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NOURISHING TOMORROW

Addressing Obesity Through Food Systems in South Asia

Deepika Anand | Santu Ghosh | Libby Hattersley | Hideki Higashi

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ABBREVIATIONS AND ACRONYMS

BBR ▸ Beta-binomial regression

BMI ▸ Body mass index

CE ▸ Consumption expenditure

CI ▸ Confidence interval

CVD ▸ Cardiovascular disease

DALYs ▸ Disability-adjusted life years

DBM ▸ Double burden of malnutrition

DI ▸ Dietary intake

ED ▸ External drivers

FAO ▸ Food and agriculture organization

FESC ▸ Food environments and supply chains

FOPL ▸ Front-of-package nutrition labeling

FBDG ▸ Food-based dietary guidelines

GBD ▸ Global burden of disease

GHDx ▸ Global health data exchange

GDP ▸ Gross domestic product

HFSS ▸ High fat, salt and sugar

HIC ▸ High-income countries

IFCB ▸ Individual factors and consumer behaviours

IHME ▸ Institute for health metrics and evaluation's

IPA ▸ Insufficient physical activity

IQR ▸ Interquartile range

JHU ▸ Johns Hopkins University

LSCR ▸ Lower secondary completion rate

NCD ▸ Noncommunicable disease

NCD-RisC ▸ NCD risk factor collaboration

OOP ▸ Out-of-pocket

OR ▸ Odds ratio

PA ▸ Physical activity

RAI ▸ Relative attribution index

SD ▸ Standard deviation

SES ▸ Socioeconomic status

SSB ▸ Sugar-sweetened beverage

T2DM ▸ Type 2 diabetes mellitus

WHO ▸ World Health Organization

DEFINITIONS

Agricultural infrastructure index	A composite indicator that measures the ability to store and transport crops to market based on assessment of a country's road, rail, port, air transport, and irrigation infrastructure, as well as investment in crop storage facilities. A higher score indicates more developed infrastructure.
Consumption expenditure (CE) per capita	Market value of all goods and services, including durable products such as cars, washing machines, and home computers purchased by households.
Dietary energy in the food supply	Also called dietary energy supply, this is the amount of kilocalories per person per day that is available in a country's food supply.
Double burden of malnutrition (DBM)	The coexistence of overnutrition (Overweight and obesity) and undernutrition (Underweight, stunting, wasting, and micronutrient deficiencies) within the same populations, households, and individuals over the life-course
External drivers	External drivers are factors that originate outside of the core food system but significantly influence its structure, function, and outcomes.
Food environment	The food environment refers to the physical, economic, and social settings where people interact with the food system for the purpose of acquiring and eating food.
Food supply chain	The food supply chain includes all the steps and processes involved in producing and moving foods from field to fork.
Food systems	Food systems encompass the interconnected people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food (Food systems dashboard 2024).
Gender inequality index	The gender inequality index reflects gender-based disadvantages in three dimensions—reproductive health, empowerment, and the labor market. It uses a scale from 0 to 1, where 0 indicates equal outcomes for women and men and 1 indicates that one gender is at the lowest possible level in all measured areas.
Individual factors and consumer behaviours (IFCB)	Individual factors refer to personal characteristics that influence food choices (such as age, gender, income, education, cultural background, and health status) while consumer behavior refers to the way in which individuals make food-related decisions, including what, when, and how they eat.

Insufficient physical activity (IPA)	IPA is defined by the World Health Organization as less than 150 minutes of moderate-intensity or less than 75 minutes of vigorous-intensity physical activity per week.
Lower secondary completion rate (%)	This is the number of new entrants in the last grade of lower secondary education, regardless of age, divided by the population at the entrance age for the last grade of lower secondary education.
Number of modern grocery retailers per 100,000 population	Euromonitor retailer types included in this category are hypermarkets, supermarkets, discounters, forecourt retailers (Grocery outlets attached to gas or petrol stations), and convenience stores. These stores sell predominantly food and beverages and are typically part of large companies or brands that have multiple locations.
Overweight (For children <5 years)	Weight-for-age >2SD above median of the WHO child growth standards
Obesity (For children <5 years)	Weight-for-age >3SD above median of the WHO child growth standards
Overweight (For children & adolescents (5-19 years))	Weight-for-age >1SD above median of the WHO child growth standards
Obesity (For children & adolescents (5-19 years))	Weight-for-age >2SD above median of the WHO child growth standards
Overweight (For adults)	BMI > 25kg/m^2 (Global), BMI>23kg/m^2 for South Asia
Obesity (For adults)	BMI > 30 kg/m^2 (Global), BMI>25 kg/m^2 for South Asia
Packaged food sales per person	This refers to the total sales of packaged food and soft drinks in the calendar year per person (US$ per person). Packaged food is considered any food that is sold in a protective barrier such as plastic, cans, or paper.
Proportion of insufficient physical activity (IPA)	This refers to the proportion of the population not meeting the recommended amount of PA per week (For adults: At least 150 minutes of moderate-intensity pa, at least 75 minutes of vigorous-intensity pa, or a combination of both; For adolescents: At least 60 minutes of moderate-to-vigorous pa per day).

1. See https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-(age-standardized-estimate)-(-).

Proportion of urban population	This is the proportion (%) of the population living in an urban area.
Gini index	Gini is a measure of income inequality, with a value of 0 representing total equality and 100 indicating total inequality.
Poverty headcount ratio	This is the proportion (%) of the population living on less than $2.15 a day at 2017 international prices.
Relative attribution index (RAI)	The RAI is the relative change in odds of obesity due to each parameter per year for a country.
Stunting (For children and adolescents)	Height-for-age <2 SD below median of the WHO child growth standards.
Trade as a proportion of GDP	Sum of exports and imports of goods and services measured as a share (%) of Gross domestic product (GDP).
Underweight (For children <5 years)	Weight-for-age <2SD below median of the WHO child growth standards
Underweight (For adults)	BMI < 18.5kg/m^2
Wasting (For children <5 year)	Weight-for-height <2 SD below median of the WHO child growth standards

EXECUTIVE SUMMARY

The South Asian region, consisting of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka, is facing complex epidemiological and nutrition transitions. Overnutrition (Overweight and obesity) and related noncommunicable diseases (NCDs) are rising rapidly across the region, while undernutrition remains a significant challenge. The health, economic, and social costs of this double burden of malnutrition (DBM) are enormous and disproportionately affect poor and marginalized groups, perpetuating poverty and inequalities. Overweight and obesity significantly increase an individual's risk of developing multiple NCDs, including three of the top four causes of NCD-related death and disability globally-cardiovascular diseases (CVDs) such as heart disease and stroke, Type 2 diabetes mellitus (T2DM), and some cancers. A meta-analysis conducted for this report confirmed significant associations between obesity and T2DM and obesity and hypertension in South Asian populations, underscoring the urgent need for public health strategies to tackle the region's escalating obesity burden.

While the causes of obesity are complex, unhealthy diets and insufficient physical activity (IPA) are key modifiable risk factors. Dietary and activity patterns in the region have changed dramatically in recent decades, driven by a range of factors including economic growth, rapid urbanization, and increased availability, accessibility, marketing, and consumption of energy-dense processed foods. Consumption of healthy foods, such as fruits, vegetables, whole grains, legumes, nuts, and seeds, is far below the recommended levels in all South Asian countries. Unhealthy diets high in sodium, added sugars, unhealthy fats, and calorie-dense processed foods, and low in whole grains, legumes, fruits, and vegetables are a major risk factor for weight gain, obesity, and multiple NCDs, including CVDs, T2DM, and some cancers. Meanwhile, IPA is a growing concern in the region, particularly among specific demographic groups.

Food systems play a pivotal role in driving obesity by determining the types of foods produced, available, and accessible to different populations, and shaping food preferences and choices. Food systems are complex, encompassing the interconnected people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food. The ways in which different aspects of food systems influence diets differ between and within countries, including between population groups. Country-specific food system analysis are essential to understand these dynamics and to effectively reorient food systems towards supporting healthier diets.

This report presents the findings of a novel analysis of the contribution of different pillars of food systems to temporal trends of overweight and obesity in South Asian countries, using aggregated national-level temporal data. The analysis found that all aspects of food systems are associated with rising obesity in the region, reaffirming the importance of analyzing food systems using a whole-of-system approach. While only a small proportion of the incremental trend of obesity in South Asia (10-12 percent) could be attributed to factors related to food systems during the study period, it is highly likely that this was due to a lack of high-quality data, which limited the parameters that could be included in the analysis. The true contribution of food systems to the increasing trend of obesity in South Asia is likely to be substantially higher. Similarly, while the

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2. The double burden of malnutrition is defined as the coexistence of overnutrition (overweight and obesity) and undernutrition (underweight, stunting, wasting, and micronutrient deficiencies) within the same populations, households, and individuals over the life course.

findings suggest that some aspects of food systems-namely external drivers and individual factors and consumer behaviours (IFCB) have contributed most to the incremental trend in obesity in South Asia, the analysis of other domains (particularly food environments and supply chains, but also dietary intakes) was severely limited by a lack of data.

Significant positive associations were detected between obesity trends in South Asia and external drivers like urbanization, global trade integration (measured as trade share to GDP), consumption expenditure (a marker of economic activity and growth), and declining gender inequality. Smaller positive associations were detected between obesity and the food environment and supply chain variables analyzed (dietary energy supply, modern grocery retailer density, packaged food sales, and agricultural infrastructure development). Significant positive associations were detected between obesity and dietary intakes of red and processed meats and sugar-sweetened beverages (SSBs). Intakes of healthy dietary components, including fruits, vegetables, nuts, seeds, and legumes in the region were too low to detect any associations. The findings were confirmed by separate meta-analyses conducted for this report, which found significant positive associations between obesity and living in an urban locality, socioeconomic status (SES), insufficient physical activity (PA), and consumption of unhealthy foods in South Asian populations.

Notwithstanding data limitations, the findings in this report provide rich information on the links between specific components of food systems and obesity in South Asian countries. These findings can be used to inform policy advice and discussions relating to food systems and obesity in the region, including to communicate the importance of using a food systems approach to more effectively tackle the root causes of obesity. A preliminary desk review of obesity-related policies in all seven South Asian countries conducted for this report highlighted multiple gaps and opportunities to strengthen current responses using this approach. As a preliminary study, this report lays the groundwork for more in-depth analyses of the links between food systems and obesity in South Asia. It is hoped that the methodology developed in this study can be replicated and expanded on as more high-quality data become available.

1 OVERVIEW

The burden of noncommunicable diseases (NCDs) in South Asia is rising rapidly. South Asian countries—Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka-are also experiencing high levels of the double burden of malnutrition (DBM), characterized by a rapid rise in overnutrition (overweight and obesity) alongside persistent undernutrition (underweight, wasting, stunting, and micronutrient deficiencies). Overweight and obesity significantly increase an individual's risk of developing multiple NCDs, including three of the top four causes of NCD-related death and disability globally-cardiovascular diseases (CVDs) such as heart disease and stroke, T2DM, and some cancers. The DBM poses a particularly pernicious public health threat due to its life course effects increasing the risk for developing NCD earlier in life.

An unhealthy diet is a key modifiable risk factor for obesity. As countries advance in their economic status, lifestyle and dietary changes linked to urbanization and economic growth have shown a transition away from traditional food staples towards increased consumption of foods high in calories, sugars, sodium, and unhealthy fats. Globally, this shift in diets, along with reduced physical activity (PA) and increases in sedentary lifestyles, has been a key driver of the rise in obesity.

Food systems influence diets by determining which foods are produced, the types of foods available and accessible, and people's food preferences and choices. Food systems encompass the interconnected people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food (Fanzo and Davis 2021). Food systems are themselves shaped by a range of external drivers, including population and economic growth, urbanization, globalization and trade, politics, and sociocultural contexts. Although the transformation of food systems and diets is a global phenomenon, the ways in which different aspects of food systems are contributing to the rising burden of unhealthy diets, obesity, and NCDs differs between and within countries.

Country-specific evidence and analysis are needed to guide the development and implementation of effective food system and fiscal policies to reduce the burden of unhealthy diets. This report comes at a critically important time for South Asian countries. While progress has been made in reducing the region's high burden of undernutrition, continued concerted efforts are needed for countries in the region to meet the global nutrition targets by 2030. At the same time, urgent action is needed to address the escalating burden of overnutrition and diet-related NCDs in the region. This

includes reviewing all existing policies for their impacts (both intended and unintended) on food systems and diets, as well as implementing global best practice policy recommendations for reducing unhealthy diets.

PURPOSE AND SCOPE OF THIS REPORT

The aim of this report is to provide region-and country-specific evidence on the links between food systems and obesity in South Asia to support effective government policies and actions to reduce the burden of unhealthy diets in the region. It is an extension of the 2022 World Bank report "Nourishing Tomorrow: Food Systems and Fiscal Policy to Address Obesity in South Asia" (Report No. AUS0003143), which examined the association between overweight and obesity and different components of food systems in South Asia using univariate analysis. This report extends that analysis by exploring the attribution of different domains and components of food systems to obesity in South Asian countries using multivariate regression. A systematic review and meta-analysis of the evidence on the links between obesity and NCDs in the region was conducted to validate the findings.

OUTLINE

The report is organized as follows: **Chapter 2** highlights the ongoing transitions in South Asia, including shifts in disease patterns, nutrition, diets, and lifestyles. **Chapter 3** examines the associations between obesity and key NCDs in South Asian populations, shedding light on how obesity contributes to the rising burden of conditions such as diabetes, CVDs, and hypertension in the region. **Chapter 4** presents the results of an analysis of the contribution of different components of food systems to obesity in South Asian countries, focusing on four domains: Individual factors and consumer behaviors (IFCB), food environments and supply chains (FESC), dietary intake, and external drivers (ED). It also summarizes the findings of a country-specific review of existing policies aimed at supporting healthier food systems and diets in the region. Finally, **Chapter 5** provides some recommendations to support the strengthening of policy responses aimed at reducing the burden of unhealthy diets and obesity in SAR.

2 SOUTH ASIA IN TRANSITION

South Asian countries are experiencing rapid shifts in disease burden and dietary patterns. While undernutrition continues to affect millions, perpetuating cycles of poverty and poor health, shifting diets and activity patterns are driving rising rates of overweight, obesity, and related NCDs, such as CVDs and T2DM. This chapter explores the multifaceted nature of these transitions, examining their underlying drivers, health implications, and the socioeconomic impacts on the region.

2.1 DISEASE TRANSITION

South Asia is transitioning from communicable diseases and maternal health challenges to confronting NCDs as the leading cause of death and disability. NCDs accounted for 66 percent of all deaths and 58 percent of all disability-adjusted life years (DALYs) in the region in 2019 (IHME 2021). While the burden of NCDs is lower in South Asia than in other regions except Sub-Saharan Africa, it is rising rapidly (Figure 2.1). CVDs have become the single leading cause of death and disability in the region, accounting for 30 percent of all deaths and 15 percent of DALYs in 2019. T2DM accounted for 3.3 percent of all deaths and 2.6 percent of DALYs in 2019 (IHME 2021), with DALY rates rising in all South Asian countries although some countries observed declines in death rates (Figure 2.2) due to nonfatal morbidity of T2DM.

Contrary to a widespread assumption in the region that NCDs are primarily concerns of the affluent, the burden of NCDs is rising rapidly in low-income countries as well. In 2021, NCDs led to 18 million deaths under 70 years old, with 82 percent of these fatalities occurring in low-and middle-income countries. Further, studies have shown that populations with lower socioeconomic status (SES) are at an elevated risk of developing NCDs-diabetes, stroke, myocardial infarction, and cancer-and are also at an elevated risk of NCD risk factors such as high BMI, tobacco use, alcohol use, and hypertension (Niessen et al. 2018). NCD risk factors also tend to be socially patterned, with lack of access to healthy diets and PA (particularly leisure activity), tobacco smoking, and heavy alcohol consumption typically concentrated among the poor. This has consequences for future rapid growth of the NCD burden among lower-income groups in the region. NCD figures may underrepresent the true burden among lower-income groups that are less likely to access health services due to lower access to basic health care services as well as lower health awareness.

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3. DALYs for a disease or health condition are the sum of the years of life lost to due to premature mortality and the years lived with a disability due to prevalent cases of the disease or health condition in a population. One DALY represents the loss of the equivalent of one year of full health.

Figure 2.1. Percent of Total Deaths and DALYs Caused by NCDs in Different Regions and South Asian Countries

NCD share of total deaths by World Bank region

NCD share of total disease burden by World Bank region

Legend: East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, Sub-Saharan Africa

NCD share of total deaths in SAR countries

NCD share of total disease burden in SAR countries

Legend: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

Source: Global Burden of Disease Compare, 2021
Note: NCD = noncommunicable disease.

Figure 2.2. Diabetes Death and DALY Rates in South Asian Countries Over Time

Deaths per 100K of Type 2 diabetes mellitus in SAR countries

DALYs per 100K of Type 2 diabetes mellitus in SAR countries

Legend: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
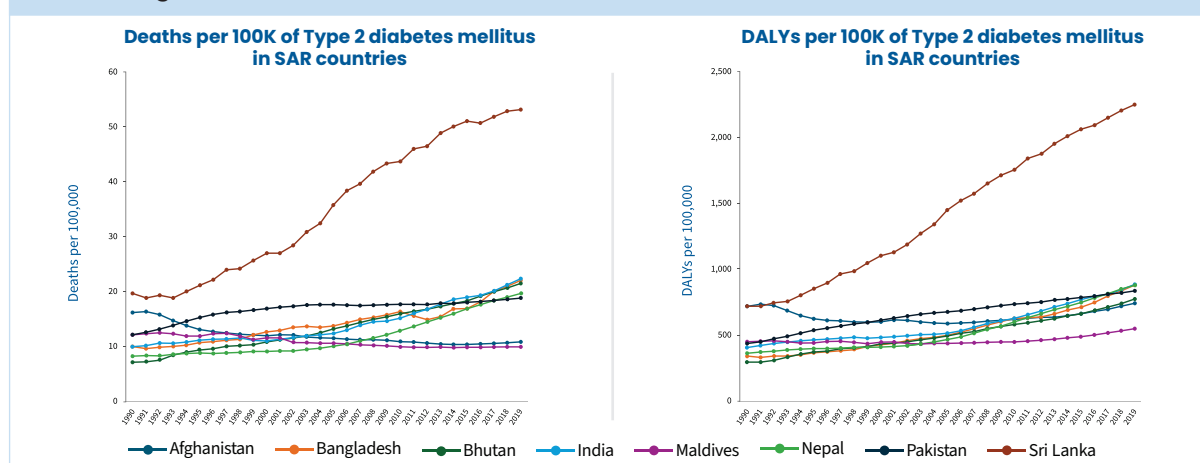
Source: IHME GBD 2021
Note: SAR = South Asia.

4. See https://www.who.int/data/gho.

4

The health, economic, and social costs of NCDs are immense. NCDs are often chronic in nature and require long-term care, increasing pressure on health care systems and placing a significant financial burden on individuals and their households through out-of-pocket (OOP) spending on health care. NCDs also lower productivity and slow economic growth through reduced labor force participation in the working age population as people with NCDs are less productive, work for fewer years, and die prematurely. These impacts disproportionately affect the poorest and most marginalized groups, perpetuating poverty and inequalities. High costs of NCD care, mainly OOP, can be crippling for low-income households, with catastrophic health expenditure due to NCDs concentrated in the poorest households (bottom 40 percent). Research from South Asia indicates that households affected by NCDs face significantly higher OOP costs, are at greater risk of catastrophic health expenses, and have an increased likelihood of falling into poverty compared to those without NCDs (Rijal et al. 2018). While NCDs are more prevalent in older age groups, they can develop at any age and often affect people during their most productive years, with lifelong consequences. Worldwide, more than one in three deaths due to NCDs (40 percent) occur in people below 70 years of age (GBD, 2021). NCDs tend to develop gradually, and often subtly, over time. Once affected, people often live with the consequences of NCDs for the rest of their lives.

Excess weight gain, commonly defined using Body mass index (BMI), is a major driver of NCDs, particularly CVDs and T2DM. High BMI was directly accountable for 8.52 percent of all-cause deaths and 5.89 percent of global DALYs in 2019, with the highest BMI-attributable DALYs linked to CVDs, diabetes and kidney disease (Figure 2.3). CVDs were the primary cause of high BMI-related deaths (40.1 per 100,000 people) and DALYs (1045.37 per 100,000 people) in 2019, followed by diabetes and kidney disease (12.54 deaths per 100,000 people, and 547.26 DALYs per 100,000 people), per Chen et al (2024). See box 2.1 for a more detailed look at BMI.

Figure 2.3. DALYs Attributable to High BMI, Global, All Ages (1990–2021)
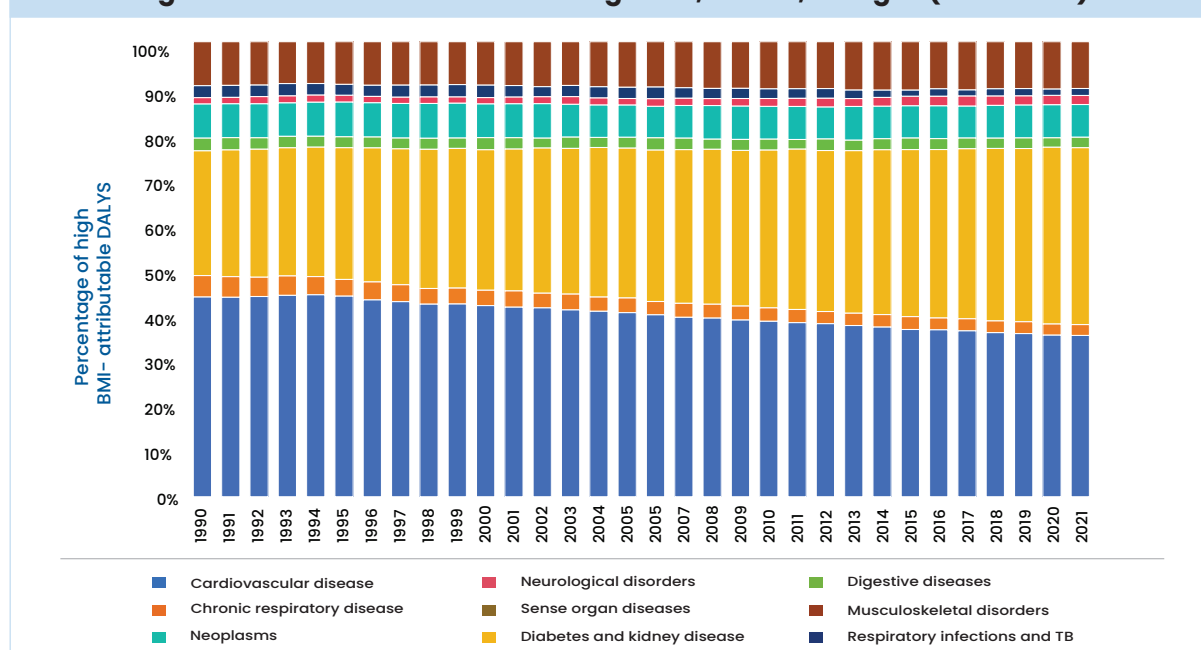
Note: BMI = body mass index; DALYs = disability-adjusted life years; TB = tuberculosis.

