Asia

Eliciting a policy response for the rising epidemic of overweight-obesity in India

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Summary
India is experiencing multiple transitions with respect to nutrition patterns, epidemiology and demography. Along with staggering childhood undernutrition, a rapid rise in chronic diseases and their risk factors including overweight-obesity (O-O), among all sections of society, is compounding India’s health challenges. We present an overview of the O-O scenario (prevalence, determinants) and profile existing initiatives to address this modifiable risk factor in India. Urgent attention from all sectors, committed resources, policy support and targeted actions are warranted to combat the dual burden of malnutrition. The health systems should be reoriented and strengthened, in addition to enabling actions in other sectors, to address prevention and control of non-communicable diseases and associated risk factors like O-O.

Keywords: India, non-communicable diseases, obesity, overweight.

Introduction
India is currently grappling with multiple health challenges spanning the life cycle. On the one hand, India has one of the highest numbers of hungry and undernourished children, and on the other, non-communicable diseases (NCDs) are the leading causes of death and disability (1,2). Several drivers, such as accelerated economic growth, an expanding middle-class population, growing urbanization and an increasingly sedentary lifestyle, contribute to the rise of NCDs as a major public health challenge in an Indian context (3). Ethnic South Asians are so vulnerable to diabetes that, in the United Kingdom, being of Indian descent is viewed as a risk factor in itself (4). Whether this susceptibility is genetically, epigenetically or gestationally programmed is as yet not well determined, but its amplified expression due to urbanization magnifies the impact of the nutrition transition in India (5).

Overweight and obesity are important risk factors for NCDs (6,7). This paper presents the profile of overweight-obesity (O-O) in the Indian health and development context by describing the burden of disease with respect to NCDs (to which O-O is an important contributor), profiling the current programmes and policy responses in the health and other sectors and discussing how policy can be catalyzed to pay greater attention to O-O prevention.

Prevalence of and trends in O-O in India
NCDs are the leading cause of death in the Southeast Asia region of the World Health Organization (WHO), killing 7.9 million people annually (55% of the total deaths in the region) (8–10). In India, the rise of NCDs is alarming, accounting for 53% of the deaths in 2008 (3,11). The recent Indian Council of Medical Research (ICMR) India Diabetes (INDIAB) study (2011), with data from three states (Tamil Nadu, Maharashtra and Jharkhand) and one union territory (Chandigarh), representing nearly 18.1% of the nation’s population, indicates that around 62.4 and 77.2 million people were diabetic and pre-diabetic in 2012,
respectively (12–14). The International Diabetes Federation estimates – 61.3 million diabetics in 2011 – are consistent, and project that the number of people with diabetes would reach about 101.2 million by 2030 (15). Further, a sizable proportion of adults are also hypertensive (140 million), and the number is expected to cross 214 million by 2030 (16). It is estimated that 20–40% of the Indian population in urban areas and 12–17% in rural areas have hypertension (17,18). A WHO estimate in 2008 suggested that 33% of men and 32% of women older than 25 years had hypertension in India (17). Additionally, a high percentage of Indians are in a prehypertension stage (e.g. in Mizoram, the prevalence of prehypertension was 58.5% among adults, and the prevalence of hypertension was 19%; Integrated Disease Surveillance Project [IDSP], 2007–2008). In economic terms, India lost 9.2 million years of productive life to cardiovascular diseases (CVDs) alone in 2000, and this number is expected to double to 17.9 million by 2030. The income lost owing to NCDs in 2000 was estimated to be US $9 billion, which is projected to cross US $237 billion during the decade 2005–2015 (19,20).

O-O is a common and partially modifiable risk factor for NCDs (5,21). As many as 30 million Indians are estimated to be overweight according to the latest round of the National Family Health Survey in 2005–2006 (NFHS-3). Data from national surveys and regional cross-sectional studies suggest that the prevalence of overweight is around 17.1% among adults (22) and that, among those, 5% are obese (23). Cross-sectional surveys from urban Jamnagar, Gujarat, indicated that the prevalence of overweight and obesity in 2010 was 22% and 5.2%, respectively (24). Another cross-sectional study of urban Delhi and rural Haryana adults revealed urban–rural differences in body mass index (BMI) patterns. While 35.1% of urban men and 47.6% of urban women had a BMI of ≥25, overweight was noted in only 7.7% of men and 11.3% of women from the rural population (25). The BMIs of 16.4% of the urban women in this study sample were ≥30.

