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Addressing Overweight and Obesity in Low- And Middle- Income Countries: Roles and Recommendations for Non-Governmental Organizations and Program Implementers

A position paper by

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CORE Group

CORE Group's mission is to improve and expand community health practices for underserved populations, especially women, children, and adolescents, through collaborative action and learning. We bring together leading technical experts to address global public health issues by creating a collaborative and neutral space, promoting the sharing of knowledge resulting in improved capacity at the local, regional, and global level.

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Summary

It is the position of the Nutrition Working Group of CORE Group that prevention of overweight and obesity be incorporated into nutrition programming in low- and middle-income countries (LMICs), complementing the current focus on undernutrition programming. The proportion of the global population experiencing overweight and obesity is increasing, particularly in low- and middle-income countries (LMICs) where overweight and obesity exists alongside persistent conditions of undernutrition and among populations often targeted for development and humanitarian assistance, such as women of reproductive age and young children. The determinants of overweight and obesity in LMICs are multifaceted, often differing in their manifestation by population, setting, and region, and resulting in a range of consequences, such as reductions in school performance, poor pregnancy outcomes, and economic instability. The varied and overlapping causes and consequences of overweight and obesity create a challenge for those tasked with nutrition and food security program implementation, such as governments and non-governmental organizations (NGOs). Little evidence exists on strategies, programs, and policies to address overweight and obesity in the varying LMIC contexts, including few resources for those who are active in program implementation. Therefore, the objectives of this position paper are to bring attention to the current overweight and obesity situation in LMICs and how it is being addressed (or not), and to help focus the interest and efforts of NGOs and relevant stakeholders on addressing overweight and obesity in tandem with continued efforts to address undernutrition

A literature review and 29 consultative interviews with global nutrition, health, policy, and economic experts were conducted to summarize the epidemiology of overweight and obesity in LMICs, review the evidence behind interventions tested in LMICs to address overweight and obesity, and identify specific roles that NGOs and program implementers may leverage to address overweight and obesity in LMICs based on the experts' perspectives. The roles identified for NGOs and program implementers included: 1) nutrition programming strategies and policies, 2) advocacy and stakeholder engagement, 3) partnerships in research and implementation, and 4) technical support. This paper establishes a clear need for prompt action in prioritizing overweight and obesity programming alongside a continued international commitment to undernutrition, and is intended to be a resource to inform ongoing and future nutrition efforts for CORE Group members, including NGOs and their stakeholders.

List of Abbreviations

BMI	Body Mass Index
BMS	Breast Milk Substitutes
CDC	Centers for Disease Control and Prevention
DBM	Double Burden of Malnutrition
FAO	Food and Agricultural Organization of the United Nations
IYCF	Infant and Young Child Feeding
LMIC	Low- and Middle-Income Country
NCD	Noncommunicable disease
NGO	Non-Governmental Organization
NWG	Nutrition Working Group (of CORE Group)
SSB	Sugar-Sweetened Beverage
UN	United Nations
UNICEF	United Nations Children’s Fund
WHO	World Health Organization

Methods

This position paper followed two research strategies: a qualitative literature review of existing overweight and obesity epidemiology research, interventions, policies, and strategies, and summaries from 29 consultative interviews with nutrition, health, economic, and policy experts, 18 of whom provided perspectives from LMICs. The experts’ responses are presented qualitatively along with supporting evidence from the literature review.

Limitations

The topic of overweight and obesity in LMICs is a vast topic, and the authors recognize that this document cannot fully cover the extent of the problem nor all available options and solutions. This document does not give specific policy advice, but provides information to those working on nutrition programming in LMICs, and for relevant stakeholders with decision-making power to address nutrition programming, including national and local governments, donors and funding agencies, and UN agencies (e.g., UNICEF, FAO, WFP, etc.). Finally, this document is qualitative with references to available evidence. The expressed perspectives and insights from the experts should be considered as such.

Position Statement of the Nutrition Working Group of CORE Group

It is the position of the Nutrition Working Group of CORE Group that prevention of overweight and obesity be incorporated into nutrition programming in low- and middle-income countries (LMICs), complementing the current focus on undernutrition programming. Through doing so, nutrition programs will better address both the causes and consequences of overweight and obesity, and address the growing health disparities facing LMICs with multiple coexisting forms of malnutrition and increasing prevalence of chronic diseases. Addressing overweight and obesity in LMICs through nutrition programming will require strategic partnerships between program implementers, such as non-governmental organizations (NGOs), research organizations, government entities, donor and funding agencies, the food and agriculture industries, and other stakeholders. Within these partnerships, NGOs and program implementers may aid in increasing the understanding and awareness of the etiology of overweight and obesity and their consequences within the varying LMIC contexts, advocate for prioritization in national policies and health strategies, and provide technical support to communities and national entities.

Overweight and Obesity in Low-And Middle-Income Countries

The proportion of the global population experiencing overweight and obesity continues to increase. Across the globe, rising body mass continues to be a top risk factor contributing to global disease burdens, with low- and middle-income countries (LMICs) leading this upward trend for the past 20 years (1). Overweight and obesity currently affect approximately 44% of all adults and 20% of all children 5-17 years of age, and overweight affects almost 6% of all children under 5 years of age; the vast majority of these populations reside in LMICs (**Tables 1 and 2**) (2,3). In 2016, nearly 40% of adults in Nepal were estimated to be experiencing overweight or obesity, nearly 43% of adults in Ghana, and 64% of adults in Guatemala, figures that rival rates of overweight and obesity among adults in high-income countries such as Australia (67% in 2017) and the United Kingdom (64% in 2017) (4–8).

Table 1: Estimates of malnutrition globally and by country income level among children less than 5 years of age; 2019¹

	Total	Low-income countries	Lower-middle and upper-middle income countries	High-income countries
Overweight	5.6%	2.7%	13.5%	7.6%
Stunting	21.3%	34.1%	36.1%	2.8%
Wasting	6.9%	6.6%	12.7%	0.5%

¹Source: UNICEF/WHO/World Bank: *Levels and trends in child malnutrition: Key Findings of the 2020 Edition of the Joint Child Malnutrition Estimates* (3) Overweight, stunting, and wasting are defined using the WHO Growth Standards for infants and children less than 5 years of age (9).

Table 2: Global overweight and obesity estimates by age group and country income level; 2016¹

	Low-income countries	Middle-income countries	High-income countries
Children under 5 years of age	10%	79%	11%
Children 5-19 years of age	9%	73%	18%
Adults 20+ years	4%	71%	25%

¹Source: Shekar and Popkin: *World Bank Obesity Report*; 2020 (2).

Overweight and obesity are defined as excessive accumulation of adipose tissue, or fat, with the risks to health increasing depending on the location and distribution of excessive fat accumulation (10). Approximately 80% of body fat is located just under the skin, known as subcutaneous adipose tissue, with the majority of remaining fat found surrounding major abdominal organs in the abdominal cavity, known as visceral adipose tissue. Excessive accumulation of visceral adipose tissue, which is often present in individuals experiencing overweight and obesity, increases the risk of noncommunicable diseases (NCDs), such as diabetes and cardiovascular disease (11). Body Mass Index (BMI, a ratio of weight to height) is often used to screen for overweight and obesity. Overweight in adults is defined as a BMI of ≥ 25.0 - 29.9 kg/m² and obesity as a BMI of ≥ 30.0 kg/m². Overweight and obesity are also defined as increased waist circumference (≥ 88 cm for adult women and ≥ 102 cm for adult men) (12). Children (0-18 years of age) are considered at risk of overweight with a BMI-for-age z-score (BMIZ) of ≥ 1 SD, overweight with a BMIZ of ≥ 2 SD, and obese at a BMIZ of ≥ 3 SD, according to WHO growth standards. According to the United States Centers for Disease Control and Prevention (CDC) BMI-for-age growth references, children (2-20 years of age) are at risk of overweight at $\geq 85^{\text{th}}$ percentile, and at risk of obesity at $\geq 95^{\text{th}}$ percentile (13–15). Additionally, among Asian adult populations, health risks such as diabetes seem to increase at lower BMIs, with a BMI of 23 kg/m² potentially requiring health interventions (16). BMI growth references for children also likely underestimate overweight and obesity among Asian children, however formal recommendations to revise the references have not yet been made (17,18).

