from agriculture, primarily due to their high production of soy, corn, and livestock.⁸⁸ An interesting example of the growing awareness of the relationship between agriculture and the environment can be seen in the dietary guidelines released by the Chinese Nutrition Society in June 2016. The guidelines suggest a daily per capita consumption of meat that would amount to half of China's current per capita consumption levels (although these levels aren't directly stated in the guidelines).⁸⁹ While the guidelines were designed with public health in mind, environmental groups have acknowledged their potential to reduce global GHGs, too.⁹⁰

In an effort to support the message and expand the impact of the Chinese guidelines, the U.S.-based environmental communications organization WildAid has engaged with the Chinese Nutrition Society in a public education campaign ("Less Meat, Less Heat") launched with videos featuring actor-politician Arnold Schwarzenegger, *Avatar* director James Cameron, and actress Li Bingbing to encourage the Chinese public to consume less meat.⁹¹ Although they have received less attention than China's nutrition guidelines, Sweden, Brazil, Qatar, and Germany also include sustainability in their respective dietary guidelines.⁹²

Another effort to inform people about the ecological footprint of what they eat is the "Double Food Pyramid" developed by the Italian non-profit think tank, the Barilla Center for Food and Nutrition, which is directed by owners of the Barilla pasta company.

Figure 1 illustrates the environmental impact of each food group in reverse proportion to its recommended intake.⁹³ Also worth noting (Figure 2) is the replacement of the "meat" category with a "protein" category in the United States Department of Agriculture's nutrition guide to healthy eating, "My Plate," released in 2011.⁹⁴

The academic community has also begun to focus on the issues of food, agricultural systems, and the environment. In 2014, the scientific journal *Nature* published "Global diets link environmental sustainability and human health." This study succinctly analyzes the diet-environment-health "trilemma," and proposes adoption of vegetarian, pescetarian, or Mediterranean diets to help curb GHG emissions (see box p. 6).⁹⁵

In March 2016, researchers at Oxford University published a study that shows that reducing meat consumption and transitioning to plant-based diets would cut greenhouse gas emissions by between 29 and 70 percent by 2050 and also save up to eight million lives a year by 2050. They also calculated that plant-centered diets could save between U.S. \$700 billion and U.S. \$1 trillion each year in global healthcare costs. The researchers found the greatest reductions in GHGs and the largest numbers of deaths avoided came from adopting vegetarian and vegan diets.⁹⁶

The growing discussion of the environment as part of the critical "trilemma" among academics, NGOs, and concerned individuals is a positive step toward truly understanding the interconnections within the food system and making changes to support public health and environmental sustainability locally, nationally, and globally. ♦

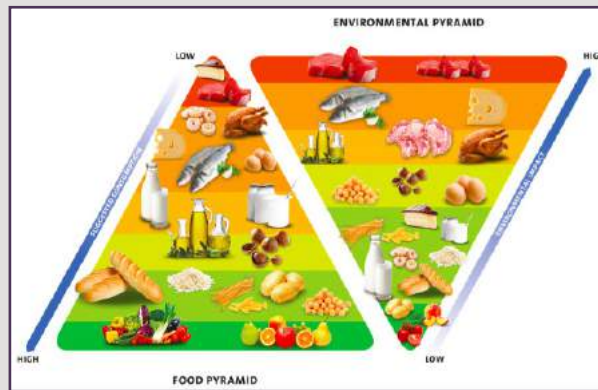


Figure 1: Double Food Pyramid



Figure 2: My Plate

products are more available by expanding into urban and rural areas alike, and driving out local retailers and wholesalers.¹⁰² “Big Food” retailers in South Africa generally have cheaper prices than local retailers, largely because they have developed a strategy of consolidating their supplies and cutting out third-party wholesalers that may demand high prices for food products.¹⁰³ As “Big Food” retailers out-compete local retailers and traditional food sources, developing countries are seeing increased access to cheap, processed foods with long shelf lives, like pre-made meals, sodas, and snack bars.¹⁰⁴

In addition, transnational food retailers heavily market their products to make them desirable and acceptable. For example, food producers develop sales

promotions in conjunction with local supermarkets and appeal to customers with nutrient claims on packaging, such as “great source of fibre.”¹⁰⁵ Television advertisements are another significant channel for marketing: in South Africa, children aged seven to fifteen watch 24 minutes of advertisements per day, on average.¹⁰⁶ Generally, transnational companies spend more money on marketing campaigns than domestic companies.¹⁰⁷ In China, KFC commercials employ irony, sentimentality, and playfulness to sell fried chicken and other menu items.¹⁰⁸ Transnational food retailers also have adapted their products to the tastes and preferences of different countries: one can find a “McMollete” on the McDonald’s menu in Mexico, and a “Bubur Ayam McD” on its menu in Malaysia.¹⁰⁹

THE DOHAD HYPOTHESIS AND THE “DOUBLE BURDEN” OF MALNUTRITION

The Developmental Origins of Health and Disease (DOHaD) hypothesis was developed in the mid-1980s by British researcher D. J. Barker and his colleagues.¹¹⁰ This theory asserts that susceptibility to obesity and other NCDs is affected by environmental exposures throughout one’s lifetime. It has been supported recently by global nutrition researcher Barry Popkin of the University of North Carolina, and helps explain why children whose mothers were food insecure may be at increased risk for obesity. Popkin has found that poor nutrition during the perinatal period (immediately before and after birth) leads to a host of metabolic and hormonal changes that actually aid survival in nutrient-poor environments.¹¹¹ However, when confronted with an environment replete with calories in later years, these adaptive mechanisms may actually contribute to greater risks for obesity and chronic disease.¹¹²