At the national level, NFHS-3 data showed that over 15% of ever-married women aged 15 to 49 years had a BMI greater than 25 kilograms per square metre (kg m⁻²), up from 11% in NFHS-2 (23). Among men aged 15 to 54 years, 9.7% were found to be overweight or obese in 2005–2006. (NFHS-3, 2005–2006) Less than 3% of adults in the NFHS-3 sample had BMIs greater than 30 kg m⁻² (obese). When disaggregated to the state level, these data reveal an expected pattern, where Bihar, Madhya Pradesh and other low-income states have O-O levels below 10% in women. The richer states, such as Punjab, Maharashtra, Gujarat, Haryana and Kerala, have O-O prevalences above 15% (23).

Serial cross-sectional surveys of the Jaipur Heart Watch (JHW) Study (15,26–30), JHW-1 (1992–1994), JHW-3 (1999–2001), JHW-3 (2002–2003), JHW-4 (2004–2005) and JHW-5 (2009–2010) reveal that in a span of 18 years, the age-adjusted prevalence of O-O rose from 21.1% to 46.2% in men and from 15.7% to 50.7% in women. Similar trends were seen in the prevalence of truncal obesity (as measured by the waist to hip ratio) which increased from 19.6% to 31.9% in men and from 49.5% to 53.9% in women.

Further, O-O is rapidly rising among children and adolescents in India (31–34). The proportion of overweight children increased from 4.9% to 6.6% between 2003 and 2005 in South India (33,35) and from 9.8% to 11.9% between 2006 and 2009 in New Delhi (36). In the NFHS-3, the O-O prevalence among pre-school children was 1.5% (23). According to a study done by Misra et al., the overall prevalence of O-O among Delhi adolescents aged 14–18 years was 24.2% (37). Another study (from Lucknow, Uttar Pradesh) reported the prevalence of obesity and overweight among low-income schoolchildren at 1.2% and 2.4%, respectively, among middle-income schoolchildren at 2.5% and 4.9%, respectively, and among children in high-income group schools at 9.3% and 13.1%, respectively (P < 0.001) (38). More schoolchildren in private schools (proxy for affluence) were overweight compared with those in government schools (29% vs. 11%, respectively) (39). Other studies from small towns in India also reveal a high prevalence of O-O among schoolchildren and adolescents: 17–22% O-O among Udipi adolescents and 18.6% and 3.5% overweight and obese, respectively, among Meerut schoolchildren (40,41).

Determinants of obesity

Indians have been shown to be more susceptible to cardiometabolic effects of obesity because (i) even though Indians have lower BMIs compared with Caucasians, the percentage of body fat is much higher among Indians (42); (ii) central adiposity is common among Indians (43); and (iii) Asians are known to have excessive insulin resistance (44).

Interestingly, obesity in adult life is linked with nutrition in prenatal and early years of life (45–53). Evidence is accumulating on the impact of low birth weight in adulthood (44,49,54,55). The Barker theory, the Brenner hypothesis and the fetal origins of adult disease hypothesis support the intrauterine origin of NCDs in adulthood. Using data from Indian birth cohorts, studies have demonstrated that children born with low birth weight, when provided with an environment of calorie sufficiency, gain more fat than muscle, which in turn predisposes them to an increased risk of NCDs in later life (55,56). Higher BMI and greater BMI gain in late childhood and adolescence lead to increased adult adiposity and central adiposity (44,47,48).
Persons of Indian ethnicity have been observed to have higher percentages of body fat and lower percentages of muscle mass than other ethnic groups (42). Further, an association between thinness in infancy and impaired glucose tolerance/diabetes in young adulthood has also been demonstrated by cohort studies (44,54,55). The New Delhi Birth Cohort Study reported an early age among Indians for the adiposity rebound, which refers to the second rise in the BMI curve that occurs between ages 5 and 7 years, and is also associated with an increased risk of overweight (54,55).

