



BACKGROUND PAPER

Eating in Developing Asia: Trends, Consequences and Policies

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EATING IN DEVELOPING ASIA: TRENDS, CONSEQUENCES, AND POLICIES

Background paper for Asian Development Outlook Update 2020

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I. INTRODUCTION

Recognition of the importance of good nutrition as critical to human flourishing, as well as to sustainable development, is growing. The estimated impact of malnutrition on the global economy is US\$3.5 trillion in direct economic costs and lost productivity, with direct treatment costs up to US\$2 trillion per year (Food and Agriculture Organization [FAO] 2013, Global Panel on Agriculture and Food Systems for Nutrition 2016). Undernutrition, particularly in early life, is associated with increased risk of infection as well as reduced cognition and educational achievement, and subsequent reduced economic productivity (Hickson and Julian 2018 and Madjdian et al. 2018). Horton and Steckel (2013) estimate that global economic losses from malnutrition measured by stunting have averaged 11% of gross domestic product (GDP) over the past century, declining in developed countries during the first half of the 1900s, but remaining high in Asia, Latin America, and Africa into the 21st century. In the Asia and Pacific region, many populations continue to experience high rates of undernutrition. Two thirds of the 49.5 million children globally under 5 years of age who are wasted (low weight for height) live in Asia, and over 50% of pregnant women in South Asia are anaemic (deficient in iron) (Harding et al. 2018 and FAO et al. 2019). Annual economic losses from low weight, poor childhood growth, and micronutrient deficiencies in Asia average 11% of GDP (United Nations Children's Fund [UNICEF] 2019, p. 62). At the same time, the prevalence of overweight and diet-related noncommunicable diseases (NCDs) are increasing rapidly, leading to a double burden of malnutrition (DBM).

Poor nutrition, caused by unhealthy diets, is also associated with an increased risk of overweight and obesity, diabetes, cardiovascular disease (CVD), and some cancers (including colon, pancreatic, and breast cancers) (Grosso et al. 2017, Jannasch et al. 2017, and Schwingshackl et al. 2017). Dietary patterns high in fruit, vegetables, whole grains, legumes, seeds, nuts, fish, and dairy; and low in processed meat, sweets, and salty foods have been shown to reduce the risk of NCDs (Maghsoudi et al. 2016, Ndanuko et al. 2016, Guasch-Ferré et al. 2019, and Schwingshackl et al. 2019). The costs of NCDs are significant. If current trends persist, the World Health Organization (WHO) estimates that heart disease, cancer, diabetes, and chronic respiratory disease will result in losses of more than US\$7 trillion between 2011 and 2025 in low-income and middle-income countries (LMICs), equivalent to about 4% of annual output (UNICEF 2019). In addition, early childhood nutrition has been identified as a critical contributor to human capital (the aggregate levels of education, training, skills, and health in a population), which is associated with higher GDP and faster economic growth (Lim et al. 2018).

Overweight and obesity in the Asia and Pacific region generates significant economic costs; the annual burden of direct medical costs has been estimated at 0.78% of GDP (Helble and Francisco 2018). Diets in Asia and the Pacific have changed rapidly with modernization and globalization. Consumption of fruits and vegetables remains low in many countries, and consumption of refined staple carbohydrates, such as white rice, dominates many diets. Consumption of highly processed foods has risen dramatically over the past 20 years (Baker and Friel 2016 and Sievert et al. 2019b).

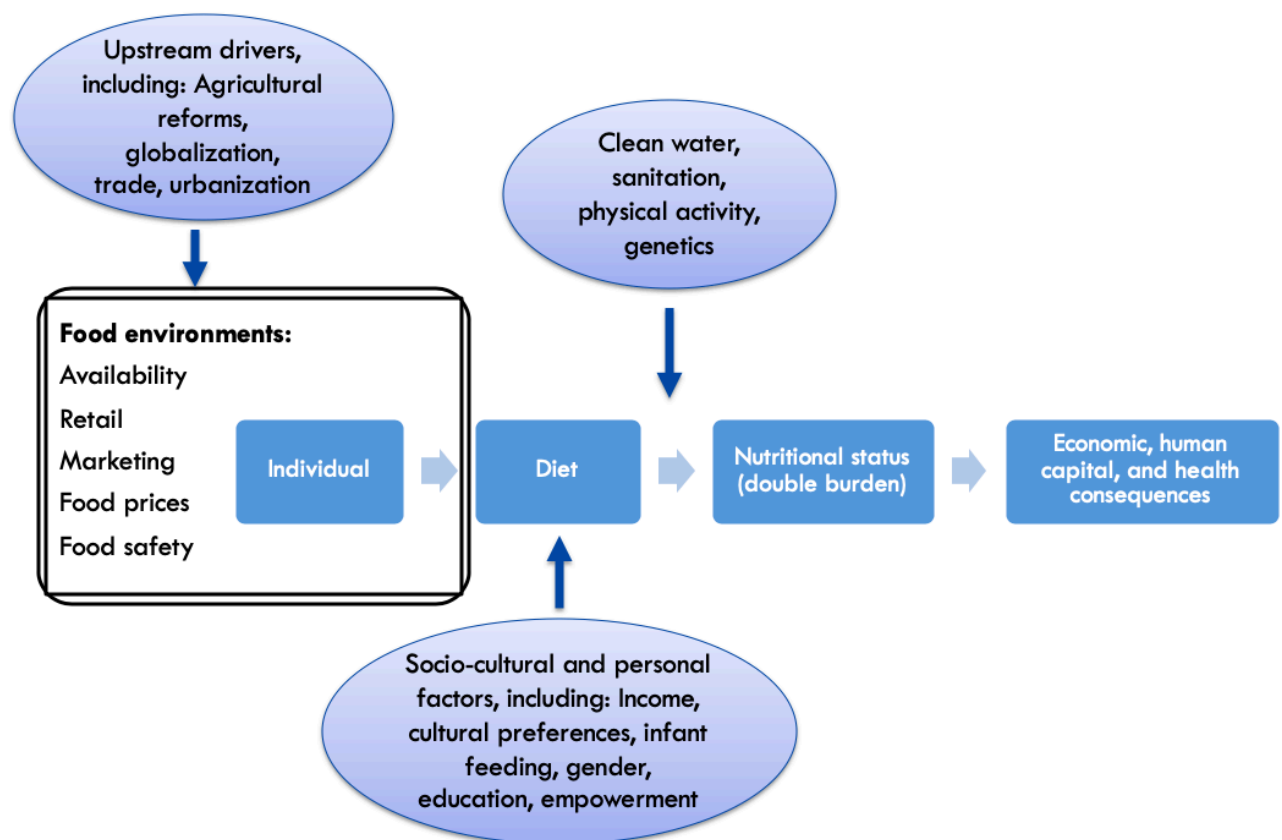
The influences on diets are complex, and include person-level considerations such as income, taste, preference, and culture (Figure 1). They also include external, or “food environment” influences, including prices, marketing, retail availability, and food safety, with major influences on these identified as trade and urbanization. Nutritional status is also affected by factors other than diet, including access to clean water, sanitation, and infant feeding; and obesity is affected by physical activity. However, in this paper we will focus on diets, food environments, and nutrition: “Eating in Developing Asia”.

In this background paper, we review changing diets, food supply, and food environments in the Asia and Pacific region. We then describe the prevalence and nature of undernutrition across the region, including anthropometric measures of undernutrition such as stunting, wasting and underweight,

“hidden hunger” resulting from micronutrient deficiencies, and dietary caloric deficiencies relating to food security. We also examine the rising prevalence of diet-related risks for NCDs (sometimes called “overnutrition”), such as dietary patterns high in salt, fat, and sugar; and low in health-protective foods, such as fruits and vegetables, and anthropometric measures of overweight and obesity. The range of forms that malnutrition takes is often referred to as the “double burden of malnutrition” (the term we will use throughout this paper) or the “triple burden of malnutrition”, in order to emphasize the diversity encompassed within the concept of nutrition.

We conclude by examining the policy response to the DBM in the Asia and Pacific region and identifying opportunities to strengthen action. Nutrition features in six of the United Nations Sustainable Development Goals and is important for the achievement of at least 12 (United Nations 2015 and Development Initiatives 2017), including those related to economic growth, education, and health. Governments across Asia and the Pacific have committed to addressing the DBM (Association of Southeast Asian Nations [ASEAN] 2017 and Dodd et al. 2020). There is widespread recognition that it is essential to have multisectoral policy approaches that address both the consumer side (such as nutrition education, food skills, and access to healthy food) and the supply side in ways that create food environments that support availability, convenience, attractiveness, and affordability of healthy foods.

Figure 1: Overview of Diets and Other Factors as Influences on the Double Burden of Malnutrition



Source: Authors' analysis.

II. TRENDS IN DIETS AND DIETARY PATTERNS

Changing dietary patterns have been observed across Asia and the Pacific. Food availability has increased, with concomitant reductions in food insecurity. However, dietary changes have also been associated with the “nutrition transition”, in which traditional diets are replaced by higher-energy diets with increased dietary risk factors for diet-related NCDs.

Per capita calorie availability has risen across the region in the past 40 years. Among the 34 developing member countries of the Asian Development Bank (ADB) for which food balance sheet data¹ are available, the supply of calories now exceeds 2,500 calories per capita per day (cal/cap/day) in all countries other than Cambodia, Timor-Leste, the Maldives, Solomon Islands, Mongolia, Afghanistan, Tajikistan, and Pakistan (Figure 2). In Central and West Asia, which in 2000 had relatively low calorie availability of 2,000–2,500 per capita, calorie availability increased overall by 17%, including by more than 25% in Armenia, Azerbaijan, and Uzbekistan. However, in Afghanistan, calorie availability remains very low, at only 2,000 cal/cap/day, which is insufficient for adequate population nutrition. In East Asia, calorie availability was over 2,500 cal/cap/day for all countries except Mongolia (which remains at less than 2,500 cal/cap/day in 2017), and the region has seen smaller increases, including a small decline in Taipei, China (Figure 2). Studies have also indicated high calorie availability in the region, including among children, whereby a 2009 analysis in the People’s Republic of China (PRC) found that approximately 30% of all children had energy intakes above requirements (Piernas et al. 2016). Calorie availability has remained fairly constant in the Pacific; between 2,500 and 3,100 cal/cap/day for Fiji, Samoa, Vanuatu, and Kiribati, but much lower for Solomon Islands. South Asia is the region with the lowest availability of calories, and has seen limited increases overall, other than in Nepal (Figure 2). Southeast Asia has seen a substantial increase in calorie availability since 2000, with a regional increase of over 20%. In particular, Viet Nam, Myanmar, and the Lao People’s Democratic Republic (Lao PDR) all had relatively low calorie availability in 2000 (Figure 2).

The predominant staples in the region are rice and wheat, except in the Pacific islands where starchy root crops remain significant (Figure 2). Diets have diversified away from staples in many countries, which reflects rising affluence and urbanization across the region (Timmer 2014). For example, in the PRC, diet quality improved between 1991 and 2011 in all sociodemographic groups (Wang et al. 2017b), including for children (Cheng et al. 2016), and the contribution of staple foods to calorie intake declined by 10 percentage points (Figure 2). Since 2000, countries in Central and West Asia and Southeast Asia have seen the greatest diversification away from staple foods. In 2017, less than half of available calories came from staple foods in East Asia, most Pacific island countries, Pakistan, Kyrgyz Republic, Georgia, Armenia, Kazakhstan, Maldives, Timor-Leste, Myanmar, Thailand, and Malaysia (Figure 2). Although rice consumption has declined, the region is still responsible for most of the world’s rice consumption; the PRC, India, and Indonesia alone account for 60% of consumption, and the Philippines and Viet Nam are also large rice consumers (Timmer 2014). In Bangladesh, which is also a major rice producer, rice contributes 70% to daily caloric intake (Timmer 2014). The most marked shift away from traditional diets has been seen in the Pacific. Since the 1960s, starchy root crop availability has declined considerably in the Pacific island countries for which data are available (Thow and Snowdon 2010). Since

¹ Food availability data provides an indication of the food supply, although it may underestimate the availability of processed (particularly imported processed) foods, which contributes significantly to fat, salt, and sugar intakes. It is also likely to be higher than actual consumption, because of losses and wastage at the point of consumption. Generally, food balance sheets are constructed for primary crops, livestock, and fish commodities up to the first stage of processing in the case of crops and to the second (and sometimes the third) stage of processing in the case of livestock and fish products.
<http://www.fao.org/economic/ess/fbs/ess-fbs02/en/> (accessed 6 April 2020).

2000, rice and/or wheat has comprised the majority of staples consumed (Figure 2). Across the region consumption of highly polished rice and refined wheat flour is becoming increasingly the norm (Awika 2011 and Rohman et al. 2014), with consumption of fiber declining.

Diversification has included the increasing consumption of animal source foods, including meat consumption, particularly poultry and pork, which has risen across the region (Milford et al. 2019 and Jakobsen and Hansen 2020). For half of the countries in the region, animal-source foods (namely meat, eggs, dairy, and fish) provided more than 15% of available calories in 2017. In Kazakhstan, Mongolia, and the PRC, these foods provided more than a quarter of available calories (Figure 2). Since 2000, increases in animal source food availability have mainly been in line with increases in per capita calorie availability; other than in Armenia, Myanmar, and Viet Nam, where the contribution to calorie intake has increased by about 10 percentage points to contribute about 20% to total calorie intakes (Figure 2). This is also reflected in dietary surveys among various population groups; for example, children in the PRC have been found to consume excessive amounts of meat (Cheng et al. 2016).