Furthermore, compromised maternal health—including being overweight, experiencing poor nutrition, and the presence of gestational diabetes—can contribute to later insulin resistance and increased obesity risk.¹¹³ These intergenerational components are important because they challenge the commonly held belief that obesity is a matter of individual responsibility. They also demonstrate that environmental factors (rather than pure DNA sequencing) are paramount to understanding the occurrence of obesity and metabolic syndrome (a set of conditions associated with higher risks for stroke, heart disease, and diabetes). Due to the speed of the nutrition transition underway in LMICs, many children are at greater risk for over-nutrition and chronic diseases, while their parents’ and grandparents’ generations were at greater risk for under-nutrition and infectious diseases. Within some households, children suffer from both under and over-nutrition, while some individuals experience both under- and over-nutrition within a lifetime.¹¹⁴

Popkin’s research also described the “double burden of malnutrition.” The term refers to the dual difficulty faced by many healthcare systems from both the incidence of infectious diseases associated with insufficient calories (under-nutrition) and the NCDs resulting from excess calories (over-nutrition). It occurs, according to Popkin, in developing countries whose markets have opened their doors to multinational food corporations, and whose domestic public health efforts have been slow to combat hunger and food insecurity. ♦

COUNTRY CASE STUDIES

These country case studies explore the factors contributing to rising rates of NCDs in Mexico, China, South Africa, India, and Brazil; the effects of fast-changing food systems and environments in each country; and what has been done, and what could be done in the future, to lessen the negative impacts being experienced.

MEXICO

PUBLIC HEALTH, RISING OBESITY, AND THE NAFTA EFFECT

Across Mexico, Coca-Cola billboards dot rural highways and small roadside shops (*tiendas*) sell bottles of Coke along with local produce. Mexico consumes more gallons of sugary beverages per year than any other country¹¹⁵, except for Chile, which has now surpassed Mexico in its consumption of sugary beverages. (The U.S. is number three.)¹¹⁶ It's not coincidental that 14 million people in Mexico are suffering from diabetes.¹¹⁷ In 2013, Mexico surpassed the U.S. as the most obese nation in the world, with a prevalence rate of 32.8 percent, to be itself superseded by Pacific Island nations. Mortality rates due to heart attack, diabetes, and high blood pressure have increased significantly along with the spike in obesity rates.¹¹⁸

The main driver of these troubling health statistics is the energy-dense, nutrient-poor Western diet, which has already changed the food landscape in Mexico, pervading areas both urban and rural. Rising income is a substantial factor in changing diets in Mexico and elsewhere. However, trade liberalization also has played a major role in what food is accessible in developing countries. After the North American Free Trade Agreement (NAFTA) was implemented in 1994, the number of unhealthy food products exported from the U.S. to Mexico increased substantially. A significant uptick also took place in the amount of raw soybean and corn

imports,¹¹⁹ two products used to make highly processed foods and feed for livestock.

In 1991, pre-NAFTA, Mexicans each consumed 290 8-oz Coca-Cola products. By 2011, consumption had more than doubled to 728 8-oz Coca-Cola products per person (nearly triple the rate in Canada).¹²⁰ According to the UN Food and Agriculture Organization (FAO), the consumption of animal fat in Mexico increased from about 34.7 g (1.2 oz) per capita per day in 1991 to 46.9 g (1.65 oz) per capita per day in 2009. A recent study linked these and other resulting dietary changes with an unsettlingly large 12 percent increase in obesity in Mexico between 2000 and 2006.¹²¹ Though obviously this rise was an unintended consequence of NAFTA, these figures help demonstrate that trade policy can actually impact public health.

Interestingly, a review of the research literature indicates that the closer an individual is to the U.S., the higher his or her risk of obesity. For example, a 2011

study at the University of California, Los Angeles, found that Mexican children living in households with close or extended family members migrating to the U.S. for work had a greater chance of becoming overweight or obese than children without migrant networks.¹²² A year later, a 2012 study showed that a higher degree of familiarity with U.S. culture, measured by frequency



Empty soda bottles on a wall in Chiapas, Mexico

of television watching in English, was associated with greater obesity risk among Mexican children in Baja, California, which borders Mexico.¹²³

Although the prevalence of abdominal obesity among adults over twenty years old in all Mexican states is relatively high (between 61.4 and 82.9 percent), the two states with the highest rates, Sonora and Tamaulipas, both have borders with the U.S. By contrast, the two states with the lowest rates of abdominal obesity, Oaxaca and Chiapas, are located in the very south of Mexico, farthest from the U.S.¹²⁴ This fact is remarkable: sheer

proximity to the U.S. has a direct bearing on diet and obesity rates.