Historically, in LMICs, undernutrition (i.e., stunting, wasting, underweight, low birthweight, anemias, and micronutrient deficiencies) has dominated the health and nutrition landscape, particularly among vulnerable populations, such as women, children, and populations experiencing poverty, while overweight and obesity have concentrated among the wealthy. However, over the past few decades, the increasing prevalence of overweight and obesity has begun to cross economic lines in LMICs, following trends of globalization and urbanization that changed food systems and food environments among populations in all income levels, making sedentary lifestyles more common and expanding access to energy-dense and nutrient-poor foods (19,20). This simultaneous presence of overnutrition alongside undernutrition in individuals, households, and populations, and throughout life has been termed the “Double Burden of Malnutrition, DBM” (21,22).

While there are general trends to DBM in LMICs, such as populations of lower socioeconomic status experiencing less overweight and obesity and more underweight than wealthier populations (23), the distribution and manifestation of the multiple forms of malnutrition vary within world regions, countries, and income levels. A country-level examination of socioeconomic inequalities and the prevalence of underweight, overweight, and obesity among adult women in LMICs reported that the within-country distribution of these conditions changed as their prevalence increased (23). For example, countries with a high prevalence of underweight saw underweight prevalence increase more for those of lower socioeconomic status with little if any change among the wealthy. Conversely, countries with a high prevalence of overweight and obesity saw overweight and obesity prevalence increase across all wealth levels, with little difference in prevalence between the wealth extremes (23). Additional differences are seen in the geospatial mapping of overweight and wasted children in LMICs. A 2020 study by Kinyoki and the Double Burden of Malnutrition Collaborators (24) revealed wide variation in the distribution of the two conditions within world regions and within countries, calling out Peru, Indonesia, and South Africa as countries with extreme within-country differences. Another study looked at variation in the distribution of overweight and obesity by socioeconomic status among urban adult women in LMICs (25), as living in an urban area is often associated with obesity (19). The authors found that over 20 years (1991-2010), obesity increased in urban settings for almost all of the 38 LMIC countries analyzed. However, underweight in urban areas also increased in approximately half of the countries, and particularly among populations of lower socioeconomic status (25), indicating that obesity may not necessarily be an outcome of urban settings, but may be more associated with wealth. This also has been examined in one study of school-age children in sub-Saharan Africa. The study found that children from wealthy households or attending affluent schools were more likely to be overweight

or obese, regardless of urban or rural residence (26). Notably, BMIs are rising in many rural populations across the globe, particularly in upper-middle income countries (25,27), which may be predictive of trends already present in high-income countries where more vulnerable populations, such as those of low socioeconomic status, are more likely to experience overweight and obesity.

Causes and Consequences of Overweight and Obesity

The determinants of overweight and obesity may differ across and within countries and populations, however they generally fall into three overlapping categories: biological, social behavioral, and environmental.

Biological Causes

Biological determinants of overweight and obesity include genetic and epigenetic pathways and early life experiences that influence the risk of developing overweight and obesity (21,28). Children who are exposed to undernutrition, overnutrition, or both simultaneously, particularly in the first 1000 days of life, are at greater risk of developing visceral adiposity, which may lead to metabolic disorders such as insulin resistance and hypertension (29,30), particularly if the child is then born into an obesogenic environment. This has been theorized to be due a mother's poor nutrition status during pregnancy effecting fetal organ development, and subsequent epigenetic changes to DNA may make it possible to pass on these risks to future generations (31). Furthermore, both undernutrition and overnutrition during pregnancy can result in uterine growth restriction, premature birth, and low- or high-birthweight infants (31). If born small, a child may experience stunting and/or rapid catch-up growth after birth, both of which may put a child at increased risk of developing overweight and obesity (29,32). With undernutrition, overweight, and obesity coexisting among populations of women of reproductive age in LMICs, rates of child overweight and obesity will likely continue to increase.

Social Behavioral Causes

Social behavioral contributors to overweight and obesity include practices related to infant and young child feeding (IYCF), eating patterns and food preferences for non-nutritive foods, and reduced levels of physical activity. IYCF practices include early introduction (prior to 4 months of age) of complementary foods and beverages to young children, including introducing sugar-sweetened beverages (SSBs) and nutrient-poor foods as complementary foods and beverages, and not following responsive feeding practices. Responsive feeding is defined as practices that “promote children’s attentiveness and interest in feeding, attention to their internal cues of hunger and satiety, ability to communicate needs to their caregiver with distinct and meaningful signals, and successful progression

to independent feeding” (33). Recent reviews of the timing of introduction of complementary foods and beverages and caregiver feeding practices report that early introduction of complementary foods and non-responsive feeding practices may be predictive of later overweight and obesity (34,35). For example, non-responsive feeding practices may encourage a child to eat beyond fullness and dismiss internal satiety signals, increasing the likelihood of excess food and beverage intake over time.

Eating patterns that favor consumption of ultra-processed foods and SSBs are often deemed a “Western” eating pattern, as the pattern is commonly associated with high-income countries, higher societal status, and wealth. Snack foods (foods consumed outside of regular mealtimes) and beverages high in saturated fat, salt, sugar, and energy are widely purchased (36) and consumed (37), including in LMICs (38), and include both ultra-processed foods and beverages, as well as those locally produced within LMICs that may be less processed but are still high in energy and low in nutrients. A recent study from Nepal found that children who were high consumers of ultra-processed snack foods were at greater risk of micronutrient deficiencies and were shorter in stature than children who consumed these foods less often (39), demonstrating the potential biological effects of displacing healthier foods with less nutritive foods. Additionally, consumption of sugar in liquid versus solid form, such as in SSBs, seems to override biological signals of hunger and disrupt normal hormonal satiety pathways. This means that consumption of SSBs can cause greater hunger and less awareness of actual physiological needs, potentially resulting in overconsumption of non-nutritive calories (40). Over time, this can lead to negative health outcomes, such as increased fat accumulation in the liver, overweight, and obesity (41,42).

In some LMICs, researchers have noted a shift away from traditional eating patterns towards these obesogenic Western eating patterns, particularly as those foods become more available. For example, in the Pacific Small Island Developing States (i.e., Fiji, Kiribati, Federated States of Micronesia, Nauru, Republic of Marshall Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu), the island populations depend largely on imported foods, with little decision-making power of which foods are imported. As a result, over time the food preferences and eating patterns of the island communities developed to favor foods high in saturated fats, such as canned meats and turkey tails, and low in nutrient-density, such as white rice and sugar. The unfortunate outcomes have been losses of traditional farming and cultivation practices that impacted both the islands’ agricultural biodiversity and the population’s nutritional choices, and increased prevalence of overweight, obesity, and NCDs (43).

Cultural ideologies and societal perceptions and attitudes about body size also influence health outcomes, including overweight and obesity. A recent study quantifying various dimensions of culture and their relationships with BMI found that cultures focused on individualism (versus collectivism), indulgence (versus restraint), or those focused on short-term goals (versus long-term goals) were more likely to have higher BMIs, among other studied dimensions (44). Other cultural beliefs that reinforce overweight and obesity are those that elevate persons with overweight and obesity as higher status or as having better standards of living. Additionally, some cultures believe that women should not be physically active and should display their femininity and fertility with a larger body size, perpetuating overweight and obesity as a cultural ideal. These beliefs also indicate that the link between diet and effects on health is not always well understood or promoted within cultures, as has been noted in the literature (45–47).

Environmental Causes

Environmental contributors to overweight and obesity often include changes to food systems and food environments that increase access and affordability to poor quality foods, reduce access and affordability of nutrient-dense foods like fruits and vegetables, and influence poor eating and physical activity patterns. Food and nutrition insecurity often result in diminished dietary quality and diversity, due to limited access to affordable nutrient-dense foods, such as animal sources of protein, fruits, and vegetables (48). This may lead to overweight and obesity if the diet is frequently supplemented with nutrient-poor food options, such as diets high in staple food carbohydrates or cheaper ultra-processed foods and energy-dense items (48).

The trend of urbanization in global communities has resulted in reduced physical activity levels. Some of this may be due to the increased availability and use of local motorized transportation in both urban and rural areas of many LMICs, which decreases the necessity to walk or bicycle, and has been associated with greater adiposity in rural South African communities (49). The transition from more manual and active occupations to more sedentary occupations in urban settings of many LMICs may also contribute to overweight and obesity (19). Additionally, the increased number of women in the workforce has reduced the time working women and mothers have to prepare foods at home, resulting in a greater reliance on convenience foods, which tend to be high in energy, salt, sugar, and saturated fats (50).