Box 2.1. Defining and Diagnosing Overweight and Obesity

Overweight and obesity are defined by the World Health Organization (WHO) as excess adiposity (body fatness) that poses a risk to health. Diagnosis of overweight and obesity in adults (ages 20 years and older) is typically made using body mass index (BMI)a cut points of 25kg/m^2 and 30kg/m^2, respectively. However, WHO recommends lower cut points of 23kg/m^2 and 25kg/m^2, respectively for South Asian populations due to a genetic predisposition to higher health risks at lower BMI (WHO, 2022). South Asians exhibit a unique phenotype with a higher body fat percentage and central adiposity at lower BMI, which predisposes them to metabolic risks at lower BMI thresholds compared to other populations (Yajnik, 2002).

In children and adolescents ages 5–19 years, a BMI greater than 1 standard deviation (SD) above WHO's Child growth standards median is considered overweight, while a BMI greater than 2 SD above the median is considered obese (WHO 2020). In young children under five years of age, weight-for-height measures are used (Table B2.1.1). A recent Lancet paper on the definition and diagnostic criteria of clinical obesity has recently proposed a new diagnostic approach to obesity that focuses on the measures of body fat and signs and symptoms of ill health (The lancet diabetes & endocrinology 2025). The current study, however, has taken BMI for all analytical purposes.

Table B2.1.1: Body Mass Index (BMI) Cut Points for Defining Overweight and Obesity in Adults (kg/m2)				
	Adults		**5–19 years**	**<5 years**
	Global	**South Asia**		
Overweight	25	23	BMI-for-age >1 SD above WHO Child Growth Standards median	Weight-for-height >2 SD above WHO Child Growth Standards median
Obese (class I)	30	25	BMI-for-age >2 SD above WHO Child Growth Standards median	Weight-for-height >3 SD above WHO Child Growth Standards median
Obese (class II)	35	30		
Obese (class III)	40			

Source: WHO (2000)
Note: BMI = Body mass index; SD = Standard deviation; WHO = World Health Organization.

a. BMI is weight in kilograms divided by height in meters squared (kg/m2).

The causes of NCDs are complex, but many could be prevented by reducing modifiable risk factors like unhealthy diet, Insufficient physical activity (IPA), tobacco smoking, and alcohol use. The behavioral risk factors contribute to metabolic changes, including raised blood pressure, elevated blood glucose levels, abnormal blood lipids, and weight gain, that increase risk of multiple NCDs. To reduce the global burden of NCDs, WHO has introduced a Global Action Plan for the Prevention and Control of NCDs (2013–2030). The plan is aligned with Sustainable Development Goal 3.4, which aims to reduce premature deaths from NCDs by one-third by 2030. The analysis attempted to map the progress of South Asian countries on this action plan. While it was encouraging to note that India, Bangladesh, Nepal, and Sri Lanka have developed country-specific NCD policies focusing primarily on healthier food environments, obesity prevention, and tobacco and alcohol control, there is limited information on the enforcement, resource constraints, and gaps in health care infrastructure that remained key challenges in fully achieving WHO's NCD targets.

2.2   NUTRITION TRANSITION

The prevalence of overweight and obesity is rising rapidly in all South Asian countries among both adults and children. Between 2000 and 2022, overweight and obesity rates increased to: 27.5 percent from 7 percent in Bangladesh, 48.4 percent from 22 percent in Bhutan, 30.5 percent from 11.5 percent in India, 55 percent from 28 percent in Maldives, 31.6 percent from 11 percent in Nepal, 56.3 percent from 24 percent in Pakistan, and 39.4 percent from 15.9 percent in Sri Lanka (NCD-RisC 2024). The prevalence of underweight among adults has sharply declined across the region over the same period (Figure 2.4). This period coincides with the significant economic expansion in South Asia, possibly leading to reduced poverty rates, improved food security, and enhanced health care services, especially in reproductive health (Tata-Cornell Institute 2023; UNICEF 2021; FAO 2022).

Figure 2.4. Prevalence of Overweight and Obesity (BMI > 25kg/m^2) and Underweight (BMI < 18.5kg/m^2) Among Adults Over 18 Years in South Asia

Source: NCD Risk Factor Collaboration (NCD-RisC) network dashboard (https://www.ncdrisc.org/index.html).
Note: SAR = South Asia region.

The prevalence of overweight and obesity among children (>5 years) in the region is also rising rapidly. Since 2000, the sharpest increase was observed in the Maldives (31 percent from 8 percent). Elsewhere across the region, the rate has increased to: 8.2 percent from 2.9 percent in Bangladesh, 18.3 percent from 5.7 percent in Bhutan, 10.3 percent from 1.9 percent in India, 8.8 percent from 3.9 percent in Nepal, 18.8 percent from 3.9 percent in Pakistan, and 17 percent from 4.5 percent in Sri Lanka. The prevalence of child undernutrition showed a steady decline across all South Asian countries, with the smallest decline observed in Maldives (Figure 2.5).

Figure 2.5. Trends in Prevalence of Overweight (BMI-for-age >1SD) and Underweight (BMI-for-Age <-2SD) Among Children and Adolescents (5–18 years) in South Asia
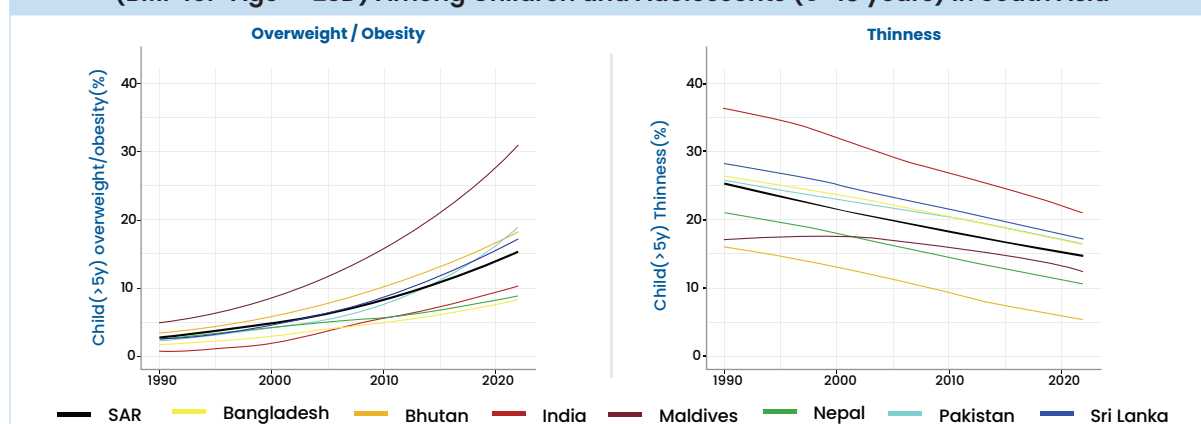
Source: NCD Risk Factor Collaboration (NCD-RisC) network dashboard
Note: SAR = South Asia region.

While progress has been made in reducing undernutrition, especially child stunting, South Asia continues to have some of the highest rates globally. Stunting prevalence (Height-for-age <2 SD below median of the WHO child growth standards) among children under five years of age ranged from 15.3 percent in Maldives to 37.6 percent in Pakistan in 2022 (WHO 2024). Prevalence of underweight (Weight-for-age 2 SD below median of the WHO child growth standards) among children under five years ranges from 12.7 percent in Bhutan to 31.5 percent in India, while under-five wasting prevalence (Weight-for-height <2 SD below median of the WHO child growth standards) ranges from 5.9 percent in Bhutan to 18.7 percent in India (WHO 2024).

As a result, South Asian countries are grappling with a complex dual burden of malnutrition, with undernutrition (underweight, stunting, wasting, and micronutrient deficiencies) and overnutrition (overweight and obesity) coexisting within populations, households, and individuals across the life course. The human and economic costs of this burden are enormous. Overweight and obesity were estimated to cost the global economy US$1.96 trillion, a number that is expected to rise to US$4.32 trillion in 2035 (Lobstein et al. 2023; Okunogbe et al. 2022). Economic losses related to obesity are estimated at 3.58 to 8.73 percent of gross domestic product (GDP) in developing Asian countries (Shekar and Popkin 2020), though a lack of studies in this region means that the true value of economic losses is likely to be far higher.

2.3 TRANSITIONING DIETS

The rapid rise in obesity and NCDs in South Asia in recent decades has coincided with a period of economic growth, rapid urbanization, and profound changes in lifestyles across the region. Urbanization and rising incomes, along with technological advances and profound changes to food systems in the region, have significantly increased the availability, accessibility, and marketing of energy-dense processed foods and beverages (Pineda et al. 2024). Consumption of these foods has increased sharply as dietary patterns have shifted towards "Westernized diets," away from traditional, locally-sourced foods. Urbanization and technological changes have also significantly reduced occupational and leisure-time PA levels. These profound shifts in diets and energy expenditure in the region are mirrored in countries around the world and are known as the nutrition transition (Popkin and Ng 2021).

Unhealthy diets are a major driver of weight gain, obesity, and multiple NCDs, including CVDs, T2DM, and some cancers. Specifically, diets high in sodium, added sugars, unhealthy fats, and calorie-dense processed foods and low in whole grains, legumes, fruits, and vegetables significantly increase an individual's risk of weight gain, obesity, and multiple NCDs. In South Asia, daily per capita intake of healthy foods like milk, nuts and seeds, whole grains, legumes, vegetables, and fruits remains significantly below the levels recommended by the Institute of Health Metrics and Evaluation's Global Burden of Disease Study (IHME-GBD) (2018) for all South Asian countries. Although intake of these healthy foods has been increasing over the years, it still falls short of meeting the optimal healthy diet requirements. In contrast, the consumption of unhealthy foods, such as excess red and processed meat and sugar-sweetened beverages (SSBs), exceeds optimal levels (Figure 2.6).

Figure 2.6. Dietary Intake by South Asians
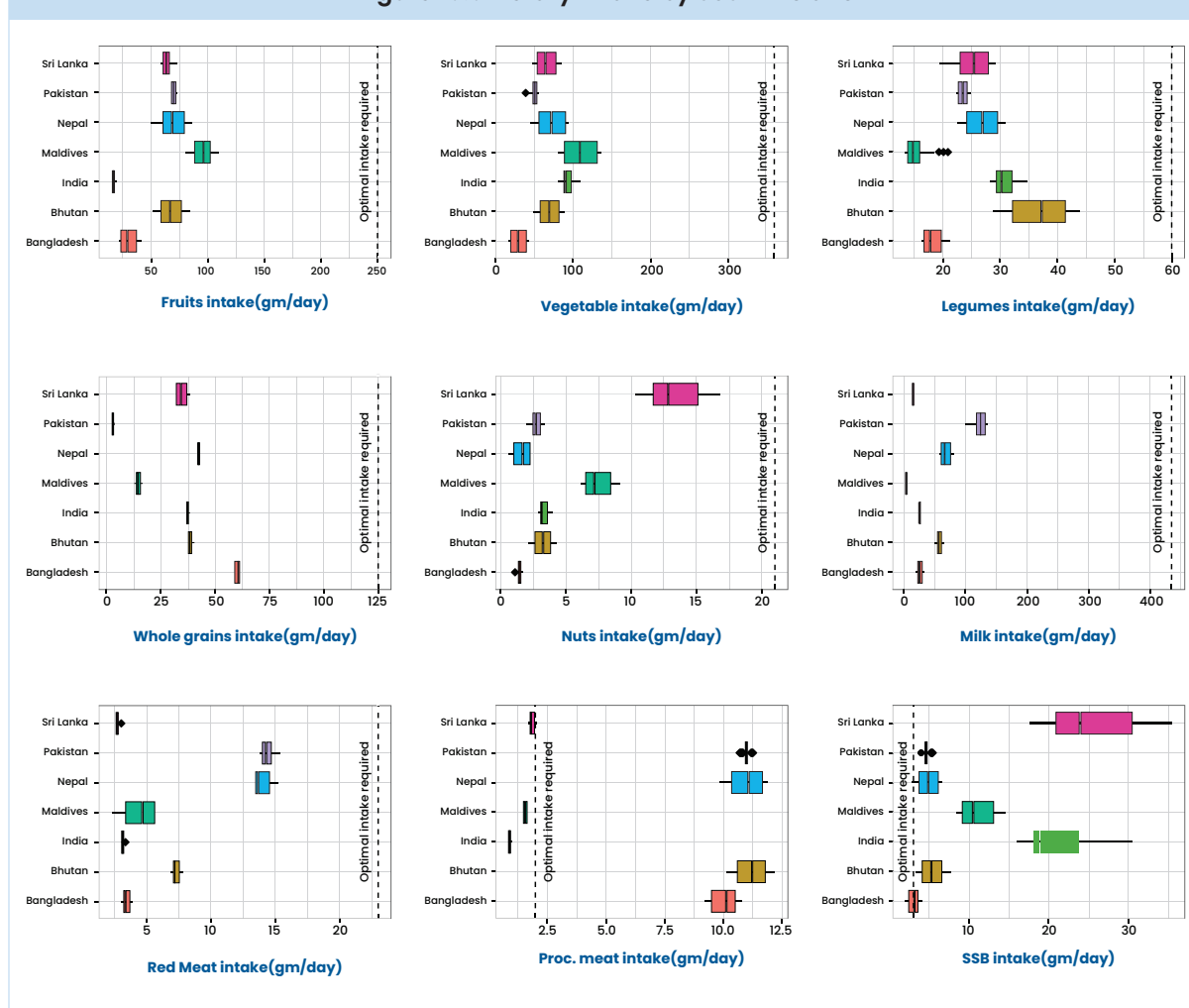
Source: Global Burden of Disease, 2021

Dietary risk factors continue to significantly contribute to the NCD burden in South Asia, with notable changes between 1990 and 2021 (Figure 2.7). Low fruit intake remains the leading dietary risk factor, contributing substantially to CVDs and neoplasms in both years. The growing prominence of processed meat and sugary beverage consumption in 2021 reflects a dietary shift towards calorie-dense, processed foods. Despite progress in some areas, persistent gaps, such as high sodium intake and low fiber consumption, underline the continued need for targeted nutritional interventions. These findings highlight the urgent need to prioritize healthier diets to reduce the growing burden of NCDs across the region. In Pakistan, 96.5 percent of the population consumes unhealthy diets rich in fats and sugars, often influenced by cultural practices like indulgent communal meals during celebrations (Saeedullah et al. 2022; Saeed et al. 2016). Bhutan has seen a rise in consumption of refined carbohydrates, sugary drinks, and fried foods, with low fruit and vegetable intake among adolescents (~30 percent) and high fast-food consumption (~15 percent) (Choeda et al. 2016; Wangdi et al. 2018). Similarly, in the Maldives, over 70 percent of students consume less than two portions of fruits and vegetables daily, while 30–33 percent regularly consume sweet snacks and sugary drinks (Cazzaniga et al. 2023). Addressing changing dietary behaviours is a critical public health priority in these nations.

Figure 2.7. Burden of Disease Attributable to Dietary Risks (1990, 2021; All Ages, South Asia)

1990

Low fruit
Low omega-3
Loe whole grains
Low vegetables
Low nuts and seeds
Low fiber
Low omega-6
High sodium
Low legumes
High trans fat
High processed meat
Low milk
Low calcium
High red meat
High sweetened beverages

Diabetes & CKD
Cardiovascular diseases
Neoplasms

DALYs per 100,000

2021

Low fruit
Loe whole grains
Low nuts and seeds
Low vegetables
Low omega-3
Low omega-6
High sodium
Low fiber
Low legumes
High trans fat
High processed meat
High sweetened beverages
High red meat
Low milk
Low calcium

Diabetes & CKD
Cardiovascular diseases
Neoplasms

DALYs per 100,000

Source: IHME GBD Compare 2021.
Note: CKD = Chronic kidney disease; DALYs = Disability-adjusted life years.

Access to and affordability of healthy diets in the region is a major concern (Box 2.2). Only 1.1 percent of Nepali adults consume the WHO's recommended daily intake of 400 grams of fruits and vegetables (Nepali et al. 2020). In Bangladesh, an estimated 75–92 percent of the population does not consume sufficient fruits and vegetables in a day (Mustafa 2021). In Pakistan, only 15 percent of children meet the minimum dietary diversity criteria, with low consumption of fruits and vegetables (Muzi et al. 2017). Another study indicated that less than 20 percent of the Pakistani population meets the WHO's recommended daily intake of fruits and vegetables (Mahmood et al. 2015).

More than one billion people living in South Asia-more than half (54 percent) of the region's population-were estimated to be unable to afford a healthy diet in 2022. Within the region, the largest proportion of people unable to afford a healthy diet in 2022 lived in India (788 million or 56 percent of the population), Pakistan (138 million or 58.7 percent of the population), and Bangladesh (82 million people or 48 percent of the population).

The cost of a healthy diet is defined as the minimum cost of purchasing the least expensive locally available foods to meet requirements for energy and Food-based dietary guidelines (FBDG) for a representative person within energy balance at 2330 kcal/day, taking into account local food preferences and cultural norms and existing consumption patterns. The average cost of a healthy diet in South Asia in 2022 was US$4.16 dollars per person per day in Purchasing power parity (PPP) terms, higher than the global average of US$3.96. The cost of a healthy diet ranged from US$5.28 PPP dollars per person per day in Bhutan to US$3.36 PPP dollars in India.

Source: World Bank Food Prices for Nutrition Database 2025, version 3.1.

Unhealthy diets disproportionately affect low-income groups. In Bangladesh, insufficient energy and protein intake, alongside high fat and excessive carbohydrate (>70 percent) consumption were more prevalent among poor households, according to findings from the 2018 Bangladesh Integrated Household Survey (Ahmed 2022). According to India's recent National Family Health Surveys (Rounds 4 and 5), fewer women including pregnant women and men were eating each of the six food groups (dairy; pulses, beans, and legumes; dark leafy green vegetables; vitamin-A rich fruits; eggs; and chicken, meat, or fish) in 2021 than in 2016. This is indicative of decreased food diversity among Indians and could partially be attributed to the increasing cost of healthy food-especially the proteins. As high-quality protein sources (like dairy, eggs, fish and meta) are expensive, explains why over 40 percent of India's poorest women (including pregnant women) are not consuming dairy, and almost 60 percent of them (and 40 percent of men) are not consuming eggs, meat, or fish (Jain et al. 2023).

As countries progress, the key behavioral risk factors for obesity shift from high-income to low-income groups, particularly the urban poor. At earlier stages of economic development, higher SES groups are more likely to be able to afford excess calories and processed foods and avoid physically demanding work. Urban and rural poor, on the other hand, are more likely to consume traditional diets low in processed foods and earn their livelihoods through physically active labour. With rising incomes, urbanization, and increased integration within the global economy, the key behavioural risk factors for obesity (Including diets high in processed convenience foods and IPA) shift to poorer groups, particularly the urban poor. Box 2.3 presents an example from India that shows how diets of the poor are also changing in the country. Low-income populations, particularly in urban areas, are more likely to consume cheap, calorie-dense, and processed convenience foods that are high in sugars, fats, and refined carbohydrates due to financial and time constraints. These foods are often low in essential nutrients.

> ## Box 2.3. Dietary Transition in India
>
> The Household Consumer Expenditure survey by the National Sample Survey Office (2023–2024) reveals a substantial increase in the consumption of energy-dense foods compared to the 2011–2012 survey. Per capita energy intake in most Indian states now exceeds the daily energy requirement for an adult male (ICMR 2020). National estimates indicate a 10 percent increase in per capita energy consumption and fat intake has surged by 45 percent, with the lowest socioeconomic groups reporting a nearly 60 percent increase over the past decade. Energy from Sugar-sweetened beverages (SSBs) increased by 90 percent at the national level, with rural and lower socioeconomic groups showing a ~100 percent increase. Energy intake from packaged processed foods grew by 12 percent, with consumption highest among urban and higher socioeconomic groups. Per capita consumption of packaged processed foods jumped from 5g to 21g over the decade.

2.4 TRANSITIONING LIFESTYLES

IPA is a growing concern in South Asia, particularly among specific demographics. IPA is defined by the WHO as less than 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity PA per week (WHO 2018). In India, the proportion of the population estimated to be insufficiently physically active rose from 22.4 percent in 2000 to 49.4 percent in 2022 (NCD-RisC 2024). Less than 50 percent of adults in Pakistan engage in sufficient PA (WHO 2018). Lower levels of IPA are also reported in Nepal, with the 2019 STEPS survey reporting IPA levels of 7.4 percent among adults and 10.8 percent among adolescents.

IPA is more prevalent in urban populations. Urban residents tend to be more physically inactive due to sedentary lifestyles associated with urban living, such as increased screen time, motorized transportation, and fewer opportunities for physical exercise (Baig et al. 2020). In contrast, rural residents are generally more active due to the physical nature of agricultural work.

Higher levels of IPA are reported among women than men, with cultural norms, safety concerns, and limited access to recreational facilities contributing to gender differences. Higher levels of IPA have been reported among women than men in India (57 percent compared to 42 percent) (NCD-RisC 2024) and in Pakistan (60 percent compared to 40 percent) (Ahmed et al. 2019).