Although these statistics paint a bleak picture, Mexico has taken some steps to address the emerging public health threats within its borders. In 2010, the Mexican government under then-president Felipe Calderón enacted the *Ley Antiobesidad*, or anti-obesity law. This required physical education in public elementary and middle schools and restricted the amount of calories, salt, and fat in foods sold in public schools.¹²⁵ Mexican public health officials have criticized this law, however, because it doesn't ban the *consumption* of processed foods; rather, it restricts how processed food is sold and marketed in schools. In January 2014, Mexico also passed a one-peso-per-liter tax on sugar-sweetened beverages, as well as an eight percent sales tax on certain processed foods. Two years later, purchases of sugary beverages had decreased by between 10 and 12 percent.¹²⁶

All of this leads to a crucial question: How can a country like Mexico go through a nutrition transition without jumping directly from under-nutrition to over-nutrition? To be sure, the solutions need to be multi-faceted. Perhaps a law banning processed food sales entirely from public schools would reduce how much of these foods students eat during the day. Forward-thinking policy would also subsidize local fruit and vegetable growers and connect them with schools, thereby supporting both local economies and encouraging healthy eating habits among school-aged children.

Although rewriting trade agreements, i.e., NAFTA, would prove a complex and difficult task, it would be in the best interest of Mexico's public health to reject or revise future trade agreements that allow—or encourage—such astronomical flows of corn, soy, and meat and dairy products into its domestic market. ♦

CHINA

THE LITTLE EMPEROR'S BURGER

Though many Chinese know that American fast food is unhealthy and leads to weight gain, the growing trendiness of Western fast food among young people in China has contributed to its increased consumption. American franchises in China such as KFC have been thriving. In the U.S., the chain amassed 4,618 locations in 61 years. In China, however, KFC boasted the establishment of 4,260 locations in just 26 years.¹²⁷ China now consumes overall twice as much meat as the U.S.: at least a whopping 71 million tons per year.¹²⁸ Yum! Brands (the parent

company of KFC, Taco Bell, and Pizza Hut) foresees significant growth in China, after spinning off Yum China from the main Yum! Brands in 2016. Yum China more than doubled its outlets in China between 2008 and 2016, from 3,000 to more than 7,000.¹²⁹

Meanwhile, McDonald's has been expanding in China at the rate of 10 new restaurants per week.¹³⁰ These alarming



A McDonald's in Beijing, China

figures reveal how much American fast-food culture has already permeated China. American fast-food chains serve consumers Western-style food products: high in saturated fat, simple carbohydrates, and sugar, with a lot of processing and little nutritional density. In contrast, a traditional rural Chinese diet features plant-based protein, low cholesterol, plus some dietary fat.

With the burgers and fries come a host of public health consequences. A 2012 study published in the journal *Circulation* found that Chinese men and women who consume Western fast food more than twice a week were at higher risk for diabetes and cardiovascular disease.¹³¹ According to Dr. Tsung Cheng at the U.S.'s George Washington University Medical Center, "fast food and physical inactivity" are the two most important factors fueling childhood obesity in China. China's youth are

particularly at risk for developing chronic disease. Like the U.S., China has seen an increase in weight gain and related chronic health conditions among children and young people.¹³²

A 2012 study in *Obesity Reviews Journal* compared the risk of chronic disease in China to other countries, including the U.S. The researchers found that approximately 12 percent of Chinese children and adolescents aged seven to eighteen were overweight, and about 1.7 million children under eighteen suffered from diabetes.¹³³ In 2016, the *European Journal of Preventative Cardiology* published a study that showed rural Chinese children (boys especially) suffered higher rates of obesity than children in urbanized areas.¹³⁴ Additionally, the rate of diabetes among Chinese adolescents aged twelve to eighteen was about four times that of American teenagers.

Of course, fast-food consumption is only one piece of a larger puzzle. Obesity is a result of both biological and environmental factors, including one's access to and knowledge about healthy food and one's family and community traditions around food. What drives someone to eat fast food is complex. It is possible that in China this drive may have been amplified by the one-child policy, which, from 1979 through 2015, required most families, with a few exceptions, to have no more than one child. Single children are called *xiao huangdi*, which means "little emperors."¹³⁵

This glorified status within the family structure is often said to create an environment where adults dote upon the child, feeding them whatever foods they desire. Wikipedia even has a page devoted to "Little Emperor Syndrome." Essentially, the single child receives an excessive amount of attention, which often leads to eating a lot of fast food. Whether the high rates of diabetes and childhood obesity in China can be blamed on fast food, "Little Emperor Syndrome," or both (as well as

other factors), these issues demand serious public health attention. The Chinese government should carefully regulate fast-food marketing to children and teens, as well as encourage fitness programming in schools.

The EatSmart@School Campaign, a program run by the Chinese Department of Health, assists primary schools that want to create a more sustainable, healthy food environment. This campaign helps schools establish "healthy eating policies," in order to increase awareness, and provides online resources including recipes and printable nutrition education materials for teachers and parents. It is also possible now that China has ended the one-child policy, that the phenomenon of "little emperors" will lessen in years to come.