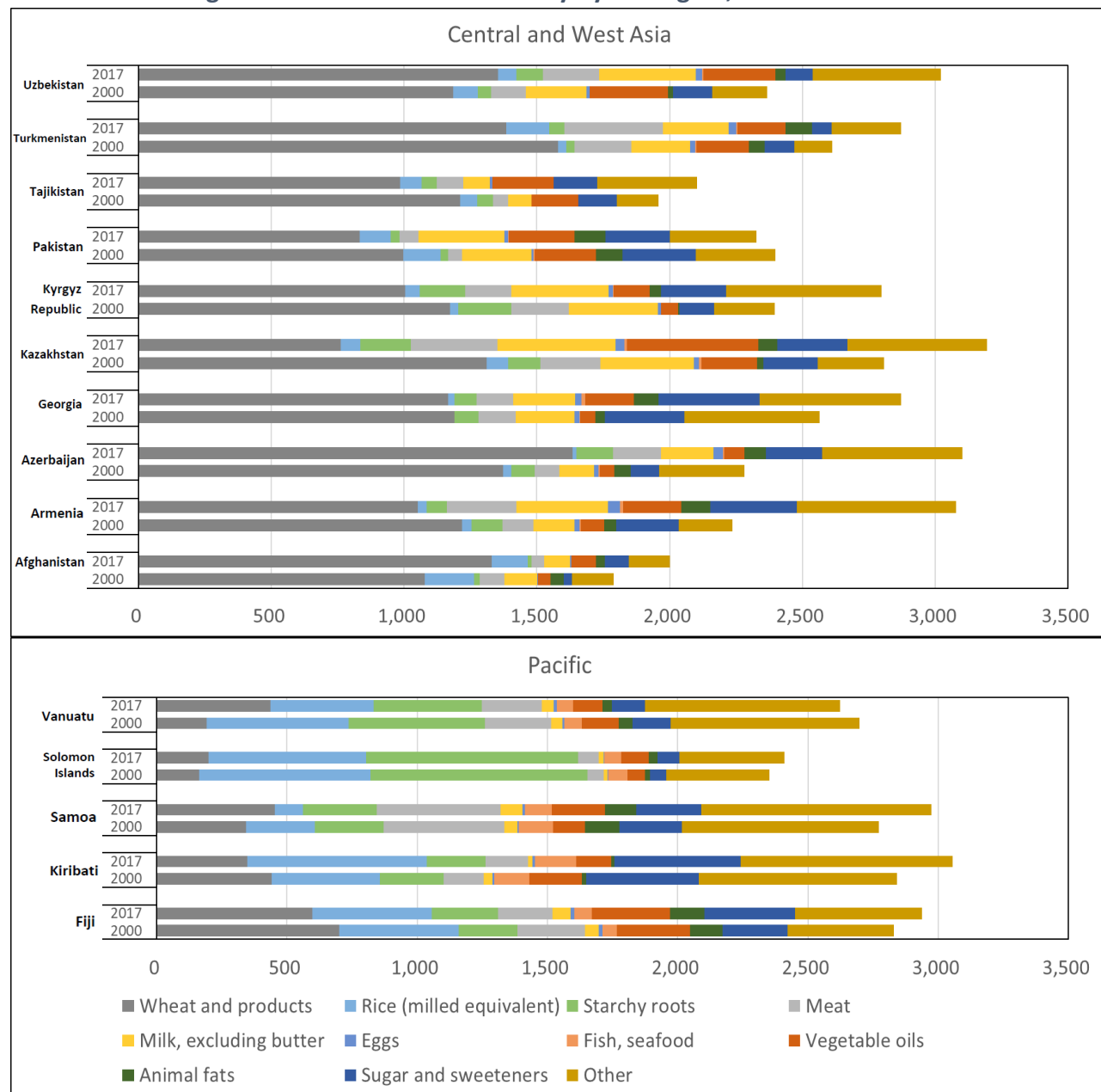
With this diversification has come increased availability of animal and vegetable fats, which contribute over 15% of available calories in Pakistan; Kazakhstan; Taipei, China; the Republic of Korea (ROK); Fiji; and Malaysia (Figure 2). Consumption of foods cooked in fats and oils has increased across the region, particularly in South Asia where consumption of partially hydrogenated vegetable oils containing trans fats (e.g., vanaspati) is common, and is a significant health concern because of its association with heart disease (Hills et al. 2018). Sales of vegetable oils (i.e., palm, coconut, and blended vegetable oil) are rapidly increasing in the Pacific, becoming the primary source of fat (Sievert et al. 2019a), as well as in Asia (Baker and Friel 2016), with Malaysia being a country of particular concern (Baker and Friel 2016).

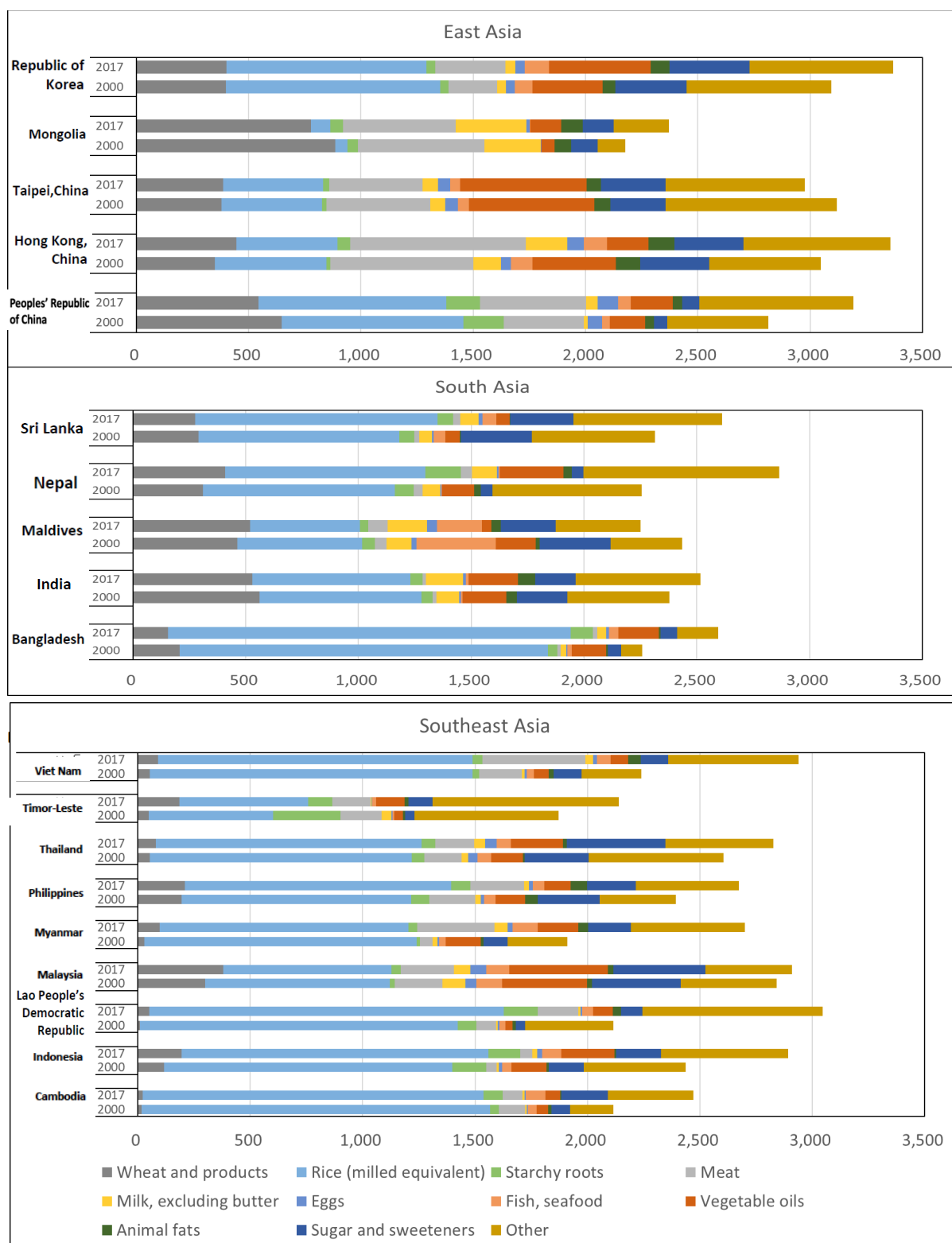
Consumption of sugar has also risen across the region, particularly in South Asia, Southeast Asia, and the Pacific (Lipoeto et al. 2013, Hills et al. 2018, and Santos et al. 2019). Diets high in sugar are also associated with an increased risk of dental caries, which is also creating a significant health burden across the region (Almoudi et al. 2019). Since 2000, sugar intakes have risen in all countries, mainly in line with overall increases in calorie intakes, although a notable increase of 4% in the contribution of sugar to calorie intake occurred in Thailand, Cambodia, and Fiji (Figure 2). For a third of countries with food balance sheet data, the contribution of sugar to calorie availability in 2017 was 10% or above (Figure 2), which exceeds the recommended limit for consumption set by the WHO (WHO 2015b). In the case of sugar, the available data may be an underestimate of consumption because of the difficulty of accounting for imported processed foods in food balance sheet data noted above.

Consumption of processed and fast food, particularly foods high in salt, fat, and sugar, has increased across the region. The Global Burden of Disease study in 2017 found consumption of sodium and sugar-sweetened beverages were higher than the optimal level in Asia and the Pacific (Afshin et al. 2019). Euromonitor data indicates that processed food sales have increased rapidly throughout the Asia and Pacific region, particularly in middle-income countries. Major types of processed foods consumed in Asia include instant noodles, soft drinks (particularly in Thailand and Philippines), and oils and fats (particularly in Malaysia) (Baker and Friel 2016). Increases in total beverage sales in the region have been driven mainly by carbonated soft drinks and juice (Baker and Friel 2016 and Sievert et al. 2019a). For example, juice sales in Tuvalu increased by 73% between 2004 and 2018 (Sievert et al. 2019a). In the Pacific, processed food sales in Kiribati, Papua New Guinea, Solomon Islands, and Vanuatu increased by over 40% between 2004 and 2018 (Sievert et al. 2019a). The most common processed foods in the Pacific were baked goods, followed by edible oils; sauces, dressings, and condiments; processed meat (Sievert et al. 2019a). Similar patterns are seen in Asia. In urban Indonesia, between 1998 and 2013, consumption of pre-prepared food and beverages doubled from 13% to 31%, while expenditure on

staples (mainly rice), fish, meat, eggs, and milk declined and expenditure on oils and fats, vegetables, legumes, and fruits remained stable (Jaffee et al. 2019).

Figure 2: Total Calorie Availability by Subregion, 2000 and 2017



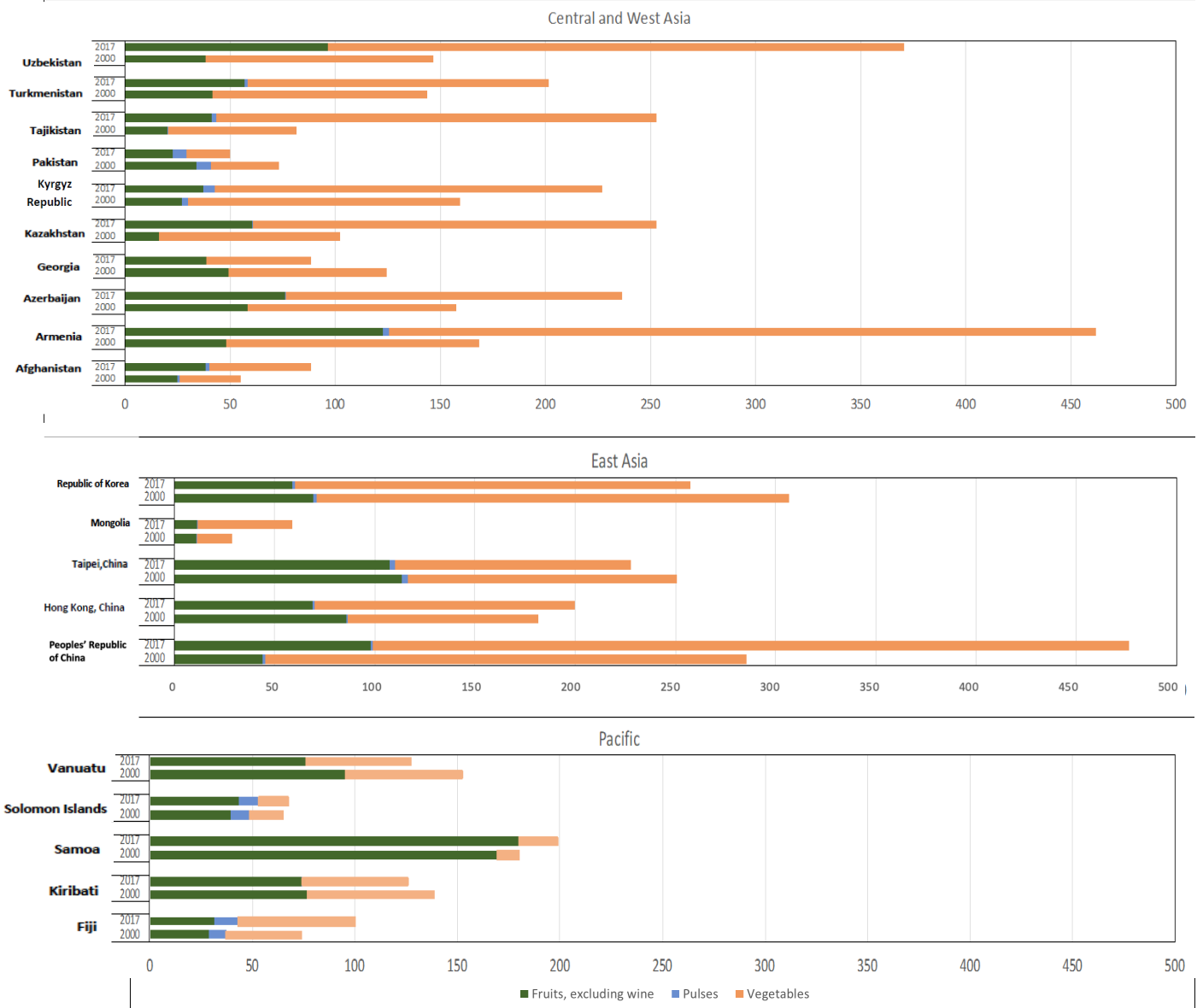


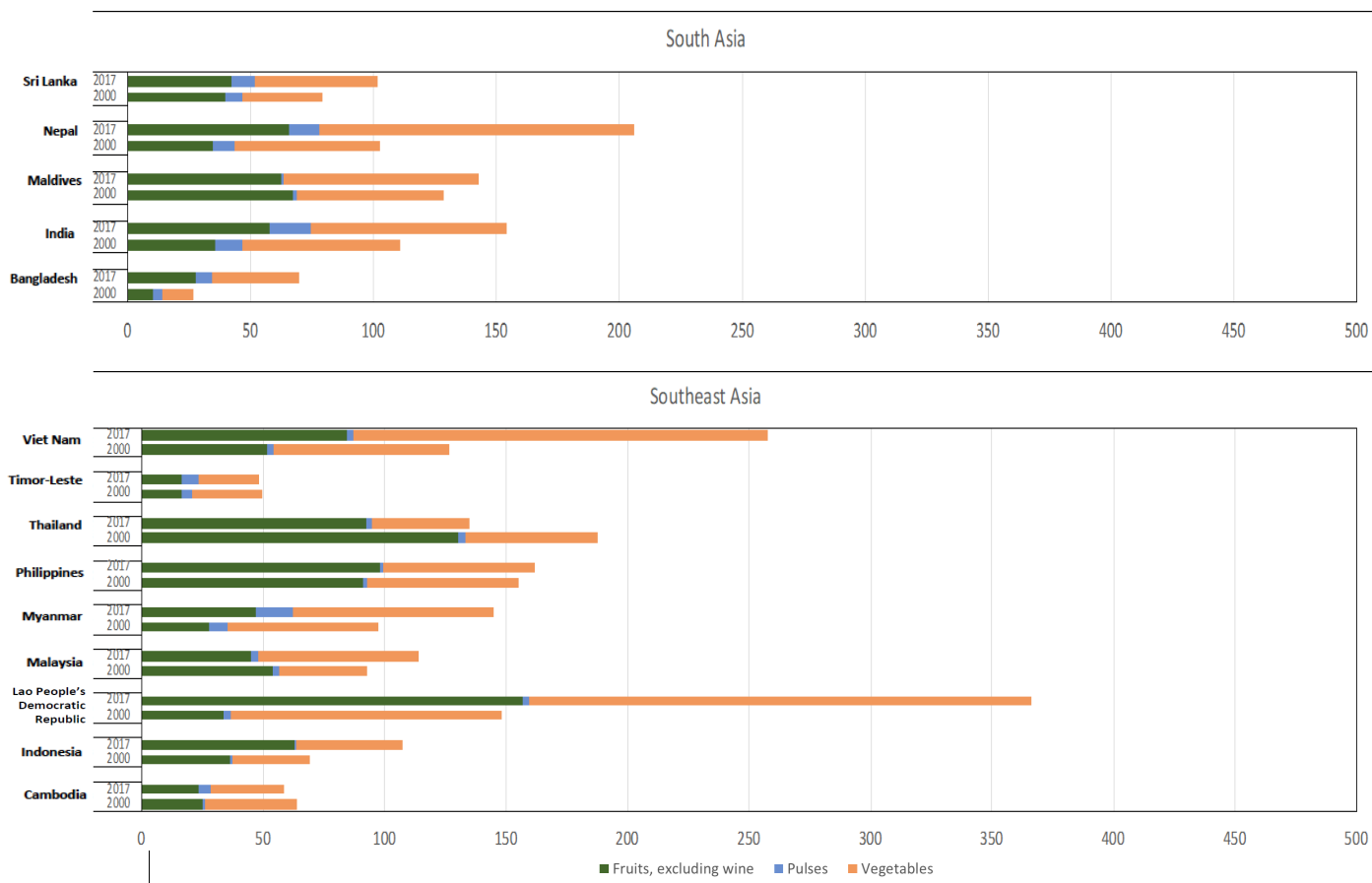
Source: Food and Agriculture Organization of the United Nations. FAOSTAT data. <http://www.fao.org/faostat/en/#data/>. (accessed 10 March 2020).