Obesogenic food systems and environments are also shaped by commercial determinants of health, or those involving “the production, marketing and consumption of commercially produced

products, food and drinks—such as those containing sugar, salt and *trans* fats, alcohol and tobacco” (51). For example, commercial industries, such as the SSB industry or snack foods industry, help shape food preferences and food purchasing habits of school-age children and adolescents through targeted marketing and advertising (52).

Consequences

Obesity is classified as a disease by the WHO, the World Obesity Federation, the American Medical Association, and others, due to its chronic and relapsing pathophysiology (53), and classified as a risk factor for disease by the Global Burden of Disease research group (54). Overweight and obesity are linked to a host of health and economic outcomes. Adults with overweight and obesity are at higher risk of developing NCDs, such as cardiovascular disease, diabetes, and cancer, all of which increase the risk of premature death (death between the ages of 30 and 69 years) (10,55). In LMICs, approximately 85% of premature deaths are due to NCDs (55).

Children who experienced poor fetal growth, stunting, or undernourishment in the first two years of life are at increased risk for metabolic diseases such as high blood pressure and overweight and obesity (56). Poor nutrition in early life has also been linked to lifetime reductions in human capital, including lower attainment in school, reduced skills development, and lower wage earnings (57). Adults with overweight and obesity are more likely to experience increased absenteeism at work, which may reduce earnings and increase health care costs (58). The costs of overweight and obesity are significant not only to the individual, but also to national and global economies. In the United States in 2010, about 20% of all national medical costs were due to overweight and obesity, and in Brazil, health care costs due to overweight and obesity are expected to double between 2010 and 2050 (2). Data on the economic impacts of overweight and obesity in LMICs is limited, however, considering the correlation of overweight and obesity with NCD risk and premature mortality, it is likely the cost to both individuals and countries will rise in the coming decades.

Finally, overweight and obesity are linked to increased risk of depression, anxiety, and other mental health disorders worldwide, including in low- and middle-income countries (59). Though it is difficult to determine if mental health disorders are a cause or consequence of overweight and obesity, they often coexist, and together create a significant health burden in LMICs with one study predicting that depression alone will be one of the top three leading causes of disease burden in LMICs by 2030 (60). For individuals with mental health disorders, the illnesses may increase the risk of falling into or

remaining in poverty, reduce educational attainments, and are associated with higher risk of chronic disease (61), all of which reduce an individual's ability to contribute to society (62,63).

In summary, these findings illuminate the ever-widening global reach of overweight and obesity, as well as their potential causes and health and economic implications. They also highlight the important distinctions in how the conditions manifest in different LMIC contexts. These distinctions, including the coexistence of multiple forms of malnutrition within populations, countries, and world regions, create significant challenges to address overweight and obesity in existing public health strategies, especially as the majority of strategies in LMICs continue to focus on reducing undernutrition. Within the international public health and nutrition communities, conditions of undernutrition can no longer be the sole focus of policies, programming, and interventions as the growing populations with overweight, obesity, and additional forms of malnutrition deserve both attention and resources.

Interventions and Strategies to Address Overweight and Obesity in LMICs

Nutritional interventions in LMICs, upper-middle income countries, and high-income countries often target vulnerable populations, such as people living in or experiencing poverty, women, and children, as these populations tend to be at greater risk of poor nutritional outcomes. However, interventional evidence to address overweight and obesity from LMICs is sparse. Thus, it is useful to briefly review the evolution and current state of overweight and obesity interventions, and then summarize those that have been implemented in LMICs.

Evolution and Current State of Overweight and Obesity Interventions

The causes and consequences of overweight and obesity are multifaceted and differ by context. Efforts to intervene in the progression of overweight and obesity initially focused on changing individual behaviors thought to cause obesity, such as restricting calories and increasing physical activity (64). As the known causes of obesity became more nuanced, overweight and obesity interventions expanded to address the greater food environments, such as addressing portion sizes in restaurants. These interventions documented some success by increasing awareness and changing some individual purchasing and consumption patterns, but without the long-term effects of reducing BMI (65–67).

It then became clear that simultaneously addressing the overlapping biological, social behavioral, and environmental contributors to overweight and obesity was necessary, and this strategy now has an evidence base of mixed success at reducing BMI among adults, or preventing excess weight in preschool-age children and adolescents (68,69). For adults, interventions that address multiple risk

factors for overweight and obesity and NCDs have been successful at reducing BMI (70), such as interventions targeting reductions in blood pressure and adiposity. However, it has been noted that among adults, the goal of addressing overweight and obesity may be better attained by preventing additional weight gain rather than aiming to lose weight and sustain the weight loss long-term (64,71). This strategy also may be helpful for reducing weight stigma (i.e., stigma associated with overweight and obesity (72)) as participants may focus on creating a healthier lifestyle to maintain their current weight, rather than attempting to lose weight and maintain the loss (73).

Interventions for school-age children are more likely to be successful at preventing excess weight gain if the interventions are multi-component and address diet quality, eating patterns, and physical activity, and involve multiple stakeholders such as schools and caregivers (74–80). A 2018 systematic review of interventions to address overweight and obesity in children (almost exclusively in upper-middle and high-income countries) reported that school settings have the strongest intervention evidence base with positive results, and particularly if the intervention involves a secondary setting, such as after-school programs or home (80). For the school-based interventions with positive results, the effect of BMI change among children receiving interventions (compared to ‘control’ children) was 0.33 to 0.05 kg/m². This review also noted that school-based interventions with follow-up periods of 6-12 months or longer tended to have positive effects, and that many of the interventions with null results had short durations of implementation, from five weeks to less than a school year. Additionally, about half of the studies with null results for school-based interventions were single component interventions, that is they only included nutrition, physical activity, or body measurement tracking (80).

For infants and young children, interventions to prevent overweight and obesity include the promotion and support of breastfeeding and responsive feeding practices. A recent systematic review noted that any breastfeeding (as opposed to none) may reduce the risk of child- and adulthood overweight and obesity by 12-14%, with longer durations of breastfeeding more strongly associated with risk prevention (81). The majority of evidence associating breastfeeding with reduced risk of obesity comes from observational studies, with at least one randomized controlled trial determining breastfeeding to not be protective (82). However, there are a number of hypothesized mechanisms through which breastfeeding may influence overweight or obesity risk. One of which is that the greater protein content of infant formula has been associated with increased infant weight gain and childhood obesity (83). A second is that breastfed infants may be better able to regulate their satiety signals than formula-fed infants. This ability allows breastfed infants to control their feeding, and learn to listen to

hormonal signals to stop eating when they are full. Children with stronger responsiveness to satiety have been associated with lower BMIs (84). Responsive feeding practices (i.e., caregivers attending to young children’s needs in a prompt, supportive, and contingent manner) have been shown to promote normal weight among young children (33,35), and repeated exposure to nutrient-dense foods such as fruits and vegetables during pregnancy, breastfeeding, and complementary feeding, has been shown to increase consumption of those foods among exposed children (85), which may improve overall dietary quality and reduce the risk of overweight and obesity. A recent review of early childhood obesity trends in high-income countries suggested that in addition to the promotion and support of breastfeeding and overall improved dietary quality for young children, interventions for young children should also include meticulous growth monitoring and evaluation for excessive weight gain, particularly during the first two years of life (86).

In recent years, upper-middle and high-income countries have focused on legislative interventions targeting the greater food environment aiming to prevent further increases in overweight and obesity (87). SSB taxes in Mexico, and a multi-pronged approach in Chile of food-labeling, taxation, and restrictive marketing of ultra-processed foods and beverages to children, were implemented with the intention of changing consumer purchasing and consumption patterns that could ultimately result in reductions in overweight and obesity. Evaluations of the legislation implementation do show decreases in population purchasing and consumption patterns of ultra-processed foods and beverages (88,89). However, an evaluation of industry-driven product reformulation in Chile showed that few products had been reformulated to contain less salt, sugar, or saturated fats even though the products now must be labeled as containing “nutrients of concern” (90). This may indicate that though consumers are starting to change some of their behaviors due to the Chile’s legislation, the changes are not yet enough to influence industry. Though data on the sustained effects on BMI from these policies remain to be seen, as of 2019, 42 countries around the world have passed or implemented SSB taxation policies, and 33 countries have passed or implemented food-labeling legislation (2).