In 2016, the Chinese government issued new dietary guidelines that encourage reduced consumption of meat, with a suggested maximum of 200 grams (7 ounces) of meat, poultry, fish and dairy per day.¹³⁶ That is about half of current per capita consumption levels. The effects of these new guidelines remain to be seen, i.e., how they



Diet "pagoda" produced by the Chinese Nutrition Society

"translate onto the plate" for China's 1.4 billion people, as Lucy Luo of JUCCE, a Shanghai-based NGO, writes.¹³⁷

Although these types of campaigns and national dietary guidelines are beneficial and necessary, attitudinal shifts also need to occur in order to effect lasting change in consumption habits. Though it will certainly prove a complex task, the global image of American fast food as a trendy, modern signifier of wealth needs to change. In fact, it needs to be reversed completely so that countries like China do not fall victim to the same chronic diseases that are so common in the U.S.

Although no country has yet attempted to transform the image of American fast food, perhaps China can take on the challenge. As a nation moving rapidly through an economic and nutrition transition, Chinese policymakers

recognize the links between health and changing diets; perhaps they will also reconsider and work to reshape the idealized image of American fast food. Interestingly, consumption of Western fast food decreased 16 percent in China between 2012 and 2015.¹³⁸ Hopefully, this statistic is an indicator of China moving toward more healthful eating habits. ♦

SOUTH AFRICA

WHERE FOOD INJUSTICE WANDERS NEXT

One of the defining landmarks in Johannesburg, South Africa was the Coca-Cola Dome (now named the Ticketpro Dome for its new corporate sponsor): a 19,000-person arena sponsored by the beverage giant. Coke has become increasingly popular in South Africa, where an average of 254 Coke products were consumed by each South African in 2010. That's more than the international annual average of 89 Cokes per person (and nearly double the number consumed per capita in South Africa in 1992),¹³⁹ and is quickly approaching the 403 Coke products consumed each year by the average American.¹⁴⁰

Along with Coca-Cola, KFC is a significant presence in South Africa, with more than 700 locations in the country.¹⁴¹ Thanks to the increasing availability of soda and fast food, South Africans are developing the chronic diseases associated with the nutrient-poor Standard American Diet.

As diets around the world are becoming less varied,¹⁴² and more dependent on processed convenience foods,¹⁴³ few places demand attention more than South Africa does. With its history and present determined by persistent inequalities and a fierce ongoing battle for racial and economic justice, South Africa today poses these questions: What is fueling the adoption of the Western-style diet here? Who is affected the most?

In recent years, South Africans have been migrating from rural areas to urban centers in search of work. Along with more opportunity, life in an urban environment offers easy access to big supermarkets and fast-food chains. While access to supermarkets can often be a good thing, large chains like Shoprite and Pick n Pay¹⁴⁴ carry mostly packaged foods that contain processed meat, refined flour and sugar, and artificial preservatives. These are the very ingredients that are tied to diet-related illnesses across the industrialized world.

Many of those who have recently migrated to urban centers consider their rural diets of unprocessed starches such as *pap* (a porridge made from ground corn), high-fiber vegetables, and plant proteins to be “poverty foods,” and have come to embrace the fried fare and animal protein readily available in commercially dense environments. Meanwhile, steep food and fuel prices make food insecurity a persistent and pressing issue in South Africa. From 1999 to 2008, access to healthy food improved in both the country's rural and urban regions. However, the rate of food insecurity remains higher in South Africa's rural areas than in urban ones. More than 33 percent of rural residents were food insecure in 2008 compared to about 20 percent of urban dwellers.¹⁴⁵ A more recent study, conducted in Johannesburg, found that 70 percent of people living in the city's “informal settlements” (often shacks) either skip meals or eat the same foods each day.¹⁴⁶

The Development Bank of Southern Africa (DBSA) also found that, in 2008, 79 percent of households in the major cities of Cape Town, Johannesburg, and Msunduzi went without food because of a sharp rise in food prices. The DBSA also found a direct link between poverty and food security; predictably, more money means better access to healthy, safe foods.¹⁴⁷ Whereas many South Africans go without adequate calories and nutrients, many also deal with a range of Western, chronic diseases associated with over-nutrition. In other words, South Africa is a stark example of a country suffering from the “double burden of malnutrition.”¹⁴⁸

Dr. Zandile Mchiza, senior scientist at the Medical Research Council of South Africa, has found that early childhood under-nutrition can lead to obesity later in life. This is cause for concern for low-income South Africans, many of whom probably did not get enough nutritious food when they were young. Obesity is a well-known risk factor for diabetes.¹⁴⁹ In 2015, according to the Heart and Stroke Foundation of South Africa, 70 percent of South Africans were overweight or obese. Black women have the highest rates of obesity, affecting about one-third of the population. Among men, whites have the highest obesity rate, at 18 percent.¹⁵⁰

In 2014, about six percent of the South African population was diabetic, according to Dr. Larry Distiller, founder of the Centre for Diabetes and Endocrinology

in Johannesburg. But, as Distiller told *Health 24* recently, some in the nation are bracing for a “diabetes tsunami.” The International Diabetes Federation estimates that the prevalence rate will nearly double in South Africa by 2030.¹⁵¹ In 2015, the Federation reported the prevalence rate in South Africa at 7 percent.¹⁵²

Cultural norms in South Africa often favor bigger bodies, especially among women. Thinness has come to be associated with the scourge of HIV, which, in 2015, affected 19.2 percent of South Africa’s adult population aged fifteen to forty-nine.¹⁵³ HIV can also be a risk factor for diabetes because antiretroviral drugs can cause glucose intolerance as a side effect.¹⁵⁴ The adoption of the nutrient-poor American-style diet in urban South Africa now means that doctors and patients in the region must be aware of the potential link between HIV and diabetes.