Other drivers for O-O include:

**Unhealthy diet**

Dietary patterns of both rural and urban Indians reflect the trends in urbanization and affluence and can explain the trends in O-O. Surveys conducted by the National Nutrition Monitoring Bureau between 1975 and 1991 documented a gradual decrease in the daily consumption of cereals and pulses with relatively little change in the calories consumed, indicating substitution of other sources of energy, such as fats (57,58). With economic progress accelerating since the early 1990s, such changes in dietary patterns have been accentuated. One of India’s most socially developed states, Kerala, with the highest literacy rate (greater than 90%) and high life expectancy, low fertility and low child mortality rates, exhibits a high prevalence of NCDs and their risk factors (Figure 1) (27).

The quinquennial household expenditure surveys conducted by the National Sample Survey Organization (NSSO) show that consumption of cereals and pulses have continued to drop in the last two decades, whereas that of edible oils, eggs and meat has increased (59). Since the early 1990s, the relative increase in consumption of edible oils, eggs and meat has been 72%, 171% and 69%, respectively, among rural residents, compared with 46%, 81% and 50%, respectively, among urban residents. However, it is critical to point out that the absolute quantities of edible oils and fats, milk, eggs, meat and vegetables consumed are much greater in urban areas (59). Other findings include increasing consumption of processed snacks, junk food and sugar-sweetened beverages among urban children (37,59,60), a fall in the number of meals prepared and consumed at home (59), and a growing trend towards eating out (59).

Soft drink sales in India grew 76% between 1998 and 2002, from 5,670 million bottles to over 10,000 million and were expected to grow at least 10% per year through 2012 (61). In spite of this growth, annual per capita consumption was only six bottles vs. 17 in Pakistan, 73 in Thailand, 173 in the Philippines and 800 in the United States. This is being seen by the beverage industry as a major market of opportunity, as evident from the statement of an Indian executive of the Coca Cola company: ‘Making Indians thirst for more Coke drinks is our challenge.’ (Hindu Business Line, 05/11/2011, Page 5, Edition: Mumbai).

A comparison of consumption data from the NSSO surveys with the dietary recommendations for moderately active Indians indicates a 5–10% deficiency in cereal consumption and an 8–25% deficiency in pulse consumption. In sharp contrast, there is a 23% excess consumption of oils and fats in rural areas and a 58% excess in urban areas. The trends indicate that increasingly, people are replacing traditional energy sources (also a source of fibre), such as coarse grains, millets and other cereals, with calorie-dense (otherwise nutritionally poor) foods, such as oils and dairy products. Factors driving such consumption patterns among all sections of Indian society include globalization, rising per capita incomes, rapidly changing lifestyles and changing agriculture patterns. In the last five decades, the greatest increases in cultivation, production and yields among all food groups have been noted for sugarcane and oilseeds (28).

**Physical inactivity**

According to the Global Health Observatory of the WHO, insufficient physical activity is the fourth leading risk factor for mortality (62). Globally in 2008, 31% of adults aged 15 and over were insufficiently active (men 28% and women 34%). Approximately 3.2 million deaths and 32.1 million disability-adjusted life years (DALYs), representing about 2.1% of the global DALYs, each year are attributable to insufficient physical activity (63). Undertaking 150 min of
moderate physical activity a week or the equivalent is estimated to reduce the risk of ischaemic heart disease by approximately 30%, the risk of diabetes by 27% and the risk of breast and colon cancers by 21–25% (64). Additionally, regular physical activity lowers the risk of stroke, hypertension and depression.

Data from the Indian Migration Study (2004) reported trends in physical activity for rural to urban migrants (65,66). Total activity was found to be highest among rural men, whereas migrant and urban men reported similar but lower activity levels (P < 0.001). Women showed similar patterns. Sedentary behaviour and television viewing were lower among rural residents and similar among migrant and urban groups. Sleep duration was highest in the rural group and lowest in urban nonmigrants (64). A recent analysis from the same dataset revealed significant associations between the reduction of active travel to work (e.g. walking, bicycling and public transport) and cardiovascular risk. The prevalence of O-O was found to be 50.0%, 37.6%, 24.2% and 24.9%, respectively, among participants using private transport, using public transport, bicycling and walking to work (67).

The International Prevalence Study on Physical Activity (2009) also provided data that allow comparison of physical activity behaviours in 20 countries for the first time (68–70). For some countries, these data represent the first large-scale measurement of physical activity. In this study, the data from India, with a sample size of 1,004 subjects 18–64 years of age, revealed that 23.4% were less active, 38.7% were moderately active and only 37.9% were highly active. However, the WHO in 2008 estimated the prevalence of physical inactivity in India at 10.8% among males and 17.3% among females (overall 14%).