While IPA increases with age, several studies have also reported higher levels of IPA among adolescents compared to adults. In Maldives, 78 percent of adolescent boys and 86 percent of adolescent girls are estimated to be physically inactive, compared to 26 percent of adult men and 35 percent of women (WHO 2022). Estimated IPA levels among adolescents in the Maldives remained virtually unchanged between 2001 (83.6 percent) and 2016 (81.9 percent) (Guthold et al. 2020)

SES also plays a crucial role in PA levels. Individuals from higher socioeconomic backgrounds are often more inactive due to lifestyle factors such as sedentary jobs and the use of private vehicles. Conversely, those from lower socioeconomic backgrounds may have more physically demanding jobs but still lack structured exercise (Nishtar et al. 2016). Environmental and infrastructural barriers significantly impact PA levels. Limited access to parks, recreational areas, and safe walking paths restricts opportunities for exercise. Additionally, concerns about air pollution and road safety further discourage outdoor physical activities (Siddiqui et al. 2018).

This chapter has described South Asia's rapidly changing malnutrition and disease burden, underscoring the urgent need for region-specific, evidence-based strategies to mitigate the growing economic and social costs of unhealthy diets and obesity while continuing efforts to address undernutrition. The following chapter presents the results of an in-depth analysis of the evidence of associations between obesity and key NCDs in South Asian populations.

3 OBESITY AND NCDS IN SOUTHEAST ASIA:
INSIGHTS FROM A SYSTEMATIC REVIEW AND META-ANALYSIS

This chapter presents the results of a meta-analysis of the associations between obesity and select NCDs in South Asian populations. Earlier studies identified strong links between obesity, central adiposity, T2DM, and hypertension in South Asian populations (Deepa et al. 2011; Gupta et al. 2008). Mechanisms for these links include insulin resistance, systemic inflammation, and metabolic disruptions contributing to these conditions.

The systematic review includes studies conducted from January 1952 to June 2024. Most of the evidence sorted for meta-analysis were from cross-sectional studies. The limitations include reliance on aggregated national-level data from stochastic models, risking ecological fallacy, and sparse information on factors defining country-specific food system frameworks. The pooled Odds ratio (OR) of T2DM was 1.98 (95 percent CI: 1.60, 2.46) among obese people of any age against normal body weight, with ~50 percent of the risk attributed to obesity in South Asia. The association was strongest in Bangladesh, followed by Nepal and India. The pooled OR estimates of hypertension among obese people was 2.65 (95 percent CI: 2.36, 2.98), with 62 percent of the risk attributed to obesity. Association was strongest in Nepal, followed by India and Bangladesh. However, very limited studies on CVDs and obesity in South Asian countries were conducted in the region. There was only one eligible study in Bangladesh that estimated a significant OR of 2.28 (95 percent CI: 1.27–4.08).

METHODOLOGY

Literature Search and Data Extraction: A comprehensive literature search was conducted using PubMed and Google Scholar databases to identify relevant studies published from January 1952 to June 2024. The search focused on studies involving South Asians residing in South Asia. The search terms included combinations of "obesity," "diabetes," "hypertension," "cardiovascular diseases," and "Asia," as well as specific medical subject headings (MeSH) terms such as "obesity [MeSH Terms]" AND "type 2 diabetes [MeSH Terms]" AND "incidence [MeSH Terms]" AND "India [MeSH Terms]." As an example, one search term used was "(((Obesity [MeSH Terms]) AND type 2 diabetes [MeSH Terms]) AND incidence [MeSH Terms]) AND India [MeSH Terms]."

Inclusion and Exclusion Criteria: Studies were selected based on predefined inclusion criteria, which included studies with key words like "BMI," "waist-hip ratio," and "waist circumference," and those examining the association between obesity and T2DM, hypertension, and CVDs. Only studies where T2DM was defined as a fasting blood glucose level of ≥126 mg/dL or 7.0 mmol/L were included. Hypertension was defined by a systolic blood pressure of ≥140 mmHg and/or a diastolic blood pressure of ≥90 mmHg. All types of CVDs were considered. Studies involving pregnant women, those testing the effects of drugs on these conditions, and studies on South Asians residing outside of South Asia were excluded.

Screening Process: Titles and abstracts of identified studies were initially screened for relevance, followed by full-text assessments to evaluate methodological quality and relevance. Data extraction was performed systematically, capturing study characteristics, participant demographics, obesity measures, outcome measures, and effect estimates. The initial database search yielded 6,578 articles for diabetes, 9,312 for hypertension, and 1,537 for cardiovascular diseases. After screening the titles and abstracts, 90 articles were selected for diabetes, 138 for hypertension, and 40 for CVDs. Following a thorough full-text assessment, 52 articles were deemed relevant for diabetes, 84 for hypertension, and 27 for CVDs. Ultimately, 12 studies on diabetes, 35 on hypertension, and 13 on CVDs met the inclusion and exclusion criteria and were included in the final analysis.

Obesity Classification: Several studies have utilized varying BMI cut offs to define obesity, with some using a threshold of BMI >25 kg/m^2, while others have used BMI >30 kg/m^2. We included studies that defined obesity irrespective of the specific BMI cut off used. Additionally, to maintain consistency and comparability in our analysis, we included only those studies where the OR was reported and the reference category was defined as individuals with normal weight (BMI 18.5–24.9 kg/m^2). Studies that used underweight individuals as the reference category were excluded from our review. Furthermore, to maintain uniformity, measures of central obesity (such as waist circumference and waist-to-hip ratio) were not included in this analysis.

Data Synthesis: This approach ensured that the effect estimates were comparable across studies, providing a more robust synthesis of the association between obesity and health outcomes such as T2DM, hypertension, and CVDs in South Asian populations. Pooled effect estimates were calculated using random-effects models, with heterogeneity assessed via the I^2 statistic.

KEY RESULTS

The association between obesity and T2DM was significant across all SAR countries analyzed (OR 1.98, 95 percent CI: 1.60, 2.46); with attributional risk estimated to be around 49.5 percent. Studies reported from Bangladesh showed the strongest association (pooled OR of 2.40; 95 percent CI: 1.55, 3.72; ~58 percent of T2DM risk linked to overweight or obesity) compared to India (pooled OR of 1.71; 95 percent CI: 1.25, 2.35; ~42 percent of risk linked to overweight or obesity) and Nepal (pooled OR of 2.01; 95 percent CI: 1.67, 2.42; ~50 percent of risk linked to overweight or obesity). The random effects model revealed substantial heterogeneity across studies, highlighting the varying degrees of risk associated with obesity in different South Asian contexts, possibly due to differences in genetic, environmental, and lifestyle factors (Figure 3.1).

Figure 3.1. Meta-Analysis of Data from Studies Exploring the Association between Obesity and Type 2 Diabetes

Study	Odds Ratio [95% CI]
Das, S., et al 2018, Bangladesh	3.00 [2.38, 3.79]
Sen, K. K. et al 2023, Bangladesh	1.92 [1.50, 2.46]
Anjana, R. M. et al. 2017 (Rural), India	1.59 [1.41, 1.80]
Anjana, R. M. et al. 2017 (Urban), India	1.57 [1.37, 1.79]
Bharati, D. R. et al 2011, India	1.91 [0.80, 4.58]
Deepa, M. et al 2015, India	1.62 [1.33, 1.98]
Ghorpade, A. et al. 2013, India	3.40 [2.00, 5.79]
Kapoor, N. et al. 2020, India	2.75 [1.50, 5.04]
Kumar, P. et al. 2021, India	0.77 [0.48, 1.24]
Mehta et al., 2011, Nepal	2.07 [1.30, 3.29]
Shrestha et al., 2020, Nepal	2.00 [1.63, 2.45]
Jafar et al 2006, Pakistan	3.05 [2.41, 3.85]
Random-Effects Model	1.98 [1.60, 2.46]

Odds Ratio

Similarly, the association between obesity and hypertension was consistently strong across the region. The pooled OR from the random-effects model was 2.65 (95 percent CI: 2.36, 2.98), indicating a significant association between obesity and an increased risk of hypertension in this population with attributable risk of ~62 percent. Substantial heterogeneity across studies was observed. Hence, stratified analysis of the studies from Nepal exhibited the highest association, followed by India and Bangladesh, with an overall attributable risk of approximately 60 percent in South Asia (Figure 3.2). Very limited studies on CVDs and obesity in the region were found until 2023. Only one eligible study, which was in Bangladesh, estimated significant OR of 2.28 (95 percent CI: 1.27–4.08) (Figure 3.3).

Figure 3.2. Meta-Analysis of Data from Studies Exploring the Association between Obesity and Hypertension

Study	Odds Ratio
Al-Shoaibi et al., 2022, Female,Bangladesh	1.99 [1.00, 3.98]
Al-Shoaibi et al., 2022, Female,Bangladesh	1.48 [0.63, 3.47]
Al-Shoaibi et al., 2022, Male,Bangladesh	1.65 [0.65, 4.19]
Al-Shoaibi et al., 2022, Male,Bangladesh	1.82 [0.48, 6.87]
All et al., 2022,Bangladesh	3.94 [1.64, 9.47]
Bably Sabina Azhar et al., 2022,Bangladesh	1.31 [0.76, 2.26]
Barua et al., 2021,Bangladesh	4.01 [3.02, 5.33]
Bishwajit et al., 201, Female,Bangladesh	2.20 [1.46, 6.99]
Hasan et al., 2021,Bangladesh	1.90 [1.00, 3.62]
Hasan et al., 2021,Bangladesh	2.26 [1.71, 2.98]
Hossain et al., 2019,Bangladesh	3.22 [3.13, 3.32]
Hossain et al., 2019,Bangladesh	2.10 [1.73, 2.55]
Khan et al., 2021,Bangladesh	2.60 [2.16, 3.14]
Nguyen et al., 2022,Female,Bangladesh	2.99 [2.46, 3.64]
Nguyen et al., 2022,Female,Bangladesh	2.72 [2.01, 3.69]
Rahman et al., 2017,Female,Bangladesh	3.04 [2.99, 3.10]
Rahman et al., 2017,Male,Bangladesh	3.03 [2.96, 3.11]
Sen et al., 2023,Bangladesh	2.64 [3.19, 4.16]
Sutradhar et al., 2020,Female,Bangladesh	3.62 [2.97, 4.41]
Talukder et al., 2024,Bangladesh	1.92 [1.38, 2.67]
Yesmin et al., 2023,Bangladesh	4.23 [2.72, 6.57]
Bhagyalaxmi Sidenur, 2023,India	2.60 [2.29, 2.96]
Ghosh & Kumar, 2019,India	2.28 [1.95, 2.66]
Hossain et al., 2019,India	2.16 [1.82, 2.56]
Hossain et al., 2019,India	2.04 [1.45, 2.88]
Talukder et al., 2024,India	2.75 [2.25, 3.37]
Bhat et al., 2019,Nepal	2.21 [0.86, 1.76]
Hossain et al., 2019,Nepal	1.78 [1.44, 2.20]
Hossain et al., 2019,Nepal	3.20 [3.11, 3.30]
Talukder et al., 2024,Nepal	3.40 [2.74, 4.21]
Jayawardana et al., 2017,Male,Sri Lanka	5.30 [4.16, 6.75]
Random-Effects Model	2.65 [2.38, 2.98]

Odds Ratio

Figure 3.3. Meta-Analysis of Data from Studies Exploring the Association between Obesity and Cardiovascular Diseases

Study	Odds Ratio
Khan et al., 2016,Bangladesh,CHD	2.28 [1.27, 4.08]
Rao et al., 2024,China,MACCE	1.10 [0.94, 1.29]
Rao et al., 2025,China,AMI	1.16 [0.62, 2.17]
Rao et al., 2026,China,Stroke	1.31 [0.63, 2.71]
Random-Effects Model	1.32 [0.95, 1.84]

Odds Ratio
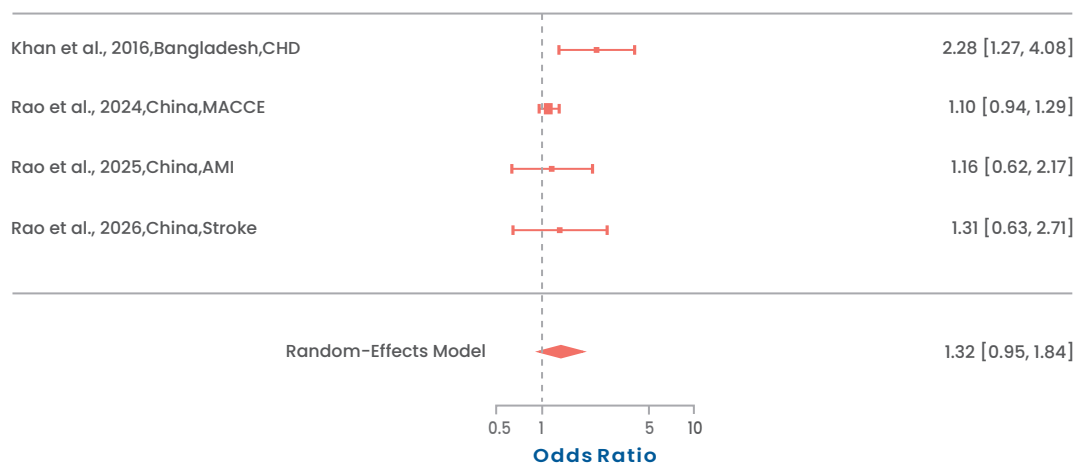
This systematic review and meta-analysis reveal significant associations between obesity and its related comorbidities—T2DM, hypertension, and CVDs—in South Asian populations. While obesity was strongly linked to T2DM and hypertension across the region, with attributable risks of 50 percent and 60 percent, respectively, variations in risk were observed among countries, likely due to genetic, environmental, and lifestyle factors. Bangladesh showed the strongest association with T2DM, while Nepal exhibited the highest link to hypertension. Numerous studies have explored the relationship between obesity and its associated comorbidities in South Asian populations. For instance, a study by Deepa et al. (2011) highlighted the high prevalence of T2DM in urban Indian populations and its strong association with obesity and central adiposity. Similarly, research by Gupta et al. (2008) demonstrated a significant link between obesity and hypertension in South Asians, emphasizing the need for effective intervention strategies to mitigate these risks. The metabolic mechanisms underlying the association between obesity and T2DM, hypertension, and CVDs are complex and multifaceted. Obesity is known to exacerbate insulin resistance, a primary driver of T2DM (Hahn et al.2006; Hotamisligil et al. 2006). In the context of hypertension, obesity contributes through various pathways, including increased sympathetic nervous system activity, renal sodium retention, and activation of the renin-angiotensin-aldosterone system. These mechanisms collectively lead to elevated blood pressure levels (Hall et al. 2015). The INTERHEART study, a large international case-control study, identified abdominal obesity as a major risk factor for myocardial infarction in South Asians. This study underscored the critical role of central adiposity in increasing the risk of CVDs (Yusuf et al. 2004). The pathophysiological pathways through which obesity leads to CVDs include dyslipidemia, characterized by elevated levels of triglycerides and low-density lipoprotein cholesterol, and reduced levels of high-density lipoprotein cholesterol (Lavie et al. 2009; Krauss 2004).

The findings from this systematic review and meta-analysis highlight significant associations between obesity and its related comorbidities in South Asian populations. While the magnitude of reported attributable risks should be interpreted with some caution due to an overreliance on evidence from cross-sectional studies, the findings underscore the critical need for public health strategies to tackle the region's escalating obesity burden. The following chapter presents the results of an in-depth analysis of the role of food systems and diets on the increasing trend of obesity in South Asian countries.

FOOD SYSTEMS AND OBESITY:
4. FROM PLATE TO WEIGHT

The food system forms the foundation of a population's dietary behavior, driven by food production, availability, accessibility, and affordability. A food system–based approach to mitigating health issues delves beyond individual choices to explore the broader dynamics at play. It examines the entire food system—from field to fork—tracing every step, process, and connection involved in food movement. This approach also considers the sociocultural, economic, and environmental contexts that influence these activities, offering a holistic perspective on the complex interplay between food and health. This chapter summarizes the findings of an in-depth analysis of the contribution of different components of food systems to obesity in SAR countries. A systematic review and meta-analysis of existing evidence was also conducted to validate the findings. The key findings that emerged are as follows:

Rapid urbanization and widening global trade networks (Measured as trade share to GDP) were found to be the most dominant external drivers contributing to rising obesity rates in South Asia, along with declining gender inequality. Elevated consumption expenditure (A marker of economic activity and growth) and IPA were also found to be positively associated with obesity trends. Due to lack of data, the contribution of only two dietary intake indicators-meat consumption and SSB consumption-were analyzed, with both found to be significantly associated with the rising trend of obesity in South Asian countries. Very limited data availability constrained the analysis of the food supply chain and food environment indicators.

Food systems play a crucial role in shaping dietary patterns and are central to addressing the growing obesity problem. They determine what foods are produced, their availability, accessibility, and affordability, ultimately influencing people's food preferences and choices. These systems not only impact food supply chains and environments but also affect individual behaviors. Their interactions significantly influence food and nutrition security, livelihoods, and environmental sustainability, all of which are deeply intertwined with the rising prevalence of obesity (Fanzo and Davis 2021).

Although the profound transformation of food systems and diets is a global phenomenon, the ways in which different aspects of food systems contribute to unhealthy diets and obesity differs between and within countries. Countries have distinct culinary traditions and food preferences that shape dietary patterns and consumption habits. The types of foods available in a region also influence dietary choices. Country-specific analysis is therefore important to identify the root causes of obesity and support the development of targeted policy responses.

4.1 FOOD SYSTEMS FRAMEWORK

Multiple frameworks have been developed in recent years to facilitate understanding of the various components, outcomes, and drivers of food systems. The Food Systems Framework, led by the Global Alliance for Improved Nutrition, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and the Food and Agriculture Organization of the United Nations (FAO), was used to guide this analysis (Johns Hopkins University is a past founding partner). This framework captures the complexities and interdependencies inherent in food systems while breaking them down into the following main components: external drivers, food supply chains, food environments, and individual factors (Figure 4.1).

Figure 4.1. Food Systems Framework
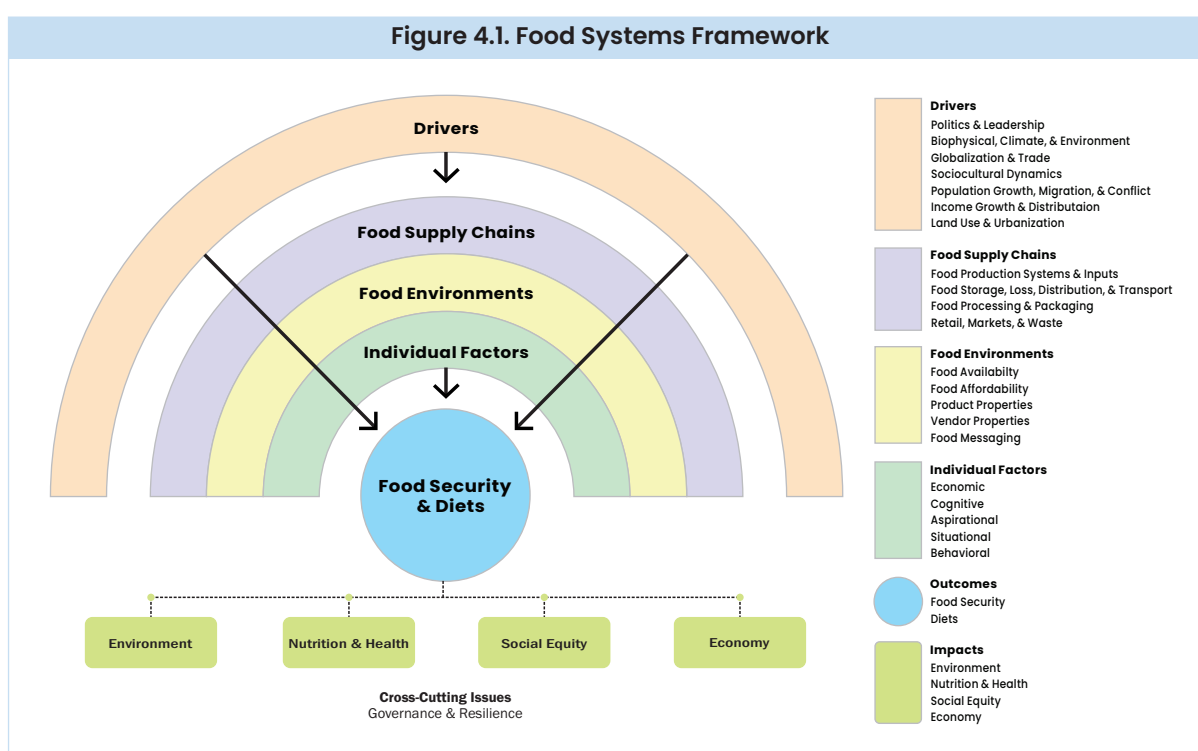
Source: The Food Systems Dashboard

The analysis in this report focused on the four domains of the framework, namely: individual factors and consumer behaviors (IFCB), food environments and supply chains (FESC), dietary intake, and external drivers. The choice of domain-specific factors was driven by availability of data.

Individual Factors and Consumer Behaviors (IFCB)

Individual factors refer to personal characteristics that influence food choices (such as age, gender, income, education, cultural background, and health status), while consumer behavior refers to the way in which individuals make food-related decisions, including what, when, and how they eat. Consumer behavior is influenced by individual factors, social norms, accessibility, and economic conditions. There are several subparameters that constitute this domain. However, due to data limitations, only consumer expenditure and IPA were considered for the analysis.

► ***Consumption expenditure (CE) per capita:*** This is the market value of all goods and services, including durable products such as cars, washing machines, and home computers purchased by households. Higher incomes and socioeconomic status typically increase consumption expenditure and can influence food choices.

► ***Proportion of IPA:*** Proportion of the population not meeting the recommended amount of PA per week (For adults: At least 150 minutes of moderate-intensity PA, at least 75 minutes of vigorous-intensity PA, or a combination of both; for adolescents: at least 60 minutes of moderate-to-vigorous PA per day). IPA negatively impacts energy balance by reducing energy expenditure.

Food Environments and Supply Chains (FESC)

The food supply chain includes all the steps and processes involved in producing and moving foods from field to fork. This includes agricultural production, storage and distribution, processing and packaging, and retail and marketing, and involves farmers, processors, wholesalers, transporters, and retailers. The food environment refers to the physical, economic, and social settings where people interact with the food system for the purpose of acquiring and eating food. This includes physical places where people buy food, such as stores or markets. It also includes factors like food availability, prices, affordability, safety, quality, convenience, and marketing. Food environments shape diets by influencing what people can buy, the way people access foods, and the food messaging people are exposed to. Although this domain has numerous parameters, based on the limited available data, the following four FESC parameters were included in the analysis:

► **Dietary energy in the food supply:** Dietary energy in the food supply (or dietary energy supply) is the number of kilocalories per person per day that is available in a country's food supply. Dietary energy in food supply is an important indicator of the food environment.