Note: Countries are those in the region for which 2017 FAO Food Balance Sheet Data are available.

The Global Burden of Disease (GBD) study in 2017 found low intake of all types of healthy food in all 21 GBD regions. However, two exceptions were high vegetable intakes in Central Asia and legumes in South Asia (Afshin et al. 2019). There are limited analyses available, but estimates from the GBD study in 2000 suggest that intakes have been inadequate over the long-term; mean consumption of fruit and vegetables in all subregions in the Asia and Pacific region were below recommended intakes (Lock et al. 2005). Food availability data show that availability of fruit, vegetable, and pulses vary widely, but availability is particularly high in Central and West Asia, and East Asia (Figure 3). Since 2000, availability has increased for all countries except Pakistan; Georgia; Taipei, China; Timor-Leste; and Cambodia. There are geographical and agricultural differences evident in the data; for example, rising agricultural productivity in Armenia, Uzbekistan, the PRC, Viet Nam, and Nepal during this period. The WHO recommends consumption of at least 400 grams of fruit and vegetables (including legumes) per day. Notably, for countries with food balance sheet data available, there is insufficient availability in all but the PRC and Armenia (Figure 3). In Cambodia, Timor-Leste, Bangladesh, Solomon Islands, Mongolia, Afghanistan, Georgia, and Pakistan, availability is below 100 grams per capita per day. This low availability is supported by evidence that shows insufficient consumption across the region (Aryal et al. 2015). In the PRC, 60% of children in a 2009 survey consumed inadequate amounts of fruits and vegetables according to the Chinese Dietary Guidelines (Cheng et al. 2016). Fruit and vegetable consumption has also been reported as low in adolescents in Southeast Asia, with insufficient consumption (less than five serves per day) reported by 85% of adolescents in India, 75% in Indonesia, 83% in Myanmar, 77% in Sri Lanka, 67% in Thailand, and over 95% in Nepal (Peltzer and Pengpid 2012 and Dhungana et al. 2019).

Figure 3: Fruit, Vegetable, and Pulse Availability, by Subregion, 2000 and 2017





Countries are those in the region for which 2017 FAO Food Balance Sheet Data are available.

Source: Food and Agriculture Organization of the United Nations. FAOSTAT data <http://www.fao.org/faostat/en/#data/> (accessed 10 March 2020).

A. Inequalities in Dietary Consumption

Inequalities in dietary consumption have been found across the region, in part because of inequalities in access to nutritious foods at the household and community levels. The major determinants of access include gender, socioeconomic status, geography, land ownership, and cultural factors.

Women and girls can face barriers to access nourishing food and increased food insecurity, particularly in South Asia and Central Asia (FAO 2019a and FAO et al. 2019d). Recent reviews have found that adolescent girls in South Asia are less likely to consume nutritious food than boys (Aguayo and Paintal 2017 and Aurino 2017). For example, only 20%–40% of South Asian adolescent girls met the recommended dietary intake and had low protein intakes (Aguayo and Paintal 2017). Gendered inequality in household food distribution can be mediated by socioeconomic status, education, culture, and ethnicity. In South Asia, the highest inequity was found to occur in households experiencing severe or unexpected food insecurity, and also in wealthier, high caste households as a result of male preference; in contrast, poorer low caste households were more equitable (Harris-Fry et al. 2017). In Indonesia, gendered dietary diversity was influenced more by ethnicity than socioeconomic status because of food culture (Kunto and Bras 2019). For example, Batak children from households of lower socioeconomic status consumed fruits and dairy products less often than children from Minangkabau

households, but consumed more animal source foods, which were more expensive but culturally preferable, and had lower dietary diversity overall (Kunto and Bras 2019).

Socioeconomic status has a major influence on dietary intakes, with low socioeconomic households across the region experiencing higher levels of food insecurity and reduced access to nutritious foods (FAO 2019a and FAO et al. 2019d). Reviews from South Asia and Central Asia find that indicators of poor dietary intake and undernutrition are much higher among low-income households (Torlesse and Aguayo 2018 and FAO 2019a). Recent analyses in Cambodia, Myanmar, Indonesia, and the PRC find that dietary diversity and nutrient intakes are lower in children in poor households in both urban and rural areas, but particularly in rural areas (Wang et al. 2017a and Harvey et al. 2018). This reflects findings from LMICs broadly, which suggest that socioeconomic status is positively associated with consumption of nutritious foods such as fruit, vegetables, fiber, and fish, but also with increased consumption of processed foods high in salt, fat, and sugar (Allen et al. 2017). However, food insecurity can also coexist with obesity in environments where calorie-dense processed foods are inexpensive (Farrell et al. 2017). Recent research from Samoa showed that those with higher incomes consumed more high-sugar food, fried food, and high-sugar beverages than those in lower-income groups (Farrell et al. 2019).

The wellbeing and education of women is also positively associated with dietary diversity and intakes. Maternal nutritional status and education are associated with increased household dietary diversity and nutrient intakes across the region (Wang et al. 2017a, Harvey et al. 2018, Sraboni and Quisumbing 2018, and Torlesse and Aguayo 2018). A study in Bangladesh also found that women's empowerment (measured by using the Women's Empowerment in Agriculture Index) was associated with measures of dietary quality improvement in children, adolescents, and adults in the household (Sraboni and Quisumbing 2018).

Another contributor to differences in dietary intakes is urbanization, which is also discussed in more detail below. Consumption of processed foods high in salt, fat, and sugar is consistently greater in urban areas throughout the region (Reardon et al. 2015, FAO et al. 2019d, FAO 2019a, and d'Amour et al. 2020). However, processed food consumption is also rising in many rural populations in the region. For example, analysis of household Living Standard Measurement Survey (LSMS) data (between 2007-2010/11) shows that highly processed food consumption comprised 22% of total processed food consumption in rural areas in Bangladesh (compared to 26% in urban), 36% in Indonesia (compared to 47%), 37% in Nepal (compared to 58%) and 29% in Viet Nam (compared with 39%) (Reardon et al. 2014). In addition, research from Nepal highlights geographical aspects of food access, with households in a mountainous region experiencing high rates of food insecurity and poor diets (54% of the households were food insecure, and over half of the mothers had low dietary diversity). In this context, improved food security was associated with owning cultivable land (Singh et al. 2020).

B. Young Child Feeding

A critical time period for maintaining good nutrition is the introduction of food for infants and young children up to 3 years of age, known as complementary feeding (as it is recommended that it coexist with breastfeeding). Complementary feeding has been a long-term concern in the Asia and Pacific region, where rice-based weaning foods are heavily relied upon, which has contributed to low dietary diversity in many countries (Inoue and Binns 2014 and Aguayo 2017). Consumption of diverse energy- and nutrient-dense foods is important for young children to obtain all the nutrients necessary for adequate nutrition. The proportion of young children who meet minimum dietary diversity varies widely across the region. For example, research by the South Asian Infant Feeding Research Network in 2010 found that only 15% of children under 2 years in India were meeting the minimum dietary diversity

requirements in India, about 40% in Bangladesh and Nepal (Senarath and Dibley 2012). Determinants of low dietary diversity across all countries were a lack of maternal education and lower household wealth (Senarath and Dibley 2012).

At the same time, dietary changes associated with the nutrition transition are also being observed in very young children. A study conducted in Nepal and Cambodia found that over 70% of 6–23-month-olds in Kathmandu Valley, and 55.0% in Phnom Penh, had consumed a commercially produced snack food in the previous day, rising to over 90% in Kathmandu Valley and over 80% in Phnom Penh when asked about the previous week (Pries et al. 2017). Over 30% of 6–23-month-olds in Phnom Penh and of 15% in Kathmandu Valley had consumed commercially produced sugar-sweetened beverages (Pries et al. 2017). Similarly, in urban slum areas in Indonesia and India, consumption of ready-to-eat foods and snack foods (including sweet biscuits) among young children has been reported as common, in addition to healthy foods such as cereals, fish, and milk (Thow et al. 2016 and Martha et al. 2017).

III. FOOD ENVIRONMENTS AND DRIVERS OF DIETARY CHANGE

The food environment reflects external influences—such as prices, retail availability, marketing, and food safety, with major influences on these including trade and urbanization—that interact with person-level determinants of diet, such as income, taste, preference, and culture (Turner et al. 2018). Food environments describe the context in which people make decisions about what they eat, where and when, and are an important factor to consider in seeking to promote good nutrition. For example, the school food environment is critical for promoting good nutrition in the early years of habit formation. In this section, we examine key indicators of the food environment in the Asia and Pacific region, and the influence of major drivers (urbanization and trade) on food environments.

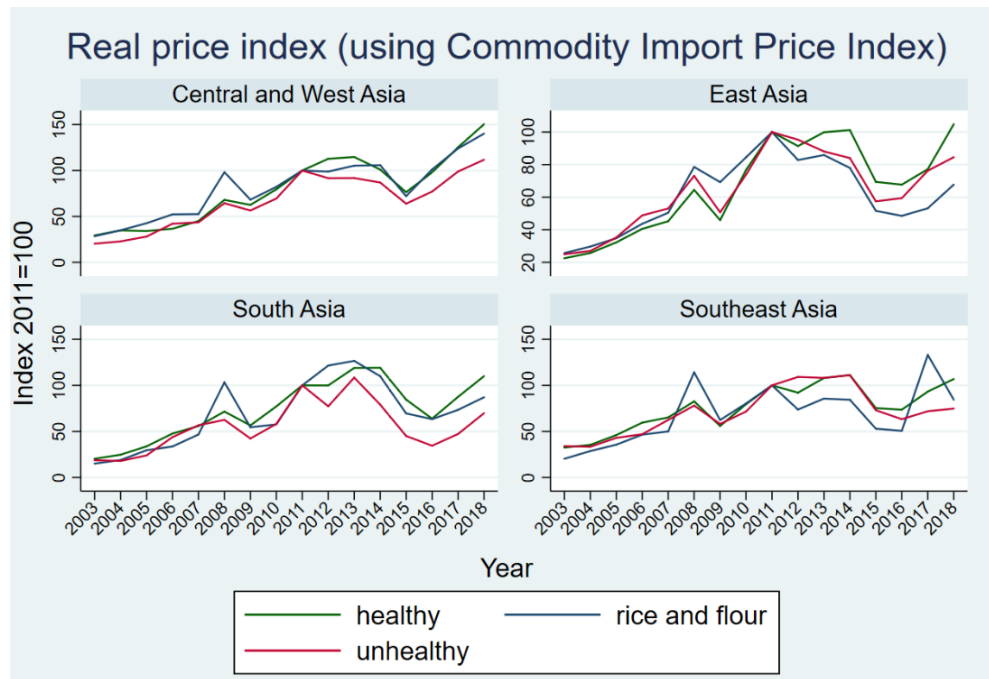
A. Price Trends

The price of food in the Asia and Pacific region is intimately linked to food security and nutrition, particularly for low-income populations in the region (ADB 2011 and FAO 2018a). Food is a major contributor to the consumer price index, and comprises a significant component of expenditure for poor households (Dizon and Herforth 2018). ADB has estimated that a 10% rise in domestic food prices in developing Asia result in a 1.9 percentage point increase in poverty incidence, translating to an additional 64.4 million people living below the \$1.25-a-day poverty line (ADB 2011). In low-income countries, stable prices for staple foods benefit not only consumers but also farmers, through reducing risk and stabilizing livelihoods (Dawe and Timmer 2012). Economic crises can have a significant impact on food security and nutrition through their dual impacts on food prices and on incomes. One of the significant impacts of the food price spikes during the 2007–2008 global financial crisis was increased food insecurity and, in many countries, prices did not return to their pre-crisis level. There is some evidence that children’s nutrition suffered as a result of these price increases, particularly among girls and those living in households on low incomes (Brinkman et al. 2009 and Overseas Development Institute 2014). Earlier, the 1997–1998 Asian financial crisis similarly affected nutrition through sharp increases in food prices and reduced investments in poverty reduction and nutrition programs (FAO et al 2019d).

Although the prices of rice and wheat have risen since 2010 in the region, the inflation-adjusted prices have remained fairly constant over this time, indicating minimal real price increases (FAO 2016). However, it is important to note that price and market shocks often have a greater impact on urban households than on rural households in the region because urban households rely more on the market for food and other services (FAO 2018a).

Import prices of indicator foods have increased steadily across the region since 2003, with a spike observed around 2011–2013 (Figure 4). The fastest rise in food prices was observed in Central and West Asia, whereas prices in the other subregions only recovered from the subsequent downfall towards the end of the period. In Central and West Asia and South Asia the three food groups followed a similar upward price trend. However, since 2011, the price difference between unhealthy foods and the other two food groups has become larger. Imported fruits and vegetables seem particularly expensive in recent years (Figure 4).

Figure 4: Price Trends of Indicator Foods
(indexed to year 2011 = 100)



Notes:

1. Indicator foods defined according to Friel (2013). Healthy foods include fresh fruits and vegetables, including staple root crops, pulses, nuts, seeds, and staple whole-grain cereal. Unhealthy foods include fatty meat, energy dense beverages, savory ready-to-eat snacks and meals, sweet snacks, sugars, and other caloric sweeteners.
2. Graphs by Asian Development Bank regions.

Sources: United Nations COMTRADE database (accessed 20 March 2020); authors calculations

One challenge for nutrition is that the cost of nutritious food is often high. As our analysis of trade data shows, the price of unhealthy food has risen more slowly than healthier foods, particularly in Central Asia and South Asia (Figure 4). In Southeast Asia, the indicator unhealthy foods were most expensive in relative terms at the beginning of the period, but at the end of the period they were the cheapest food. Cross-country analysis suggests that the falling price of less-healthy processed foods may be because of increasing production and efficiencies in the manufacture of processed foods within the region, reducing manufacturing and transport costs (Baker and Friel 2016). These observations are supported by in-country research. For example, in low-income housing in Kuala Lumpur with high rates of malnutrition (22% of children under 5 stunted; 23% overweight or obese), caregivers reported that high food prices were a primary barrier to preparing healthy meals for their children (FAO 2018a). In India, relative food prices of food items, namely cereals and vegetables, were found to be significantly associated with the risk of being underweight and overweight/obese (Kulkarni et al. 2017). A recent World Bank analysis found that the nutritious food price index increases faster than the consumer price index, and that this can be exacerbated during lean or “hungry” seasons (Dizon and Herforth 2018). Historical analyses suggest that, as the cost of staple food in the region declined following the green revolution, some populations experienced decreased dietary diversity as production of traditional crops, leafy vegetables, and fish declined, and they became relatively more expensive (Glover and Poole 2019).