The IDSP, which conducted an NCD risk factor survey (2007–2008) in seven states in India, also reported on the prevalence of physical inactivity (Table 1) (71). The survey contacted 5,000 households in urban and rural areas of each of the seven states. More than half of the population was in the category of low physical activity in all the states except rural Madhya Pradesh. The mean time spent in total physical activity ranged from a low of 924 metabolic equivalent of task (MET) minutes per day in Maharashtra to a high of 2,106 MET minutes per day in Madhya Pradesh. The mean time spent in work-related physical activity by the respondents ranged from a low of 128 min per day in Maharashtra to a high of 293 min per day in Madhya Pradesh. The proportion of people reporting low physical activity was higher among urban respondents than among rural respondents. However, the pattern of prevalence by age, education and occupation was similar in both rural and urban populations. Females were less active than their male counterparts in all age groups. Physical activity was lower among respondents with higher levels of education compared with respondents with lower levels of education. Occupational differences in physical work activity were observed across all the categories. The people included in the categories of agriculture and manual work engaged in more physical work in comparison with other occupational categories (like domestic workers, executives and businesspeople) in all seven states.

### Table 1

<table>
<thead>
<tr>
<th>States</th>
<th>AP</th>
<th>MP</th>
<th>MH</th>
<th>MZ</th>
<th>KE</th>
<th>TN</th>
<th>UTK</th>
</tr>
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<tbody>
<tr>
<td>Urban</td>
<td>78.0</td>
<td>68.0</td>
<td>86.0</td>
<td>79.0</td>
<td>79.0</td>
<td>71.0</td>
<td>92.0</td>
</tr>
<tr>
<td>Rural</td>
<td>64.0</td>
<td>32.0</td>
<td>77.0</td>
<td>63.7</td>
<td>50.0</td>
<td>62.0</td>
<td>58.0</td>
</tr>
<tr>
<td>Overall</td>
<td>68.0</td>
<td>42.0</td>
<td>81.0</td>
<td>71.0</td>
<td>76.0</td>
<td>66.0</td>
<td>67.0</td>
</tr>
</tbody>
</table>

Source: Indian Council of Medical Research, Integrated Disease Surveillance Project 2007–8 (71). AP, Andhra Pradesh; KE, Kerala; MH, Maharashtra; MP, Madhya Pradesh; MZ, Mizoram; TN, Tamil Nadu; UTK, Uttarakhand.

### Poor breastfeeding practices

An important health benefit of exclusive breastfeeding is prevention of obesity. According to NFHS-3 data, only about 46.3% of infants are exclusively breastfed up to 6 months of age. Further analysis of age-wise data of NFHS-3 also reveals that exclusive breastfeeding rapidly declines from the first month to the sixth month, and only about 20% of infants continue it until 6 months. Further, the initiation of breastfeeding within 1 h of birth is only 24.5%.

### India’s policy response to obesity: existing interventions and programmes

The international public health community’s keen interest in NCD prevention was evident in the numerous high-level gatherings, which drew the attention of global policy makers, top bureaucrats, civil society partners and donor agencies (72–74). In May 2008, at the 61st World Health Assembly, health ministers endorsed the Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases (75). This plan defines six objectives, including promoting interventions to halt the rise of O-O, for implementation during the 6-year period from 2008 to 2013 with a particular focus on low- and middle-income countries and vulnerable populations. A recent landmark event was the September 2011 United Nations (UN) high-level meeting on NCDs to raise awareness and create leadership at the highest political levels to tackle this growing burden. This well-attended meeting, civil society efforts, international conferences and high-impact publications in renowned journals have brought NCDs onto the radar of policy makers, researchers and public health
professionals from developed and developing countries, including India (11,73,76,77).

India recognizes undernutrition as a major threat to health and development. The Prime Minister of India, who is also the chair of the National Council on India’s Nutrition Challenges, has referred to malnutrition (specifically undernutrition) as the national shame. The 2012 Hunger and Malnutrition report evaluating 112 districts in nine states of the country revealed that 42.3% of children under the age of 5 years are underweight, 58.8% are stunted and 11.4% are wasted (HUNGaMA survey, 2012) These abysmally high statistics, although disputed by a few economists, underscore that undernutrition is still a major problem in India. However, the sole preoccupation of policy makers with undernutrition is slowly giving way to recognition of NCDs as an additional challenge. The policy imperative for India is to reflect on the NCD deliberations, UN resolutions and developed action plans and to chart its own road map for tackling the modifiable risk factors, such as O-O, with respect to NCD prevention and control.