Current Strategies and Overweight and Obesity Interventions in LMICs

In LMICs, current strategies to address overweight and obesity include national health strategies with overweight and obesity and/or NCDs part of their action plans and dietary guidelines, and implementation or scaling up of universal health care plans. According to WHO’s 2019 NCD country capacity survey (91), 95% of all countries within WHO regions have NCD-focused units, branches, or departments within the Ministry of Health (or equivalent) and 94% of these units have full-time staff.

However, in the African and South East Asian regions, only 15% and 55%, respectively, of the countries have an operational policy, strategy, or action plan that includes addressing overweight and obesity, exemplifying that overweight and obesity continues to be under-prioritized at the government level in these regions. Food-based dietary guidelines are considered an important tool by the FAO for governments to provide support and guidance on healthy and sustainable country- and population-specific diets. However, only 100 countries worldwide have food-based dietary guidelines (out of a possible 215), and just seven countries in Africa (92,93). Additionally, many countries do not have monitoring and evaluation systems in place to assess adherence to dietary guidelines, and how or if diet quality has shifted due to their implementation (94). Finally, while many LMICs are implementing or attempting to scale up universal health care plans, structural and systemic challenges, such as lack of health service infrastructure in rural areas or low percentage of government health spending on social insurance schemes, make this process difficult and continue to leave vast populations without adequate access to health services (95).

A recent World Bank Report summarized interventions addressing overweight and obesity in LMICs (2). Of the intervention typologies listed (i.e., fiscal policies, regulatory policies, agriculture and food systems policies, transport and urban design, and early childhood nutrition programs), the authors noted that the evidence is currently greatest for fiscal policies, and that early childhood nutrition programs have the strongest evaluation base, though most still focus on undernutrition. A key point that must be continually highlighted is that the evidence base for interventions to address overweight and obesity that have been tested in LMICs is small, and needs extensive attention by the research and programmatic communities. Researchers and program implementers may learn from the history of interventions tested in high- and upper-middle income countries, but adapting those interventions to LMICs contexts will be critical to their success. A review that analyzed the components of effective childhood complementary feeding behavior change interventions in LMICs reported that effective strategies included those that identified “cultural barriers and enablers” with formative research, clearly connected the program impact pathway to the complementary feeding behavior change intervention, and assessed the intervention’s effectiveness throughout the study (96).

A summary of interventional studies and systematic reviews of interventional studies that aimed to address overweight and obesity in LMICs is included in **Table 3** (children and adolescents) and **Table 4** (adults). For children and adolescents, the vast majority of the studies took place in schools or in after-school programs. There was great variation in how the studies measured and reported their findings,

however, a key characteristic of successful interventions (that is, interventions that reported a decrease in measurements of overweight and obesity), and was similar to findings from interventions from high-income countries, was that the successful interventions involved multiple components. Studies that reported success in LMICs used behavior modification strategies that targeted both dietary improvements and increased physical activity opportunities. Many also involved multiple stakeholders, such as teachers and families. However, as Klingberg et al. expressed in their systematic review of children's interventions in Africa (97), many upper-middle and high-income countries emphasize a need to involve caregivers in children's overweight and obesity prevention strategies, but this involvement must be adapted to the different LMIC contexts. For example, some sub-populations in LMICs may be more community-oriented or collective in nature (44); therefore, involving a larger community base, such as a church congregation or entire village, may be more conducive to an intervention's implementation than limiting the involvement to a child's immediate caregiver. Characteristics of successful adult interventions in LMICs also included multiple components, and more research is needed to fill in the many gaps in studies for this sub-group.

Table 3: Interventions to Address Overweight and Obesity Among Children and Adolescents in Low- and Middle-Income Countries From Literature Review

Author (Year)	Title	Type	Countries Included	Age Group	Intervention(s)	Selected Results
Ansari et al. (2010)	Associations between physical activity and health parameters in adolescent pupils in Egypt https://doi.org/10.3390/ijerp-h7041649	Intervention study	Egypt	Secondary school children, mean age 15.7 years	Physical activity intervention that included 1 hour of moderate exercise 3 times a week for 3 months after school in addition to the regular 30 minutes 2 times a week during school hours.	As measured by BMI, overweight decreased by 12.5% in the intervention group and increased by 37.3% among the control group.
Bhave et al. (2015)	Effectiveness of a 5-year school-based intervention programme to reduce adiposity and improve fitness and lifestyle in Indian children; the SYM-KEM study doi: 10.1136/archdischild-2015-308673	Intervention study	India	7-15 years	5 year school-based program that included multiple components: increased physical activity opportunities, increased fruit and vegetable content of school meals, forbid sale of fast-food outside school gates, health education program for students, and workshops and newsletters for teachers.	One group of intervention children did not reduce BMI but did reduce mean waist circumference (non-significant) compared to controls. They also spent less time being sedentary, ate more fruit, and were more physically fit than the controls.
Carducci et al. (2020)	Effect of Food Environment Interventions on Anthropometric Outcomes in School-Aged Children and Adolescents in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis https://doi.org/10.1093/cdn/nzaa098	Systematic review and meta-analysis	China, Thailand, Mexico, Brazil, India, South Africa, Turkey, Malaysia, Lebanon, Tonga, Fiji, Iran, Argentina	5-19 years	Analyses of 11 RCTs and 6 quasi-experimental studies for the effects of food-related behavioral and environmental interventions on diet-related health outcomes. All studies included multicomponent interventions.	6 RCTs that measured mean change in BMI indicated an overall decrease in mean BMI (-0.11 mean difference). Other analyses showed no or insignificant effects on weight outcomes.

Draper et al. (2010)	Evaluation of a school-based physical activity intervention in Alexandra Township doi: 10.17159/2078-516X/2010/v22i1a320 (included in Klingberg et al. systematic review)	Intervention evaluation	South Africa	Primary school children grades 4-6	Evaluated the impacts of the Discovery Healthy Lifestyle Programme 4 months post-implementation. The Programme included increased physical activity and health education one time per week.	Mean weight (kg) increased 1.3 kg in the post-implementation evaluation.
Hochefeld et al. (2016)	Does school breakfast make a difference? An evaluation of an in-school breakfast programme in South Africa https://doi.org/10.1016/j.ijedudev.2016.07.005 (included in Klingberg et al. systematic review)	Intervention evaluation	South Africa	6-17 years	Measured the effects on BMI among children participating in a school breakfast program in the first year of the program's implementation.	From baseline to final, there was a 4.3% decrease in severely overweight participants and a 3.1% decrease in overweight participants.
Kameswararao et al. (2009)	Survey of childhood diabetes and impact of school level educational interventions in rural school in Karimnagar district doi: 10.4103/0973-3930.53123	Intervention study	India	School children	6 month intervention split into 4 groups: obesity prevention and reduction; prevention of excessive sweets, chocolates, and carbohydrate consumption; reduction in TV viewing; increased physical activity. The intervention included 2 hours each week of education for children, caregivers, and teachers about reducing the risk of obesity and diabetes, including changes in diet and physical activity habits.	Post intervention, obesity decreased by 0.33% among children with obesity, excessive consumption of sweets decreased by 27.4% and prolonged TV watching decreased by 19.3%, and poor levels of physical activity decreased by 16.9%.
Klingberg et al. (2019)	Childhood obesity prevention in Africa: a systematic review of intervention effectiveness and implementation	Systematic review	South Africa, Tunisia, Uganda	2-18 years	14 interventions were summarized. N=12 were school-based or part of after school programs. Interventions targeted	Summarized effects by intervention outcome (overall evidence was assessed as weak): No effect on dietary

	https://doi.org/10.3390/ijerp16071212				physical activity and diet through changes or additions to school curriculums, increasing physical activity opportunities, targeting a school meal program, providing training or materials to parents and teachers, and changing the school environment. Most were multi-component.	behaviors; no to positive effect on physical activity; and no to positive effect on anthropometric outcomes (<i>see Draper et al., Hocheveld et al., Maatoug et al., Naude et al., and Nyawose et al. for anthropometric outcomes summaries</i>).
Maatoug et al. (2015)	School-based intervention as a component of a comprehensive community program for overweight and obesity prevention http://dx.doi.org/10.5888/pcd12.140518 (included in Klingberg et al. systematic review)	Intervention study	Tunisia	11-16 years	3 year multi-component school-based intervention that involved teachers in promoting physical activity and healthy diets. Included after school sports, providing nutrition information to parents, asking stores to stock healthier snacks, and children were rewarded when they choose healthier snacks (stickers).	The intervention group increased their fruit and vegetable intake by 3%. The number of overweight participants decreased by 2.6%. The number of obese participants decreased by 0.5%.
Naude et al. (2008)	Body fat, body mass index in black South African adolescents after a physical activity intervention programme: PLAY study https://journals.co.za/content/ajpherd/14/4/EJC19552 (included in Klingberg et al. systematic review)	Intervention study	South Africa	13-18 years	19 week physical activity intervention that included twice-weekly hour long physical activity opportunities.	Waist-to-hip ratio and % body fat appeared to decrease for intervention participants.
Nyawose et al. (2016)	The impact of a school-based and family physical activity intervention on learners' health behavior	Intervention evaluation	South Africa	11-15 years	4 month intervention including 2 one-hour physical activity workshops per month and additional	Reduction in mean weight pre- versus post-intervention by 0.09 kg/m ² .