B. Food Safety

In 2019, the emergence of a novel coronavirus in a wet market in the PRC has drawn global attention to potential human risks associated with food safety and informal food markets. There is widespread recognition of an increased risk of infectious human diseases originating from animals as a result of expanding human habitation and climate change; 60%–70% of newly emerged diseases have come from animals (FAO Regional Office for Asia and the Pacific 2014). Food safety principles of water, sanitation, and hygiene are key underlying drivers of nutrition and are pivotal to reversing malnutrition (FAO 2018a).

With urbanization and rising affluence, government and consumer attention to food safety issues is increasing in the region (Ortega and Tschirley 2017). Supply chains to urban areas are often longer, with more opportunities for contamination during transportation, storage, and retail (FAO 2018a). For example, in Viet Nam, urban consumers are increasingly aware of food safety issues. As incomes rise, food continues to be obtained in diverse ways, but increasingly from formal food outlets (such as supermarkets) because of their association with higher food safety standards (Wertheim-Heck and Spaargaren 2016). Most Asia and Pacific countries are members of the Codex Alimentarius Commission (the United Nations body that develops food safety standards) and have developed national food safety standards. For example, India's Food Safety and Standards Act 2006 and the Food Safety Act 2013 of the Philippines. Adoption of food standards has also been encouraged by increasing trade; the World Trade Organization Agreement on Sanitary and Phytosanitary Measures references the Codex Alimentarius. The requirements placed on meeting food safety standards in a trade context mean that countries have increased their focus on food safety throughout the supply chain, especially those destined for export (Kathuria 2018). Many Asian countries food safety standards have been adopted and adapted from private standards used in high-income countries as a means to facilitate trade (Michida and Nabeshima 2017). A recent analysis in Malaysia found that the food sector, particularly that relevant to international trade, was highly regulated with respect to sanitary and phytosanitary (Devadason and Govindaraju 2016).

However, the burden of food-borne disease in Asia and the Pacific remains high. Despite rising awareness among consumers and adoption of food safety standards by governments, capacity for enforcement remains low in many countries (Ortega and Tschirley 2017 and WHO 2018). Together with Sub-Saharan Africa, Asia has the highest incidence of food-borne disease and resultant deaths, leading to productivity loss estimated at US\$63.1 billion (Jaffee et al. 2019). Food-borne disease in Asia are primarily because of microbial hazards during food preparation and food storage (Jaffee et al. 2019). Primary sources include animal products, fruit, and vegetables, including fish in some parts of Asia (for example, raw or partially cooked fish is common in Southeast Asia and the PRC) (Jaffee et al. 2019). Lack of proper storage facilities are common in the region, including cold storage and during food transport (Prabhakar et al. 2010). Improper storage can also result in aflatoxins in staple food crops, when high moisture is present during harvest, and when drying and storage of crops are inadequate. This is particularly common in South Asia and Southeast Asia (Jaffee et al. 2019). Another source of concern is the informal food retail sector, particularly wet markets, where hygiene and waste disposal can be challenging (FAO 2018a).

C. Urbanization

Over half the global population now lives in cities and this is expected to reach two-thirds by 2050, with the majority of the increase in LMICs (Graziano da Silva and Fan 2017 and Makombe et al. 2017). Asia has the highest rate of urbanization in the world, and India and the PRC alone are estimated to account for 28% of the world's urban population growth by 2050 (United Nations Department of Economic and Social Affairs [UN DESA] 2019). Urban food environments in the region have several prominent features, which have both strengths and limitations from a nutritional point of view. These include a diverse food market; high availability of processed foods high in fat, salt, and sugar; and an abundance of pre-prepared food (both healthy and unhealthy) to be purchased outside of the home. The Marshall Islands provides a good example of some of the benefits and detriments typical of urban environments: urban children compared with rural children have been shown to have more diverse diets, but they also consume more foods and beverages high in sugar, and foods high in fat (FAO 2018a). Also, it is important to note that there is a lot of variation between different urban environments (Law et al. 2019 and d'Amour et al. 2020), and they are also rapidly changing over time. For instance, 85% of Thailand's urban population had access to supermarkets in 2014, almost doubling the percentage over the preceding decade (Kelly et al. 2014 and Hawkes et al. 2017).

The urban poor are especially vulnerable to challenges in consuming a nutritious diet because of lack of access to cash to purchase adequate food. Those engaged in the informal job market are especially vulnerable. There are 189 million people living in urban poverty in developing Asia, which accounts for 69% of the developing world's total urban poor (Mathur 2013). In urban Pakistan, it is estimated that two-thirds of the population cannot afford a nutritious diet (FAO 2018a). Sixty-five million of the urban poor are in India (Ezeh et al. 2017), where food insecurity in slums is very high and has been reported to be over three-quarters in slums in northern India (Ezeh et al. 2017). Extremely poor urban households spend more than half of their household budgets on food, with those in Tajikistan spending 74% (Ruel et al. 2017). Recent research from Nepal has shown diet quality to be very low among slum dwellers with over 90% consuming less than 5 servings of fruit and vegetables per day (Oli et al. 2013). The urban poor are also less likely to have access to safety nets like food allowances because of a lack of official documentation and a permanent address; for instance, in India, over one-third of households living in slums are in non-notified areas. In the PRC, it is common for rural to urban migrants to live without permits in urban areas, meaning they are not granted access to public services (FAO 2018a). Overpopulated and unhygienic living conditions often mean that there is insufficient space to store or prepare food safely (FAO 2018a).

In urban areas, a diverse range of places to acquire food is on offer. These include supermarkets, open market vendors, informal street vendors, and restaurants (Liu et al. 2015, Ruel et al. 2017, and FAO 2018a). However, income affects where and how food is sourced. Those with very low incomes tend to acquire food from smaller retail spaces such as local shops, and often source food from fairs, street vendors, and hawkers, which are usually part of the informal food market. Wet markets selling fresh food are a vital food source. For example, in Thailand, shopping in fresh markets is associated with increased vegetable consumption (Kelly et al. 2014 and Hawkes et al. 2017). However the urban poor often need to travel long distances, incurring additional expenses, to overcrowded retail markets or street stalls where hygiene, drainage, clean water, and waste disposal are often insufficient. For those on low incomes, commuting to acquire food accounts for up to one-third of household food expenditure (Seidler 2001). In contrast, consumers with middle or high incomes often shop at modern supermarkets, which tend to be conveniently located and offer a diverse range of foods. Often these stores offer foods in bulk for a lower price than smaller stores, and those with suitable transportation can access this source of affordable food (Seidler 2001). Those on higher incomes also purchase a significant amount of

pre-prepared foods such as from convenience stores, restaurants, and street vendors (Graziano da Silva and Fan 2017).

In terms of type of food retail space, supermarkets deserve special mention as the growth of the grocery retail sector, or “supermarketization”, is a key driver of ongoing food system change in developing countries in the region (Reardon et al. 2012). Supermarkets offer positives and negatives for healthy eating. On the positive side, they offer a diverse range of nutritious foods and food safety standards are generally good, so they have potential to contribute to healthy diets. On the negative side, they are also a strong contributor to selling unhealthy foods, including those high in sugar and fat, which are often highly processed. The nutritional implications for consumers depend on relative pricing of healthy and unhealthy foods, marketing strategies, the range of foods sold, the location of the outlet, and the marketing and promotional strategies adopted by the store (Hawkes 2008 and Baker and Friel 2016).

Urban diets tend to contain more calorie-dense, processed, low-nutrient foods which are often high in salt, fat, and sugar as these foods are easily accessed and are convenient and affordable (Liu et al. 2015, Hawkes et al. 2017, Ruel et al. 2017, FAO 2018a, and Graziano da Silva and Máximo 2019). Also, urban populations have a high level of exposure to food marketing. Households in cities tend to have higher television ownership and environmental advertising such as billboards, and therefore view more commercials advertising sugary snacks, sugary drinks (Hawkes et al. 2017 and FAO 2018a). For those with higher incomes, employment circumstances often mean working hours are spent away from the home, so urban households tend to seek pre-prepared foods from sources including convenience stores and street vendors (Graziano da Silva and Fan 2017 and d’Amour et al. 2020). In the PRC, urbanization has been shown to contribute significantly to consumption of food away from the home (Liu et al. 2015). Similarly, recent research from India shows that expenditure on processed foods and consumption of food away from the home were higher in urban and metropolitan areas than in rural areas, in all income groups except for those in the lowest income group (d’Amour et al. 2020), which may also reflect higher female participation in out-of-home labor. Such dietary patterns may increase the risk of overweight and obesity. For example, in the Lao PDR recent analysis of the national STEPwise approach to NCD risk factor surveillance database showed that urban residence and having meals outside the home were each independently associated with overweight and obesity (Pengpid et al. 2018).

D. Schools

The school food environment consists of all the areas and places where food is acquired (including canteens, kiosks, informal food vendors, and vending machines) and consumed in schools and their immediate environment. It also takes into account the nutritional content of foods sourced from the school environment. The school food environment also encompasses all food promotion and consumer information made available, such as marketing and promotions, food labelling, and food pricing (FAO 2019b and 2020 and da Costa et al. 2020). School food environments provide a critical opportunity to teach and foster healthy food consumption behaviors for students, for advancing nutrition and sustainable development, and for interaction with the broader community. They also provide an opportunity to provide nutritious food and clean drinking water to students (Reeve et al. 2018 and FAO 2019b).

Evidence from several countries in Asia shows high availability and accessibility of unhealthy foods in school canteens and that school communities (school teaching and leadership staff, parents, and students) have limited awareness about healthy food environments (Sharma et al. 2019). A 2016 in-depth study on school food environments in the Philippines, which included government policy makers, school principals, and food providers, identified a range of challenges to ensuring healthy eating among

children, enabling parallels to be drawn across the region (Reeve et al. 2018). These were (i) a high density of “sari-sari” (small convenience stores) around the school perimeter, from which children commonly purchased unhealthy snack foods and beverages, including biscuits, cola, and sugar-sweetened powder mixes for drinks; (ii) difficulties governing the sale of junk food in the school environment because of decentralization, limited human resource capacity of community nutrition health workers, and competing priorities because of the DBM; and (iii) conflicting priorities caused by processed food companies funding school feeding programs, educational resources, and school infrastructure. Various examples of food industry branding on school infrastructure were given; for instance, Coca Cola Foundation schoolhouses (Reeve et al. 2018). There is evidence from the PRC that school environment factors, such as availability of soft drinks at schools and fast food outlets around schools, are associated with increased body mass index (Li et al. 2011). Similar challenges exist in the Pacific; for instance, in Samoa, unhealthy food options are readily available in and around schools (Erica Reeve unpublished).

There are also efforts underway in the region to combine nutrition education programs with other food environment interventions to maximize the benefits. One example is the school feeding program in Malaysia: a school-based intervention called Rancangan Makanan Tambahan that integrates nutrition education and provision of healthy meals (Teo et al. 2019). School garden programs have been shown to be an effective approach to teaching students about healthy eating, while also providing fresh fruit and vegetables to school meal programs and the local community, as has been done successfully in Laguna Province in the Philippines (FAO 2018b). In the Pacific subregion, there are several successful examples of nutrition education programs. However, a 2019 review identified great potential for expansion and more coordination of programs, if financial, infrastructure, and teaching capacity were increased (FAO 2019c).

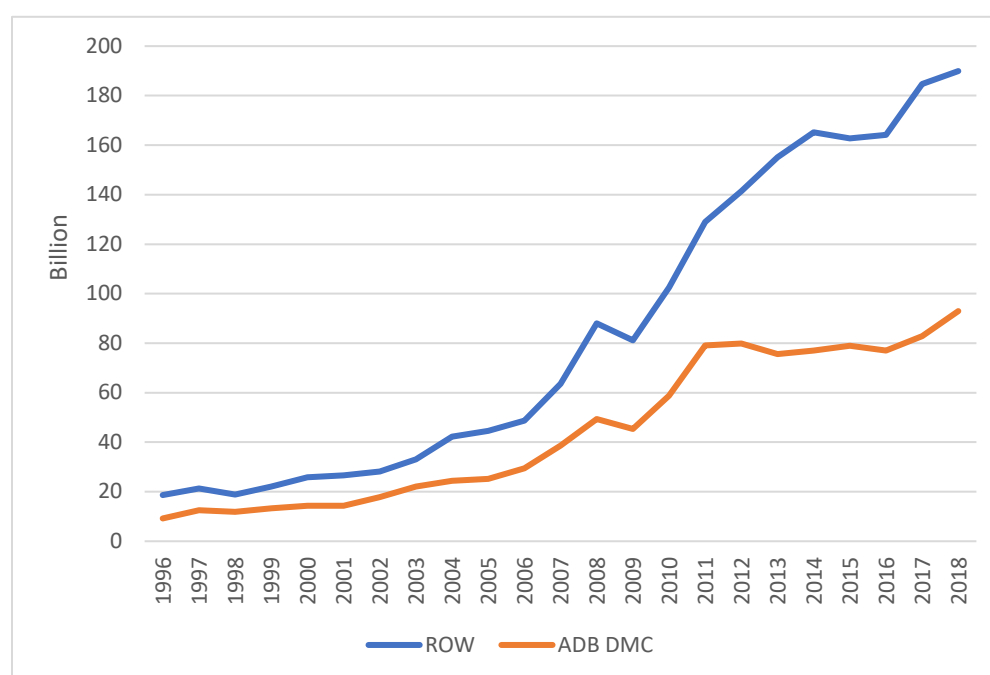
E. Trade in Foods

Trade in foods is recognized as an upstream influence on food security and nutrition. Food production is typically more volatile than consumer demand, and trade in foods therefore can be critical to ensure food security. Domestic fluctuations in production, e.g., because of adverse weather events, can be balanced by importation of food.² Further, a more open trade regime allows for the cheaper importation of agricultural inputs, thereby increasing agricultural productivity. Agricultural productivity growth is a particularly effective strategy to reduce poverty, as it increases the incomes of the poor, of whom many are farmers, and lower the cost of basic foods which constitute a large share of the poor’s expenditures (Martin 2017). Evidence from Asia indicates that trade has contributed to food security in the region (Anderson et al. 2013). Trade data shows that imports into ADB countries have risen dramatically since the mid-1990s, with a greater increase in imports from the rest of the world (ROW) compared with regional trade since 2011 (Figure 5). This result is interesting as, compared with all other trades, intra-regional trade grew stronger than trade with the ROW. Analysis by commodity groups showed that the strongest growth was in imports of unprepared food from the ROW and prepared food from the region and the ROW (Figure 6). Unprepared foods are defined as those that are not processed, and are typically sold in its original form. Our definition allows that foods, such as fruits or vegetables, can undergo simple preparations to extend the shelf life. Prepared foods are typically those that are not

² As Burgess and Donaldson (2010) show, in the case of India, connecting a district to the national railway network almost completely eliminated famines in that region. R. Burgess and D. Donaldson. 2010. Can Openness Mitigate the Effects of Weather Shocks? *American Economic Review: Papers & Proceedings* 100: 449–453.

raw, but ready for consumption and usually are the outcome of a cooking process that mixes different ingredients, e.g., cookies.