O-O prevalence in India, as defined by international BMI cut-offs, is currently not alarming enough to engage the attention of policy makers. However, in the context of rising concerns about NCDs, O-O can be recognized as a contributor to the risks and an area calling for policy interventions. Also, if (i) the continuum of risk is recognized rather than arbitrary thresholds, (ii) the higher percentage of body fat among Indians at any BMI level is acknowledged as a risk factor for NCDs, and (iii) central adiposity is highlighted as an important risk factor for NCDs among Indians, greater policy maker attention can be elicited (78). Further, there is concern that O-O is a risk factor only among the affluent sections and therefore is not a public health priority or equity consideration (vis-à-vis undernutrition). This can be addressed by pointing out that risk factor transition progressively affects all sections of society and that population-based measures are needed to protect the poor, who will become increasingly vulnerable to O-O and related NCDs (79–81).

It is important to begin by mapping what exists in terms of O-O prevention (direct or indirect) programmes and policies. As noted above, the current policy scenario largely excludes a direct focus on O-O. However, in the context of ameliorating the NCD burden, certain government initiatives are worth mentioning.

**Government programmes to tackle malnutrition and NCDs**

The global burden of disease (GBD) statistics and the projected numbers for death and disability due to NCDs (obesity being the major risk factor) led the Indian Ministry of Health and Family Welfare to reduce diagnostic cut-offs for Indian BMIs to 23 kg m⁻² (from 25) and the standard waist circumference to 90 cm in men and 80 cm in women (internationally accepted waist circumference cut-offs are 102 cm in men and 88 cm in women) to fight the battle against obesity. These standards have been published in the ministry’s *Consensus Guidelines for the Prevention and Management of Obesity and Metabolic Syndrome*, released jointly with the Diabetes Foundation of India, the All-India Institute of Medical Science, the ICMR, the National Institute of Nutrition and 20 other health organizations in October 2008 (61,82).

Considering the rising burden of NCDs and the risk factors common among the major chronic NCDs, the Government of India initiated the integrated National Programme for Prevention and Control of Diabetes Cardiovascular Disease and Stroke (NPCDCS). The programme focuses on health promotion and prevention; strengthening infrastructure, including human resources; early diagnosis and management; and integration with the primary healthcare system through NCD cells at different levels for optimal operational synergies (83).

The 2012 Department of Health Research Planning Commission’s XII Five-Year Plan Document (2012–2017) recognizes NCDs as a growing challenge and summarizes research initiatives currently under way for their control and management (84). According to the XII Plan Document, research on CVD focuses on determination of the role of various micro- and macronutrients in hypertension, and research on diabetes mellitus focuses on the efficacy of anti-obesity and anti-diabetic drugs. The other interventions outlined below proposed by the constituted working group, of the Ministry of Health and Family Welfare, the Planning Commission and the Government of India, also impact O-O (see Table 2).

India’s flagship programme, the Integrated Child Development Services, focuses on addressing undernutrition and promoting child health from the point of view that there is insufficient nutrition available. Therefore, the focus is only on caloric sufficiency and not on better-quality foods, which provide balanced nutrition through desired macro- and micronutrients (85,86). It is important to note examples from other developing countries. For example, the efforts of the Government of Chile to provide caloric sufficiency resulted in increased O-O incidence (87–89). Thus greater attention to a holistic policy response with sustained health benefits is required.

The Indian Government had tabled the National Food Security Bill of 2013 in the Parliament this year and the Union Cabinet has cleared it through an ordinance in early July 2013 (90). This ordinance aims to give subsidized grains (Rs 1 or 1.7 US cents to Rs 3 or 5 US cents per kilogram) to around 67% of India’s 1.2 billion people (around 800 million).

Additionally, under article 21 of the constitution of India, every citizen has a fundamental right to health.
Under the Indian Directive Principles of State Policy, the states are mandated to take steps for health promotion and disease prevention.