► **Number of modern grocery retailers per 100,000 population:** Euromonitor retailer types included in this category are: Hypermarkets, supermarkets, discounters, forecourt retailers (grocery outlets attached to gas or petrol stations), and convenience stores. These stores sell predominantly food and beverages and are typically part of large companies or brands that have multiple locations. A higher number of modern grocery retailers per 100,000 people can be a measure of better food accessibility.

► **Packaged food sales per person:** This refers to total sales of packaged food and soft drinks in the calendar year per person (US$ per person). Packaged food is considered any food that is sold in a protective barrier such as plastic, cans, or paper. Higher packaged food sales is associated with higher consumption of energy-dense foods and beverages high in fat, salt, and/or sugar.

▶ **Agricultural infrastructure index:** A composite indicator that measures the ability to store and transport crops to market based on an assessment of a country's road, rail, port, air transport, and irrigation infrastructure, as well as investment in crop storage facilities. A higher score indicates more developed infrastructure. This is an important component of the food supply chain: higher value is an indicator of better accessibility and availability of food.

Dietary Intake

Dietary patterns are the combination, variety, quantities, and proportions of foods, drinks, and nutrients that people habitually consume, as well as the frequency with which they are consumed. Dietary intake is both a direct outcome of the food system and directly impacts population health (including malnutrition, obesity, and NCDs) as well as other food system outcomes, including environmental impacts (such as land use, water usage, and greenhouse gas or GHG emissions) and social impacts (such as livelihoods and social equity). Consumer preferences and dietary choices also shape food production and processing, influencing demand and supply dynamics. In this domain, we consider the per capita daily intake of healthy as well as unhealthy diets.

▶ **Healthy diet:** Fruits, vegetables, legumes, whole grains, nuts and seeds, and milk

▶ **Unhealthy diet:** Meat (Red meat and processed meat) and SSBs

External Drivers

External drivers are factors that originate outside of the core food system but significantly influence its structure, function, and outcomes. The factors that constitute this domain are complex and interconnected, and include economic drivers such as globalization, economic growth, and income inequality; Sociocultural drivers such as urbanization, population growth, and cultural and religion practice; environmental factors such as climate change, natural resource scarcity, and biodiversity loss; along with political, institutional, and technological drivers.

These external drivers of food systems are strongly interrelated, with rising per capita incomes linked to increasing trade, urbanization, improved agricultural production technologies, and increased spending on food (United Nation 2018; Word Bank 2023; Asian Development Bank 2021). Urban areas tend to have better infrastructure, such as roads, ports, and communication networks, which facilitate trade (United Nations 2018). Similarly, they often provide more job opportunities, particularly in sectors like services, education, and health care, where women are more likely to be employed. This can lead to greater financial independence for women and reduce gender gaps in income (Chant McIlwaine 2016). These, in turn, can influence food choices and dietary patterns, as well as reduced activity levels in urban areas. The following external driver parameters were considered for the analysis based on available data.

- ▶ **Proportion of urban population:** This is the proportion (Percent) of the population living in an urban area. Rapid urbanization is one of the important external factors that is directly associated with food accessibility, affordability, and choices.

- ▶ **Trade as a proportion of GDP:** This refers to the sum of exports and imports of goods and services measured as a share (Percent) of GDP. Growing globalization in trade improves economic conditions that influence affordability and food choices.

- ▶ **Gender inequality index:** This reflects gender-based disadvantages in three dimensions-reproductive health, empowerment, and the labor market. It uses a scale from 0 to 1, where 0 indicates equal outcomes for women and men and 1 indicates that one gender is at the lowest possible level in all measured areas. Women play a key role in choice of food; Hence, their empowerment can alter food consumption patterns.

- ▶ **Lower secondary completion rate (Percent):** This refers to the number of new entrants in the last grade of lower secondary education, regardless of age, divided by the population at the entrance age for the last grade of lower secondary education. It is an indicator of education level, a key determinant of economic condition, food security, and choice of healthy food.

Environmental drivers in the food system framework include factors such as climate change, air pollution, and the physical environment (For example, urbanization, infrastructure, and access to green spaces). However, the current analysis excludes the climate parameters which are discussed and reported separately.

4.2 DATA SOURCES AND METHODOLOGY

4.2.1 Attribution to the Domains of the Food System Framework

Obesity data were obtained from Food System Dashboard and NCD Risk Factor Collaboration (NCD-RisC). Consumption data were converted to constant 2017 international dollars using PPP rates from the International Comparison Program. Population estimates were obtained from the World Bank. Dietary energy supply was based on national-level data from FAO's Food Balance Sheets. Dietary intake data were compared against optimal per capita intake of different food items reported by GBD 2017.

The analysis was conducted in two stages. First, multivariate regression analysis was conducted to assess the relative contribution of each domain and parameter to obesity in each South Asian country. A beta-binomial regression (BBR) model was used to estimate direct effects of domain-specific factors on obesity as an outcome. Country-specific temporal trend data were adjusted by fusing penalized cubic spline stratified by country into the BBR model under a generalized additive model framework. Where data were insufficient, the BBR model was fused with country-specific random intercepts under a generalized linear mixed model framework. Where data were sparse,

direct effects of individual factors were approximated by the regression slope of the factor adjusted only for country-specific trends, assuming that the temporal trend of a country would be able to capture the trend of other factors, to some extent. Results are reported as OR per Interquartile range (IQR) increase in each parameter.

Second, a Relative attribution index (RAI) for each parameter within each domain was developed by combining the estimated regression slopes produced in the first stage and the country-specific linear time trend (Υ, slope of time) for each parameter, using the equation:

$$RAI(\%)=100\times \left[exp\left(\sum_{i=1}^{p} \beta_i \gamma_i \right) -1 \right] \text{ ,p is the no. of factors}$$

The RAI is the relative change in odds of obesity due to each parameter per year for a country.

4.2.2 Policy Analysis

A comprehensive policy analysis was conducted across seven South Asian countries—Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka-to assess their policy readiness to tackle the rising burden of obesity and identify gaps (If any). The study involved a desk review of constitutional provisions, food systems, nutrition, health, and education policies, with a focus on obesity prevention measures (Fiscal and nonfiscal) like food labeling, marketing restrictions, agricultural subsidies, and school nutrition programs.

4.3 FINDINGS

Individual factors and consumer behaviors and external drivers of food systems were mostly responsible for the growing trend of obesity among adults as well as children in South Asia. However, lack of high-quality data limited the parameters that could be included in the analysis. As a result, only ~12 percent of the trend among children and ~10 percent of adults in the region are observed to be attributable to food systems. It is, therefore, highly likely that the true contribution of food systems to the trend of obesity in South Asia is substantially higher than found in this analysis. Each subsection of the findings (Subsection 4.3.1 to 4.3.4) begins with a discussion of key findings related to that specific domain, followed by an exploration of its relative contribution to obesity. This is supported by a review of relevant literature, including meta-analyses, to validate the findings. Finally, the policies currently in place in the region that address the challenges within that domain are presented and analyzed.

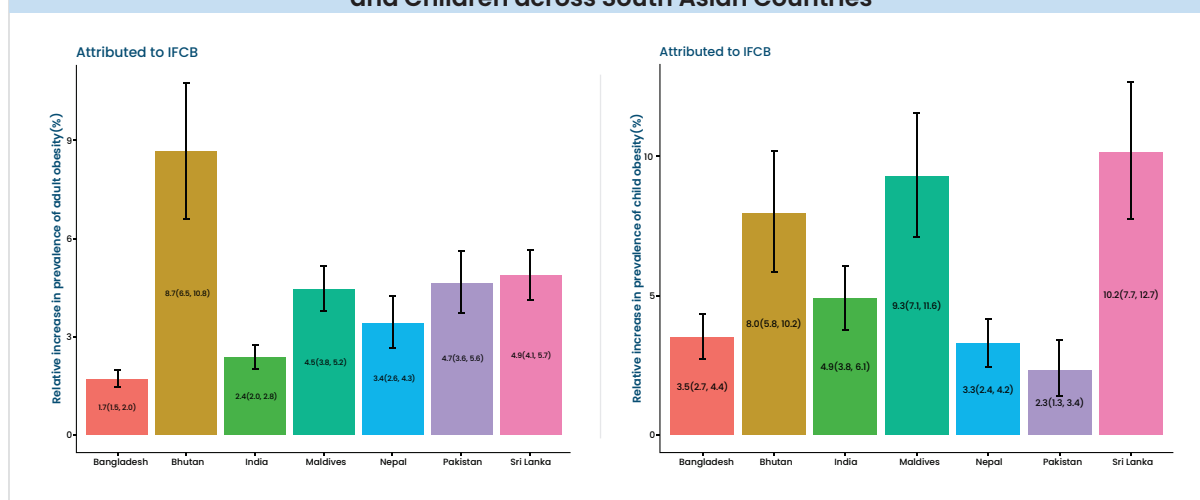## 4.3.1 Individual Factors and Consumer Behaviors (IFCB)

Individual factors refer to personal characteristics that influence food choices, such as age, gender, income, education, cultural background, and health status. These factors shape how individuals perceive food, make decisions, and form preferences.

Consumer behavior is the way individuals make food-related decisions, including what, when, and how they eat. It is influenced by individual factors, social norms, accessibility, and economic conditions. Understanding consumer behavior in food systems helps identify patterns in food consumption and the drivers behind dietary choices, which can be used to design policies promoting healthier and more sustainable food practices.

CE was significantly positively associated with adult obesity in all South Asian countries (OR 1.79, 95 percent CI:1.55–2.06 in Bhutan, Nepal, and Pakistan and OR 1.39, 95 percent CI: 1.26–1.52 in Bangladesh, India, Maldives, and Sri Lanka). IPA was also found to be significantly associated with adult obesity in Bhutan, Nepal, and Pakistan (OR 2.04, 95 percent CI:1.84–2.27), but not in Bangladesh, India, Maldives, and Sri Lanka where IPA levels are declining. Both CE and IPA were significantly positively associated with odds of obesity in children in all South Asian countries (OR 1.43, 95 percent CI:1.32–1.54 for CE and 1.37, 95 percent CI:1.26–1.49 for IPA). However, as with adults, levels of IPA among children were declining in Bangladesh, India, Maldives, and Sri Lanka. These countries were therefore excluded from the RAI.

Annual growth in obesity attributed to IFCB ranged from 1.7 to 8.7 percent (Maximum in Bhutan; Minimum in Bangladesh) for adults and from 2.3 to 10.2 percent for children (Maximum in Sri Lanka; Minimum in Pakistan) (Figure 4.2). However, a deeper investigation is necessary to understand the relative attribution across countries of South Asia.
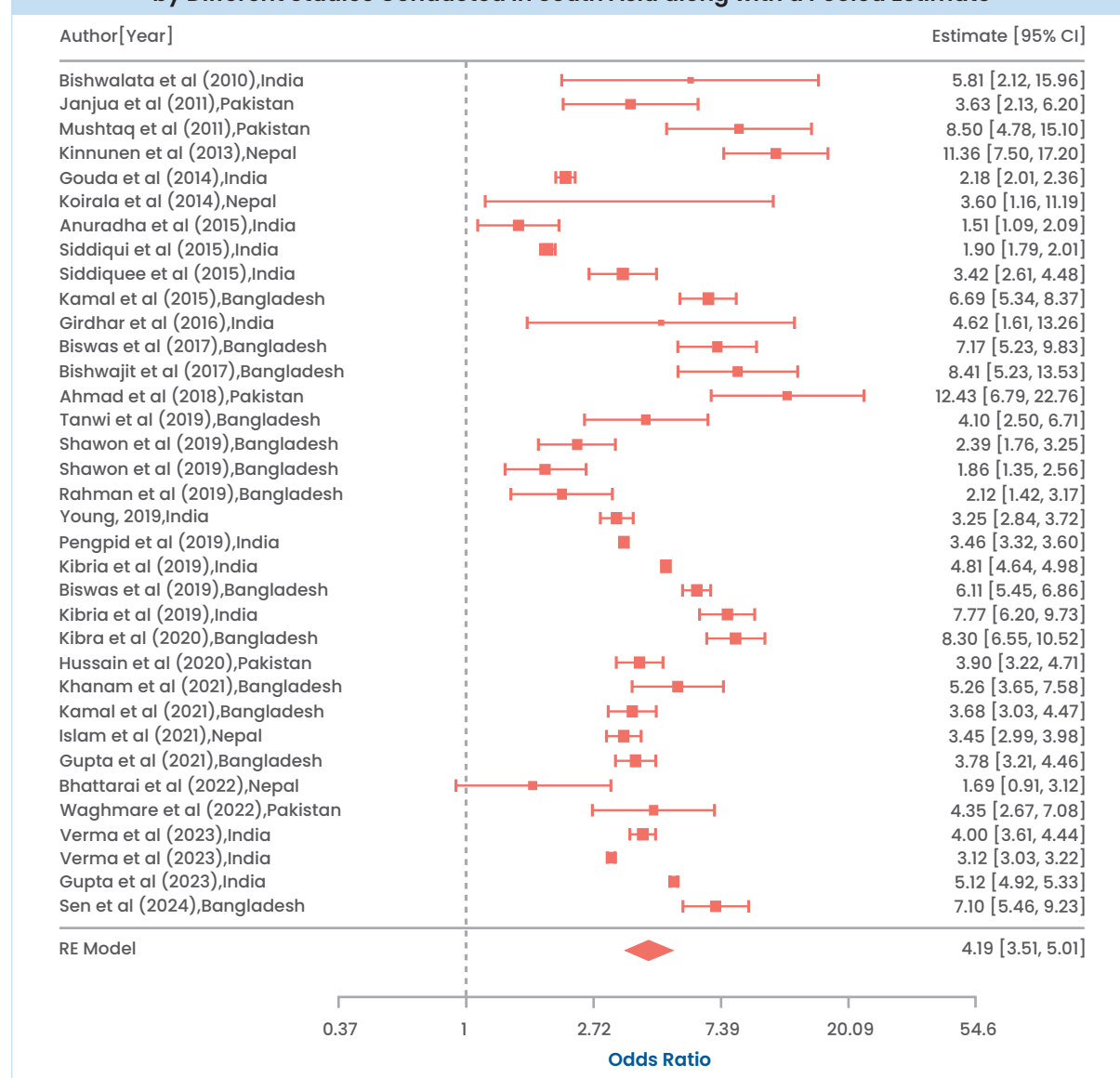

Figure 4.2. Relative Attribution Index of IFCB for Obesity among Adults and Children across South Asian Countries

Note: IFCB = Individual factors and consumer behaviors.

These findings align with those from a meta-analysis of the associations between obesity and high SES (Reported OR ranges 1.5–12.4 (Pooled estimate of 4.2, 95 percent CI: 3.5–5.0) (See figure 4.3), and obesity and low PA (OR range of 1.06–6.24 (Pooled estimate of 2.24, 95 percent CI: 1.74–2.90). IPA rates increased in India from 22.4 percent in 2000 to 49.4 percent in 2022 (NCD-RisC 2024), while over 50 percent of adults in Pakistan report inactivity (WHO, 2018). Adolescents in the Maldives are highly inactive, with 78 percent of boys and 86 percent of girls affected, compared to 26 percent of adult men and 35 percent of women (WHO 2022). IPA is higher in urban populations, particularly among women, due to sedentary lifestyles and cultural norms. Gender disparities are evident, with 57 percent of women inactive in India compared to 42 percent of men (NCD-RisC 2024), and there are similar trends in Pakistan (Ahmed et al. 2019). Addressing this requires promoting active lifestyles through urban planning, inclusive recreational spaces, awareness campaigns, and policies that consider cultural and gender-specific barriers.

Figure 4.3. Forest Plot Summarizing Reported OR of Overweight or Obesity for High SES by Different Studies Conducted in South Asia along with a Pooled Estimate

Author[Year]	Estimate [95% CI]
Bishwalata et al (2010),India	5.81 [2.12, 15.96]
Janjua et al (2011),Pakistan	3.63 [2.13, 6.20]
Mushtaq et al (2011),Pakistan	8.50 [4.78, 15.10]
Kinnunen et al (2013),Nepal	11.36 [7.50, 17.20]
Gouda et al (2014),India	2.18 [2.01, 2.36]
Koirala et al (2014),Nepal	3.60 [1.16, 11.19]
Anuradha et al (2015),India	1.51 [1.09, 2.09]
Siddiqui et al (2015),India	1.90 [1.79, 2.01]
Siddiquee et al (2015),India	3.42 [2.61, 4.48]
Kamal et al (2015),Bangladesh	6.69 [5.34, 8.37]
Girdhar et al (2016),India	4.62 [1.61, 13.26]
Biswas et al (2017),Bangladesh	7.17 [5.23, 9.83]
Bishwajit et al (2017),Bangladesh	8.41 [5.23, 13.53]
Ahmad et al (2018),Pakistan	12.43 [6.79, 22.76]
Tanwi et al (2019),Bangladesh	4.10 [2.50, 6.71]
Shawon et al (2019),Bangladesh	2.39 [1.76, 3.25]
Shawon et al (2019),Bangladesh	1.86 [1.35, 2.56]
Rahman et al (2019),Bangladesh	2.12 [1.42, 3.17]
Young, 2019,India	3.25 [2.84, 3.72]
Pengpid et al (2019),India	3.46 [3.32, 3.60]
Kibria et al (2019),India	4.81 [4.64, 4.98]
Biswas et al (2019),Bangladesh	6.11 [5.45, 6.86]
Kibria et al (2019),India	7.77 [6.20, 9.73]
Kibra et al (2020),Bangladesh	8.30 [6.55, 10.52]
Hussain et al (2020),Pakistan	3.90 [3.22, 4.71]
Khanam et al (2021),Bangladesh	5.26 [3.65, 7.58]
Kamal et al (2021),Bangladesh	3.68 [3.03, 4.47]
Islam et al (2021),Nepal	3.45 [2.99, 3.98]
Gupta et al (2021),Bangladesh	3.78 [3.21, 4.46]
Bhattarai et al (2022),Nepal	1.69 [0.91, 3.12]
Waghmare et al (2022),Pakistan	4.35 [2.67, 7.08]
Verma et al (2023),India	4.00 [3.61, 4.44]
Verma et al (2023),India	3.12 [3.03, 3.22]
Gupta et al (2023),India	5.12 [4.92, 5.33]
Sen et al (2024),Bangladesh	7.10 [5.46, 9.23]
RE Model	4.19 [3.51, 5.01]

Odds Ratio: 0.37   1   2.72   7.39   20.09   54.6

A review of country-level policies revealed that many nations in the region have implemented or are in the process of developing initiatives to promote healthier food choices and active lifestyles aimed at combating obesity.
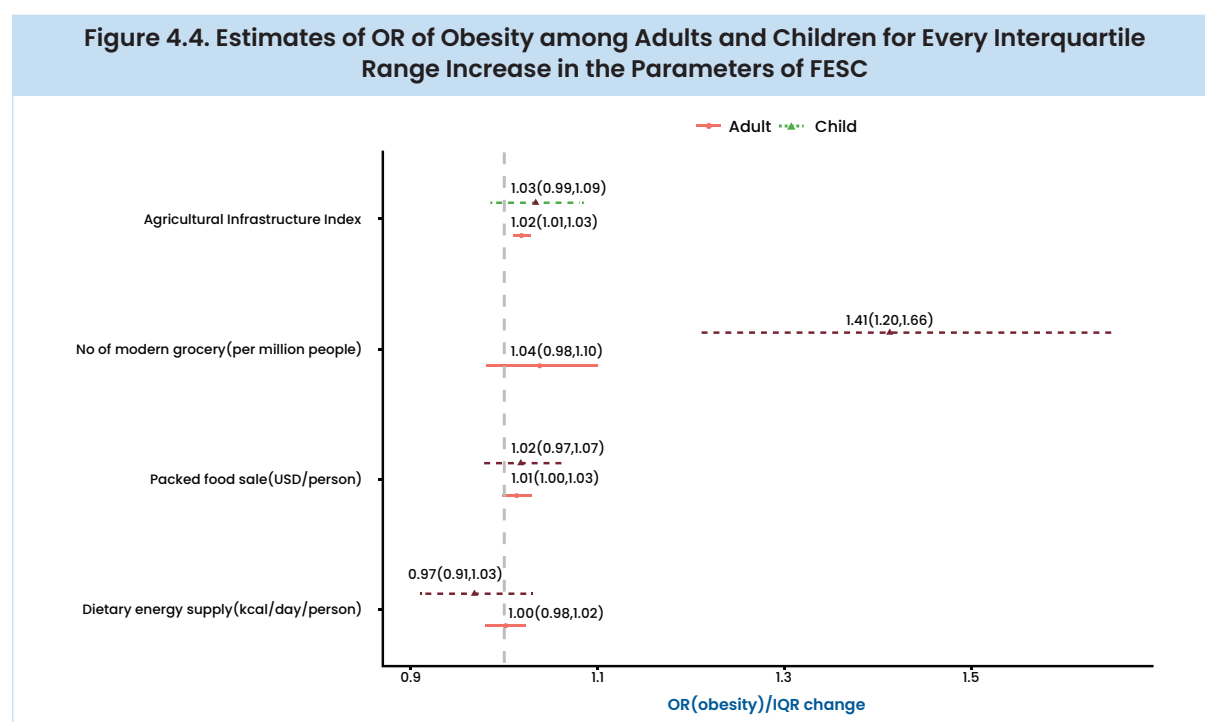
- ▶ **Policies promoting healthier diets:** Bangladesh's National Food and Nutrition Security Policy (2020) focuses on increasing the availability and affordability of nutritious foods such as fruits, vegetables, and whole grains, and discourages the consumption of unhealthy, high-calorie foods. Bhutan's National Health Promotion Strategic Plan (2015–2023) emphasizes public awareness, encouraging healthy eating habits. India's Eat Right India Movement (2018), led by the Food Safety and Standards Authority of India, promotes healthy eating through public awareness campaigns, food labeling regulations, and trans fat reduction strategies. The Maldives' Integrated National Nutrition Strategic Plan (2013–2017) promotes nutrition through food subsidies for 80 percent of eligible families, aims to reduce child obesity below 5 percent, and ensures 60 percent of children ages 6–24 months eat fruits and vegetables daily. It also targets 30 percent of adults consuming over 400 grams of fruits and vegetables daily. Nepal's Multi-Sector Nutrition Plan (MSNP) II (2018–2022) promotes dietary diversity by integrating efforts across the health, education, and agriculture sectors to improve overall nutrition. Pakistan's National Action Plan for NCDs focuses on promoting healthy diets through public awareness campaigns and reducing salt, sugar, and fat consumption. The plan also advocates for healthier food options in schools, public spaces, and workplaces. Sri Lanka's Colour Coding Labelling System (2019) mandates color-coded nutrition labels on packaged foods, using red, amber, and green indicators to inform consumers about sugar, fat, and salt content, helping them make healthier food choices and combating rising obesity rates.