The South African public health community has starting taking steps to encourage healthier eating. Because sodium causes high blood pressure, and high blood pressure is a major risk factor for cardiovascular disease and stroke, the South African government in 2013 passed legislation that capped the amount of salt that can be added to some processed foods sold in grocery stores. The legislation includes a 50 percent reduction of sodium in bread and comparable reductions in margarine, soups, and gravies.¹⁵⁵ (Initial restrictions took effect in 2016.)

Public health professionals hope that with this measure, along with help from industry,¹⁵⁶ rates of high blood pressure will go down. “Help from industry” is a tricky concept though, since companies’ bottom lines often take precedence over public health or corporate social responsibility. According to Kelly Brownell of Duke University’s Sanford School of Public Policy in the U.S., “The arresting reality is that companies must sell

less food if the population is to lose weight, and this pits the fundamental purpose of the food industry against public health goals.”¹⁵⁷ This is as true in South Africa as it is in the U.S.

In 2015, in an effort to link food, health, and concern for animals and the environment, Humane Society International (HSI) launched “Green Monday” in South Africa. It is a campaign akin to Meatless Mondays, which aims to decrease meat consumption and promote a plant-based diet for better health and environmental sustainability. The Green Monday initiative is supported by several media personalities, including actress Natalie Becker. It has worked with chefs and urban

agriculture groups to popularize affordable vegan meals that are cooked with traditional vegetables and grains.¹⁵⁸

In a country like South Africa, where healthy indigenous diets remain fresh in many people’s minds, the question remains: is it possible to leave one’s rural home, make more money, and enjoy the benefits

of urban life without experiencing the diet-related illnesses that often accompany this journey? The health and wellbeing of millions of South Africans stand to benefit from the answers. ♦



A KFC in Plettenberg Bay, one of hundreds in South Africa

INDIA

THE HIDDEN CONSEQUENCES OF THE NUTRITION TRANSITION

In India, large numbers of people under thirty line up outside McDonald’s to order the Chicken Maharaja Mac, India’s beef-free version of the Big Mac.¹⁵⁹ Fast food and sodas are “all the rage now” in the country, according to Indian public health activist Shobha Shukla.¹⁶⁰ Ice cream is also becoming much more popular, with international brands like Baskin Robbins, Häagen Dazs, and Magnum already vending throughout India, alongside Indian

brands.¹⁶¹ Although many Indians do not eat beef for religious reasons, Muslims, Christians, and even some Hindus are eating more meat from cows and buffaloes.¹⁶²

India's booming middle class—estimated to number between 50 million and 250 million, depending on what threshold is used and whether it is measured by income or wealth¹⁶³—is driving demand for meat, eggs, and processed dairy products like ice cream (milk has long been a staple of most Indian diets). Despite India's long tradition of ethical vegetarianism, only about 30 percent of India's 1.3 billion people now call themselves vegetarian.¹⁶⁴ For many Indians, particularly in urban areas, owning a television, driving a car, wearing Western brand-name clothing, or eating meat are symbols of affluence, independence, and modernity. "We are quick, hygienic, clean, and are seen as part of global culture," Vikram Bakshi, managing director of McDonald's India, told Agence France-Presse.¹⁶⁵

But being part of "global culture" carries enormous health risks. Heart disease is responsible for the majority of deaths in India,¹⁶⁶ and more than 60 million Indians have been diagnosed with diabetes.¹⁶⁷ That's nearly five percent of India's people, and this number is expected to rise—and quickly. Many other developing countries including South Africa,¹⁶⁸ Mexico,¹⁶⁹ and China¹⁷⁰ are facing a similar dilemma. As their middle classes grow and rural to urban migration accelerates, more people are shifting away from diets high in unprocessed starch, high-fiber vegetables, and plant proteins. Instead, they are adopting a Western-style way of eating, full of animal protein and fat, refined carbohydrates, and sugar.

India, like South Africa, is currently experiencing the double burden of malnutrition. In 2014, over 40 percent of Indian adults were considered underweight, while obesity rates have climbed steadily throughout the last 40 years.¹⁷¹ Diabetes trends in India are "absolutely frightening," says Nikhil Tandon, professor

of endocrinology at the All India Institute of Medical Sciences.¹⁷² "Young people who are the drivers of the economy, who are the protectors of their family, are going to be lost," due to the fast-rising prevalence of diabetes, according to Prathap Reddy, a cardiologist and founder of a large network of private hospitals in India.¹⁷³

In India, income is closely associated with malnutrition, researchers have found. Richer women who likely have access to a variety of foods tend to be overweight, while poorer women who cannot afford the most basic foods tend to be underweight.¹⁷⁴ And even as a growing number of Indians eat higher up the food chain, under-nutrition remains a stubborn problem. More than

40 percent of Indian children younger than five are malnourished.¹⁷⁵

To combat high rates of diabetes and obesity, India is poised to take measures similar to those the Mexican government has put in place. The Indian health ministry is working on a proposal that would tax sugar-sweetened beverages and junk food, as well as put in place regulations