National Nutrition Policy of 1993

Subsequent to the UN World Summit for Children in 1990 and the World Declaration and Plan of Action for Nutrition in 1992, the Government of India adopted the National Nutrition Policy (NNP) in 1993. The NNP first sets the policy in the context of development and emphasizes the nutrition-poverty cycle. It views the problem of undernutrition as part of a larger set of interlinked processes in the sectors of agriculture, food production and processing, and food distribution. The policy does not feature O-O, perhaps because at the time it was developed, India was grappling with huge numbers of underweight and stunted children. The potential NCD epidemic looming in India demands that the national policy be revisited and that, in light of the current health threats, suitable modifications be incorporated (91).

Regulations pertaining to the junk food and beverage industries

Junk food consumption has also rampantly increased in India. According to the National Restaurant Association of India 2010 report, the ‘fast food industry is growing at a compound growth rate of 35–40% annually. A major chunk of these markets is captured by global players like McDonald’s, Kentucky Fried Chicken, Pizza Hut, Domino’s, Subway, Taco Bell, Coca Cola, PepsiCo, Barista etc. Domestic players like Nirula’s, Haldiram’s, Bikanerwala etc. are not lagging behind either.’ Starbucks, another big name in the food industry, entered the Indian market in January 2013. With foreign direct investment in India, the markets will be open to several international food companies.

The primary targets of the junk food industry are children. Data from cross-sectional surveys also reveal that ‘more than 40% of the urban children eat out once or more in a week, 70% of children eat chips once or more in a week, 38% eat burgers once or more in a week, 48% eat pizzas once or more in a week.’ (92).

To curb the increasing prevalence of O-O among children and adolescents in India, a public interest litigation was filed in 2010 by the Uday Foundation in the supreme court to ban the sale of junk foods and carbonated beverages within a 500-yard radius of schools throughout the country (93). As a result, the High Court, New Delhi, India, directed the Food Safety and Standards Authority of India (FSSAI) to take charge. The FSSAI will release guidelines in July 2013 (telephone conversation on 17 May 2013 with the Uday Foundation). The Ministry of Health and Family Welfare has requested that the chief ministers and health ministers of the states prohibit the sale of junk food on school premises. In 2011, the WHO issued a recommendation to ban junk food in schools and on playgrounds to promote a healthy diet and tackle childhood obesity (94). A few countries, including Great Britain,

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Department of Health Research proposed interventions to combat NCDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial number</td>
<td>Domains</td>
</tr>
</tbody>
</table>
| 1 | Tobacco control | • Raise taxes on tobacco  
• Clean indoor air legislation  
• Tobacco advertising ban; information and labelling; brief advice to help quit tobacco; counselling to quit tobacco |
| 2 | CVD prevention | • Salt reduction in processed food via voluntary agreement with industry and/or via legislation  
• Health education through mass media  
• Treatment for high blood pressure and cholesterol |
| 3 | Diabetes and complications | • Health education on diet and physical activity  
• Diabetes detection and management in primary health care  
• Intensive glycaemic control  
• Retinopathy screening and photocoagulation  
• Neuropathy screening and preventive foot care |
| 4 | Cancer | • Screening for cervical, breast and oral cancers  
• Strengthening of cancer therapy in district hospitals |
| 5 | Dental caries | • Education on oral health and hygiene, reducing dietary sugars, water fluoridation |
| 6 | General measures | • Promote physical activity in schools and throughout society  
• Restrict marketing of and access to food products high in salt, sugar or unhealthy fats  
• Targeted early detection and diagnosis using inexpensive technologies |

Mexico, and the United Arab Emirates, have enforced bans on the sale of junk food in schools. Although the Indian Government has not yet established a policy to ban junk food in schools and their close perimeters, the state governments of Delhi and Uttar Pradesh have issued instructions to schools not to allow the sale of junk food in school canteens.

Advertisements and TV viewing guidelines
Advertisements aimed at children use tools like cartoon characters, sweepstakes prizes or celebrity endorsements to sell junk food. In India, no specific laws or guidelines regulate the advertising or marketing of junk foods. Provisions in different statutes and some guidelines issued by the self-governing Advertising Standards Council of India (ASCI) may be used to regulate the advertising of junk food. The ASCI guidelines state that advertisements should not mislead consumers to believe that the consumption of products advertised would lead to positive personal changes (95). The guidelines also caution against indiscriminate use of advertisements for promotion of products hazardous to society or individuals. The ASCI has prescribed various guidelines for foods and beverages, such as (i) all nutritional and health benefit claims in food and beverage advertisements are required to be substantiated scientifically so that they do not mislead customers, and (ii) messages in advertising to children should portray the products accurately and in keeping with children’s ability to understand. Such measures encourage caution in the advertising of foods and beverages that have a high content of sugar and fat. The FSSAI has also produced the ‘Guidelines: Code of Self Regulation in Food Advertisement.’ However, all these measures are voluntary rather than mandatory.