- ▶ **Policies promoting active lifestyles:** Bangladesh has integrated promotion of PA into their National Youth Policy (2017), encouraging the development of sports facilities, open spaces, and playgrounds to create an active environment. Bhutan's National Physical Activity Guidelines provide recommendations on activity levels and promote active lifestyles. India's Fit India Movement strengthens physical education in schools and enhances sports infrastructure to encourage a more active lifestyle. The Maldives' Guidelines for Physical Activity and Health (2022) further support obesity prevention by targeting a 10 percent relative reduction in IPA by 2030. Sri Lanka has introduced Physical Activity and Sedentary Behavior Guidelines, aiming to achieve a 10 percent relative reduction in the prevalence of IPA by 2025.

4.3.2 Food Environments and Supply Chains (FESC)

Food environments refer to the physical, economic, and social settings where people access and interact with food. This includes supermarkets, markets, restaurants, and food policies, as well as factors like food prices, availability, quality, and marketing. Food environments shape what people can buy, influencing dietary patterns and nutrition.

Food supply chains involve the processes that bring food from production to consumption. This includes farming, processing, transportation, distribution, and retail. The efficiency, sustainability, and resilience of supply chains affect food security, affordability, and environmental impacts, making them crucial to the overall food system.

Key indicators analyzed under this domain include dietary energy supply, modern grocery retailer density, packaged food sales, and agricultural infrastructure development. Due to sparse data for this domain, all four parameters could not be included in a single BBR. Instead, one parameter at a time was included with random intercepts for each country and linear time trend. For adults, small positive associations were identified between dietary energy supply, packaged food sales, and agricultural infrastructure index and obesity. Per IQR, an increase in dietary energy supply results in a 7 percent rise in odds of obesity, 3 percent growth for packaged food sales, and a 2 percent hike in the agricultural infrastructure index for adults. None of the others were statistically significant. Among children, only the number of modern grocery outlets per million population was significantly associated with obesity (41 percent rise in odds of obesity per IQR increase in number of modern grocery outlets per million). (See figure 4.4).

Figure 4.4. Estimates of OR of Obesity among Adults and Children for Every Interquartile Range Increase in the Parameters of FESC

Note: IQR = Inter quartile range; OR = odds ratio.

Overall, annual growth in obesity attributed to FESC ranged from 0.6 to 1.4 percent among adults, and from 0.1 to 3.3 percent among children. Figure 4.5 presents the country-level differences. For example, in Nepal, for adults, 1.4 percent of annual growth of obesity was attributed to FESC. Elsewhere, it was 1.2 percent for Sri Lanka, 1 percent for Bangladesh, 0.7 percent for Maldives, and 0.6 percent for Indian and Pakistan, mainly attributed to dietary energy supply and agricultural infrastructure index.

Similarly, 3.3 percent of annual growth of child obesity was due to FESC for Pakistan, 2.6 percent for Maldives, 1.3 percent for India, 0.9 percent for Bhutan, 0.6 percent for Sri Lanka, and 0.1 percent for Nepal, mainly attributed to the number of modern grocery outlets per million population. However, results from this domain should be interpreted with caution due to data limitation.

Figure 4.5. Relative Attribution Index of FESC for Obesity among Adults and Children across South Asian Countries
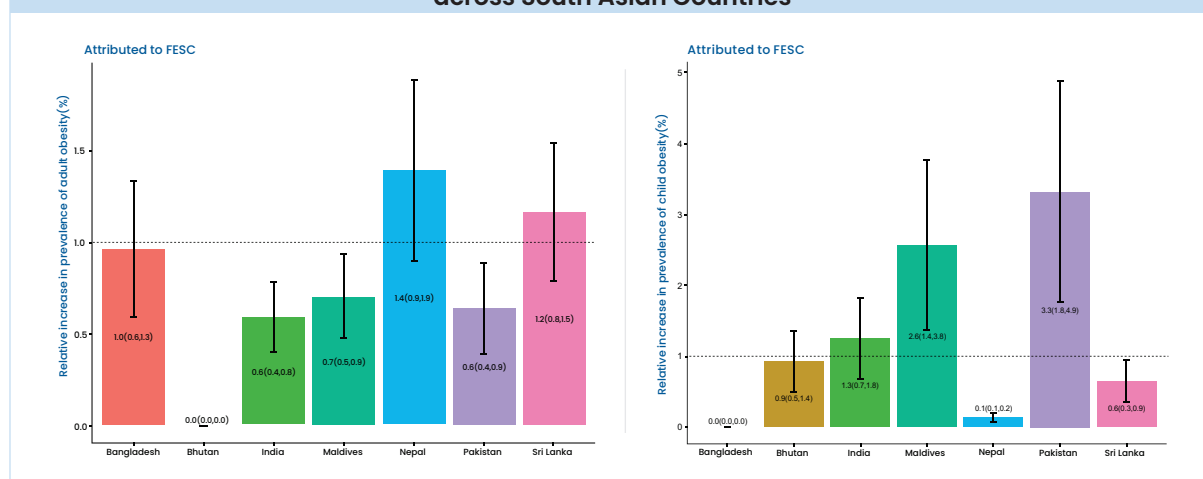
In addition to policies outlined in section 4.3.1., several countries have implemented national policies aimed at improving food environments and supply chains. For example, in Bangladesh, the National Food and Nutrition Security Policy (2020) aims to enhance food availability, promote dietary diversity, and address malnutrition through sustainable food systems. Bhutan's Farm-to-School Program ensures school children receive nutritious, locally sourced foods, fostering better dietary habits from an early age. India's Food Safety and Standards (Safe food and balanced diets for children in school) Regulations (2020) regulate the sale and advertisement of junk and high in fat, sugar, and salt (HFSS) foods within school premises while promoting balanced diets to combat childhood obesity. In Maldives, the Energy Drink Policy (2023) regulates the sale and marketing of energy drinks. Sri Lanka's SSB tax (2017) discourages the consumption of sugary drinks by raising prices, reducing sugar intake and helping curb obesity rates.

4.3.3 Dietary Intake

Diets are influenced by all aspects of the food system, and they impact nutrition and health. Diets also have large impacts on the environment. Diets and food systems have major impacts on the use and degradation of land and water resources, as well as on greenhouse gas emissions and climate change.

Per capita intakes of healthy diet components are far below optimal levels (as recommended by GBD 2019) in all South Asian countries, while intakes of red and processed meats and SSBs exceed optimal levels and are increasing (Figure 4.6a). The highest annual increase in daily meat consumption was observed in Maldives, followed by Nepal and Bhutan. The incremental increase in SSB consumption was observed in Sri Lanka, followed by India and Maldives. Due to very low intake levels of healthy diet components, it was not possible to detect any significant negative associations with obesity. However, significant positive associations were detected between obesity and excess intakes of red and processed meats and SSBs.

Among unhealthy foods, only meat (red and processed) and SSB intakes were found to be associated with obesity. The analysis revealed that every 1gm increase in per capita meat intake was associated with increased odds of obesity in adults (1.7 percent, 95 percent CI: 0.4–3.0) and in children (2.6 percent, 95 percent CI: 1.5–3.6). Similarly, every 1gm increase in per capita daily consumption of SSBs was associated with increased odds of obesity in adults (2.0 percent, 95 percent CI: 0.7–3.4) and children (3.4 percent, 95 percent CI: 2.3–4.5).

Annual obesity growth due to unhealthy diets ranged from <1.0 percent to 2.3 percent among adults and <1.0 percent to 2.1 percent among children (Figure 4.6b), with notable variations across countries. Sri Lanka recorded the highest rate of increase, with unhealthy diets contributing to 2.1 percent of annual obesity growth among children and 1.3 percent among adults. India ranked second, with 1.5 percent and 0.9 percent of obesity growth among children and adults, respectively, likely driven by the rapid rise in sugar-sweetened beverage (SSB) consumption. Maldives followed, with unhealthy diets accounting for 1.1 percent of obesity growth in children and 0.7 percent in adults. All other countries reported an obesity growth rate below 1 percent due to unhealthy diets.

Figure 4.6. Relative Attribution Index of Diet intake for obesity among adults and children in SAR countries
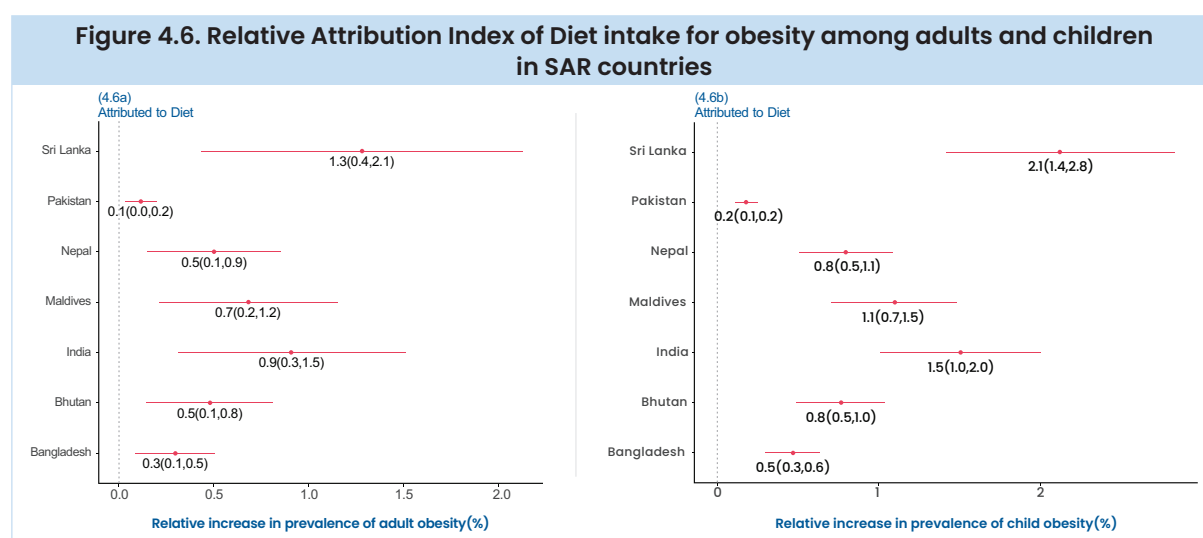
The findings align with those of a meta-analysis on the association between unhealthy dietary factors and obesity, showing a pooled OR of 2.8 (95 percent CI: 2.2–3.5) (Figure 4.7). Though most of the ORs reported in the forest plot were from cross-sectional studies, the risk of overweight or obesity among those who consume any kind of unhealthy food was as high as approximately eight times those who did not consume. Unhealthy diets disproportionately impact low-income groups, with poor households in Bangladesh showing imbalanced macronutrient intake and Indian populations experiencing declining food diversity due to rising costs. As economies develop, obesity risk factors shift from high- to low-income groups, particularly the urban poor who increasingly rely on cheap, calorie-dense, processed foods due to financial and time constraints. (Refer to box 2.3 in chapter 2, which summarizes the findings from the recent national survey from India that highlights that over the last decade, consumption of unhealthy foods (like sugar sweetened beverages and processed foods high in energy, salt, sugar, and/or unhealthy fats) has also expanded to low-income households as well as rural areas.

Figure 4.7. Reported OR of Overweight or Obesity for Consumption of Any Kind of Unhealthy Diet by Different Studies Conducted in South Asia

Author[Year],exposure, country	Estimate [95% CI]
Mahmood et al.(2010),Snacking,Nepal	5.42 [1.52, 19.30]
Mahmood et al.(2010),Eating out,Nepal	7.10 [2.29, 21.98]
Goyal et al.(2011),Junk food,India	1.99 [1.29, 3.08]
Goyal et al.(2011),Eating out,India	7.92 [5.18, 12.12]
Goyal et al.(2011),Snacking,India	4.22 [2.45, 7.28]
Siddiquee et al.(2015),High-fat food,India	1.79 [1.20, 2.65]
Macwana et al.(2016),Eating out	1.80 [1.03, 3.16]
Nawab et al.(2016),Tea,Nepal	7.77 [1.61, 37.52]
Godakanda et al.(2018),Fast food,Sri Lanka	1.90 [1.22, 2.95]
Godakanda et al.(2018),SSB,Sri Lanka	1.90 [1.24, 2.90]
Pengpid et al.(2019),Fried food,Afghanistan	1.08 [1.04, 1.13]
Banna et al.(2020),Junk food,Bangladesh	4.80 [1.80, 12.80]
Banna et al.(2020),Fast food,Bangladesh	7.00 [2.77, 17.72]
Banna et al.(2020),Soft Drink,Bangladesh	3.90 [1.49, 10.22]
Banik et al.(2020),Fast food,Bangladesh	2.71 [1.59, 4.62]
Sapkota et al.(2020),Junk food,Nepal	2.56 [1.15, 5.70]
Sapkota et al.(2020),Soft drink,Nepal	2.91 [1.16, 7.27]
Tripathi et al.(2020),Fast food,Nepal	3.42 [1.01, 11.61]
Singh et al.(2021),Soft Drink,Nepal	5.44 [2.93, 10.10]
Singh et al.(2021),High-fat food,Nepal	2.17 [1.18, 3.99]
Singh et al.(2021),Junk food,Nepal	5.71 [2.55, 12.80]
Mahumud et al.(2021),Fast food,LMIC/HIC	1.32 [1.26, 1.38]
Mahumud et al.(2021),Soft drink,LMIC/HIC	1.28 [1.18, 1.38]
Mahjabin et al.(2020),Junk food,Bangladesh	2.75 [0.31, 24.34]
Grace et al.(2021),Fast food,India	2.39 [1.32, 4.32]
Grace et al.(2021),Chocolates/Sweets,India	4.10 [2.04, 8.24]
Grace et al.(2021),Snacks,India	3.34 [1.80, 6.20]
Sidenur et al.(2022),Junk food,India	2.60 [0.53, 12.87]
RE Model	2.80 [2.21, 3.54]

Odds Ratio: 0.14 0.37 1 2.72 7.39 20.09 54.6

On the policy front, most of the countries in the region have developed FBDGs and nutrition policies to promote healthier diets. These promote consumption of protective foods like fruits and vegetables, legumes, whole grains, nuts, seeds, and dairy foods and discourage excessive consumption of red meat, processed foods, and SSBs. Further, there is a lot of focus on trans fat reduction in the region. For example, Sri Lanka's Food (trans-fat) Regulations of 2022 impose strict limits, capping trans fats at 2 percent of total fat in food products, banning partially hydrogenated oils, and mandating clear labelling on packaging. Similarly, Bangladesh's Limiting Trans Fatty Acids in Foodstuffs Regulations, 2021 set a limit of 2 grams per 100 grams of total fat in all foods, effectively eliminating industrial trans fats and requiring nutrient declarations on labels. In India, the Food Safety and Standards (Prohibition and Restrictions on Sales) Second Amendment Regulations, 2021, effective 2022, restricts trans fats to below 2 percent in processed foods and prohibits the sale of HFSS foods near school premises. Nepal has also set a maximum limit of industrial trans fats in foods, capping them at 2 grams per 100 grams of total fat, effective 2024. Pakistan has been collaborating with civil society organizations to develop regulations limiting trans fats to 2 percent in all food sources, aiming to safeguard public health. Bhutan and the Maldives have also made policy commitments to limit trans fats, indicating progress toward future regulations.

4.3.4 External Drivers

External drivers are factors outside the core food system that significantly shape its structure, function, and outcomes. These include economic drivers like globalization and income inequality; sociocultural factors such as urbanization and population growth; environmental challenges like climate change and resource scarcity; as well as political, institutional, and technological influences.

The highest rate of urbanization was observed for Bhutan, followed by Bangladesh, Maldives, Nepal, India, Pakistan. The proportion of the urban population of Sri Lanka remained constant during the study period. The rate of increase in trade as a proportion of GDP was highest for India and Bhutan, followed by Bangladesh and Nepal. The trend was negative for Maldives and Sri Lanka and remained unchanged for Pakistan. The rate of reduction in gender inequality was observed across all the South Asian countries, highest in Bhutan followed by Maldives and lowest in Sri Lanka. Though the lower secondary completion rate (LSCR) exhibited inverse association with obesity, increasing trends were observed across all countries consistently. Therefore, it was assumed that the LSCR cannot contribute to the increasing trend of obesity in the region; hence, it was excluded from the RAI of external drivers (Figure 4.8).

Figure 4.8. Estimated Linear Trend of the Parameters of External Drivers in Terms of Slope Per Year
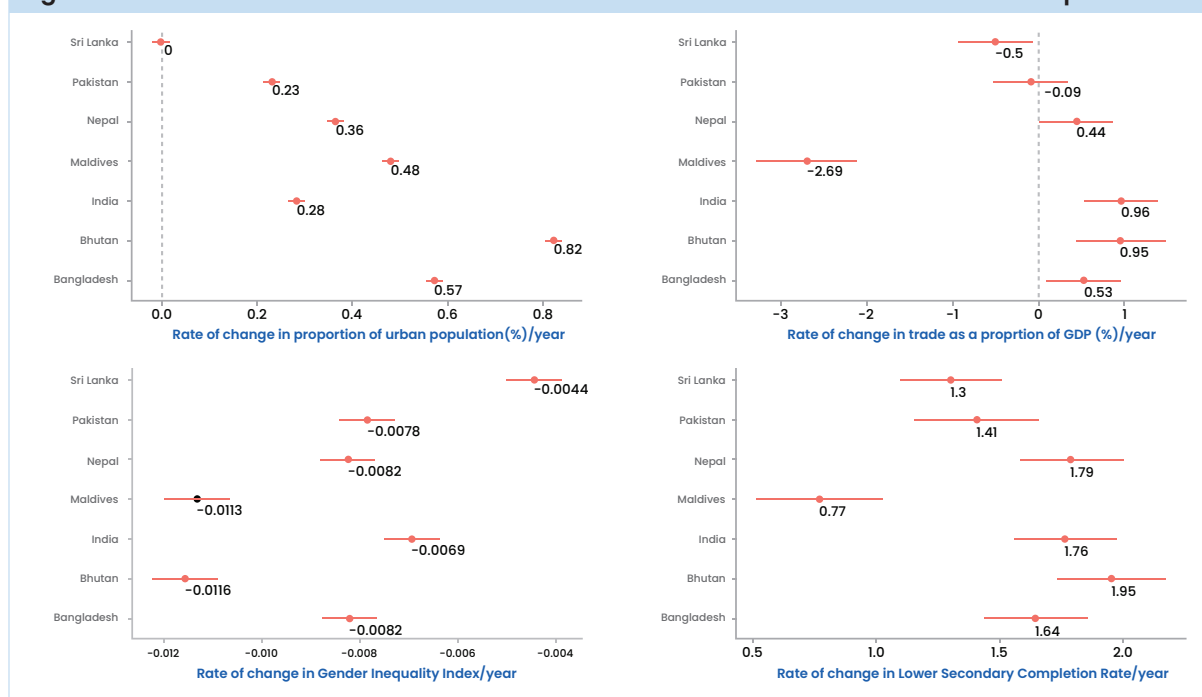
Note: GDP = Gross domestic product.

Every IQR increase in the proportion of the urban population was associated with a 38 percent (95 percent CI:28–48) increase in the odds of obesity among adults and a 12 percent (95 percent CI: 3–22) rise among children. Similarly, every IQR increase in trade as a proportion of a country's GDP was associated with a 37 percent (95 percent CI:33–42) hike in the odds of adult obesity and a 28 percent (95 percent CI:22-35) increase in odds of child obesity. On the other hand, every IQR increase in the gender inequality index was associated with a 52 percent (95 percent CI: 47-57) decrease in the odds of adult obesity and a 58 percent (95 percent CI: 53–62) drop in the odds of child obesity. A similar inversely proportional association was observed for the LSCR, with every IQR increase in LSCR associated with a 39 percent (95 percent CI:31–46) reduction in the odds of obesity among adults. However, no significant association was observed between LSCR and child obesity (Figure 4.9).

Figure 4.9. Relative Attribution Index of External Drivers across South Asian Countries
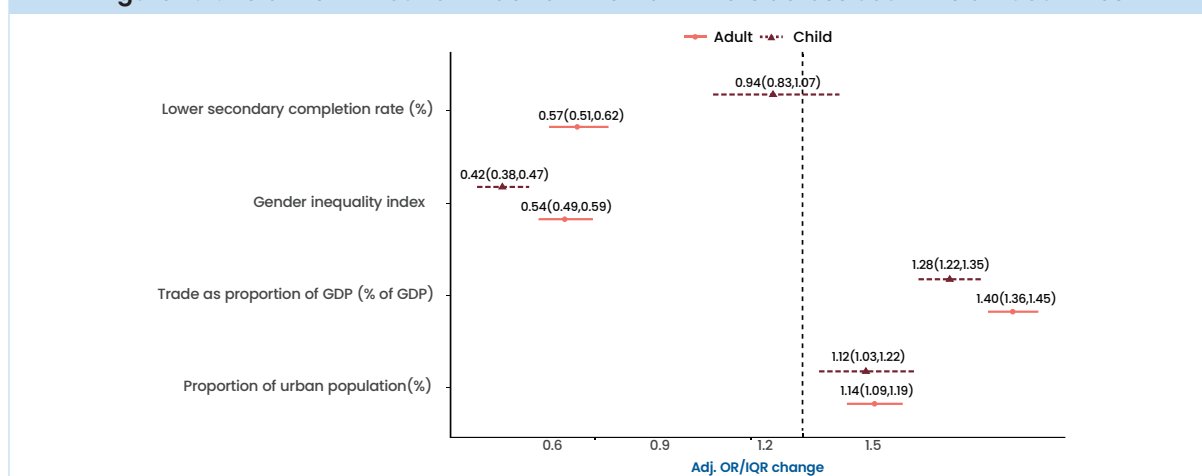
Note: IQR = Interquartile range; OR = odds ratio.