Figure 5: Imports of Food by ADB Developing Member Countries from Other ADB Developing Member Countries and Rest of the World
(1996–2018, value of imports in current United States dollar)



ADB = Asian Development Bank, DMC = developing member country, ROW = rest of the world.

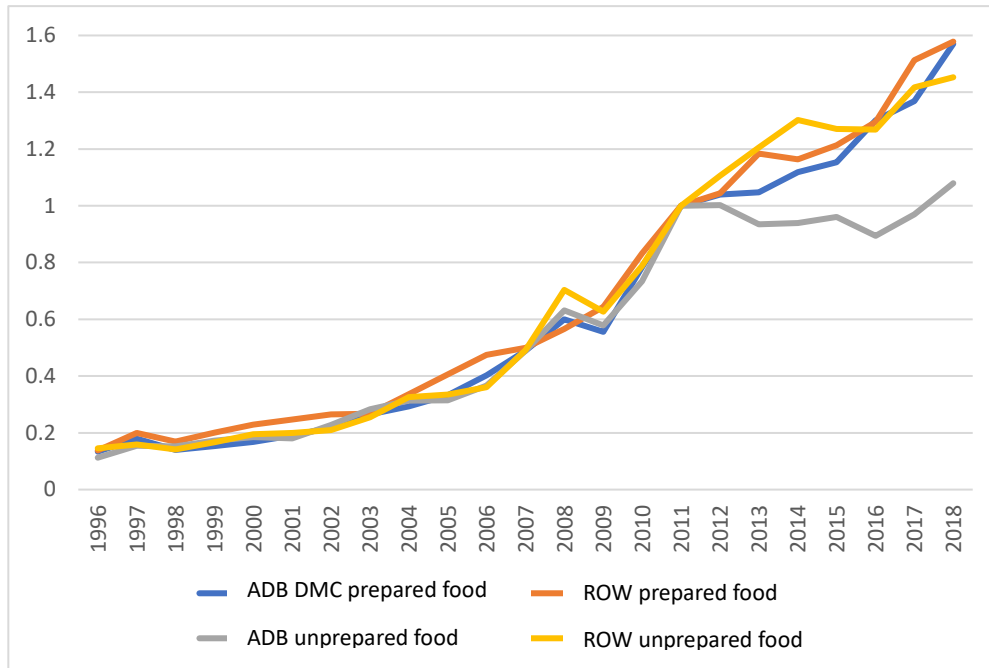
Note: Definition of food HS chapter (two-digit): HS 02–04, 07–12, and 15–21

Sources: United Nations COMTRADE database (accessed 20 March 2020); authors calculations

Opening food trade typically allows consumers to have access to a larger variety of foods and to cheaper calories. Existing evidence suggests that trade in foods indeed has helped to improve the dietary quality and reduce undernutrition (García-Dorado et al. 2019). For example, rising incomes and trade openness helped to increase dietary diversity in 26 post-communist countries of Eastern Europe and Central Asia for the period 1996–2013, during which time trade reforms triggered growth in trade flows and foreign direct investment, which in turn affected food systems in these countries (Krivonos and Kuhn 2019).

However, with the price of foods falling, there is an increased risk of an excessive calorie intake and, subsequently, of obesity. For example, studies of the nutrition transition show rising imports of highly processed foods and beverages; India and the PRC are two of the top five markets globally for sugary drinks sales (Popkin et al. 2019). In Central Asia, trade openness was also linked to a higher contribution of oils and fats to calorie availability (Krivonos and Kuhn 2019). Also, there is growing evidence that globalization also shapes several factors that influence the eating behavior. More than trade of foods, it seems that food marketing and advertisement can contribute to the creation of an obesogenic environment (Etilé and Oberlander 2019). Thus, on the one hand, opening trade can give consumers the opportunity to access a wider variety of food at more stable and lower prices. On the other hand, the empirical evidence so far suggests that social globalization, such as information flows via TV and the internet, also influence diets and health (Miljkovic et al. 2015, Costa-Font and Mas 2016, Oberlander et al. 2017, García-Dorado et al. 2019).

Figure 6: Growth Trends in Imports of Prepared and Unprepared Food (1996–2018) Indexed 2011 = 100



ADB = Asian Development Bank, DMC = developing member country, ROW = rest of the world.
 Note: Definition of prepared food: HS 16–21; unprepared food: HS 02–04; 07–12; 15. Trend based on value of imports.
 Sources: United Nations COMTRADE database (accessed 20 March 2020); authors calculations

Analysis of “indicator” commodity imports into the region shows that all subregions had an increase in imports of healthy foods (Figure 7). The greatest increase occurred in Central Asia with a sevenfold increase between 2003 and 2018, and with concomitant increases in the value of healthy food imports. Unhealthy food imports also increased in all subregions (Figure 7). The increase was particularly strong in South Asia and Southeast Asia. In Central Asia, unhealthy food imports almost stagnated, and their value steadily declined as a proportion of total imports. Staple foods (rice and flour) witnessed the least dynamic development.

Figure 7: Imports of Indicator Foods, Volume, and Value, by ADB Subregion



Note: Indicator foods defined according to Friel (2013). Healthy foods include fresh fruits and vegetables, including staple root crops, pulses, nuts, seeds, and staple whole-grain cereal. Unhealthy foods include fatty meat, energy dense beverages, savory ready-to-eat snacks and meals, sweet snacks, sugars, and other caloric sweeteners.

Sources: United Nations COMTRADE database (accessed 20 March 2020); authors calculations

IV. CONSEQUENCES: THE DOUBLE BURDEN OF MALNUTRITION

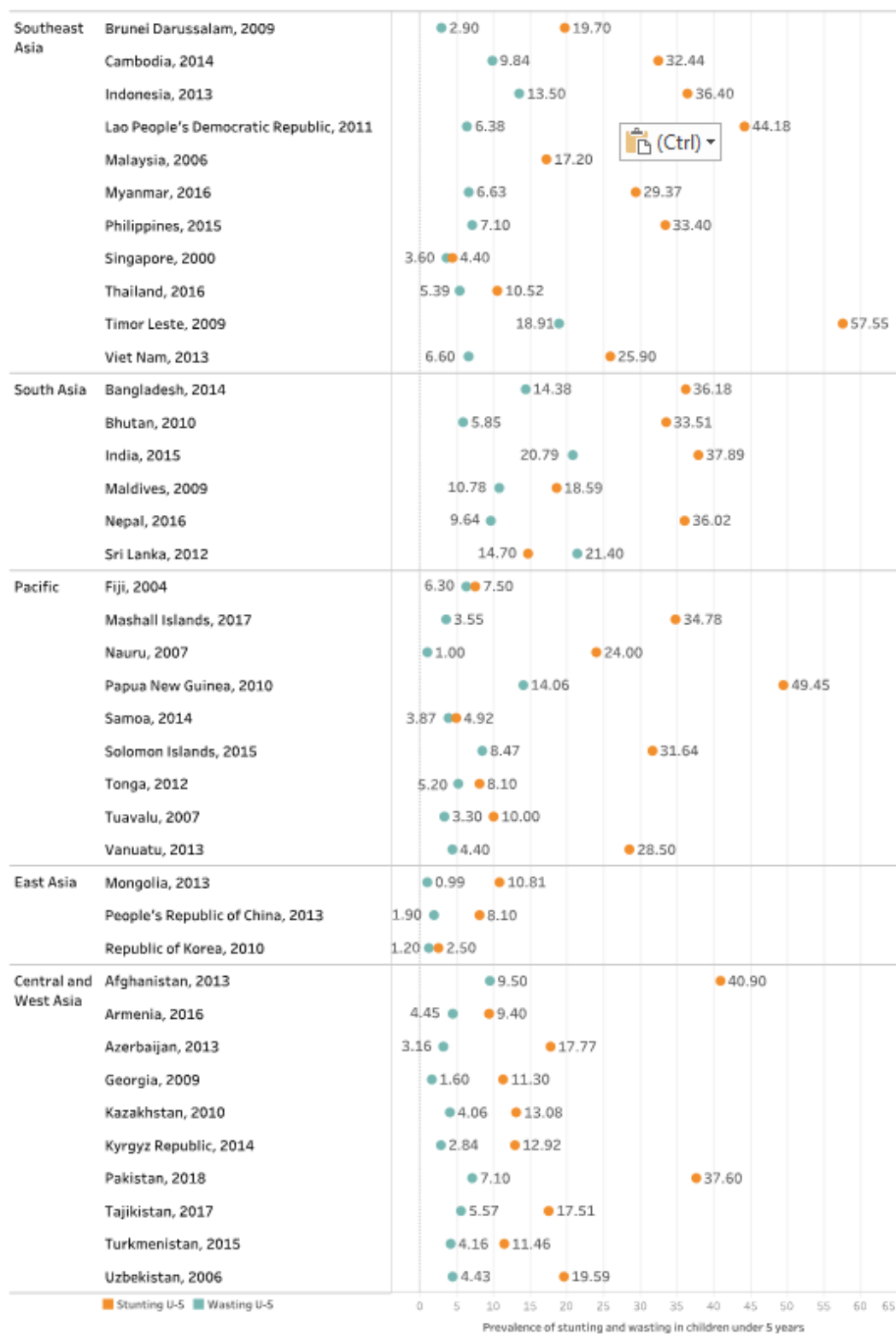
The double burden of malnutrition (DBM) is defined as concurrent manifestation of undernutrition (stunting, wasting, underweight, or micronutrient deficiency) with overweight or obesity (indicators of an unhealthy diet). The DBM affects many countries, with highest numbers found in most LMICs. The Asia and Pacific region is a global hotspot for the DBM, with South Asia, East Asia, and the Pacific experiencing high burdens (Popkin et al. 2019). A recent analysis of the DBM globally found that, of the 15 countries with a rising prevalence of multiple forms of malnutrition, six are located in the Asia and Pacific region: Kyrgyz Republic, Indonesia, India, Bangladesh, Nepal, and the PRC (Popkin et al. 2019). Indonesia has the most severe rates of the DBM documented to date, but rates are rising rapidly throughout the region. The DBM now has begun also to be evident in the poorest LMICs, mainly because of increases in prevalence of overweight and obesity.

The DBM can manifest at (i) the national level, where countries have both undernutrition and unhealthy diets prevalent among their population, (ii) the household level, where households have members with different forms of malnutrition, and (iii) the individual level, where an individual experiences multiple forms of malnutrition either concurrently (e.g., being overweight and anaemic) or at different points in life (Shrimpton 2012, Abdullah 2015, and WHO 2017). There are four most known types of the DBM within the same household: (i) overweight and stunted child, (ii) overweight mother and wasted under-5 child, (iii) overweight mother and stunted under-5 child, or (iv) thin mother and overweight child (Popkin et al. 2019). In the Marshall Islands, for example, a quarter of households have a stunted child with an overweight or obese mother (FAO 2018a). In India, the proportion of households with an underweight child and an overweight mother increased from 4% to 5% in rural India and from 6% to 8% in urban India between 2004 and 2012 (Dang and Meenakshi 2018). In this section of the paper, we will focus on the DBM at the national level within the region.

A. Child Nutrition

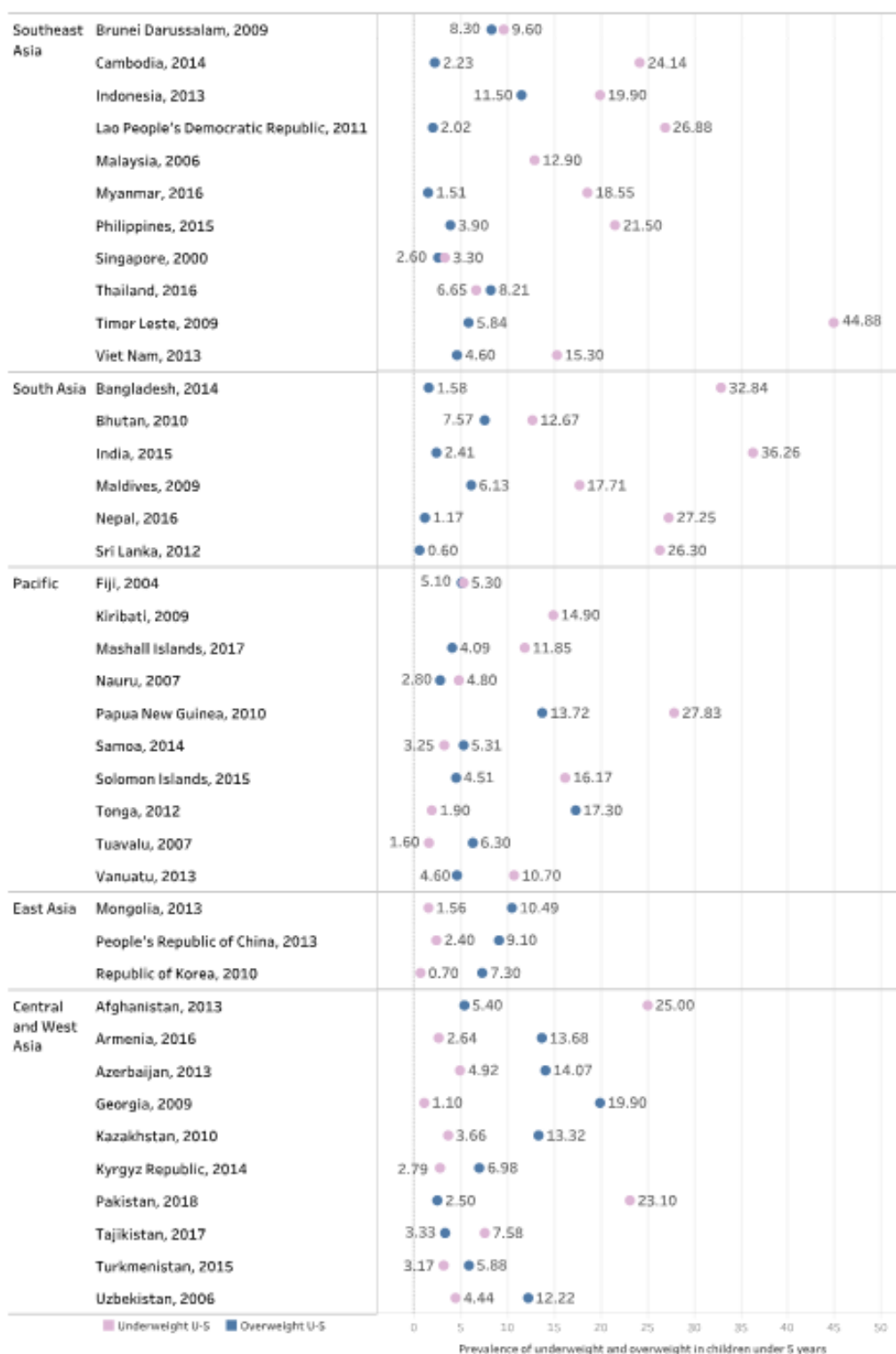
Underweight (low weight for age), stunting (low height for age), and wasting (low weight for height) are the main measures of child undernutrition, and all have serious health consequences. In 2018, stunting was estimated to affect over one fifth of children under 5 globally (WHO 2020). There have been some reductions in undernutrition in the region, but it remains a significant challenge (FAO 2018a and Torlesse and Aguayo 2018). Major drivers of stunting in the region have been identified as poor dietary quality and quantity for children under 2 years of age, and poor maternal nutrition (before and during pregnancy) (FAO 2018a and Torlesse and Aguayo 2018). Data from the Global Health Observatory for the region indicates that the highest prevalence of stunting, wasting, and underweight was found in South Asia, closely followed by Southeast Asia (Figure 8 and Figure 9). Overall, East Asia had the lowest prevalence of measures of child undernutrition. The prevalence of stunting and wasting has been found to be lower for urban than for rural children in the region, with significant effects of living in rural areas observed in Cambodia, India, the Lao PDR, Myanmar, and Viet Nam (FAO et al. 2019d). In some countries with high levels of stunting, including Bhutan, Pakistan, and Timor-Leste, it has also been found that up to half of overweight children are also stunted (FAO 2018a).