Food Safety and Standards Act of 2006
India’s Food Safety and Standards Act was formulated to consolidate laws relating to food manufacture, storage, sale and distribution as well as safe delivery and consumption of food items. This act currently does not define any food as junk food or fast food. Junk food falls under the category of proprietary food, or food not standardized under regulations. This category of food is only required to declare its composition and comply with the general regulations of the act (78). The act created the FSSAI to establish science-based standards for food items and to regulate manufacturing, processing, distribution, sale and import of food to ensure safe and wholesome food for human consumption (90). Street foods contribute to the rising burden of O-O in rural and urban-poor populations due to their affordability. Oils used in street foods are primarily trans fat, increasing the risk of obesity and CVD. The FSSAI has oversight of food inspectors, food samplers, and designated officers.

Food labelling and packaging guidelines
The disclosure of information on food labels in India is primarily governed by the Prevention of Food Adulteration Act of 1954, which focuses mainly on basic product information with less emphasis on health and nutritional information. However, recent amendments regarding packaging and labelling of food under part VII of the Prevention of Food Adulteration Rules of 1955 mandate the disclosure of health and nutritional claims on food labels along with basic information. The FSSAI suggests that nutritional information or nutritional facts per 100 g, 100 mL or servings of the product should be given on the label and should contain (i) energy value in kcal; (ii) the amounts of proteins, carbohydrates (specify quantity of sugar) and fats in g or mL; and (iii) the amount of any other nutrient for which a nutrition or health claim is made. Food labels should provide detailed information on macronutrients, namely, carbohydrates, proteins and fats, along with total calorie content, sugars, trans fats and saturated fats per serving of the product (96).

However, strict policies are required to prevent misleading information. A leading brand of vegetable oil in India (Saffola) promotes its cooking oil as cholesterol free. But vegetable oils are not a source of cholesterol in the diet. Leading brands of potato chips (Lays and Bingo) give misleading information on trans fat content. In addition leading junk food brands (including McDonald’s) do not provide information about their burgers, pizzas and fries on their products. It is available on their websites, which most consumers do not check. Discrepancy is also observed between the information on the websites of McDonald’s India and McDonald’s USA.

Most of the packaged junk food in India does not even mention trans fat, as that is not required by the law. Several themes were identified related to the complexity of regulating trans fat in India by Shauna Downs (97,98). A lack of trans fat awareness; the large, unorganized retail sector; a need for suitable alternative products that are both acceptable to consumers and affordable; and a need to build capacity for regulation and enforcement are crucial factors affecting India’s ability to successfully regulate trans fat. The limited number of food inspectors will create an additional challenge in terms of enforcement of trans fat regulation. The authors suggest that legislating an upper limit of trans fat in partially hydrogenated vegetable oils will likely be the most effective approach to reducing it in the food supply. The FSSAI expert group deliberations in 2010 led to the formulation of trans fats guidelines that recommend less than 10% trans fats in food products. This has been proposed to be sequentially reduced to 5% within 3 years (99). Ongoing engagement with industry, agriculture, trade and processing sectors will prove essential in terms of product reformulation (97,98).
Fruit and vegetable intake

Low fruit and vegetable intake is among the top 10 risk factors for NCDs. Approximately 1.7 million deaths worldwide are attributed to low fruit and vegetable intake (96). India is the second largest producer of fruits and vegetables in the world (annual production of 94 million tonnes) but unfortunately ranks quite low in actual per capita consumption (120–140 g d⁻¹). According to the WHO, the recommended intake of fruits and vegetables is four to five servings per day (about 450–500 g).

Schools in the United States and the United Kingdom provide a serving of fruit as part of a school lunch. Similar recommendations can be implemented in India as part of the school midday meal programmes to improve the availability and consumption of fruits and vegetables among children (100).