Chicken Maharaja Mac on sale at a McDonald's in India

on advertising to children.¹⁷⁶ The state of Kerala in the south of the country has independently proposed a 14.5 percent "fat tax" on unhealthy foods served at fast-food chains (although the tax would not target local restaurants that serve fried or fatty foods).¹⁷⁷ Kerala is experiencing rising rates of overweight and obesity, ranking it second among Indian states.¹⁷⁸

In addition to policy changes, ultimately, perceptions also need to change so that citizens of India and other countries see the Western-style diet for what it is: a recipe for obesity and chronic disease. The situation in India raises the question of whether the nutrition transition is an inevitable process, in India and the rest of the global South? Or, could food-insecure countries provide the calories their people need without gleaning them from saturated fats, sugar, and processed foods? ♦

BRAZIL

NEW DIETARY GUIDELINES: COOK AND EAT WHOLE FOODS, BE WARY OF ADS

What if your national dietary guidelines advised you to cook and enjoy fresh, whole foods, and serve them with friends and family while thinking critically about food advertising? Hard to imagine, isn't it? Well, that's exactly what Brazil's Ministry of Health is recommending with the "food based" dietary guidelines it released in 2014. Unlike the U.S. dietary guidelines (or "MyPlate"), which focus on reducing solid fats and added sugars, and pinpoint a long list of nutrients to consume or reduce, Brazil's guidelines keep it simple by encouraging people to eat more fresh, unprocessed foods. It's worth listing the guidelines' recommendations in full:

- Prepare meals from staple and fresh foods.
- Use oils, fats, sugar, and salt in moderation.
- Limit consumption of ready-to-consume food and drink products.
- Eat regular meals, paying attention, and in appropriate environments.
- Eat in company whenever possible.
- Buy food at places that offer varieties of fresh foods. Avoid those that mainly sell products ready for consumption.
- Develop, practice, share, and enjoy your skills in food preparation and cooking.
- Plan your time to give meals and eating proper time and space.
- When you eat out, choose restaurants that serve freshly made dishes and meals. Avoid fast-food chains.
- Be critical of the commercial advertisement of food products.¹⁷⁹

"I think it's terrific that [Brazil's guidelines] promote real foods, cooking, and family meals, rather than worrying about the nutritional quality of processed foods or dealing with single nutrients," says Marion Nestle, a prominent author and professor in the department of nutrition, food studies, and public health at New York University.

As in many developed and developing countries, Brazil has seen recent spikes in the numbers of overweight

and obese people. In 2011, nearly half of Brazilians were overweight, and about 16 percent were obese.¹⁸⁰ Carlos Monteiro of the University of São Paulo attributes this widespread increase in BMI to the transition from unprocessed or minimally processed foods such as rice, fruits, and vegetables to "ultra processed foods."¹⁸¹

Like the U.S., Brazil is a major agricultural producer. Brazil-based JBS is the world's largest processor of animal protein, and the nation tops the world in exports of beef and chicken.¹⁸² It's also a leading player in the global soybean boom, and miles and miles of Brazil's rainforest and savannah have been cleared of trees and other vegetation in recent decades to grow livestock feed on a massive scale.¹⁸³ Alongside their thriving agricultural export trade, Brazilians have begun eating more meat, dairy products, and eggs. And as the Brazilian middle class has grown, transnational food companies have expanded their operations and marketing in Brazil, spreading U.S.-style fast-food culture further.¹⁸⁴

But the new diet guidelines are pointing in the opposite direction: they advocate slower food. By focusing on the importance of taking the time to prepare meals and eat in the company of others, the new Brazilian dietary guidelines prioritize food culture and the environment in which meals are consumed. This is extremely important: Research by the U.S. Department of Agriculture (USDA) has shown a link between eating outside the home and increased obesity.¹⁸⁵

The tenth and final Brazilian dietary recommendation, "Be critical of the commercial advertisement of food products," is particularly unusual in the world of dietary guidelines. This indicates that at least some policymakers within the Brazilian government are aware of the harmful effects of advertising and are actively trying to combat food industry manipulation through policy statements (and actions).

There's a history here. In 2013, São Paulo, Brazil's largest city, fined McDonald's U.S. \$1.6 million for using toys and other inducements to appeal to children.¹⁸⁶ São Paulo also was the first city in Brazil to adopt Meatless Mondays ("Segunda Sem Carne" in Portuguese), which has now expanded to 15 cities across the country. Brazil's government has also mandated healthier school food.¹⁸⁷

It's still early to assess the impacts of Brazil's dietary guidelines, and ready access to a range of healthy foods

remains a challenge in the country, as it does in most places. But the guidelines do provide an important model and a vision that's absent from most countries' efforts so far. Perhaps in future policymakers in other regions both North and South will look to Brazil's pioneering food guidelines and put more value on a critical-thinking, home-cooking, socially vibrant culture of real food than on the interests of "Big Food." ♦

RECOMMENDED ACTIONS

In the U.S., "obesity epidemic" has become a catchphrase, and has caught the attention of many concerned individuals. The public health community in the U.S. has proposed various measures to address rising rates of overweight and obesity and the growth in NCDs, from taxing sugar-sweetened beverages to regulating junk-food marketing to children. Although major policy changes remain to be enacted, the public health community in the U.S. is acutely aware of these issues and is actively working to combat obesity and, in particular, childhood obesity.