Overall, 1.4-6.6 percent of the annual growth in obesity in South Asian countries was attributed to external drivers, mainly driven by increasing urbanization, trade share to GDP, and decreasing gender inequality. There were country-level differences, as seen in other domains (Figure4.10). Results showed that 6.6 percent and 6.1 percent of the annual increment in obesity in Bhutan was attributed to external drivers for adults and children, respectively. In the Maldives, the RAI was 4.9 percent for adults and 4.7 percent for children. In Bangladesh, 4.5 percent and 4.2 percent of the rate of obesity increment among adults and children were attributed to external drivers. The RAI was 3.9 percent and 3.7 percent in Nepal for adults and children, respectively; while this figure for India was 3.7 percent and 3.4 percent for adults and children, respectively. In Pakistan, 3.1 percent of the rate of increment of obesity among adults and children was attributed to external drivers. In Sri Lanka, the RAI was 1.4 percent for adults and 1.5 percent for children

Figure 4.10. Relative Attribution Index of External Driver across the South Asian Countries
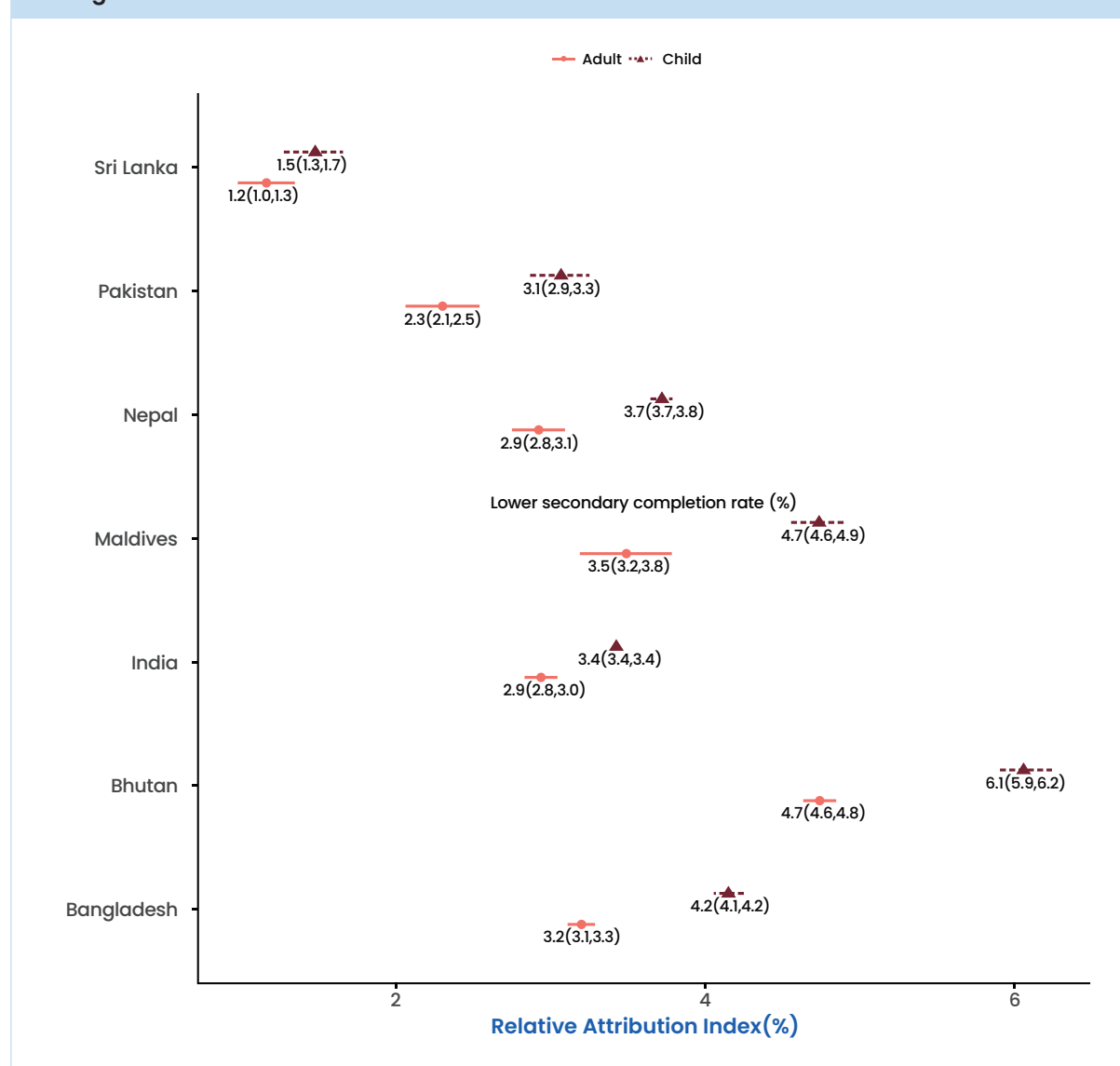
Meta-analysis highlighted that reported risks for obesity and overweight for those living in urban locations were 1.15 to 3.1 times higher than those living in rural locations. The pooled OR of 1.5 (95 percent CI: 1.35–1.66) was obtained (Figure 4.11). Urban areas tend to have better infrastructure such as roads, ports, and communication networks, which facilitates trade (United Nations 2018). Similarly, urban areas often provide more job opportunities, particularly in sectors like services, education, and health care, where women are more likely to be employed. This can lead to greater financial independence for women and reduce gender gaps in income (Chant McIlwaine 2016). Rapid urbanization was observed in Bangladesh (~39 percent urban population), Pakistan (~37 percent urban population), and India (~35 percent urban population), followed by Nepal (~21 percent urban population) and Sri Lanka (~18 percent urban population). Therefore, this could be a major factor for the increasing trend of obesity in South Asia, mediated through increasing trade and financial independence among women (United Nation 2018; Word Bank 2023; Asian Development Bank 2021). These factors, in turn, could influence the choice of high-fat and high-sugar diet due to increasing accessibility along with reduced PA owing to the lack of the appropriate built environment in urban areas.

Figure 4.11. Odds Ratio of Overweight and Obesity for Living in Urban Locations in South Asia

Author(Year),Country	Estimate [95% CI]
Kinnunen et al(2013),Nepal	1.40 [1.29, 1.53]
Kamal et al(2015),Bangladesh	1.30 [1.16, 1.45]
Siddiqui et al(2015),India	1.79 [1.75, 1.82]
Ahmad et al(2018),Pakistan	3.10 [1.75, 5.47]
Pengpid et al(2019),India	1.34 [1.32, 1.36]
Biswas et al(2019),Bangladesh	1.52 [1.48, 1.57]
Young et al(2019),India	2.20 [2.11, 2.30]
Ahmad et al(2020),Bangladesh	1.39 [1.01, 1.92]
Asif et al(2020),Pakistan	1.23 [1.12, 1.36]
Gupta et al(2021),Bangladesh	1.75 [1.57, 1.93]
Verma et al(2021),India	1.16 [1.12, 1.20]
Verma et al(2021),India	1.31 [1.29, 1.33]
Hossain et al(2022),Bangladesh	1.53 [1.01, 2.31]
Tanveer et al(2022),Pakistan	1.46 [1.08, 1.97]
Kundu et al(2023),India	1.52 [1.50, 1.55]
RE Model	1.50 [1.35, 1.66]

Odds Ratio

On the policy front, countries like India and Bangladesh have introduced urban food environment guidelines, including restrictions on unhealthy food advertising, urban farming initiatives, and zoning laws to limit fast food outlets near schools. Sri Lanka's National Policy on Urban Agriculture (2021) promotes urban farming to increase the availability of fresh produce, tackling food insecurity driven by rapid urbanization. On the trade front, Sri Lanka and Nepal have implemented import regulations and tariffs to curb ultraprocessed food imports while promoting local food production. Recognizing the link between food security, gender empowerment, and nutrition, several South Asian countries have implemented targeted policies. In Bangladesh, the Vulnerable Group Development (VGD) program empowers women through food security initiatives, nutrition training, and income-generating activities. Bhutan's Gender Equality Policy (2020) enhances women's participation in economic and social sectors, improving their access to resources that support household nutrition. India's Pradhan Mantri Poshan Scheme (2021) provides free, nutritious meals to schoolchildren, improving both health and educational outcomes while encouraging gender equity in school enrollment. The Maldives' National Education Curriculum (2015) integrates nutrition education to instill healthy eating habits from an early age. Pakistan's National Gender Policy Framework (2022) addresses gender disparities by empowering women with resources and decision-making authority, leading to improved dietary practices.

4.4 DISCUSSION

The increasing trend of obesity in South Asia can be largely attributed to both external drivers and IFCB influenced by the region's food system. Urbanization, linked to rising education levels, global trade, and decreasing gender inequality, is found to play a significant role in the growing prevalence of obesity. Unhealthy dietary practices, sedentary lifestyles, and low PA are major determinants of obesity in the region. The growing per capita income and improving socioeconomic conditions, fueled by urbanization and advancements in agricultural production, may explain the increased spending on high-fat, high-sugar foods, as well as processed meats, contributing to the obesity increase in South Asian countries.

Figure 4.12 illustrates the relative contributions of different factors—IFCBs, external drivers, FESCs, and dietary intake—to rising obesity trends across South Asian countries. IFCBs are the leading contributors to obesity trends in most countries, particularly in Sri Lanka (56 percent), Pakistan (55 percent), and Bhutan (55 percent). However, in Bangladesh (60 percent), India (49 percent), Maldives (45 percent), and Nepal (41 percent), external drivers such as economic growth and urbanization play a more prominent role, highlighting their influence on systemic determinants of health. Dietary intake, while comparatively smaller across all countries, shows a higher contribution in Sri Lanka (15 percent) and India (12 percent), indicating shifts toward calorie-dense diets.

Figure 4.12. Comparison of Relative Attribution Index across All Domains for Children across South Asian Countries

Country	Individual Factors & Consumer Behaviour	Food Environments & Supply Chains	External Drivers	Dietary Intake
Sri Lanka	56%	14%	16%	15%
Pakistan	55%	7%	36%	1%
Nepal	36%	18%	41%	5%
Maldives	42%	6%	45%	6%
India	32%	8%	49%	12%
Bhutan	55%	0%	42%	3%
Bangladesh	23%	13%	60%	4%
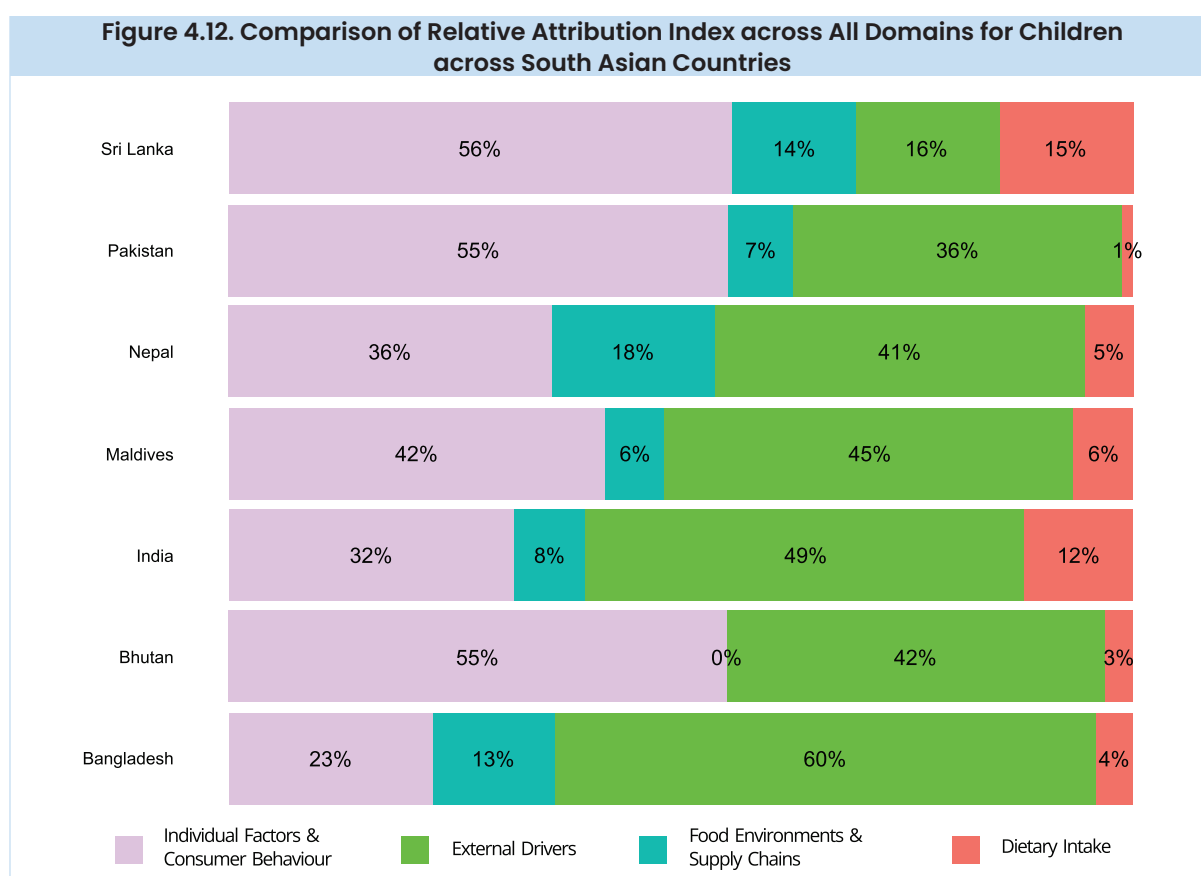
The WHO Acceleration Plan (2022) aims to combat the global obesity epidemic by 2030. The plan has recommended a technical package with 10 high-impact interventions. With 31 governments committed, the plan emphasizes country-specific actions to promote healthy lifestyles, regulate harmful food marketing, introduce nutrition labeling, and integrate obesity management into primary health care. The WHO South-East Asia Regions Call (2024) urged countries to strengthen policies promoting healthy diets and physical activity to combat rising obesity and NCD levels. Similar to the findings from the current analysis, the report identified common gaps across the region, including insufficient regulation of unhealthy food marketing, inadequate public awareness campaigns, challenges in policy implementation due to resource constraints, and limited comprehensive data on obesity and NCD prevalence.

The region has made notable progress in implementing WHO-recommended interventions to address obesity, but implementation remains uneven across countries. Table 4.1 summarizes the current status of various interventions recommended in the WHO package to combat obesity in South Asia. Fiscal policies, such as taxes on SSBs, have been introduced in Bangladesh, India, Pakistan, and Sri Lanka, though their enforcement and long-term impact are unclear. Subsidies for healthy foods like fruits and vegetables are scarce. Food labeling regulations have been slow to develop, with India's front-of-pack warning labels still under discussion. Sri Lanka has extended its traffic light labeling system from sugar to fat and salt content in packaged foods. The early food environment in South Asia faces significant challenges as unhealthy snacks and sugary beverages are readily available in

schools. While countries like India and Sri Lanka have issued guidelines for healthy eating in early childhood education centers, enforcement remains limited. Marketing regulations for unhealthy foods targeted at children are inconsistent, with insufficient monitoring allowing aggressive advertising to persist. Physical inactivity is another concern due to urbanization, sedentary lifestyles, and limited public infrastructure for exercise. Though Bangladesh, India, and Sri Lanka have integrated physical activity promotion into national policies, safe recreational spaces remain inadequate. Public awareness campaigns and emerging digital health innovations—such as artificial intelligence–driven nutrition monitoring—show promise but face challenges in scaling due to resource constraints. Overall, while South Asian countries are aligning with WHO's Acceleration Plan, gaps in enforcement and policy integration hinder sustained progress.

Table 4.1. Mapping South Asian Readiness to WHO Acceleration Plan (2022)

INDICATORS	BANGLADESH	BHUTAN	INDIA	MALDIVES	NEPAL	PAKISTAN	SRI LANKA
Fiscal policies (Taxes)	Green	Red	Green	Green	Green	Green	Green
Fiscal policies (Subsidies)	Red	Red	Red	Red	Red	Red	Red
Food labeling	Red	Red	Yellow	Red	Red	Red	Green
Food and beverage marketing	Red	Red	Red	Red	Red	Red	Green
Early food environment	Yellow	Yellow	Green	Green	Red	Green	Green
Public food procurement	Red	Yellow	Green	Green	Red	Yellow	Green
Physical activity	Green	Green	Green	Green	Yellow	Green	Green
Building capacity in the health system to deliver obesity management services	Red	Yellow	Yellow	Red	Red	Red	Yellow
Public education and awareness	Green	Green	Green	Green	Green	Green	Green
Innovations	Yellow	Yellow	Green	Green	Yellow	Yellow	Yellow

Key: ■ Policy not in place (Red) ■ Policy under consideration (Yellow) ■ Policy in place and implemented (Green)

5 LOOKING FORWARD

This report presents the findings of a novel analysis exploring the connections between different components of food systems and the rising trend of obesity in South Asia. This chapter briefly presents a few strategic suggestions to tackle the emerging health challenges associated with rising obesity in the region. While the strength of association varies across components, the analysis confirms that all aspects of food systems are associated with rising obesity in the region, reaffirming the need for a holistic, whole-of-systems approach. It is hoped that the methodology developed in this study can serve as a foundation for future research, with potential for replication and expansion as more high-quality data become available.

Improve availability and quality of country-level data on all aspects of food systems in South Asia.

While this analysis found that only a small proportion of the incremental trend of obesity in South Asia (10–12 percent) could be attributed to factors related to food systems during the study period, it is highly likely that this was due to a lack of high-quality data, which limited the parameters that could be included in the analysis. The true contribution of food systems to the increasing trend of obesity in South Asia is likely to be substantially higher. Similarly, while the findings suggest that some aspects of food systems—namely external drivers and IFCBs—have contributed more to the incremental trend in obesity in South Asia than others, the analysis of other domains (particularly FESC but also dietary intake) was severely limited by a lack of data. It would be encouraging for the researchers if nationally representative, disaggregated data on dietary intakes (including diet quality) and related behaviors are available to better unpack this complex interaction of food systems with obesity. Including diet quality indicators in national surveys like the Demographic and Health Surveys would provide essential insights for developing and evaluating effective nutrition policies.

CE per capita—a marker of a country's economic activity and growth-was found to be significantly positively associated with adult obesity in all South Asian countries. Dietary energy supply, packaged food sales, and the agricultural infrastructure index were all found to be positively associated with adult obesity in South Asia, while the number of modern grocery outlets per million population was significantly positively associated with child obesity. These variables are linked to economic development, income growth, and greater integration into global food supply chains, which have been major drivers of the nutrition transition in countries around the world. Significant positive associations were detected between obesity and excess intakes of red and processed meats and SSBs. There is a robust body of evidence linking SSB consumption to weight gain and obesity in a dose-

response relationship, while high intakes of red and processed meats may be associated with increased risk of obesity (Nguyen et al. 2023). High consumption of red and processed meats can also increase risk of chronic diseases, including CVDs, T2DM, and some cancers, and should be limited (Rouhani et al. 2014).

Comprehensive food policies are needed to improve the healthiness of food environments and supply chains.

Considering the significant positive associations between obesity and excess intakes of red and processed meats and SSBs, as well as the link to increased risk of multiple NCDs, cost-effective, evidence-based policies for addressing unhealthy diets set out in global guidance documents should be prioritized and adapted to South Asian country contexts. These recommendations include fiscal and regulatory policies to increase the availability and affordability of healthy foods, and to decrease the availability, affordability, and promotion of unhealthy foods and beverages, such as taxes on SSBs, subsidies for fruits and vegetables, regulatory policies like mandatory front-of-pack nutrition labeling, and restrictions on unhealthy food marketing to children, as well as standards for foods sold and provided in schools.

Increase availability, affordability, and consumption of healthy foods, including fruits and vegetables, in the region.

Intakes of healthy dietary components, including fruits, vegetables, nuts, seeds, and legumes, over the study period were insufficient to detect any negative associations with obesity. However, there is strong, consistent evidence that inadequate consumption of healthy dietary components, including fruits, vegetables, and whole grains, is linked to a range of adverse health outcomes, including obesity and multiple NCDs. Increasing consumption of these foods in South Asian populations should be a priority. This requires coherent actions across all aspects of food systems, from redirecting agricultural subsidies and redesigning agricultural training and extension programs, to improving food supply chain infrastructure, to nutrition education, food skills, and literacy programs.

Prioritize urban planning policies to promote active lifestyles, such as incorporating walkable spaces, cycle tracks, and public green areas.

Insufficient Physical Activity was found to be significantly positively associated with adult obesity in Bhutan, Nepal, and Pakistan, where IPA levels are rising. IPA levels are high across South Asia, particularly in urban populations and among women, due to sedentary lifestyles, cultural norms, limited active transport and recreation infrastructure and facilities, and rising temperatures and air pollution levels. Addressing these issues requires promoting active lifestyles through urban planning, inclusive recreational spaces, awareness campaigns, and policies that consider cultural and gender-specific barriers. India's Smart Cities Mission provides an example of how urban planning can encourage physical activity and reduce sedentary behaviors.

Obesity should be prioritized as a key risk factor for NCDs, with its management integrated into NCD prevention and care at all health care levels.

The rapid rise in obesity-associated NCDs is a critical public health threat to the region. While countries across the region have sought to respond to this threat, the response to date has been insufficient. There is enough literature that shows that excess body fat contributes to insulin resistance, hypertension, and systemic inflammation, increasing disease risk and driving up health care costs. The findings from the systematic review and meta-analysis of this report have also highlighted significant associations between obesity and its related comorbidities like T2DM, hypertension, and CVDs in South Asian populations. Overall, half of the T2DM is attributable to overweight and obesity, and similar pattern was observed for hypertension. Hence, it is important to prioritize and integrate obesity prevention strategies in the region to reduce the growing health burden of NCDs. Each country's NCD prevention policy must integrate a plan of action to mitigate overweight and obesity, promoting healthy diets and increased PA.