	https://hdl.handle.net/10520/EJC192184 (included in Klingberg et al. systematic review)				nutrition education as part of the school curriculum.	
Uijtdewilligen et al. (2016)	Preventing childhood obesity in Asia: an overview https://doi.org/10.1111/obr.12435	Systematic review	China, India, Pakistan, Singapore, Thailand	Preschool- and school-age children	Of the 17 included studies, n=16 conducted the interventions in a school or child-care facility. Interventions were generally delivered by teachers or parents and used behavioral modification strategies that included physical activity opportunities and nutrition education. The typical duration was 3 months to 1 year with weekly engagement in the activities.	Effects on the prevalence of overweight and obesity were mixed with most reporting no significant changes. Outcomes that measured health knowledge, healthier diets, or increased physical activity reported positive significant effects in some of the studies.
Verstraeten et al. (2012)	Effectiveness of preventive school-based obesity interventions in low- and middle-income countries: A systematic review https://doi.org/10.3945/ajcn.112.035378	Systematic Review	Brazil, Chile, China, Hungary, India, Iran, Mexico, Russia, South Africa, Thailand, Trinidad and Tobago	6-18 years	N=22 studies that included school-based interventions and aimed to prevent obesity through behavior modification strategies (dietary and/or physical activity changes). Mean intervention duration was 9 months and mean follow-up length was 11 months.	N=4 studies included diet-only interventions (mainly nutrition education), n=10 studies included physical activity only intervention (mainly including additional physical activity opportunities), and n=11 included both. BMI decreased in n=8 studies (effect size range: -0.7-0.0)

Table 4: Interventions to Address Overweight and Obesity Among Adults in Low- and Middle-Income Countries from Literature Review

Author	Title	Type	Region/ Country	Age Group	Intervention(s)	Selected Results
Cook et al. (2008)	Relationship between adiposity and pedometer-assessed ambulatory activity in adult, rural African women https://doi.org/10.1038/ijo.2008.26	Observational study	South Africa	Women 15-55 years	Electronic pedometers were worn by participants for 7 days and physical activity level was compared to BMI.	Every increase of 5000 steps per day was associated with a decreased BMI of 1.4 kg/m ² .
Sarrafzadegan et al. (2013)	Outcomes of a comprehensive healthy lifestyle program on cardiometabolic risk factors in a developing country: the Isfahan Healthy Heart Program http://www.aimjournal.ir/Article/417	Program evaluation	Iran	Adults with mean age 39 years	A 3-4 year multi-component intervention targeting healthy nutrition, increased physical activity, tobacco control and stress reduction. Implementation was community-wide and included public education through mass media, marketing, and legislation and policy development.	Among females in the intervention area, overweight/obesity decreased by 1.6%, abdominal obesity decreased 19.4%, and hypertension, hypercholesterolemia, and hypertriglyceridemia decreased significantly. Among men in the intervention area, overweight/obesity increased 4.7%, abdominal obesity decreased 2.2%, and hypercholesterolemia and hypertriglyceridemia decreased, but hypertension increased slightly (0.5%).
Uthman et al. (2015)	Multiple risk factor interventions for primary prevention of cardiovascular disease in low- and middle-income countries: A Cochrane review https://doi.org/10.1002/14651858.CD011163.pub2	Systematic Review	Turkey, China, Mexico, Nigeria, Brazil, India, Pakistan, Romania, and Jordan	Adults 18+ years	Randomized-controlled trials of interventions that aimed to address multiple risk factors of cardiovascular disease, including dietary advice, reducing alcohol, smoking cessation, reducing body weight, and increasing physical activity. All included a follow-up period of at least 6 months.	N=13 trials were included. N=7 reported BMI with a pooled effect showing a statistically significant reduction in BMI and waist circumference. Other significant pooled effects included a reduction in systolic and diastolic blood pressure.

The Role of NGOs in Addressing Overweight and Obesity in LMICs

Perspectives from global nutrition, health, economic, and policy experts

NGOs and other program implementers (hereafter referred to collectively as NGOs) are in a position to address overweight and obesity in LMICs due to their often long standing in-country relationships, ability to advocate within governments, access to international funding and auxiliary resources, and common commitments to working with disadvantaged and hard to access populations. However, though NGOs are often tasked with creating and implementing nutrition programs, they often lack specific guidance to address overweight and obesity in contexts where historically their focus has been on undernutrition.

Twenty-nine experts in global nutrition, health, economics, and policy were interviewed for their perspectives and insights on how NGOs may be better able to address overweight and obesity within their roles in LMICs, including what programs, policies, and reforms are needed to do so. They emphasized the responsibility of NGOs to include both under- and overnutrition in all their decisions and actions. As one expert remarked: *NGOs must look at the whole problem and not just continue looking at only one side.* Addressing the multiple burdens of malnutrition present in LMICs may be of particular concern to NGOs now due to COVID-19, with increased poverty, disrupted food systems, and decreased food access in LMICs potentially setting a foundation for later risk of developing overweight and obesity (see **Spotlight on COVID-19 and Overweight and Obesity in LMICs in Appendix A**).

Experts noted that programs, policies, and reforms to address overweight and obesity in LMICs will need to not only address proximal influences, such as improving dietary quality, increasing physical activity, and supportive feeding behaviors (i.e., promotion of breastfeeding, responsive feeding, formation of food preferences, and satiety responsiveness (33,35)), but also systemic influences, including inequitable access to safe and nutritious food, poverty, food insecurity, insufficient health care, cultural norms and body image perceptions, and gender inequities, among others. Building upon the widely-disseminated UNICEF framework of malnutrition determinants (98), which has recently been updated to include additional determinants such as responsive care, health care, learning opportunities, and others (99), frameworks that address cross-cutting drivers of the multiple forms of malnutrition will be crucial for the development of effective programs and policies.

Pradeilles et al. (100) used a socio-ecological framework to examine the shared drivers of overnutrition and undernutrition and how they may be addressed through the double duty actions proposed by the WHO. Double duty actions are actions that can be undertaken to simultaneously

address under- and overnutrition (101,102). Pradeilles et al. identified 83 shared drivers and suggested that 75% of these could be addressed through double duty actions. For example, one double duty action is the regulation of marketing, which can be applied to limiting marketing of breast milk substitutes (BMS). Limiting the marketing of BMS is a shared driver of both undernutrition and obesity as it encourages breastfeeding, which promotes appropriate child feeding practices and reinforces satiety responsiveness, all of which may be helpful in preventing both undernutrition and overnutrition (33).

In their 2017 review, Jaacks et al. (103) reviewed current evidence and key considerations for addressing maternal and child overweight and obesity in LMICs. They identified four entry points to address overweight and obesity within undernutrition programming: integration of overweight and obesity into national nutrition plans, food systems, education systems, and the school system through improved school feeding programs. They then proposed a framework for implementation along with an adapted Demographic and Health Survey step-by-step guide for how to do so. The result is a clear and evidence-based resource for how to address overweight and obesity in LMICs through programming and policy that may be used by NGOs across various settings, and overlaps with many of the experts' suggestions.

With these considerations in mind, the roles of NGOs for addressing overweight and obesity in LMICs reported by the experts were: 1) nutrition programming strategies and policies, 2) advocacy and stakeholder engagement, 3) research partnerships and implementation, and 4) technical support.