Governments in some LMICs have begun to take action in the form of revised dietary guidelines, excise taxes, and advertising regulations. However, the relationship between the export of the standard Western diet and ensuing NCDs in LMICs is a pressing reality that deserves greater awareness from academics, policymakers, public health professionals, and the public itself. Much more could and should be done to reverse the growing trend of NCDs in LMICs, including these wide-ranging and specific actions:

1. Policymakers in the global South must be made more aware of the high costs to health systems and individual well-being of the adoption of the Western diet and means of food production. Because policymakers

produce legislation, it is important that they are familiar with research that shows the links between poor diets and chronic disease. An educational campaign led by the World Health Organization (WHO), for example, could target policymakers of LMICs and provide them with a set of specific measures they could institute to promote healthier, more sustainable diets and food environments. These could include fiscal measures, public-

procurement policies, regulations on industry practices and expansion, training of health professionals and educators, and public engagement. Public health journals also should be made more broadly available in the global South, and knowledge of open-access journals such as the *Public Library of Science (PLOS)*, which published its series on "Big Food" in 2012, should also become widespread.¹⁸⁸



Soybeans being harvested in Brazil's Cerrado region

One of the major reasons behind expanding consumption of American-style fast food and junk food in LMICs is the image of wealth, modernity, and even cleanliness inherent in Western fast-food chains and supermarkets. These assumptions must be questioned and reversed first by policymakers themselves. They should not idealize the Western diet, but rather see and inform their citizens about its nutritional deficiencies and unhealthy excess.

2. Governments of LMICs ought to reduce the presence of "Big Food" through a variety of means. Young people are particularly vulnerable to marketing efforts and often cannot distinguish advertisements from neutral information. Governments should regulate food corporations' marketing campaigns by limiting the number of fast-food and junk-food advertisements seen by youth on television, in public schools, and in public school vicinities. This could be accomplished through collaborative efforts among public health officials, child nutrition advocates, and concerned parents, like the example of the Berkeley

(California) Healthy Child Coalition's grassroots campaign to pass the city of Berkeley's sugary-sweetened beverage tax in 2014.¹⁸⁹ Governments should also develop nutrition standards that companies' food products must meet in order to advertise to children and adolescents. For example, a sugary product could be required to contain a certain amount of fiber. A backlash from the food industry may ensue, but if governments set nutrition standards for marketing, food companies will be obligated to change their product recipes to comply. This type of initiative may lower rates of consumption of processed foods, and ultimately may help curb childhood obesity in developing countries. Governments should also consider capping the number of fast-food outlets or chain supermarkets in a given region or locality to support local businesses and promote healthier eating habits. To change the balance of power with large food producers, governments could create regional alliances with a common agenda and negotiating positions.

3. Governments of developed nations and LMICS ought to subsidize production of vegetables, fruits, legumes, and grains. Access to healthy whole foods may increase their consumption and limit that of high-fat, sugar-laden foods. While access is important, affordability is another necessary factor. One of the biggest draws of fast food and processed convenience foods is their low cost. If fresh fruits, vegetables, legumes, and grains are subsidized and therefore cheaper, they will be more attractive to consumers. Such a policy would almost certainly fuel a reaction from the food industry, but policymakers would have the incentive of reduced healthcare costs for chronic disease in the short- and long-term (along with environmental benefits). If the U.S. or another industrialized country were to and reallocate some of their corn, soy, meat and dairy subsidies to vegetable production, cultivation of and access to a diverse array of vegetables would likely increase and could also encourage other governments, in the midst of the nutrition transition to follow suit.

4. Public health officials should create educational programs targeted at specific populations, e.g., rural residents and urban residents, higher income groups and lower income groups, children and adults. While some LMICS have higher rates of obesity and chronic disease

in wealthier, urban areas, in others, it is poor, rural areas that carry the burden. Public health messages regarding nutrition habits and sustainable diets will likely have a greater effect if they are focused on specific demographic groups. Messaging should be developed in a way that the target population can understand it, relate to it, and hopefully consider making lifestyle changes. Of course, public health messaging targeted to children will be different than that aimed toward adults. An educational campaign for children might offer cooking and tasting workshops that focus on a different colored vegetable each week, whereas an educational campaign geared toward adults might consist of ads in transportation systems that stress the importance of eating vegetables, fruits, legumes, and grains, and engaging in physical activity. Although public health campaigns and educational programs will require funding from health departments or other government agencies, the healthcare systems of LMICS will save money in the long term by preventing weight gain and chronic disease in their populations. There would likely be positive outcomes for farmers of plant-based foods and local food businesses as well.

5. Global development policy should encourage and support healthy, sustainable diets and systems of food production. Several of the United Nations' 17 Sustainable Development Goals (SDGs) are relevant to such efforts, especially goals 2 (zero hunger), 3 (good health and wellbeing), 12 (responsible production and consumption), and 15 (life on land). As the SDGs more fully inform global development priorities and funding for them, it will be important for researchers and advocates for sustainable diets and food systems to encourage governments and international agencies to develop concrete policy measures and provide the budgets needed to implement them. In many countries of the global South, awareness of the connections among NCDs, food security, and the Western diet and Western methods of food production remains limited, even as global food corporations target these countries for expansion. The asymmetries in this equation need to be changed, and it is the responsibility of policymakers, researchers, public health professionals, academics, and civil society in the South and North to promote and ensure this change through a range of policies and institutions.