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FOOD SYSTEMS, DIETS & OBESITY: BANGLADESH

Bangladesh has a growing burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)
OVERWEIGHT: **22.1%**
OBESITY: **5.4%**

CHILDREN (5-18 years)
OVERWEIGHT: **6.3%**
OBESITY: **1.9%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m² | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

29% of adults are living with hypertension

18% of adults are living with diabetes

71% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to stop obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟩	The Value Added Tax and Supplementary Duty Act (2012), Ministry of Finance 25-35% Supplementary Duty on sugar-sweetened beverages (SSBs)
Fiscal polices (Subsidies)	🟥	
Food labelling	🟥	
Food and beverage marketing	🟥	
Early food environment	🟨	Policies to enhance the nutritional quality of food provided in early childhood education and care settings
Public food procurement	🟥	
Physical activity	🟩	National Youth Policy (2014), Ministry of Youth and Sports Promotes development of sports facilities and integrates physical education into school curricula
Building capacity in the health system to deliver obesity management services	🟥	
Public education and awareness	🟩	Second National Plan of Action for Nutrition (2016–2025), Ministry of Health and Family Welfare Integrates nutrition education across formal and informal education settings
Innovations	🟨	Exploring digital health interventions and community programs to strengthen health services and promote healthy lifestyles.

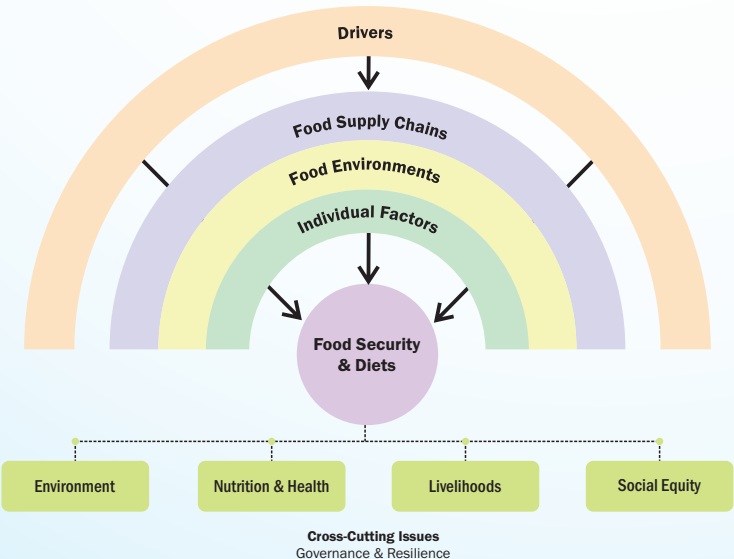🟥 Policy not in place   🟨 Policy under consideration   🟩 Policy in place and implemented

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in Bangladesh

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.

Drivers
Food Supply Chains
Food Environments
Individual Factors
Food Security & Diets

Environment | Nutrition & Health | Livelihoods | Social Equity

Cross-Cutting Issues
Governance & Resilience

Relative contribution of key food system components to rising obesity in Bangladesh

60% **External Drivers**
Urbanization, trade, gender, education

13% **Food Environment & Supply Chain**
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

23% **Individual Factors & Consumer Behavior**
Consumption expenditure and physical activity

4% **Outcomes- Diets**
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in Bangladesh and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

External drivers have made the greatest relative contribution to the rise in obesity in Bangladesh: 60%

▶ **Proportion of population living in an urban area: 40%**
Urban population growth (2023): 3%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles.
Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

▶ **Trade as a proportion of GDP (2023): 31%**
GDP growth rate (2023): 6%
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability and consumption of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

▶ **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders): 0.498**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles.
Gender-responsive policies are needed to support women's empowerment and healthy diets.

FOOD ENVIRONMENTS AND SUPPLY CHAINS*

▶ **Dietary energy supply: 2,581 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

▶ **Modern grocery retailer density: 0.3 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods.

▶ **Retail value (total sales) of packaged foods and soft drinks: USD $39.7 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats.

▶ **Supply chain infrastructure index: 32.3**
Higher score indicates more developed infrastructure, which is typically associated with improved food availability and access.

INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

▶ **Household final consumption expenditure (constant 2017 international dollars per capita): $5,312.5**
Annual growth (%) per capita (2022): 6.4%
Sustained GDP growth in Bangladesh (>5% per decade) has driven higher incomes and consumption expenditure, which is associated with increased purchasing of processed foods.

▶ **Insufficient physical activity**
Adults (18+): **20% (Male 20%, Female 21%) (2022)**
Adolescents (11-17yrs): **66% (Boys 63%, Girls 69%) (2016)**
Source: WHO NCD Data Portal, 2025
Physical inactivity is a major risk factor for weight gain, obesity, and multiple NCDs, including CVD and cancers.

DIETS*

▶ Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in Bangladesh
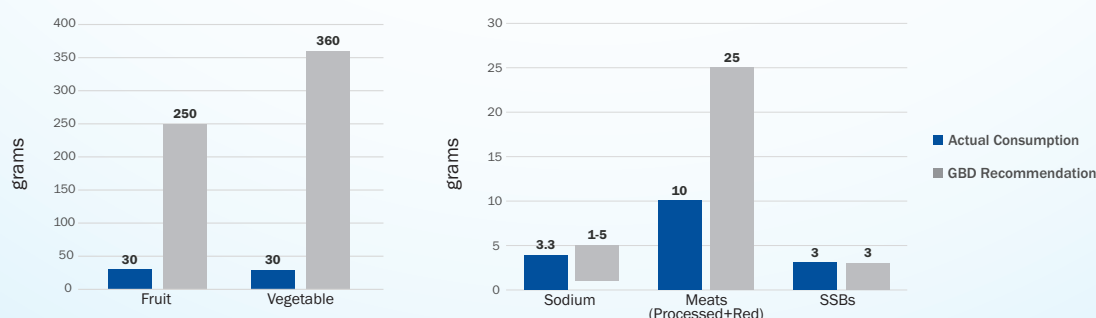
*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021

FOOD SYSTEMS, DIETS & OBESITY: BHUTAN

Bhutan has a growing burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)
OVERWEIGHT: **35.6%**
OBESITY: **12.9%**

CHILDREN (5-18 years)
OVERWEIGHT: **12.2%**
OBESITY: **6.0%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m^2 | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

43% of adults are living with hypertension

16% of adults are living with diabetes

72% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to address obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟥	
Fiscal polices (Subsidies)	🟥	
Food labelling	🟥	
Food and beverage marketing	🟥	
Early food environment	🟨	The Nutrition Dietary Guidelines for School Children aim to ensure that school-aged children have access to healthy meals and snacks. But require to be implemented in schools.
Public food procurement	🟨	The government has initiated actions to incorporate nutrition criteria into public food procurement processes. The National Nutrition Strategy and Action Plan 2021-2025 includes strategies to ensure that food provided in public institutions meets nutritional standards.
Physical activity	🟩	National Physical Activity Guidelines (2011), Ministry of Health Aiming to promote physical activity for all age groups and health statuses,
Building capacity in the health system to deliver obesity management services	🟨	Efforts are underway to strengthen the health system's capacity to manage obesity, guided by the National Nutrition Strategy and Action Plan 2021-2025.
Public education and awareness	🟩	National Health Promotion Strategic Plan (2015-2023), Ministry of Health The strategic plan offers a broad framework to guide policymakers, health promoters, educators, and stakeholders in strengthening health promotion.
Innovations	🟨	Bhutan is exploring innovative approaches to tackle obesity by integrating Gross National Happiness into health policies to promote well-being.

🟥 Policy not in place   🟨 Policy under consideration   🟩 Policy in place and implemented

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in Bhutan

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.
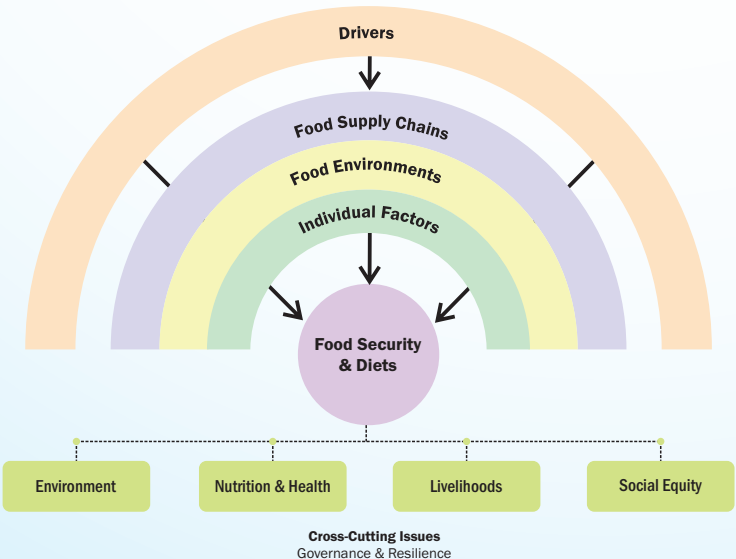
Relative contribution of key food system components to rising obesity in Bhutan

42% External Drivers
Urbanization, trade, gender, education

0% Food Environment & Supply Chain
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

55% Individual Factors & Consumer Behavior
Consumption expenditure and physical activity

3% Outcomes- Diets
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in Bhutan and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

▶ **Urban population as % of total population: 44%**
Urban population growth (2023): 2.2%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles. Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

▶ **Trade (% of GDP): 86% (2022)**
GDP growth rate (2022): 5.2%
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

▶ **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders) : 0.334**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles. Gender-responsive policies are needed to support women's empowerment and healthy diets.

FOOD ENVIRONMENTS AND SUPPLY CHAINS*

▶ **Dietary energy supply: 3,215 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

▶ **Modern grocery retailer density: 2.6 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods.

▶ **Retail value (total sales) of packaged foods and soft drinks: USD $69.7 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats.

INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

Individual factors have made the greatest relative contribution to the rise in obesity in Bhutan (55%)

▶ **Household final consumption expenditure (constant 2017 international dollars per capita): $6,781.2**
Annual growth per capita (2023) : **5.3%**
Higher consumption expenditure driven by rising incomes is associated with higher purchasing of processed foods.

▶ **Insufficient physical activity**
Adults (18+): **10% (Men 9%, Women 11%) (2022)**
Adolescents (11-17yrs): **84% (Boys 83%, Girls 85%) (2016)**
Source: WHO NCD Data Portal, 2025
Physical inactivity is a key risk factor for obesity and a major concern among adolescents in Bhutan.

DIETS*

▶ Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in Bhutan
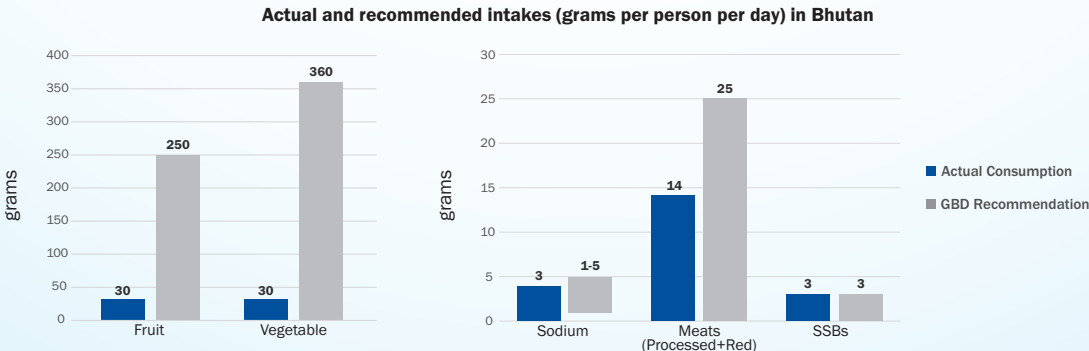
*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021

FOOD SYSTEMS, DIETS & OBESITY: INDIA

India has a growing burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)
OVERWEIGHT: **22.9%**
OBESITY: **7.6%**

CHILDREN (5-18 years)
OVERWEIGHT: **6.8%**
OBESITY: **3.5%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m² | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

31% of adults are living with hypertension

23% of adults are living with diabetes

68% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to address obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟩	The Central Goods and Services Tax Act, (2017) ,Ministry of Law and Justice 28% GST on carbonated soft drinks plus 12% compensation cess
Fiscal polices (Subsidies)	🟥	
Food labelling	🟨	Efforts are ongoing to implement front-of-pack labelling (FOPL) by Food Safety and Standards Authority of India
Food and beverage marketing	🟥	
Early food environment	🟩	Food Safety and Standards (Safe Food and Balanced Diets for Children in School) Regulations (2020), Ministry of Health and Family Welfare Aim to ensure safe and nutritious food in schools, specifying responsibilities for school authorities and promoting healthy eating habits.
Public food procurement	🟩	Food Safety and Standards (Prohibition and Restrictions on Sales) Second Amendment Regulations (2021), Ministry of Health and Family Welfare Implemented policy to reduce industrial trans fat to 2% by mass of the total oils/fats present in the product,
Physical activity	🟩	Fit India Movement (2019), Ministry of Sports and Youth Affairs Aims to encourage people to adopt a healthy lifestyle
Building capacity in the health system to deliver obesity management services	🟨	The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS) includes components for obesity management. However, integrating obesity management into primary healthcare services is in pipeline
Public education and awareness	🟩	Eat Right India (2018), Ministry of Health and Family Welfare Aims to transform India's food system to ensure safe, healthy, and sustainable food for all
Innovations	🟩	Smart Cities Mission (2015), Minister of Housing and Urban Affairs Aims to improve the quality of life in 100 selected cities by providing efficient services, robust infrastructure, and a sustainable environment through smart solution

🟥 Policy not in place   🟨 Policy under consideration   🟩 Policy in place and implemented

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in India

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.
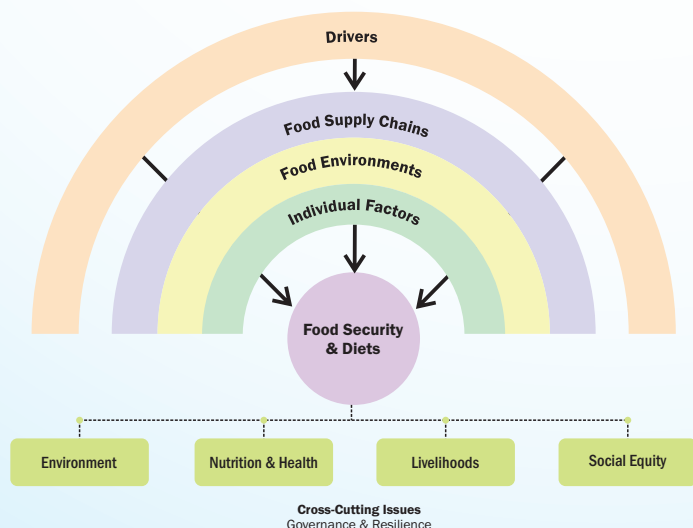
Relative contribution of key food system components to rising obesity in India

42% **External Drivers**
Urbanization, trade, gender, education

0% **Food Environment & Supply Chain**
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

55% **Individual Factors & Consumer Behavior**
Consumption expenditure and physical activity

3% **Outcomes- Diets**
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in India and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

External drivers have made the greatest relative contribution to the rise in obesity in India: 49%

▶ **Proportion of population living in an urban area: 36%**
Urban population growth (2023): 2.2%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles.
Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

▶ **Trade as a proportion of GDP (2023): 46%**
GDP growth rate (2023): 7.6%
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

▶ **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders): 0.437**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles.
Gender-responsive policies are needed to support women's empowerment and healthy diets.
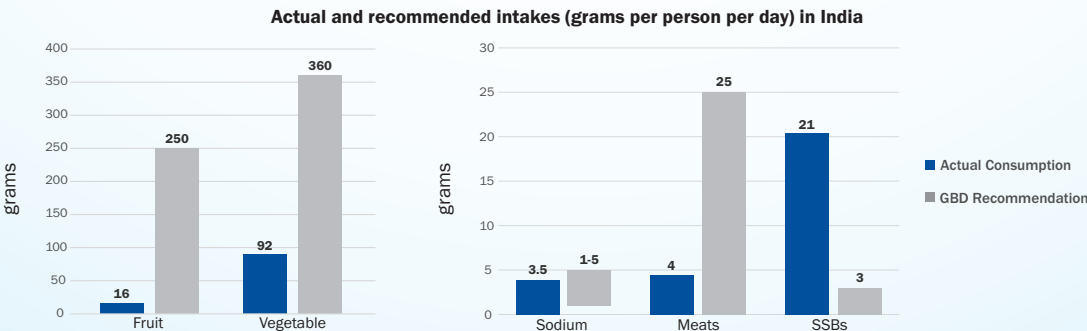
FOOD ENVIRONMENTS AND SUPPLY CHAINS*

▶ **Dietary energy supply: 2,589 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

▶ **Modern grocery retailer density: 1.4 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods.

▶ **Retail value (total sales) of packaged foods and soft drinks: USD$62.1 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats.

▶ **Supply chain infrastructure index: 51.5**
Higher score indicates more developed infrastructure and is typically associated with improved food availability and access.

INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

▶ **Household final consumption expenditure (constant 2017 international dollars per capita): $5,705.7**
Annual growth (%) per capita (2023): 3.11%
Sustained GDP growth in India (8.15% in FY24) has driven higher incomes and consumption expenditure, which is associated with increased purchasing of processed foods.

▶ **Insufficient physical activity**
Adults (18+): **49% (Male 42%, Female 57%) (2022)**
Adolescents (11-17yrs): **74% (Boys 72%, Girls 76%) (2016)**
Source: WHO NCD Data Portal, 2025
Physical inactivity is a major risk factor for weight gain, obesity, and multiple NCDs, including CVD and cancers.

DIETS*

▶ Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in India

Legend: ■ Actual Consumption ■ GBD Recommendation

Fruit: 16 (Actual), 250 (GBD); Vegetable: 92 (Actual), 360 (GBD)
Sodium: 3.5 (Actual), 1-5 (GBD); Meats (Processed+Red): 4 (Actual), 25 (GBD); SSBs: 21 (Actual), 3 (GBD)

*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021

FOOD SYSTEMS, DIETS & OBESITY: MALDIVES

Maldives has a high burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)
OVERWEIGHT: **36.4%**
OBESITY: **18.7%**

CHILDREN (5-18 years)
OVERWEIGHT: **18.4%**
OBESITY: **12.7%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m^2 | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

34% of adults are living with hypertension

15% of adults are living with diabetes

89% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to address obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟩	Maldives Export Import Act (2017), Ministry of Economic Development and Trade Import tax- 60.55 MVR/L on energy drinks, 8 MVR/L on other soft drinks and 15% on SSBs and unsweetened waters
Fiscal polices (Subsidies)	🟥	
Food labelling	🟥	
Food and beverage marketing	🟥	
Early food environment	🟩	Health Promoting School (HPS) Policy (2004) and School Breakfast Program (2019), Ministry of Education The program was launched as a pilot project in 25 schools during the first term of the 2019 academic year and was later expanded to 188 and then 203 schools.
Public food procurement	🟩	Integrated National Nutrition Strategic Plan (2013-2017), Ministry of Health Aims to address malnutrition, including undernutrition in children and overweight and obesity in adults
Physical activity	🟩	National Policy on Physical Activity for Healthier Living (2022), Ministry of Health Aims to raise awareness, promote active lifestyles, and reduce non-communicable diseases.
Building capacity in the health system to deliver obesity management services	🟥	
Public education and awareness	🟩	Education Sector Plan (2019-2023), Ministry of Education includes nutrition awareness and physical activity in school curricula. Behavior change campaigns from the Multi-Sectoral NCD Action Plan focus on salt reduction, trans-fat awareness, and lifestyle modifications.
Innovations	🟩	Mobile health initiatives like the Fit Maldives App leverage technology to encourage physical activity

🟥 **Policy not in place**   🟨 **Policy under consideration**   🟩 **Policy in place and implemented**

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in Maldives

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.

Drivers → Food Supply Chains → Food Environments → Individual Factors → Food Security & Diets

Environment | Nutrition & Health | Livelihoods | Social Equity

Cross-Cutting Issues
Governance & Resilience
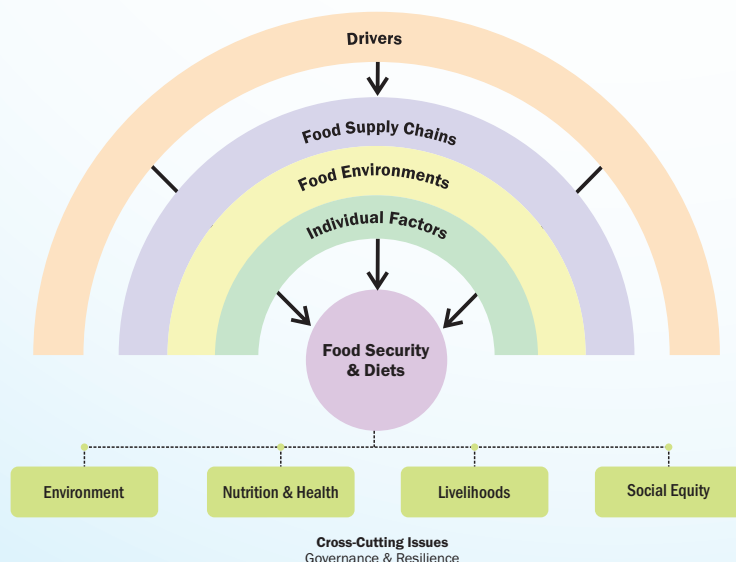
Relative contribution of key food system components to rising obesity in Maldives

45% External Drivers
Urbanization, trade, gender, education

6% Food Environment & Supply Chain
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

42% Individual Factors & Consumer Behavior
Consumption expenditure and physical activity

6% Outcomes- Diets
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in Maldives and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

External drivers have made the greatest relative contribution to the rise in obesity in Maldives : 45%

▶ **Proportion of population living in an urban area: 42%**
Urban population growth (2023): 1.4%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles.
Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

▶ **Trade % of GDP (2023): 150%**
GDP growth annual (2023): 4.7%
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

▶ **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders) : 0.328**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles.
Gender-responsive policies are needed to support women's empowerment and healthy diets.

FOOD ENVIRONMENTS AND SUPPLY CHAINS*

▶ **Dietary energy supply: 2,653 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

▶ **Modern grocery retailer density: 18.4 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods

▶ **Retail value (total sales) of packaged foods and soft drinks: USD$178.2 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats

▶ **Supply chain infrastructure index:**
Higher score indicates more developed infrastructure and is typically associated with improved food availability and access.

INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

Individual factors have contributed significantly to the rise in obesity in Maldives: 42%

▶ **Household final consumption expenditure (constant 2017 international dollars per capita) (2023) : $8,911.1**
Annual growth (%) per capita (2023) : **10.7%**
Sustained GDP growth in Maldives has driven higher incomes and consumption expenditure, which is associated with increased purchasing of processed foods.