Nutrition Programming Strategies and Policies

Many of the nutrition programs implemented by NGOs are determined by the priorities and interests of donors, funding agencies, and governments, and are largely centered on addressing undernutrition, thus integrating overweight and obesity into undernutrition programming will be necessary. In the design of these programs and policies, NGOs should strive to be thoughtful and intentional in their design, ensure the programs and policies are informed by the evidence base, are culturally relevant, and have the potential to be sustainable and scalable. NGOs should also emphasize to stakeholders specifically how the program may address both under- and overnutrition. This may begin to move the conversation towards including overweight and obesity in future nutrition programs, and increase interest in funding programs aimed at all forms of malnutrition.

Update Current IYCF Programs to Address Overnutrition

Many IYCF program that are already in place focus on undernutrition and can be updated to also address overnutrition. This may include the adaptation of growth monitoring programs to monitor risk of excess weight gain in early childhood (102), and including counseling at prenatal visits to connect nutrition status during pregnancy to later health risks. For example, in programming to support and promote breastfeeding, mothers may be educated about how breastfeeding may reduce the risk of child obesity and that lactational amenorrhea associated with breastfeeding may allow for greater birth spacing so mothers may enter the next pregnancy without (or with less) excess weight. Also, mothers must understand why obesity may make it more difficult to breastfeed (e.g., by causing biological delays in milk production (104)) to promote greater self-actualization. Additionally, if programming about responsive feeding is in place, mothers and caregivers should be informed of how building children's skills in feeding autonomy and supporting their ability to self-regulate their appetite helps create a foundation of lifelong healthy eating practices.

Target Schools and Include Adolescents

Schools are integral to addressing overweight and obesity. Many LMICs already have school feeding programs in place, which can be scaled up to meet the food security and nutrition needs of communities, improve dietary quality rather than solely providing calories, and engage children and adolescents (including very young adolescents) in nutrition and health. Within schools, nutrition can be integrated into agriculture, health, and education. For example, a school meal program may be built around nutritious commodities available in a local community, building economic links between local farmers and schools. Nutrition education may then be integrated into classroom learning so children understand the need for good nutrition and the effects on their bodies, and connect nutrition to why the school is serving the food it serves and how this connects to the larger food environment. Parents and communities may be involved in the development of the school meal program to ensure everyone is receiving the same nutrition messages, which then creates additional opportunities to provide education and increase awareness about local, nutritious foods, and the behaviors that support optimal nutrition. Depending on the needs of the community, the school meal program may be supplemented judiciously with food aid.

Develop Youth-Led Nutrition Programming

Nutrition programming led by youth creates individual autonomy and personal responsibility, which is often needed to maintain engagement, particularly among adolescents. Much of nutrition

programming is aimed at young children (0-5 years of age), or is not aligned with local youth preferences. As the nutrition status of adolescents is becoming a greater focus in LMICs (105,106), particularly in contexts where the age of first pregnancy is young, engaging youth in understanding and preventing overweight and obesity through youth-led programming may be an underutilized tool in program development. Involving youth community leaders in program development and implementation may be a place to start.

Prioritize and Promote Physical Activity

Developing and maintaining spaces for physical activity as part of nutrition programming, particularly in schools and in urban settings, should be prioritized. In urban settings, resources may be devoted to improving street safety, installing and maintaining sidewalks, and developing green spaces for communities to engage in recreational opportunities.

Integrate Cross-Cutting Nutrition Education

Integrating education about overweight and obesity into existing programs for developing critical skills is way to increase understanding and awareness of overweight and obesity across sectors. For example, programs aimed at improving farming practices may point out how the physical activity involved with farming may impact overweight and obesity risk. If a farming program aims to increase consumption of locally available foods, incorporate education about how improving dietary diversity and overall diet quality may reduce the risk of overweight and obesity. NGOs may collaborate with the local agricultural industry to increasing knowledge and awareness of local plant species that can be incorporated into the local agricultural economy.

Target the Food Environment

Influencing the greater food environment to make safe and nutritious foods and beverages affordable and accessible to all populations helps create opportunities to address overweight and obesity. For example, the provision of monetary incentives to food vendors, particularly those close to schools, may enable vendors to sell fruits and vegetables in lieu of nutrient-poor snacks and beverages, and to sell fruits and vegetables in small quantities (i.e., one banana versus a kilogram of bananas). This may entice school children to purchase fruits and vegetables instead of other nutrient-poor options. Also, the creation of “free zones” within and around schools that restricts food vendors from selling nutrient-poor foods and beverages may help shift purchasing and consumption patterns.

Develop and Strengthen Nutrition Policies and Financing

To create stronger overweight and obesity policies, policymakers should be guided by frameworks that *are sensitive to* overweight and obesity, such that the policies are understood and accepted not only by those that develop them, but also by the population the policies aim to address. Nutrition policies should target all forms of malnutrition, such as improving food environments to make nutritious foods affordable and accessible, reducing consumption of non-nutritive foods and beverages, and address the commercial determinants of nutrition, such as marketing of nutrient-poor foods to children and adolescents or taxation of such foods (51). Nutrition policies will be further strengthened when integrated into national nutrition health strategies and adequately financed. To overcome the funding gap for addressing overweight and obesity in LMICs (107), ongoing investments from private sector resources, domestic resources, and external funding, up to and including applying the funds generated from taxation policies to overweight and obesity prevention programming (108), are necessary. The *NOURISHING framework*¹ put forth by the World Cancer Research Fund International provides a package of resources for creating food policy that promotes healthy diets and reduces obesity, and *Results for Development Nutrition Financing*² contains resources and frameworks for developing, costing, and tracking nutritional financing based on the World Health Assembly nutrition targets, though many of their financial scenarios have yet to include overweight and obesity.

Advocacy and Stakeholder Engagement

Advocacy is a critical tool available to NGOs for its ability to raise awareness, understanding, and support for overweight and obesity programs and policies at local, national, and international levels. NGOs may use advocacy to form cross-sector partnerships with relevant stakeholders, thereby creating and maintaining stakeholder engagement. Such partnerships may include government officials and entities, such as the nutrition directorate in Ministries of Health and the Ministries of Education, Trade, and Agriculture, academia and research organizations, private industry, donors and funding agencies, and community leaders, among others. NGO advocacy and engagement helped generate funding for formative research necessary to pass the Chilean Food Labelling and Advertising Law (89), and was instrumental in creating awareness and support for passing the 2014 SSB tax in Mexico (109). As one expert stated: *NGOs have the latitude to advocate, lobby, and demand accountability. They must leverage their resources.*

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1. *NOURISHING Framework*. World Cancer Research Fund International <https://www.wcrf.org/int/policy/policy-databases/nourishing-framework>
 2. *Nutrition Financing*. Results 4 Development <https://r4d.org/nutrition/nutrition-financing/>

In LMICs, NGOs often have a seat at the stakeholder table. This position can be a powerful voice for communities who are at risk of or already experiencing overweight and obesity, and in particular to voice actions useful to address overweight and obesity within the community and cultural context. As advocates, NGOs may bring stakeholder awareness to current trends that overweight and obesity is increasing among the poor, not just among the wealthy. They may also bring awareness to what changes are needed within local or national food environments to better address the overweight and obesity situation based upon their in-country experiences, and importantly, link these experiences to the evidence base. As one explained: *To create a positive [nutrition] environment, start with the government of a country and the people who influence the government of that country. Then engage with private sector networks to more directly influence the roles they play. Then look to donors. Donors focus on food insecurity, undernutrition, and strengthening health systems. We need to show them how this also is beneficial for obesity prevention.* NGOs are visible advocates for public health and nutrition, thus they must be thoughtful in their actions to address overweight and obesity, such as not selling or distributing SSBs or ultra-processed foods within their institutions or at associated events and programs. When possible, NGOs may also consider not accepting funding from industries known to cause harm to public health.

When experts spoke of the greatest challenges facing overweight and obesity programming and prioritization in policy and research, the majority spoke of a lack of interest at multiple levels of engagement. At the government level, without a national overweight and obesity health strategy as part of government agendas, policymakers are less aware of the need to initiate or improve overweight and obesity-focused policies, making program sustainability and scalability untenable. This also conveys a message of unimportance to both policymakers and the general public. As one expert stated: *If governments see access and consumption of healthy food as important, maybe the general public will see it as important as well.* A continual global focus on undernutrition also makes donors less interested in prioritizing overweight and obesity, and without donor interest, funding to implement any related programming is limited or non-existent. NGO advocacy to increase and maintain interest in overweight and obesity programs and policies will be crucial to address this challenge.