Figure 8: Prevalence of Stunting and Wasting in Children Under 5, by Subregion



Source: World Health Organization. Global Health Observatory data repository. <https://apps.who.int/gho/data/node.main>. (accessed 20 March 2020)

Figure 9: Prevalence of Overweight and Underweight in Children Under 5, by Subregion



Source: World Health Organization. Global Health Observatory data repository. <https://apps.who.int/gho/data/node.main> (accessed 20 March 2020).

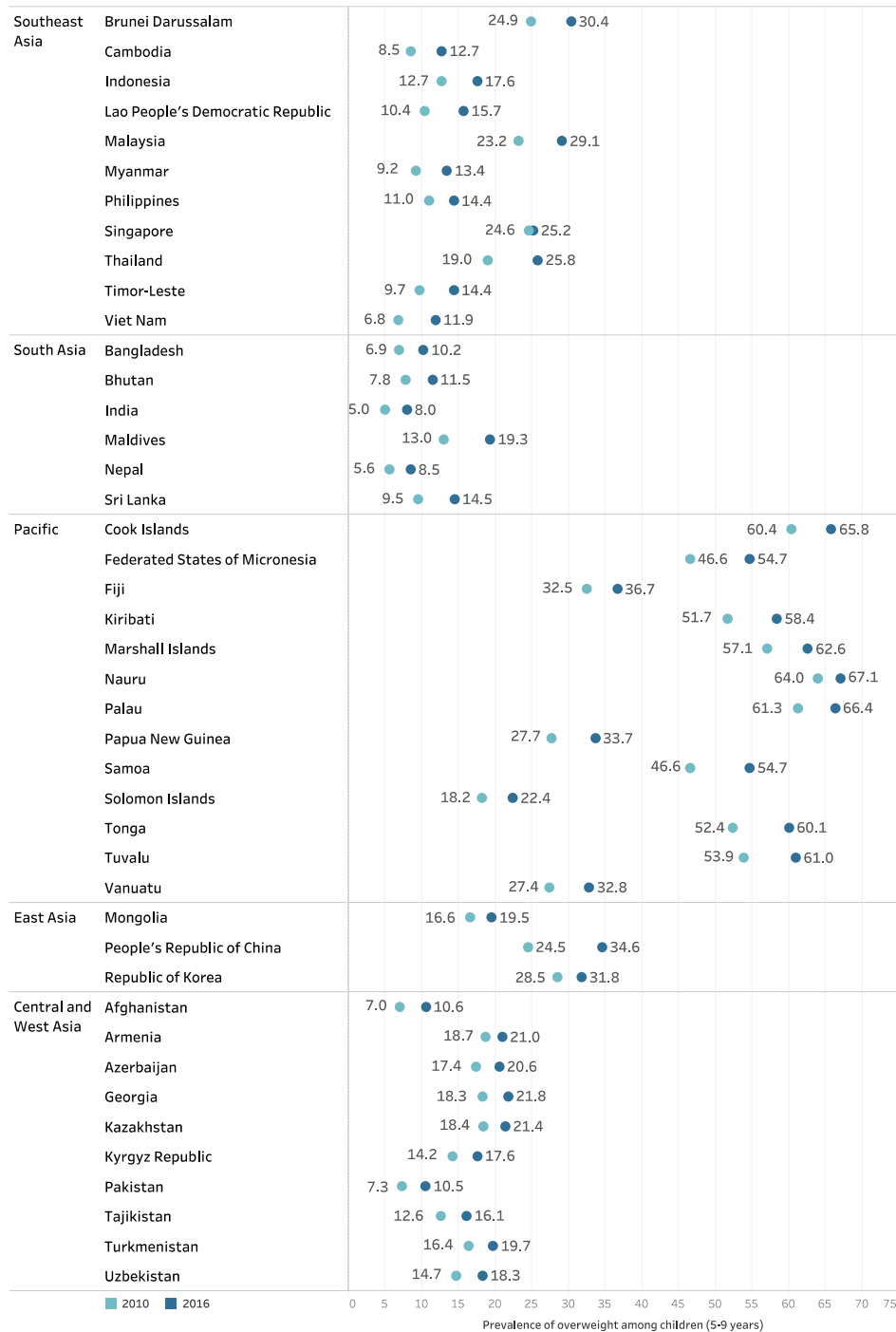
All subregions were observed to have a higher prevalence of stunting in children under 5 years, compared with wasting (Figure 8). The country with the highest prevalence of stunting was Timor-Leste (58%), followed by Papua New Guinea (49%) and the Lao PDR (44%), and the lowest prevalence was the ROK (Figure 8). The country that has the highest prevalence of wasting was observed in Sri Lanka and India (21%), followed by Timor-Leste (19%), and the lowest prevalence in Mongolia. The highest prevalence of underweight was observed in Timor-Leste (45%), followed by India (36%) and Bangladesh (32%), and the lowest prevalence was found in the ROK (Figure 9).

In almost all countries in the region for which data are available, the prevalence of child underweight and overweight indicates the presence of a DBM (Figure 9). In South Asia and Southeast Asia, the prevalence of underweight in children under 5 years is higher than the prevalence of overweight³ (Figure 9). In the Pacific and Central Asia, there are significant variations in prevalence by country (for example, overweight is higher than underweight in Tonga and Georgia, but lower in Solomon Islands, Papua New Guinea, and Georgia). In contrast, in East Asia, the prevalence of overweight is higher than underweight. The highest prevalence of overweight among children under 5 was observed in Georgia (20%), followed by Tonga (17%) and Azerbaijan (14%) (Figure 9).

Among older children aged 5–9, overweight has risen across the region (Figure 10). The highest prevalence of child overweight is observed in the Pacific, as well as the most substantial increases between 2010 and 2016. The three individual countries showing the highest prevalence are from the Pacific: Nauru (67%), followed by Palau and Cook Islands (66%). Southeast Asia also experienced a substantial increase in prevalence between 2010 and 2016, and is the second leading subregion. The lowest prevalence of child overweight is evident in South Asia.

³ Overweight for children and adolescents is defined according to the WHO growth reference

Figure 10: Prevalence of Overweight (Including Obesity) in Children Aged 5–9, by Subregion



Source: World Health Organization. Global Health Observatory data repository. <https://apps.who.int/gho/data/node.main> (accessed 20 March 2020)

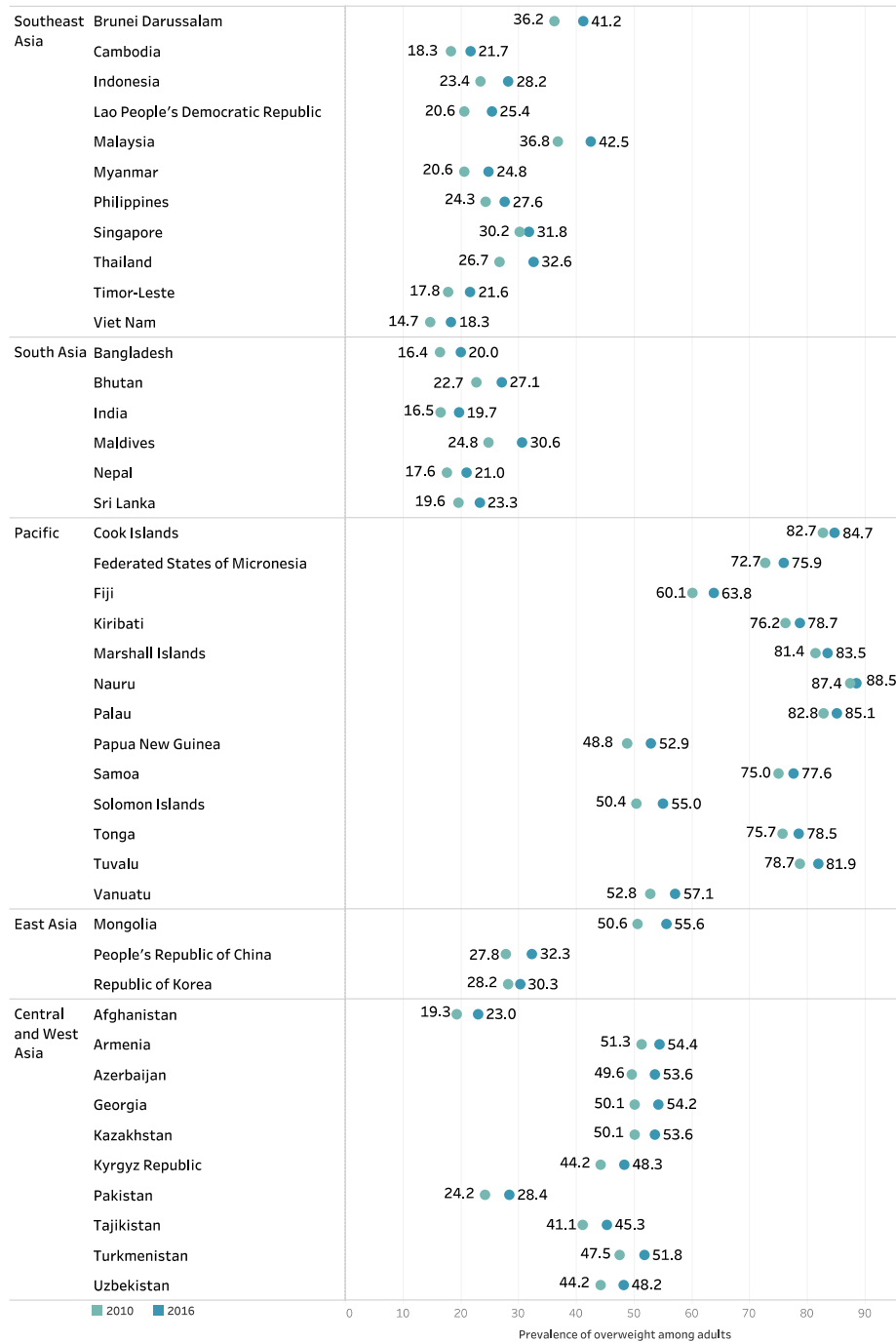
B. Overweight and Obesity among Adults

Data from the Global Health Observatory indicates that overweight among adults (defined as a body mass index greater than 25, and greater than 30 for obesity) has increased across the region since 2010 (Figure 11). The highest prevalence is observed in the Pacific, followed by Central and West Asia. Countries with the highest prevalence are in the Pacific: Nauru (89%), followed by Palau (85%) and Cook Islands (85%). However, the prevalence of overweight is also over 50% in all other Pacific island countries for which data are available, as well as Mongolia, Armenia, Georgia, Azerbaijan, Turkmenistan, and Kazakhstan (Figure 11). South Asian countries show the lowest prevalence of overweight, ranging from 20% to 31% in 2016. However, the prevalence is similarly low in much of Southeast Asia, as well as Afghanistan and Pakistan.

Across the Asia and Pacific region, those in urban areas are more likely to be overweight or obese than those in rural areas. However, average rural Body Mass Index (BMI) is rising for some regions, in particular South Asia because of multiple factors. One likely contributor is increased consumption of high calorie, processed foods in rural areas (NCD Risk Factor Collaboration 2019).

Gender and socioeconomic status are also associated with differential rates of overweight and obesity. Women in the region are especially at risk of overweight and obesity (Biswas et al. 2017). For example, prevalence of overweight and obesity among women of reproductive age in Bangladesh is high and increasing (Biswas et al. 2017). In Samoa, obesity prevalence is almost 25% higher in women than in men (Lin et al. 2017). Across the region, higher socioeconomic status is associated with a greater likelihood of being overweight and obese. For example, among school children, children from public schools in the Philippines have a much higher prevalence of undernutrition (stunting and underweight) compared with those from private schools, and those in private schools have a higher prevalence of overweight and obesity (Rachmi et al. 2018). In India, households with high socioeconomic status but low education of women are more likely to show household-level DBM (Dang and Meenakshi 2018). Overweight and obesity has traditionally been seen to affect wealthy people. However, recent evidence shows that those with relatively low incomes are also affected. In Indonesia, a higher (and rising) prevalence of overweight and obesity has been consistently observed in higher-income households between 1993 and 2014. However, the rate of increase of obesity among disadvantaged groups was higher compared with higher-income households throughout this period (Aizawa and Helble 2017).