Surveillance mechanism

Two major surveillance studies on NCDs were conducted in India, the WHO-ICMR NCD risk factor surveillance study and the IDSP (2007–2008). The ICMR leveraged its research on NCD risk factor surveillance to the development of the national plan under the IDSP to obtain state-based prevalence of selected risk factors (71). The WHO-ICMR study was a six-site pilot study with a sample size of 44,537 representing six geographic locations in India, including rural, periurban/slum and urban areas. Phase I of the IDSP included seven states with a sample size of 5,000 per state. The NCD risk factor surveillance showed a high prevalence of diabetes, hypertension and obesity in urban areas and slightly lower prevalence rates in semi-urban and rural areas. Our own data from the sentinel surveillance study among 10 industries across India not only revealed a high prevalence of modifiable risk factors among factory workers but also provided insight into successful implementation of worksite interventions for health promotion and NCD prevention (101).

Health promotion campaigns

An assessment of public health strategies designed to tackle behavioural risk factors for chronic diseases that are closely linked with obesity, including aspects of diet and physical inactivity, was carried out for a few developing countries, including India (102). These strategies include health information and communication programmes designed to improve population awareness about the benefits of healthy eating and physical activity, fiscal measures that increase the prices of unhealthy foods or restrict the costs of healthy foods rich in fibre and regulatory measures that improve nutritional information or restrict the marketing of unhealthy foods to children (103–105). A package of measures for the prevention of chronic diseases would deliver substantial health gains with a very favourable cost-effectiveness profile (106). Breastfeeding promotion is also seen to be an effective strategy to prevent O-O (107).

How can obesity prevention garner the attention of policy makers?

Undernourishment among children is a persistent problem in India and needs an urgent response (108). However, both policy makers and the community need to be equally cognizant of the emerging burden of NCDs, and thus, the modifiable risk factors merit greater attention than they currently attract (5,21,109). Different public health communities with similar goals currently approach the problems of NCDs and their risk factors in different fashion. At present, the nutrition community in India acknowledges that O-O is the major health threat but is unable to get the attention of policy makers and acquire resources. As a result of the recent high-level NCD summit, civil society advocacy, rising risk factor levels, and GBD data, the current political climate is becoming more responsive and suggests that the situation may be addressed by highlighting the rising NCD burden and positioning O-O as a major actionable area for NCD prevention (74,75,110).

It is important to stress that a single strategy may not be effective in reducing the O-O burden in India. Given the socioeconomic diversity, targeted action to deal with the needs of vulnerable groups and multisectoral interventions that have a population-wide impact are required. Mitigating the dual burden of malnutrition (under- and overnutrition) requires a balanced approach to improving nutrition security by ensuring the availability and consumption of calorically adequate and nutritionally appropriate diets at all stages of life to enhance and sustain good health. Additionally, promotion of physical activity at all ages using multipronged strategies is needed (26).

Strategic positioning is important to engage policy makers’ attention and commitment to action. Thus, different levers may work in different sectors. In urban areas, childhood obesity may be a big enough problem to advocate by itself and garner political attention; however, in rural areas, introduction of O-O as a NCD risk factor may be the appropriate route. So while we put maximal efforts into increasing the calorie content available to the poor and undernourished, we should choose wisely for them, e.g. foods that promote holistic health provide balanced nutrients rather than cheap fats and oils and simple sugars. A few government efforts are under way in this regard. A recent example worth applauding is the promise of the agriculture minister to introduce mustard oil and a few pulses through India’s public distribution system. Further, surveillance mechanisms to monitor risk factors at a
population level are being tested by the Ministry of Health and Family Welfare. Under the NPCDCS, screening for diabetes and hypertension among adults 30 years and older and pregnant women is being carried out in 100 identified districts in 21 states and in the urban slums of 33 cities with more than 1 million people (83). This should focus attention on the need to initiate sustainable policies to combat O-O.

Other possible interventions are inclusion of mandatory physical activity sessions in schools, colleges and workplaces and strict regulation of the food and beverage industries (Figure 2). Health promotion campaigns with multi-component interventions need to be tested for feasibility, cost-effectiveness, sustainability and scalability. Programmes for NCD risk factor prevention and control in India must be scientifically credible, operationally feasible, politically viable and financially sustainable, and focus on the life course approach. This requires dedicated efforts to reorient healthcare systems to focus on prevention and policy changes that address the social determinants of O-O and NCDs (111,112).

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Conflicts of interest

The authors report no conflicts of interest.

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