▶ **Insufficient physical activity**
Adults (18+): **25% (Men 25%, Women 24%) (2022)**
Adolescents (11-17yrs): **82% (Boys 78%, Girls 86%) (2016)**
Source: WHO NCD Data Portal, 2025
Physical inactivity is a key modifiable risk factor for obesity and a major concern in Maldives.

DIETS*

▶ Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in Maldives
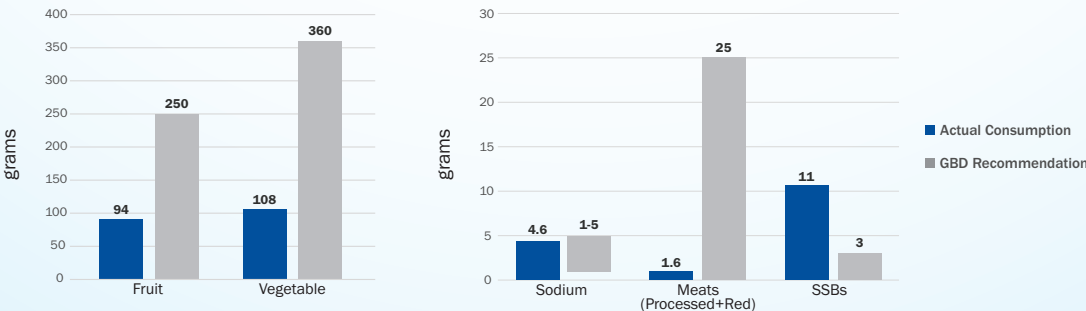
*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021

FOOD SYSTEMS, DIETS & OBESITY: NEPAL

Nepal has a growing burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)

OVERWEIGHT: **24.6%**

OBESITY: **7.1%**

CHILDREN (5-18 years)

OVERWEIGHT: **6.9%**

OBESITY: **2%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m^2 | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

36% of adults are living with hypertension

16% of adults are living with diabetes

65% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to address obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟩	Excise Duty Act (2002), Ministry of Finance Excise duty of Rs. 25 per ltr on SSB
Fiscal polices (Subsidies)	🟥	
Food labelling	🟥	
Food and beverage marketing	🟥	
Early food environment	🟥	
Public food procurement	🟥	
Physical activity	🟨	"Report Card on Physical Activity for Children and Adolescents" initiative, 2018 Studies the available evidence on ten physical activity-related indicators among Nepalese children and youth.
Building capacity in the health system to deliver obesity management services	🟥	
Public education and awareness	🟩	Multi-Sector Nutrition Plan (2018-2022), National Planning Commission Aims to improve maternal, adolescent, and child nutrition by scaling interventions and fostering an enabling environment.
Innovations	🟨	Exploring community health worker led interventions

🟥 **Policy not in place**   🟨 **Policy under consideration**   🟩 **Policy in place and implemented**

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in Nepal

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.
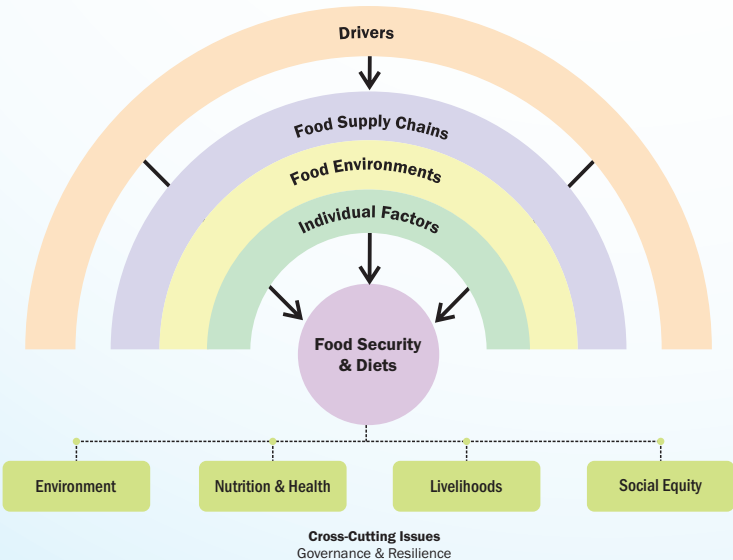
Relative contribution of key food system components to rising obesity in Nepal

41% External Drivers
Urbanization, trade, gender, education

18% Food Environment & Supply Chain
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

36% Individual Factors & Consumer Behavior
Consumption expenditure and physical activity

5% Outcomes- Diets
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in Nepal and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

External drivers have made the greatest relative contribution to the rise in obesity in Nepal: 41%

▶ **Proportion of population living in an urban area: 22%**
Urban population growth (2023): 2%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles.
Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

▶ **Trade as a proportion of GDP (2023) : 42%**
GDP growth annual (2023) : 2%
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

▶ **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders) : 0.495**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles.
Gender-responsive policies are needed to support women's empowerment and healthy diets.

FOOD ENVIRONMENTS AND SUPPLY CHAINS*

▶ **Dietary energy supply: 2,931 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

▶ **Modern grocery retailer density: 0.4 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods.

▶ **Retail value (total sales) of packaged foods and soft drinks: USD$37.6 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats.

▶ **Supply chain infrastructure index: 20.8**
Nepal scores low on this index. Higher score indicates more developed infrastructure and is typically associated with improved food availability and access.

INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

▶ **Household final consumption expenditure (constant 2017 international dollars per capita) (2023) : $3,979.2**
Annual growth (%) per capita (2023) : 0.8%
Higher consumption expenditure driven by rising incomes is associated with higher purchasing of processed foods.

▶ **Insufficient physical activity**
Adults (18+): **8% (Men 10%, Women 6%) (2022)**
Adolescents (11-17yrs): **84% (Boys 82%, Girls 85%) (2016)**
Source: WHO NCD Data Portal, 2025
Physical inactivity is a major risk factor for weight gain, obesity, and multiple NCDs, including CVD and cancers.

DIETS#

▶ Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in Nepal
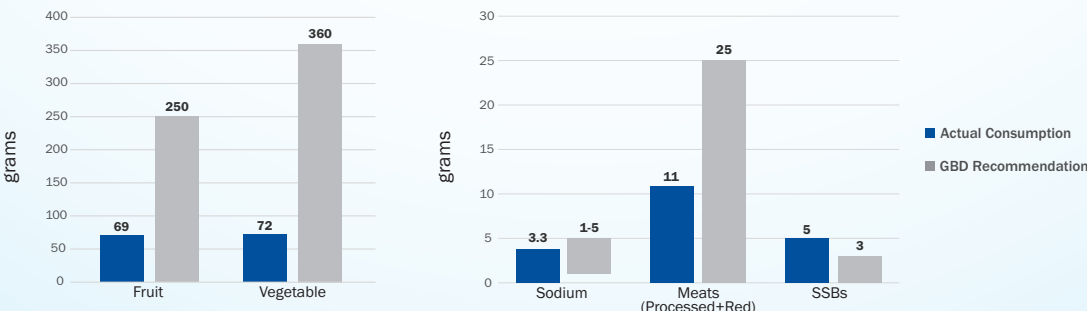
*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021

FOOD SYSTEMS, DIETS & OBESITY: PAKISTAN

Pakistan has a growing burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)

OVERWEIGHT: **32.6%**

OBESITY: **23.7%**

CHILDREN (5-18 years)

OVERWEIGHT: **10.5%**

OBESITY: **8.4%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m² | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

43% of adults are living with hypertension

31% of adults are living with diabetes

57% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to address obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟩	Federal Excise Act, (2005), Ministry of Finance 10-20% excise tax on SSBs
Fiscal polices (Subsidies)	🟥	
Food labelling	🟥	
Food and beverage marketing	🟥	
Early food environment	🟩	Punjab Food Authority (PFA) Initiatives (2017) Ban on sale of certain foods, including carbonated drinks and snacks/chips, in school canteens
Public food procurement	🟨	Efforts to establish guidelines for healthier food options in public institutions are underway.
Physical activity	🟩	The Khyber Pakhtunkhwa (KP) Provincial Sports Policy, 2018 Promotes healthy sporting activities through a systematic, participative approach involving government, educational institutions, the private sector, and local bodies.
Building capacity in the health system to deliver obesity management services	🟥	
Public education and awareness	🟩	Provincial level initiatives like School Health Education Program in Pakistan (SHEPP), School Health and Wellness Programme (SHWP) Comprised of health education on healthy lifestyle and physical activity sessions for children and training of teachers
Innovations	🟨	Exploring innovative approaches to tackle obesity, including leveraging technology and cross-sector collaborations.

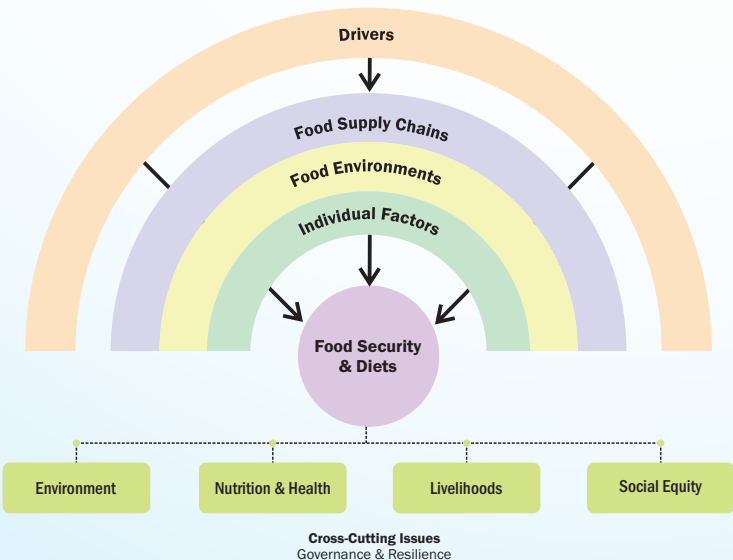🟥 Policy not in place   🟨 Policy under consideration   🟩 Policy in place and implemented

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in Pakistan

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.

Drivers

Food Supply Chains

Food Environments

Individual Factors

Food Security & Diets

Environment | Nutrition & Health | Livelihoods | Social Equity

Cross-Cutting Issues
Governance & Resilience

Relative contribution of key food system components to rising obesity in Pakistan

36% External Drivers
Urbanization, trade, gender, education

7% Food Environment & Supply Chain
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

55% Individual Factors & Consumer Behavior
Consumption expenditure and physical activity

1% Outcomes- Diets
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in Pakistan and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

► **Urban population as % of total population (2023): 38%**
Urban population growth (2023): 2.4%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles.
Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

► **Trade as a proportion of GDP (2023) : 23%**
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

► **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders) : 0.522**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles.
Gender-responsive policies are needed to support women's empowerment and healthy diets.

FOOD ENVIRONMENTS AND SUPPLY CHAINS*

► **Dietary energy supply: 2,443 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

► **Modern grocery retailer density: 2.7 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods.

► **Retail value (total sales) of packaged foods and soft drinks: USD$34.4 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats.

► **Supply chain infrastructure index: 34.2**
Higher score indicates more developed infrastructure and is typically associated with improved food availability and access.

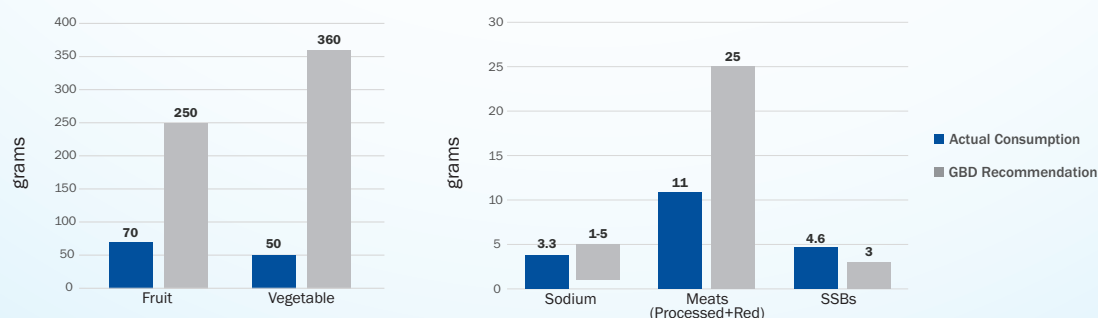## INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

Individual factors have made the greatest relative contribution to the rise in obesity in Pakistan: 55%

► **Household final consumption expenditure (constant 2017 international dollars per capita) : $4,856.2**
Annual growth (%) per capita (2023) : **2.5%**
Higher consumption expenditure driven by rising incomes is associated with higher purchasing of processed foods.

► **Insufficient physical activity**
Adults (18+): **46% (Men 34%, Women 57%) (2022)**
Adolescents (11-17yrs): **87% (Boys 85%, Girls 89%) (2016)**
Source: WHO NCD Data Portal, 2025
Physical inactivity is a major risk factor for weight gain, obesity, and multiple NCDs, including CVD and cancers.

DIETS*

► Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in Pakistan

Legend: Actual Consumption (dark blue), GBD Recommendation (grey)

Left chart (grams): Fruit — 70 / 250; Vegetable — 50 / 360
Right chart (grams): Sodium — 3.3 / 1-5; Meats (Processed+Red) — 11 / 25; SSBs — 4.6 / 3

*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021

FOOD SYSTEMS, DIETS & OBESITY: SRI LANKA

Sri Lanka has a growing burden of obesity and related non-communicable diseases (NCDs)

ADULTS (>18 years)
OVERWEIGHT: **28.7%**
OBESITY: **10.7%**

CHILDREN (5-18 years)
OVERWEIGHT: **9.5%**
OBESITY: **7.7%**

Overweight/obesity BMI cut-offs
Adults: >25kg/m^2 | Children: >1SD above WHO's child growth standards median

Source: NCD Risk Factor Collaboration (NCD-RisC) (2024)

30% of adults are living with hypertension

25% of adults are living with diabetes

85% of deaths are due to NCDs

Source: WHO NCD Data Portal, 2025

Implementation of WHO-recommended interventions to address obesity

INDICATORS		POLICIES
Fiscal polices (Taxes)	🟩	SSB Tax Policy, (2017), Ministry of Finance The tax rate is 30 cents per gram of sugar, excluding first 6g per 100ml, whichever is higher on beverages
Fiscal polices (Subsidies)	🟥	
Food labelling	🟩	Food (Colour Coding for Sugar Levels - Liquid) Regulations (2022), Ministry of Health. Mandatory color-coded 'traffic light' labels on SSBs and packaged foods, indicating sugar, salt, and fat content
Food and beverage marketing	🟩	Food (Labelling & Advertising) Regulations (2022), Ministry of Health From January 1, 2025, Sri Lanka will enforce strict regulations to limit food and beverage marketing to children and enhance consumer information.
Early food environment	🟩	Food-Based Dietary Guidelines (2011), Ministry of Health Provides guidelines for healthy eating and food provision in schools and early childhood settings
Public food procurement	🟩	Guidelines for a healthy canteen in workplaces (2013), Ministry of Health Promote healthier food choices and eating habits among the working community.
Physical activity	🟩	Physical Activity and Sedentary Behavior Guidelines (2018), Ministry of Sports Provides science-based guidance to help Sri Lankans aged 5 and older to improve their health through appropriate physical activity.
Building capacity in the health system to deliver obesity management services	🟨	Sri Lanka is working to strengthen its health system to provide comprehensive obesity prevention and management services. The National Nutrition Policy emphasizes the integration of obesity management into primary healthcare services.
Public education and awareness	🟩	Multisector Action Plan for the Prevention and Control of Non-Communicable Diseases (MSAP-NCD)(2016–2020), Ministry of Health Aims to reduce NCD burden through a multisectoral approach by promoting healthy lifestyles, reducing risk factors, and providing integrated treatment, targeting a 2% annual decline in premature mortality. Healthy life through minimum sugar consumption (2015), Ministry of Health Emphasize the importance of reducing sugar intake to promote better health
Innovations	🟨	Sri Lanka Digital Health Blueprint is yet to be implemented which would enable a Healthier Nation through Digital Transformation of Healthcare

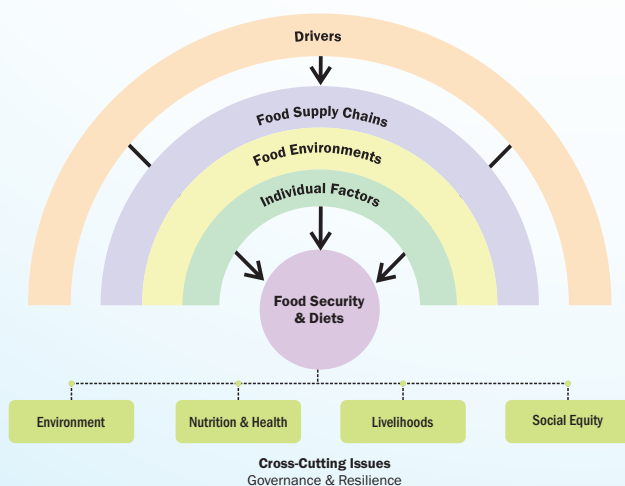🟥 Policy not in place   🟨 Policy under consideration   🟩 Policy in place and implemented

Source for Indicators: WHO Acceleration Plan to Stop Obesity, 2022

How food systems are driving unhealthy diets and obesity in Sri Lanka

Diets are shaped by food systems, which determine the kinds of foods produced, as well as influencing the foods people want to eat and can access, both physically and economically.

Food systems comprise all the people, institutions, places, and activities that play a part in growing, processing, transporting, selling, marketing, and, ultimately, eating food.

The different parts of the food system include food supply chains, food environments, and individual factors, as well as the drivers shaping them and their outcomes.

Drivers
Food Supply Chains
Food Environments
Individual Factors
Food Security & Diets

Environment | Nutrition & Health | Livelihoods | Social Equity

Cross-Cutting Issues
Governance & Resilience

Relative contribution of key food system components to rising obesity in Sri Lanka

16% **External Drivers**
Urbanization, trade, gender, education

14% **Food Environment & Supply Chain**
Dietary energy supply, modern grocery retailers, packaged food sales, agricultural infrastructure

56% **Individual Factors & Consumer Behavior**
Consumption expenditure and physical activity

15% **Outcomes- Diets**
Consumption of healthy and unhealthy food products

This brief summarizes the results of a preliminary analysis of the role different food system components have played in the rising obesity trend in Sri Lanka and other South Asian countries. The analysis was limited to a subset of indicators due to data constraints.

EXTERNAL DRIVERS*

▶ **Urban population as % of total population: 19%**
Urban population growth (2023): 0.3%
Living in an urban area is linked to higher consumption of processed foods and more sedentary lifestyles.
Urban planning policies can increase access to healthy foods and opportunities for active transport and recreation.

▶ **Trade as a proportion of GDP (2023) : 43%**
GDP growth annual (2023): 2.3%
Indicator of global market integration linked to economic growth, increased presence of multinational companies in a country's food industry, and increased availability of processed foods. Policies to mitigate adverse effects on diets and health include food marketing restrictions, nutrition labelling on packaged food, food composition and public food procurement standards, and taxes on unhealthy foods and beverages.

▶ **Gender inequality index (scale from 0 to 1, where 0 indicates full equality between genders) : 0.376**
Declining gender inequality is linked to female economic empowerment and labor market participation, which may be associated with increased consumption of convenience foods and more sedentary lifestyles.
Gender-responsive policies are needed to support women's empowerment and healthy diets.

FOOD ENVIRONMENTS AND SUPPLY CHAINS*

▶ **Dietary energy supply: 2,802 kcal/capita/day**
Dietary energy supply exceeding the caloric needs of a population (average 2,500kcal/capita/day) is linked to excess energy intakes, weight gain and obesity.

▶ **Modern grocery retailer density: 8.4 per 100,000 people**
Higher density of modern grocery retailers is associated with increased access to wider variety of foods, including unhealthy foods.

▶ **Retail value (total sales) of packaged foods and soft drinks: USD$85.9 per year per person**
Many packaged foods are highly processed, energy-dense, and high in added sugar, salt, and fats.

▶ **Supply chain infrastructure index: 52.7**
Higher score indicates more developed infrastructure and is typically associated with improved food availability and access.

INDIVIDUAL FACTORS AND CONSUMER BEHAVIOUR*

52.7Individual factors have made the greatest relative contribution to the rise in obesity in Sri Lanka: 56%

▶ **Household final consumption expenditure (constant 2017 international dollars per capita) : $8.217.4**
Annual growth (%) per capita (2023) : **1.6%**
Higher household consumption expenditure is associated with higher purchasing of processed foods, especially among lower-income households.

▶ **Insufficient physical activity**
Adults (18+): **37% (Men 29%, Women 45%) (2022)**
Adolescents (11-17yrs): **85% (Boys 82%, Girls 89%) (2016)**
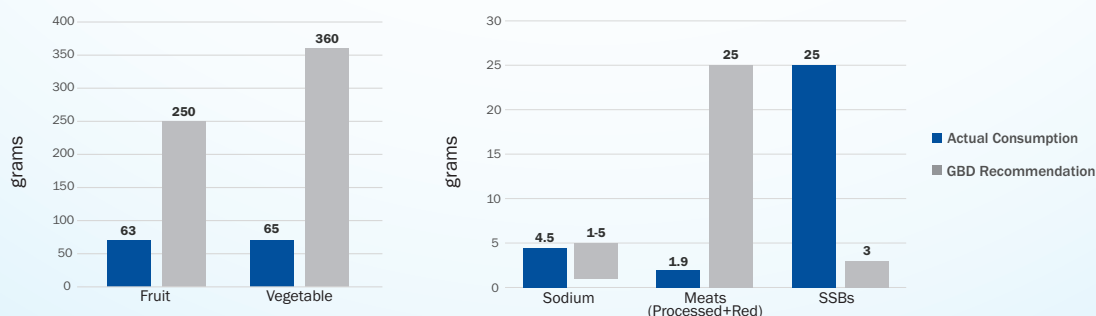Source: WHO NCD Data Portal, 2025
Physical inactivity is a major risk factor for weight gain, obesity, and multiple NCDs, including CVD and cancers.

DIETS*

▶ Low intake of protective foods (like fruits, vegetables, and whole grains) combined with high consumption of sugar, sodium, fat and processed meats increases the risk of obesity.

Actual and recommended intakes (grams per person per day) in Sri Lanka

*Food Systems Framework, led by the GAIN, Columbia Climate School, Cornell University's College of Agriculture and Life Sciences, and FAO
#IHME GBD Compare 2021