Figure 11: Prevalence of Overweight (Including Obesity) among Adults in 2010 and 2016, by Subregion



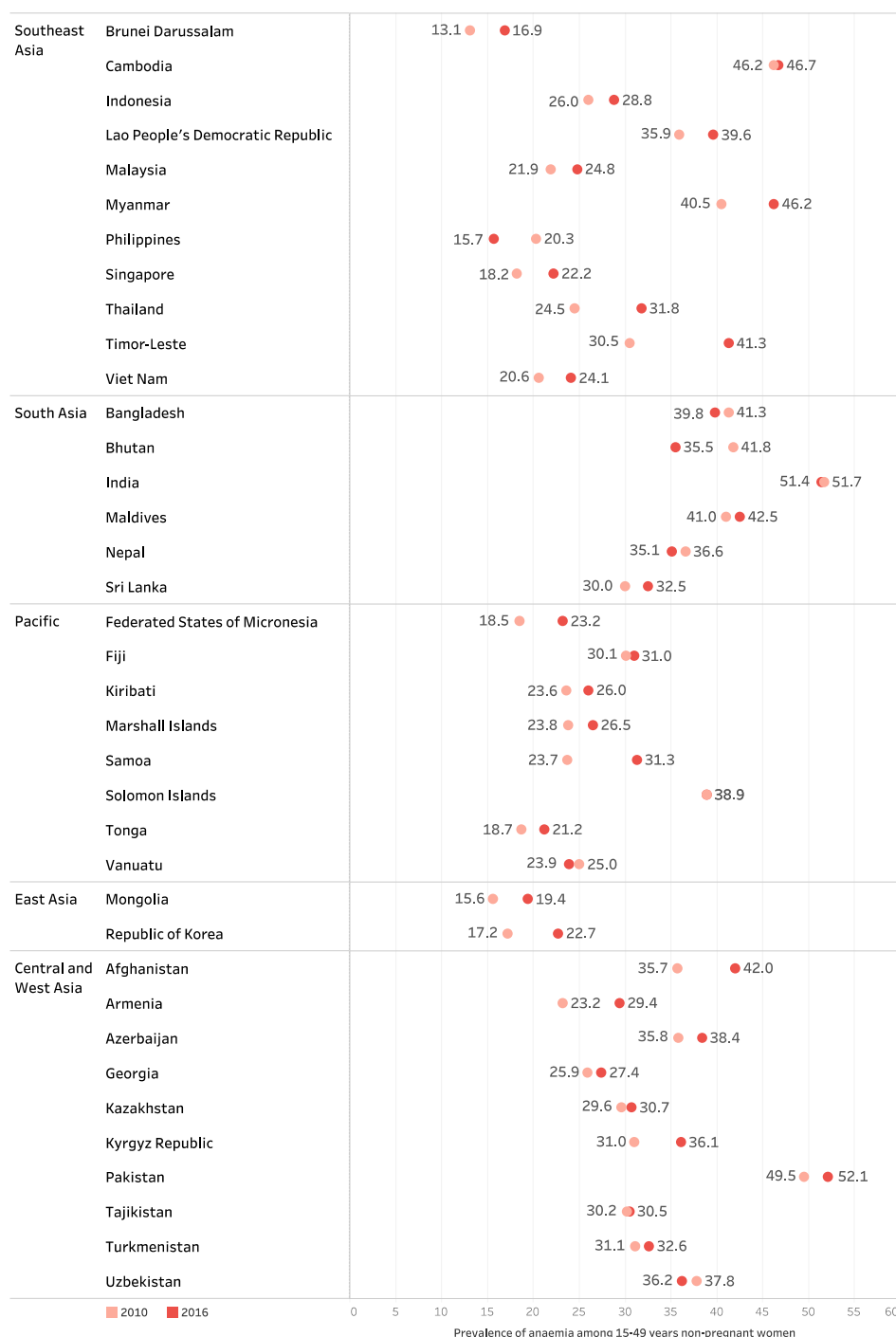
Source: World Health Organization. Global Health Observatory data repository. <https://apps.who.int/gho/data/node.main> (accessed 20 March 2020)

C. Micronutrient Deficiencies

Micronutrient deficiencies are a significant concern in the region because they are associated with poor birth outcomes for both mothers and babies, as well as impaired physical and cognitive development (FAO 2018a). The prevalence of micronutrient deficiencies has risen in most countries, and the region is unlikely to meet the WHO 2025 targets (FAO 2018a). In the Asia and Pacific region, it has been estimated that about 400 million women of reproductive age are anaemic (FAO 2018a). Data from the global health observatory show that, in 2016, the prevalence of anaemia in nonpregnant women, 15–49 years, ranged from 16% in the Philippines to 52% in Pakistan, with India (51%) and Cambodia (47%) also having a high prevalence (Figure 12). Countries in Southeast Asia experienced the most substantial increase in prevalence of anaemia between 2010 and 2016. However, countries in South Asia and Central and West Asia have the highest prevalence of anaemia overall. Some improvements are also evident. The Philippines, Bangladesh, Bhutan, India, Nepal, Sri Lanka, and Uzbekistan experienced decreases in prevalence of anaemia between 2010 and 2016.

Vitamin deficiencies are also highly prevalent in the region. Inadequate intakes of vitamin A, riboflavin, and vitamin B-12 are significant in South Asia, particularly for Bangladesh, India, and Sri Lanka (Mark et al. 2016). These vitamins are critical for immune function, vision, and healthy pregnancy. South Asia remains the world's region with the greatest number of children affected by vitamin A deficiency, which is a major cause of blindness (Harding et al. 2018). In Cambodia, recent research has found that pregnant women are not consuming sufficient nutritious food (mainly because of challenges regarding availability and affordability) to meet requirements for folate, zinc, iron, calcium, and vitamin A (FAO 2018a). In Afghanistan, 23% of women of reproductive age suffer from zinc deficiency (Harding et al. 2018).

Figure 12: Prevalence of Anemia among Women of Reproductive Age (15–49), by Subregion



Source: Source: World Health Organization. Global Health Observatory data repository. <https://apps.who.int/gho/data/node.main> (accessed 20 March 2020)

D. Health Consequences of Malnutrition

Undernutrition, either in children or adults, has serious consequences. In children, severe underweight children have a higher risk of dying from diarrhea compared with their healthy weight counterparts. In adults, underweight might lead to complications in pregnancy, intrauterine growth retardation, and death (Black et al. 2008 and 2013). Children affected by wasting tend to have low immune system functioning and are more prone to having developmental delays, with a heightened risk of morbidity and mortality (WHO 2014b and 2020). Stunted children have higher rates of morbidity and mortality, are more prone to infectious diseases, and have less optimal development of their cognitive, motor, and language functioning. They also possess a higher risk of developing degenerative diseases and, for those who are exposed to high-fat diets, have a higher risk of being overweight and/or obese in the future, which lead to NCDs (Sawaya et al. 1998, Black et al. 2013, Stewart et al. 2013, WHO 2014a and 2020, De Onis and Branca 2016, UNICEF 2016, and Kim et al. 2017a).

Unhealthy diets are associated with increased risk of major diet-related NCDs, including type 2 diabetes mellitus (diabetes) and CVD. Unhealthy dietary patterns, together with overweight and obesity, are major risk factors for the development of type 2 diabetes (Jannasch et al. 2017 and Hills et al. 2018). Evidence is also mounting for the increased risk arising from intrauterine undernutrition and overnutrition (i.e., during pregnancy) for development of NCDs in later life (Hills et al. 2018 and Wells et al. 2019). For example, fetal exposure to malnutrition during the 1959–1961 Great Chinese Famine had long-lasting impacts on physical health, including the risks of suffering a stroke, physical disabilities in speech, walking, and vision (Kim et al. 2017b).

The Asia and Pacific region accounts for over half of the total number of adults with diabetes globally (Hills et al. 2018), and the Pacific subregion has the highest age-standardized rate of diet-related diabetes deaths (Afshin et al. 2019). Prevalence of diabetes in South Asian adults is extremely high, ranging from 4% in Nepal to 9% in India (Hills et al. 2018). To date, prevalence has been highest in educated, affluent, and urban South Asians, but evidence is emerging of increasing prevalence in middle- and low-income households, and in rural settings where underdiagnosis has been common (Hills et al. 2018).

In 2017, the GBD study indicated that 64% of disability-adjusted life years lost in East Asia because of NCDs as a result of CVD (Afshin et al. 2019). In South Asia, ischaemic heart disease is the leading cause of death in India, Pakistan, Nepal, and Sri Lanka. In Bangladesh, NCDs caused 59% of total deaths in 2014, with CVD the leading contributor at 17 % (Islam et al. 2016), and stroke is the leading single cause of death (Misra et al. 2017). In 2017, stroke and ischaemic heart disease were also the leading causes of death at the national level in the PRC (Zhou et al. 2019). Hypertension is the leading modifiable risk factor for CVD and premature death worldwide. Diets high in salt are one of the major contributors to hypertension (Mills et al. 2020). Globally, the highest prevalence of hypertension among men is in Central Asia, at 39% (Mills et al. 2020).

Nutrition is also important for brain function and mental health. In particular, low intakes of omega-3 fatty acids are associated with an increased risk of depression, as are deficiencies of folate, vitamin B12, iron, zinc, and selenium; the effects on the brain can result in apathy and depression (Bodnar and Wisner 2005). Research in Bangladesh, India, and Nepal found that self-reported depression was higher in adults who consumed less than 5 servings of vegetables per day over a 30-day period (Bishwajit et al. 2017). Analysis of the effects of the 1959–1961 Great Chinese Famine found that fetal exposure to malnutrition reduced measures of mental acuity even half a century after the tragic event (Kim et al. 2017b). Childhood undernutrition and maternal malnutrition also impair immune development (Bourke et al. 2016), and are associated with an increased risk of infection, particularly in developing countries

(Dobner and Kaser 2018). Studies in developed countries suggest that infection risk is also increased in obese children and adolescents (Dobner and Kaser 2018). In addition, this immune dysfunction also contributes to higher morbidity and mortality associated with malnutrition (Bourke et al. 2016).

E. Economic Consequences of Unhealthy Diets and Malnutrition

In addition to the consequences that malnutrition has for populations in terms of health, it also impacts on the health care system, education, and human capital. In the Asia and Pacific region, of particular concern are the costs of the high stunting prevalence among children, which is associated with “increased mortality, increased morbidity (in childhood and later as adults), decreased cognitive ability, poor educational outcomes, lost earnings and losses to national economic productivity” (Shekar et al. 2016). As a result, investing in nutrition can benefit communities through poverty reduction and economic growth.

The economic consequences and costs of undernutrition are mainly indirect: lost productivity as a result of reduced capacity, illness, and death. In the Asia and Pacific region, the economic burden of underweight has been estimate at 3%–4% of countries’ total GDP (Hoque et al. 2016). The World Bank’s Human Capital Project has drawn attention to the increasing evidence for impact of fetal and childhood malnutrition on future capacity and human capital, particularly through its negative effects on educational outcomes. Nutritional deprivation impairs brain development in infants, and these poor developmental foundations mean that children are unprepared to benefit fully from education (World Bank 2018). Research from LMICs shows that the first 2 years of life (the first 1,000 days from conception to the second birthday) are a critical period during which good nutrition has a strong association with subsequent schooling (Martorell et al. 2009). Evidence from the region also demonstrates the relationship between poor nutrition and educational outcomes. A study conducted in Malaysia, Indonesia, Thailand, and Viet Nam found that undernourishment was associated with significantly lower nonverbal IQ (intelligence quotient) in 6–12-year-old children (Sandjaja et al. 2013). In India, stunting and underweight were associated with lower reading and math scores (Acharya et al. 2019). In the Philippines, child malnutrition was significantly associated with poorer educational attainment measured by test scores (Dominguez and Halili 2018). These findings are supported by evidence from other developing regions. For example, duration of schooling in Kenya was significantly lower among those that experienced early life malnutrition (Muthuuri et al. 2019), and a study in Mauritius found a linear relationship between malnutrition and IQ, which indicates that it is not only severe malnutrition that has an effect on cognitive performance (Venables and Raine 2016). An analysis in Denmark found that even short-term fasting (Ramadan) during the fetal period had a negative effect on standardized test scores in national exams, particularly among children with a relatively low socioeconomic background (Greve et al. 2017).

The World Bank Human Capital Project includes stunting as a key indicator because of the significant contribution that malnutrition makes to reduced productivity: “baseline estimates suggest that a reduction in stunting rates of 10% raises worker productivity by 3.5%” (Kraay 2018). A recent study in Kenya found that malnutrition in early life was associated with the type of employment in later life, with those experiencing malnutrition significantly less likely to have clerical jobs than those who had not (Muthuuri et al. 2019). In addition, those who had experienced malnutrition earned significantly less. A review of the evidence from South Asia found that low productivity was associated with malnutrition, particularly micronutrient deficiency (Akhtar 2016). There is also evidence from the PRC that increasing human capital is related to improvements in nutrition (Li et al. 2017).

The direct and indirect costs of malnutrition in the form of obesity and diet-related disease are also significant. A recent review for the Asia and Pacific region found that overweight and/or obesity accounted for an estimated 2%–10% of countries' total health care expenditure. The additional health care costs for overweight individuals were estimated at more than 7%, and these increased for obese individuals to about 20% (Hoque et al. 2016). Including productivity losses from obesity, recent estimates suggest that overweight and obesity cost Asia and the Pacific 0.78% of their GDP or US\$166 billion annually (Helble and Francisco 2018). A recent analysis in Indonesia estimated that the productivity loss from overweight, obesity, and related diseases in 2016 was in excess of 7 million disability-adjusted life years, and the total indirect cost was Rp368.3 trillion (\$28.3 billion) (Kosen 2018). In 2009, the productivity loss of excess weight in the ROK was estimated at \$872 million, arising from premature death, hospital admission, nursing costs and fees, and transport costs (Kang et al. 2011). There is also some evidence from the region that productivity is impacted by obesity via reductions in cognitive capacity and thus education, similar to that seen arising from undernutrition. A study conducted in Malaysia, Indonesia, Thailand, and Viet Nam found that obesity, particularly severe obesity, was negatively associated with cognitive performance among school children (Sandjaja et al. 2013).

The cost of diet-related chronic diseases is similarly substantial. A review of direct health care costs in South Asia found that annual medical costs for CVD were about US\$500, and for diabetes were closer to US\$1,000, and these costs were mainly borne by households (Walker et al. 2018). They also found that, when complications arose, costs escalated significantly because of treatment costs (e.g., for stroke and amputations). The International Diabetes Foundation has estimated that medical costs related to diabetes in 2014 were about US\$6.9 billion in South Asia (Walker et al. 2018). In South Asia, the total direct and indirect costs for diabetes care have been estimated at \$483–\$2,637 per patient, annually (Singh et al. 2019). This review also found that, on average, 6% of patients with diabetes in the region suffered catastrophic spending (when households “reduce basic expenditure by 40% to cope with health care costs”).

Estimates of productivity losses because of CVD and diabetes in the region are similarly substantial. A recent global review found estimates of annual costs (converted to 2015 prices), because of CVD-related productivity costs, of US\$0.5 billion–US\$2 billion in the ROK (Gordois et al. 2016). The cost of absenteeism because of stroke was estimated at US\$147 (35 days annually, per person) in Indonesia and US\$981 (early retirement, per person) in the PRC. An analysis of the cost of diabetes in the PRC estimated that productivity losses would equate to the amount of ¥17.4 trillion (US\$2.6 trillion) in lost GDP, with an average of ¥307,925 (US\$45,959) lost per person with diabetes (Hird et al. 2019).

V. POLICIES FOR HEALTHY EATING

Significant progress has been made on nutrition in the Asia and Pacific region. However, development continues to be hampered by food insecurity, undernutrition, and diet-related NCDs. Consistent with the rising global priority for nutrition, including the United Nations Decade of Action on Nutrition that commenced in 2016, there have been recent commitments from ASEAN and Pacific island leaders' to address the DBM (ASEAN 2017 and Dodd et al. 2020). In this section, we identify four key areas for policy action to promote healthy eating to combat the DBM in the Asia and Pacific region. Effective action on nutrition will entail a whole-of-government response, and an integrated policy approach that encompasses food systems (FAO and WHO 2014).

The five elements that we identify here build on successful initiatives within the region. The first, double-duty nutrition intervention, extends the increasingly effective interventions for undernutrition in the region to address risk factors for diet-related NCDs. These nutrition-specific interventions focus on changing behavior through nutrition education and awareness raising within health services, schools, and communities; and are largely led by the health sector. The second element is the important role of nutrition-sensitive social welfare interventions in facilitating household access to healthy food and supplemental nutrition. Such demand-oriented interventions so far have been the main approach to nutrition taken in many countries in the region (ASEAN 2017).

A combination of demand- and supply-oriented approaches are needed to effectively improve nutrition in the region. Thus, the third element is investment in agriculture and supply chains to enhance the supply of healthy foods. The fourth element addresses the food environment as a key interface between people and these supply chains. The external food environment includes the availability, price, marketing, and retail of foods, and recent research in developing countries highlights its critical nature in influencing food choice and behaviors (Turner et al. 2018). The fifth element of comprehensive policy for nutrition addresses the need for continued innovation and new technology in improving access to healthy foods.