Lack of interest in overweight and obesity prioritization may be tied to a lack of understanding of its etiology, and addressing this is important for the success of these programs and policies. Experts spoke of the stigma related to overweight and obesity and the widely held belief that obesity is caused by individual failings, which then contributes to global disinterest in addressing overweight and obesity.

Thus, improving understanding and awareness of the multiple interconnected causes and consequences of overweight and obesity, and emphasizing the role of systemic inequities rather than personal responsibility, may help shift the perspectives and willingness of stakeholders to prioritize overweight and obesity programming (**Spotlight on Stigma and Overweight and Obesity in LMICs in Appendix B**).

Partnerships in Research and Implementation

NGOs are often embedded within communities and countries for long periods of time, providing unique perspectives and forming long-standing relationships useful for identifying context-specific nutrition needs, and the potential strategies to address them. Many NGOs may not themselves be a research organization, but by partnering with locally- or internationally-based research organizations and other experts experienced in obesity research, NGOs may provide critical connections to help gather data needed to address public health priorities.

As has been previously noted, there is an alarming gap in data on overweight and obesity interventions in LMIC settings, which inhibits the ability of countries and global health entities to address them. While there is much to learn from the research in high- and upper-middle income countries, those interventions and strategies were not designed to fit LMIC contexts. The data on overweight and obesity from LMICs that is available is generally prevalence data gathered at the country-level, often from Demographic and Health Surveys (110), or from small studies and single populations, such as women or young children. While dietary patterns, nutrient intakes, and nutrition status have been examined in some LMICs (111,112), data is still lacking in many others, which makes it difficult to understand the varied drivers of overweight and obesity across differing populations and over time. Additionally, to create and maintain stakeholder engagement and program sustainability, economic evaluations of the causes and consequences of overweight and obesity in LMICs are essential.

As partners in research and implementation, NGOs may help gather the data needed to create interest in addressing overweight and obesity and move the global conversation on overweight and obesity off the sidelines and into the mainstream. To do this, NGOs may use methodologies employed in implementation science to test strategies of overweight and obesity prevention in specific contexts, and consider scalability and sustainability of interventions (113). NGOs may help examine which populations within a country or region may be most at risk of overweight and obesity, and why. They may collect information about local diets, including rapidly shifting diets in urban settings, to determine useful strategies that address the local food environment. Evidence gathered at the local level may be useful at the national level for the development of specific guidance, such as national health strategies and food-

based dietary guidelines. Additionally, as nutrition monitoring and evaluation programs are often limited or nonexistent in many LMICs (70), NGOs may help by designing nutrition programs with integrated monitoring and evaluation, or work with local and national entities to build monitoring and evaluation protocols into existing programs. Resources helpful for decision-making of which food systems to target and why is the Food Systems Dashboard¹ and INFORMAS (International Network for Food and Obesity/NCDs Research, Monitoring and Action Support)², a network of resources for monitoring the foods environment to reduce obesity and related NCDs.

Technical Support

NGOs may also have a role in providing technical support to governments and other national entities to develop and implement national health strategies and legislation addressing overweight and obesity. NGOs may bring expertise and experience from other countries to inform this process. In nutrition-related sectors, such as health, agriculture and education, NGOs may provide support and resources needed to build up these systems to better address overweight and obesity.

Conclusion and Recommendations

Addressing overweight and obesity in the contexts of LMICs will require understanding of the conditions' complexity and awareness of its growing prevalence. It will also require moving away from pervasive viewpoints attributing overweight and obesity to specific attitudes and individualistic behaviors, and towards examining how food systems and environments enable its biological and social behavioral determinants. While there is limited evidence on effective strategies to address overweight and obesity in LMICs, the expert perspectives and insights highlighted here establish a clear need for prompt action through nutrition programming strategies, policies and financing, advocacy and stakeholder engagement, partnerships in research and implementation, and technical support. A collaborative effort between NGOs and all relevant stakeholders (e.g., governments, policymakers, program developers, researchers, private industries, donors and funding agencies, and communities) is needed to truly address public health priorities in LMICs, and is central to scalable and sustainable overweight and obesity programming and policies.

Data, Research, and Implementation Science

As data and research on overweight and obesity in LMICs is limited, generating data and adding to the evidence base is crucial to addressing them in a comprehensive and context-specific manner.

2. *Food Systems Dashboard*. <https://foodsystemsdashboard.org/>
3. *INFORMAS*. <https://www.informas.org/>

This will also increase understanding and awareness of overweight and obesity among stakeholders, who may then prioritize the programs and policies in national health strategies. Alongside standard collections of anthropometric measurements, nutrition surveys and surveillance tools should prioritize the collection of additional biological, behavioral, and environmental indicators that may be associated with overweight and obesity. Such indicators may include those that measure NCD risk, such as blood pressure and serum lipid measurements, dietary consumption patterns, market purchasing habits and food availability, food insecurity, attitudes and beliefs related to body size, gender and identity influences on nutrition and health, food preferences, and physical activity habits, among others. Additionally, the application of implementation science methodology to current or future overweight and obesity programming and policies will help determine which programs and policies are successful (or not), and which are potentially scalable and sustainable.

[Integration of Overweight and Obesity Awareness and Prevention into Nutrition Programs](#)

Whenever possible, overweight and obesity awareness and prevention should be considered in the design and implementation of nutrition programs and policies. While NGOs must align their interventions and programming with the policies, strategies, and expectations of the entities with whom they collaborate, it is essential that, at a minimum, current and future nutrition programs do not inadvertently contribute to increasing the prevalence of overweight and obesity, and at best, contribute to preventing it. To be successful, NGOs must first address and gain stakeholder interest in supporting overweight and obesity programming, or look to outside sources for additional support. Then, NGOs must specify their intention to include objectives aimed at addressing overweight and obesity in their initial proposals in order to ensure availability of resources and expertise to design and implement such programs. Opportunities to do so include nutrition programs that aim to address individual or community attitudes, beliefs and behaviors around food and nutrition, school meal programs, and programs that address key tenants of IYCF practices, such as breastfeeding, complementary feeding, and responsive feeding. Additional opportunities include nutrition programs that focus on populations of interest (i.e., urban and peri-urban populations, adolescent girls and young women, women of reproductive age, school-aged children, etc.) and characteristics of interest (i.e., socio-economic status, food insecurity), as well as nutrition programs that include agricultural production, value-chain assessments, market systems development, programs that expand a population's access to nutritious food and create enabling food environments, and programs that address other commercial determinants of nutrition such as restricting marketing of nutrient-poor foods and beverages. These

opportunities provide useful examinations of the key determinants of overweight and obesity and potential leverage points for simultaneously addressing overnutrition and undernutrition.

NGOs as Advocates

NGOs are positioned to play an important role in expanding awareness and attention to overweight and obesity in LMICs. To do so, NGOs and other stakeholders must be thoughtful and informed when communicating the multi-faceted etiology of overweight and obesity, and emphasize the need to examine and address the many context-specific influences. NGOs must also actively challenge the stigma and negative perceptions associated with overweight and obesity, and advocate for programs and policies that address the underlying biological, behavioral, and environmental determinants. By consulting with both the communities NGOs serve and their partners, and maintaining an active voice in governments, industry, and among the donor community, NGOs can help prioritize overweight and obesity awareness, prompting funding and strengthening global attention.

Formation of National, Regional, or Global Communities of Practice

Within the international nutrition community, there is established and organized support for efforts to reduce undernutrition, such as stunting and wasting among children less than five years of age. This document highlights that there is a growing community also interested and willing to prioritize addressing overweight and obesity in LMICs, which justifies the formation of national, regional, or global communities of practice. National, regional, or global communities of practice, similar to those that exist to further efforts to reduce undernutrition, are likely to accelerate action, generate funding, and allow actors to identify the most cost-effective intervention strategies for scalable and sustainable programming. Such communities of practice should also collaborate and form cross-cutting partnerships with existing overweight and obesity communities of practice from high-income countries, such as the CDC's Division of Nutrition, Physical Activity, and Obesity (114) and the WHO Commission on Ending Childhood Obesity (115). Forming such communities of practice will be necessary for overweight and obesity prevention to maintain a central presence in global nutrition and health priorities.