6. Governments struggling with the “double burden of malnutrition” ought to develop strategies to address infectious diseases and NCDs simultaneously, without privileging one over another. LMICs occupy a unique geographic and temporal space, as chronic diseases have come to coexist alongside infectious diseases related to under-nutrition. Both infectious diseases and NCDs deserve effective treatment and preventive measures. Although NCDs develop over a longer period of time, they can greatly decrease quality of life, and NCDs such as heart disease can often prove deadly. At the same time, infectious diseases such as malaria, HIV/AIDS, and tuberculosis still demand attention and should not be neglected. Government officials must find ways to give equal attention to both types of diseases and should push for technological updates in healthcare systems that allow for better treatment of chronic conditions like diabetes, cancer, and heart disease. For example, electronic medical records (EMR) allow providers to share a patient’s medical history, thereby improving coordination and enhancing efficiency of the patient’s healthcare services. Development aid and capacity development programs (both North/South and South/South) should be proactive in providing the funding and knowledge that will be required.

7. Healthcare systems must equip themselves to deal with NCDs. Because chronic diseases are now becoming so common across the globe, healthcare systems in countries in the global South ought to focus more attention on NCDs than they have previously. Moreover, as countries’ incomes rise and diets continue to change, countries will likely see more NCDs, and healthcare systems and providers must be prepared to deal with them. Along with technological innovations to treat NCDs, healthcare systems in LMICs must prioritize preventive medicine in their communities, too. This means that healthcare centers should offer screenings for blood pressure, cholesterol, and cancers. Healthcare professionals also must be trained adequately to treat NCDs, be educated about the ways poor diets can result in obesity and chronic disease, and be fully capable of conveying accurate nutrition information to their patients. The benefits of reduced rates of chronic disease, as well as money saved by healthcare systems in the long term,

will far outweigh the initial start-up costs of screening programs and educating and training healthcare professionals. The training and education initiatives that are required should be supported by bi- and multi-lateral donors as well as private philanthropies concerned about global public health and the environment.

8. Trade agreements ought to be examined for unintended public health consequences before their implementation. As obesity rates skyrocket in Mexico and elsewhere, public health is becoming a pressing issue that economists and the business community should not overlook. Though governments altering existing trade agreements appears unlikely, it would be in the best interest of the public’s health to revise future trade agreements that encourage large imports of corn, soy, and animal products into emerging markets. This will require collaboration among economists, public health professionals, trade negotiators and analysts, and lawmakers. Now that researchers and policymakers have seen the ways that NAFTA brought processed food and raw ingredients for processing into Mexico (i.e., commodity crops like corn), they can be aware of this kind of public health externality when discussing future trade agreements. Public health and economic welfare can no longer be viewed as trade-offs in trade terms. Ultimately, public health *and* economic welfare must be taken into account when future trade agreements are negotiated.

9. Researchers should examine the links between changing diets and supply factors. While much research to date has focused on the relationship between dietary changes and chronic disease, much less research makes the connection to supply-side factors and the rise of industrial agriculture and intensive animal agriculture in the global South. The questions remain: How has the introduction of industrial agriculture, for crops and livestock, changed food systems overall? How has its advent affected the way people eat in LMICs? And what can be done about it? For instance, China engages in extensive industrial animal production and imports vast amounts of soybeans from Brazil to feed its livestock.¹⁹⁰ China has also been consuming more pork and poultry, and developing more diseases associated with high-fat

diets. Industrial agriculture is relatively new in LMICs, so it is worth examining how it affects perceptions around food, as well as dietary habits, and influences food systems overall. An interdisciplinary team(s) of scholars is required to investigate these questions, which span the entire food system from production to consumption, and providing strategies and answers.

10. Researchers and advocates in the global North ought to engage more with counterparts in LMICs on NCDs and food systems. It is clear that to alter the current reality in LMICs of wider adoption of Western-style diets and rising NCDs, both consumption and production of food will need to be addressed. A growing constituency in the global North of public health researchers and professionals, sustainability advocates, and food experts—chefs; educators; procurement officials for universities, school systems, and hospitals—have expertise and insights that could benefit their peers in LMICs. But mechanisms for linking those in the global North and South around sustainable diets and food systems are still limited. Public health schools at major research universities could help fill this gap by developing and funding exchange programs for public health researchers and practitioners, as well

as policymakers. They have the necessary expertise, convening power, and resources. They could also make research materials on NCDs and sustainable food systems more widely available (including through translation). United Nations agencies, global initiatives, civil society organizations working on health and sustainability issues, and activists should also seek to expand their networks in the global South to share information, strategies, and resources, and to incubate joint initiatives that, if successful, could be more widely adopted.

While it remains to be seen how Earth will sustainably feed a growing human population, it is encouraging that increased attention is being paid to how demand for and production of certain foods now central to the Western diet, especially animal products, contribute to climate change, the loss of natural resources, and public and individual health. Addressing this complex set of issues effectively and equitably will require principled action by lawmakers around the globe; cooperation from corporations; the active engagement of public health, environmental, and agricultural experts; and sustainable diets for billions of individuals, now and in the future. ♦



Carrots grown in Jiangxi province, China, 2017

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