A. Double-Duty Nutrition Interventions

Specific nutrition interventions in health care settings, schools, and communities are critical points at which nutrition education and supplemental nutrition can be delivered, which address both undernutrition and NCD prevention (WHO 2013, WHO/UNICEF 2014, and WHO 2015a). The WHO has recommended that countries adopt “double duty” actions where possible: nutrition interventions that take an integrated approach to improve both undernutrition and diet-related NCD prevention (WHO 2017). Examples of these include community level nutrition interventions, including for mothers and children, that provide advice on healthy dietary practices, and school food policies that ensure adequate intakes of healthy foods. The World Bank's Human Capital Index has drawn needed attention to the importance of early life nutrition (measured in the form of stunting) to future workforce productivity, and thus repositioned investment in nutrition interventions as essential for future economic growth and development (World Bank 2019b). Given the rising evidence for productivity impacts from obesity and diet-related chronic disease in the region, there will be additional benefits from double duty nutrition interventions for economic growth.

Community-based nutrition programs that include nutrition education as part of health services, and sometimes direct provision of healthy food, have been found to be effective in the region. For example, Thailand implemented a nationwide community-based nutrition program relatively early in the region,

contributing to reductions in undernutrition and micronutrient deficiencies (Roos et al. 2019). A recent community nutrition program in India found improved knowledge regarding healthy diets among children aged 8–11 years of age (Low et al. 2015). Supplementation is also a common and effective nutrition-specific intervention to address micronutrient deficiencies, particularly in South Asia and Southeast Asia. Supplementation programs are often focused on iron, folic acid, and vitamin A to address deficiencies among women and children; there is evidence for improvements, particularly in conjunction with other factors such as health care access and behavior change interventions (Victora et al. 2012, Dijkhuizen et al. 2019, and Roos et al. 2019). These health sector-led interventions could be strengthened with the inclusion of education and behavior change measures to promote healthy diets that are low in salt, sugar, and processed foods to address the DBM.

Also, there has been growing attention to interventions that target mothers and their babies with health and nutrition interventions during the first 1,000 days (World Bank 2018). These include nutrition education regarding the DBM in parenting training, and pregnancy- and infant-related health services (Li et al. 2017), as well as in community based programs, particularly for rural areas where health system contact is limited (Aguayo and Paintal 2017).

There are two types of direct nutrition interventions in schools that have been shown to be effective: nutrition education and school feeding. School-based nutrition education interventions to promote healthy diets are also effective strategies; they are also critical to promote good nutrition pre-conception among adolescent girls because of the importance of good maternal nutrition for birth outcomes (Vir 2016). Nutrition education and behavior change interventions in schools have been found to be effective in improving dietary practices among boys and girls in ways that prevent the DBM, including meal quality, quantity, and frequency; intake of low fat and fiber-rich foods such as whole grain cereals, fruits, and vegetables; consumption of home cooked meals; and not skipping meals (Aguayo and Paintal 2017). Evidence from Indonesia also shows that school nutrition education programs can include elements of obesity prevention effectively (Soekarjo et al. 2018).

School feeding programs, in which food is provided to children directly at low cost or free, are a key public health nutrition strategy across the world. There is a major opportunity to design these programs to address the DBM in the region through a shift from providing access to sufficient calories to promoting healthful diets and dietary behaviors (Drake 2017). In Asia, school feeding programs have been introduced in most countries, and the PRC and India have particularly large-scale programs which use nutrient-based standards which have been associated with improvements in nutrition indicators (Drake 2017). In the PRC, providing nutritious lunches for rural children has also been found to improve educational achievement (Li et al. 2017). There is significant scope to strengthen school feeding programs in the region. Although many countries have feeding programs at the national level, because of various issues including financing and governance, the implementation of school feeding programs varies considerably in terms of how many schools are covered, how many meals are fed, and what the meals consist of. For example, although Indonesia initially commenced a national school feeding program in 1998, coverage remains low at 0.14% of schools in 2016 (Sekiyama et al. 2018). Similarly, in the Lao PDR, school feeding programs have been difficult to scale up because of accessibility challenges and poor infrastructure (Buttenheim and Friedman 2011). Standards for school meals are important in ensuring that healthy food is available to children, particularly during emergencies or crises (FAO 2020). The World Food Programme has highlighted the potential for school feeding programs to mitigate the potential food insecurity impacts of coronavirus disease (COVID-19) on children and adolescents.

B. Nutrition-Sensitive Social Welfare

Addressing the poverty–health nexus will be critical to lasting improvements in nutrition in the region (Allen et al. 2017). A recent review commissioned by UNICEF in South Asia highlighted the importance of a coordinated approach involving social protection systems for improving nutrition in the region, particularly among women and children (Torlesse and Aguayo 2018). Cash transfers are particularly important for low-income households in the region, who are unable to afford a diversified healthy diet (FAO 2018a).

Cash transfers can improve nutrition through increasing the resources available for household food security. If the cash transfer goes to the primary caregiver, it can increase control over more resources for children and decrease poverty-related stress (de Groot et al. 2017). Combining cash transfers with nutrition education has been found to be feasible and acceptable to communities in the region, and to lead to improvements in diet (Alam et al. 2019). Nutrition-related complements and/or conditionalities appear to be important for maximizing the nutritional implications. For example, a conditional cash transfer program in the state of Odisha (India) targets pregnant and lactating women, and was associated with a decline of 0.84 on the Household Food Insecurity Access Scale. The scheme provides cash payments in installments, conditional on the women engaging with health services (Raghuathan et al. 2017). In contrast, in Indonesia, the conditional cash transfer program *Program Keluarga Harapan* was found to have no significant impact on child nutrition, which was explained by the lack of a nutrition-related conditionality and its low contribution to household expenditure (12%, compared with 20% in more effective programs internationally) (Aizawa 2020).

Improving nutrition through social welfare policies can be achieved also through interventions to promote empowerment of women. Two reviews from South Asia have highlighted the importance of measures for empowerment of women, such as health services for women, prevention of early marriage, completion of secondary education, enhancement in purchasing power, secure employment opportunities, and elimination of domestic violence (Vir 2016, Harris-Fry et al. 2017).

C. Investment in Diverse and Resilient Agricultural Production and Supply

Agriculture policy in many countries in the region remains focused on food insecurity, and in particular the adequate supply of calories (Gillespie et al. 2019b). This is understandable, given the persistently high rates of food insecurity and undernutrition in the region. However, there is a significant opportunity for the agriculture sector to increase investment in diverse nutrient-rich foods, such as fruit and vegetables, which are also often economically high value as well (Thow and Priyadarshi 2013, Thow et al. 2016, and Thow et al. 2018b). In many countries, this could be achieved by increasing agricultural investment in healthy, traditional foods, including staples (such as millets, local rice, or root crops), fruits, and vegetables. These foods are rich in nutrients and are generally appropriate to the ecosystems of countries, making them resilient. Investment in research and development can improve cultivation techniques and help to increase yields, as well as improve post-harvest storage and transport.

There is increasing evidence for the importance of agricultural and other food systems interventions in increasing access to diverse nutritious foods, as well as improving livelihoods and food security for rural households. In particular, evidence from South Asia indicates that interventions, such as seed, plant, and/or poultry provision; home garden training; and nutrition education can increase dietary quality and diversity (Bird et al. 2019). Efforts to improve agricultural productivity and resilience through access to inputs and credit, insurance to reduce risks, improvement of rural and marketing infrastructure, and micro-financing initiatives can also improve diets, particularly when combined with direct nutrition

interventions (Pandey et al. 2016, Vir 2016, and Anderson 2017). Diverse peri-urban farming (e.g., including chickens and leafy greens) was associated with improved food security and healthier diets in Nepal (Moucheraud et al. 2018). Similar improvements to dietary quality and diversity were seen in Afghanistan as a result of greater cropping diversity, improved market food availability, and increased livestock diversity (Zanello et al. 2019).

Global recommendations also highlight the need to strengthen value chains (Graziano da Silva and Fan 2017). In practical terms, this translates to factors such as roads, information and communication, and coordination between rural and areas on land use. It also requires improvements in market information, cold storage, and food transport to ensure food safety and reduce post-harvest losses (Prabhakar et al. 2010). For example, in the Red River Delta in Viet Nam, good information dissemination about urban markets and agricultural opportunities in rural areas, along with road infrastructure, have strengthened urban food systems and rural livelihoods (Graziano da Silva and Fan 2017, Graziano da Silva, and Máximo 2019).

D. Creating Healthy Food Environments

The WHO and FAO have recommended a range of policies to address the DBM through improved food environments. These include school food policies, labelling, restrictions on marketing of unhealthy foods to children, and fiscal interventions (such as taxes on unhealthy foods and subsidies for healthy foods) (FAO and WHO 2014). There has been limited uptake of many of these food environment policies in the region, and thus there is significant scope to develop and adopt contextually relevant policies to promote healthy food environments.

School food policies are a key mechanisms through which governments can create healthy school food environments by directly influencing the availability, marketing, and prices of foods that children are exposed to in this setting (FAO 2020). Key elements of a best-practice school food policy include setting and enforcing nutrition standards for school food, meals, and snacks; making nutritious foods more affordable through subsidies; and restricting the sale and advertisement of food products rich in fat, sugar, or salt. The FAO has recommended that school food policies are developed and implemented using a “whole school” approach, which involves engaging with local farmers, students, and parents. Within the region, the Ministry of Education in Malaysia has developed The Guide for Healthy School Canteen Management (2012) as a mandatory requirement for public schools. The guide identifies healthier foods that may be sold and less-healthy foods that are not encouraged to be sold or are prohibited in school canteens (such as sweets) (World Cancer Research Fund 2017). Similarly, the Government of the ROK prohibited the sale of sugary drinks and other energy-dense and nutrient-poor foods within school premises, as an action of a Special Presidential Committee in 2007 (World Cancer Research Fund 2017).

Governments across the region have adopted “back of pack” nutrition labelling in line with the FAO’s Codex Alimentarius guidelines, usually in the form of nutrition information panels. However, as evidence emerges regarding the difficulty that consumers have in interpreting this information, particularly in developing countries, the WHO has begun to support countries to consider interpretive front of pack labelling (WHO 2015c). Examples of an interpretive approach include the voluntary Healthier Choices logo in Thailand. The mandatory adoption of such labels have been shown to be very effective in informing healthier choices in countries such as Chile (Taillie et al. 2020). However, adoption of mandatory front of pack labels has been very limited in the Asia and Pacific region. In part, this may be because of concerns raised in the World Trade Organization, faced by Thailand and Indonesia, in response to proposals for mandatory interpretive labels regarding necessary evidence and the lack of

international standards (Thow et al. 2018a). In moving forward with effective interpretive labelling to improve information available to consumers, countries would benefit from engagement with current discussions on front of pack nutrition labelling at the Codex Alimentarius Commission (Thow et al. 2019).

Fiscal policy initiatives to disincentivize healthy food consumption and incentivize healthier foods have been recommended by the WHO to address price-related incentives. As of April 2019, 16 countries and territories in Asia and the Pacific had taxes on sugar-sweetened beverages, which are associated with poor diet quality, weight gain, and diabetes (FAO et al. 2019d). In the Philippines and Tonga, early evaluation of the taxes on sugar-sweetened beverages suggest that they are likely to be effective in reducing consumption and averting deaths (Saxena et al. 2019 and World Bank 2019a). A critical opportunity for many countries is raising the rate of taxes on unhealthy foods and beverages, which are often below the WHO recommended rate of 20%–50% (WHO 2016).

Restrictions on marketing to children have been recommended to limit the volume and the appeal of advertising to children. Such restrictions have been found to be effective in reducing exposure to advertising among children (Boyland and Whalen 2015 and Correa et al. 2019). However, within the region, there has been limited implementation of restrictions on advertising. Taipei, China is one of the few countries to have implemented strong restrictions on marketing to children under 12 years of age. These restrict television advertising of foods exceeding set fat, sodium, and sugar content limits from 5 pm to 9 pm, as well as the use of free toys to promote food in restaurants (World Cancer Research Fund 2017). In some countries, it has proved challenging to enforce such restrictions (Reeve et al. 2018).

E. Technology, Innovation, and Healthy Diets

The final element of a strong policy response to the DBM in the region will entail innovation and engagement with new technologies to support healthy diets. This includes making better use of new communication technology to promote nutrition education and healthy behaviors. Global studies indicate that mobile apps show promise in allowing nutrition education to reach populations who may not have access to traditional clinical services (Hingle and Patrick 2016). Mobile phone approaches have been successfully used to communicate information about young child nutrition in the region (Alam et al. 2019).

New technologies in the food and agriculture space also offer potential to improve food systems and nutrition. However, it is imperative that such technologies are considered in context, such that improvements in productivity, yields, and processing are not detrimental to nutritional quality (Glover and Poole 2019). New opportunities arising from food and agricultural technology include crop varieties and processing techniques that enhance nutritional quality, and new approaches to post-harvest processing to reduce losses, particularly for perishable produce such as fruits (Njogu et al. 2016 and Subramanian et al. 2018). New sources of protein are also being investigated, such as edible insects (Ssepuuya et al. 2017).

There are also significant opportunities for collaborative innovation at the community level, to create health, livelihood, and environmental benefits from food systems (FAO 2018c); for example, creating linkages between local agricultural production and school feeding, which supports improved incomes for small producers and their families, and nutrition and cognitive gains for school-age children, while also reducing transport and packaging (Gillespie et al. 2019a).

VI. CONCLUSION AND KEY MESSAGES

Improving malnutrition should be a regional priority because it bears significant personal, social, and economic costs in the Asia and Pacific region. While diets have improved in terms of diversity and the sufficiency of caloric intake in most countries, particular challenges remain for countries with very low incomes. As caloric intakes improve, the region faces the emerging challenge of unhealthy diets, as consumption of fats, sugars, and highly processed foods rises. Specific populations at high risk of poor dietary intake include young children during weaning, women and girls, households with low incomes, and rural landless households.

Food environments are improving across the region. Food prices are fairly stable, but high prices for nutritious foods are contributing to both undernutrition and unhealthy diets. Despite improvements in food safety standards, food safety remains a challenge across the region, particularly in informal settings. Urbanization and globalization have contributed to changing diets through impacts on food availability, retail, and marketing. Although urbanization can improve access to a variety of foods, people also eat more out, and consume more processed-ready-made food. Food has become less expensive and more readily available, resulting in reduced food insecurity and malnutrition, yet we see more unhealthy eating (too much calorie intake, sugar, salt, and fat). Increased openness to trade has made food supply chains more resilient and enabled access to similar foods all year around, but can also increase vulnerability to global price shocks and increase the availability and affordability of unhealthy processed food.

In line with these changes in diets and food environments, there have been improvements in undernutrition prevalence, but there is evidence of the DBM at the household, community, and national levels across the region. Undernutrition remains pervasive, and obesity rates are increasing in all countries. Obesity increased across all income groups, especially among the lower-income groups. Higher obesity rates translate into higher risk of developing diabetes and a number of cancers, which are associated with substantial health care system costs. Further, the high prevalence childhood obesity predicts further increase in obesity rates. All forms of malnutrition also hamper educational attainment and productivity in the region, leading to significant economic costs.

Flanking policies to support supply and demand for healthy foods, such as fiscal policies and education, will help to ensure that consumers take an informed decision and minimize negative externalities for the public health care system. Efforts to improve policy for the DBM should focus on integrated nutrition interventions for preventing undernutrition and obesity/diet-related NCDs, nutrition-sensitive social welfare, agriculture and supply chains for healthy foods, food environment policies, and innovation.

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