Appendix A

Spotlight on COVID-19 and Overweight and Obesity in LMICs

The increased risk of all forms of malnutrition due to the global consequences of COVID-19 is a grave concern for the international nutrition community. Disruptions to food supply chains and high rates of unemployment put vulnerable populations at greater risk of food insecurity in part due to a decreased ability to access affordable and nutritious foods. Reports estimate that in 2020, the effects of COVID-19 will add 140 million people to the current population living in extreme poverty (116) and that the prevalence of acute food insecurity in LMICs will double to 265 million people (117). Experts worry that the implications on maternal and child undernutrition will be severe and potentially long-lasting (118,119), with one report estimating that COVID-19 will cause almost 7 million additional children to become wasted in 2020 (120). As it is now clear that obesity is significant risk factor for COVID-19 severity and mortality (121), lockdowns limiting exercise, increasingly poor quality diets due to limited access to nutritious foods, and rising poverty will likely impact all forms of malnutrition, including among vulnerable populations in LMICs. As the global health community works to mitigate the effects of COVID-19 in LMICs, it will be important to include measures to monitor and prevent overweight and obesity in COVID-19 government action plans and policies alongside those aimed at monitoring and preventing underweight and wasting. Strategies for doing so may be similar, such as increasing the affordability of nutritious foods with food aid and cash-transfers, working to increase and maintain access to nutritious foods among marginalized populations, and improving access to health services for those most in need.

Appendix B

Spotlight on Weight Stigma and Overweight and Obesity in LMICs

Obesity is fascinating but it is a heartbreaking problem. So little of it is within a person's agency or control. Sure, there are behaviors they are engaged in [that may perpetuate obesity], but obesity is more than that. [An expert]

The stigma placed on individuals with overweight and obesity is of critical global concern due to its implication on the health and well-being of those experiencing it. Weight stigma is described by the World Obesity Federation as “discriminatory acts and ideologies targeted towards individuals because of their weight and size,” and gives examples of negative ideologies as believing persons with obesity are lazy, lack will power, lack moral character, have bad hygiene, are of low level of intelligence, and are unattractive, among other beliefs (72). In the interviews, eight experts referred to the negative belief that the onus of having overweight and obesity is on the individual, ignoring the complicated intersection of myriad biological, behavioral, and environmental factors tied to the cause. This misrepresentation of the etiology of overweight and obesity poses a significant challenge to addressing overweight and obesity in LMICs, and is a challenge NGOs could be instrumental in addressing with stakeholders.

Recently, a consensus statement was issued by a panel of 33 experts to end the stigma on obesity (73). Evidence was presented exemplifying the effects of discrimination against those with overweight and obesity in the workplace, healthcare, education, and in the media, including reduced access and use of health services, increased risk of anxiety and depression, and lower levels of employment. In LMICs, actions the public health sector could take to stop perpetuating weight stigma include designing programs and policies that address the social and commercial determinants of overweight and obesity, such as improving access to affordable and nutritious food, rather than focusing solely on individual behavior change. Additionally, public or private shaming or other stigmatizing behaviors should never be used in overweight and obesity prevention and treatment programming. Context-specific efforts to determine how biology, behavior, and the environment are increasing the risk of overweight and obesity are necessary to enable individuals to lead health-promoting lifestyles (73).

Funding for overweight and obesity research and programming is limited, and often constrained to a few known success stories. To advance our understanding of overweight and obesity and its evolution in LMICs, it will be necessary for those in positions to influence policy and practice in LMICs,

such as funding agencies, researchers, and program developers, to recognize and address weight stigma. In this way, governments and health agencies in LMICs may also see overweight and obesity as important and take steps to address it.

Appendix C: References

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Appendix D: Additional Resources

Resource	Description	Link
Data Dent	Aims to transform the availability and use of nutrition data by addressing gaps in nutrition measurement and advocating for stronger nutrition data systems.	www.datadent.org
Data for Nutrition	Free, online platform to promote the sharing of experiences and resources for strengthening the data value chain for nutrition and improving nutritional outcomes in LMICs.	www.datafornutrition.org
Demographic and Health Survey STATcompiler	The DHS Program STATcompiler allows users to make custom tables based on thousands of demographic and health indicators across more than 90 countries.	https://www.statcompiler.com/en/
Food Systems Dashboard	Combines data from multiple sources to give users a complete view of food systems. Users can compare components of food systems across countries and regions. They can also identify and prioritize ways to sustainably improve diets and nutrition in their food systems.	https://foodsystemsdashboard.org/
Global Food Research Program from the University of North Carolina at Chapel Hill	Publications and research for academics, policymakers, and industry on global food system trends.	http://globalfoodresearchprogram.web.unc.edu/
Helen Keller International ARCH Project (Assessment and Research on Child Feeding)	Projects, publications, and resources exploring marketing of commercial foods and diets of young children in rapidly evolving food environments.	https://archnutrition.org/
INFORMAS (International Network for Food and Obesity / Non-communicable Diseases (NCDs) Research, Monitoring and Action Support)	A global network of public-interest organizations and researchers that aims to monitor, benchmark and support public and private sector actions to increase healthy food environments and reduce obesity and NCDs and their related inequalities.	https://www.informas.org/

Global Burden of Disease	A comprehensive database of publications, data, and data visualization tools exploring factors contributing to global diseases.	http://www.healthdata.org/gbd
NCD Alliance	A network dedicated to improving noncommunicable disease prevention and control worldwide	https://ncdalliance.org/
Nutrition Connect	An initiative of the Global Alliance for Improved Nutrition (GAIN) to provide an open-access resource of nutrition-related knowledge, evidence and actions in order to make nutritious foods accessible, affordable and desirable for all.	https://nutritionconnect.org/index.php/
Scaling Up Nutrition MEAL system (Monitoring, Evaluation, Accountability, and Learning)	The MEAL system is the means for measuring the extent to which the SUN Movement is achieving results and impact.	https://scalingupnutrition.org/progress-impact/monitoring-evaluation-accountability-and-learning-meal/
University of Connecticut Institute for Collaboration on Health, Intervention, and Policy	A research institute dedicated to the creation and dissemination of new scientific knowledge and theoretical frameworks in the areas of health behavior and health behavior change.	https://chip.uconn.edu/
USAID Advancing Nutrition	A multi-sectoral nutrition project providing technical support to and implementation of nutrition interventions to address the root causes of malnutrition.	https://www.advancingnutrition.org/
World Cancer Research Fund International: Building Momentum Series	A series of reports aiming to help policymakers overcome common barriers to implementing evidence-informed nutrition policy.	https://www.wcrf.org/int/policy/our-publications/building-momentum-lessons-implementing-evidence-informed-nutrition
World Cancer Research Fund International: Nourishing Framework	A policy framework to promote healthy diets and reduce obesity.	https://www.wcrf.org/int/policy/policy-databases/nourishing-framework
WHO e-Library of Evidence for Nutrition Actions (eLENA)	An online library of evidence-informed guidelines for an expanding list of nutrition interventions. It is a single point of reference for the latest nutrition guidelines, recommendations and related information.	https://www.who.int/elena/en/

The Global database on the Implementation of Nutrition Action (GINA)	An interactive platform for sharing standardized information on nutrition policies and actions with specific indicators on overweight and obesity.	https://extranet.who.int/nutrition/gina/en
World Health Organization – Commission on Ending Childhood Obesity	A report specifying which approaches and combinations of interventions are likely to be most effective in tackling childhood and adolescent obesity in different contexts around the world.	https://www.who.int/end-childhood-obesity/about/en/
World Health Organization – Population-based approaches to childhood obesity prevention	A document identify population-based prevention as being vital to addressing rising levels of noncommunicable diseases, with specific emphasis on childhood obesity.	https://www.who.int/dietphysicalactivity/childhood/approaches/en/
World Health Organization – Interventions on Diet and Physical Activity: What Works	This report provides policy-makers and other stakeholders with a summary of tried and tested diet and physical activity interventions that aim to reduce the risk of chronic noncommunicable diseases (NCD).	https://www.who.int/dietphysicalactivity/whatworks/en/
World Health Organization - Tackling NCDs	“Best Buys” and other recommended interventions for the prevention and control of noncommunicable diseases	https://www.who.int/publications/item/WHO-NMH-NVI-17.9
World Health Organization: Global action plan for the prevention and control of noncommunicable diseases 2013-2020	A global action plan for recognizing the primary role and responsibility of Governments in responding to the challenge of NCDs and the important role of international cooperation to support national efforts.	https://www.who.int/publications/item/9789241506236
World Obesity Federation	A repository of global data, policy dossiers, and recent news articles on obesity.	https://www.worldobesity.org/resources