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Article *in* African Journal of Food, Agriculture, Nutrition and Development · April 2022

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Afr. J. Food Agric. Nutr. Dev. 2022; 22(2): 19496-19524 https://doi.org/10.18697/ajfand.107.21795

SCOPING REVIEW OF DIET-RELATED HEALTH OUTCOMES AND ASSOCIATED RISK FACTORS IN GHANA

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ABSTRACT

As part of a process to develop food-based dietary guidelines (FBDGs), the national Multi-sectoral Technical Task Team coordinating FBDGs development in Ghana has commissioned a desk review of the nutrition and health situation, and trends for all persons living in Ghana, across the entire life cycle. Using a rapid scoping review method, multiple electronic databases were systematically searched using keywords related to nutrition and health outcomes, as well as potential drivers of nutrition and health in Ghana. The review included evidence from peer-reviewed articles, unpublished manuscripts, dissertations, reports of nationally representative surveys, and other grey literature (reports of nutrition situation evaluations commissioned by international and local agencies), spanning the decade starting from 2010. A total of 48 documents were included in this review: 15 for infants and young children, 14 for adolescents, 19 for adults and women of reproductive age, and five for the elderly. Among children under five, anemia and stunting were the most prevalent nutrition-related outcomes, 62% and 19%, respectively. Underweight prevalence of 11% was observed among young children; wasting rates have remained below 10%, but registered about 20% prevalence in northern Ghana. Different levels of micronutrient deficiencies, particularly iron deficiency were reported across all age groups. Nutrient deficiency rates were higher among adolescent girls and women of reproductive age. Vitamin A deficiency was also high (21%) among under-fives. Overweight and obesity rates were high among women of reproductive age (40%) and adolescents (11% to 18% between 2013 and 2017), and still increasing. Underweight and overweight coexists among the elderly (50 years and above), at a rate of 10% and 20%, respectively. An increasing prevalence of central adiposity has also been reported among women of reproductive age (high waist circumference of 80.6%) and persons older than 60 years (67% in 2015). Rates of hypertension and cancers have also increased within the study period. Hypertension rates have been increasing with age, particularly among urban dwellers. Majority of persons with hypertension are not receiving treatment . Incidence of breast, cervical, and liver cancers were 20%, 14%, and 12% in 2018. Ghana is experiencing a double burden of malnutrition characterized by co-existing high levels of undernutrition and overnutrition. The national FBDGs for Ghana should prioritize recommendations and actions that address the dual burden of undernutrition and overnutrition.

Key words: Nutritional status, Micronutrient Deficiency, Ghana, undernutrition, Overweight, Anemia, Stunting, non-communicable disease

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INTRODUCTION

Malnutrition in all its forms is linked with reduced productivity, increased susceptibility to infections, and impaired recovery from illness. Addressing malnutrition is, thus, recognized as a global human development priority. The most recent global nutrition report shows that many countries are not only falling short of meeting these recommendations but are also off-track in their efforts to meet them; in some countries, there are malnutrition deficits across multiple indicators [1–3].

Food-based dietary guidelines (FBDGs) have been recognized as an important tool for addressing malnutrition in all its forms. Using FBDGs as part of the solutions to address malnutrition aligns with the resolutions made by global leaders [4]. Ghana, currently, does not have a national FBDGs. As a result, Nutrition stakeholders, across multiple sectors, have called for the development of national FBDGs, as part of strategies to address malnutrition [5].

In 2016, the Ministry of Food and Agriculture commenced a process to develop FBDGs for Ghana. Evidence reviews on various questions were, subsequently, commissioned to support the work of the multi-sectoral technical task team that was established to coordinate the process for developing the FBDGs. This paper presents the evidence on nutrition and health outcomes across different categories of persons living in Ghana, using evidence spanning 2010 and 2020. The review answers the primary question: What is the burden (magnitude, severity, and trends) of nutrition and health problems of public health significance in Ghana? It also seeks to identify which population sub-groups are most affected by these nutrition and health problems?

MATERIALS AND METHODS

Country context

Population and poverty: Ghana is a lower-middle-income country with an estimated population of about 30 million people; the population is growing at a rate of 2.2% (6)]. The female population is about 49%. Life expectancy has increased significantly, from only 43 years for females and 38 years for males in 1960, to a current estimate of 63 years for females, and 60 years for males (7). The Ghanaian population is relatively young; the majority of the population is thirty years old or younger (8)]. Ghana's population is rapidly urbanizing. Currently, more than half (56.0%) of the population live in urban areas, an increase from 44% in the year 2000 (8).

There are six major agro-ecological zones in Ghana (9). In most parts of the country, high rainfall patterns drive crop farming, which is a major source of food and livelihood (10). About 23% of Ghanaians are classified as poor, and 8% as extremely poor (11). Poverty in Ghana is associated with low income, malnutrition, ill-health, illiteracy, and insecurity. The trend of poverty has reduced significantly, between 1992 and 2013 from 53% to 23%; extreme poverty reduced from 38% to 8% during the same period (11). The United Nations International Children's Emergency Fund (UNICEF) estimates that approximately three-quarters of children in Ghana are multi-dimensionally poor, and face at least three types of deprivation; very few children

suffer from no deprivation (2.5%) or one deprivation (8.3%) (11,12)]. More rural-dwelling children (81.5%) were deprived in multiple dimensions, than those in urban settings (62.5%). Specifically, 39% of young children were estimated to be nutritionally deprived.

Water and sanitation: Access to potable water, water for domestic use, environmental sanitation, and resources for personal hygiene in Ghana has improved significantly in recent years [8, 13]. There is, however, limited access to water in rural settings; only 68% of Ghanaians in rural areas have sustainable access to an improved water source, compared to 93% in urban areas (13). Environmental sanitation remains a major development challenge in Ghana; only about half of the households had access to an improved toilet in 2014 (8).

Health system: Ghana's health system has been described as performing relatively well, compared to other West African countries (14). Over the past decade, two key challenges were prioritized in the health sector: 1) financial access, and 2) physical access to health care. The introduction of the National Health Insurance Scheme (NHIS) and the Community-based Health Planning and Services (CHPS) program were considered to have contributed, significantly, to address these challenges. Using, available evidence, enrolment in the NHIS by women of reproductive age was estimated at 62.0% in 2021. (15)].

Review Design

A rapid scoping review approach was utilized for this desk review. A systematic process was employed to search and extract data from multiple databases as part of the review process.

Inclusion and exclusion criteria

Only documents published in the English language, reporting evidence on nutrition and nutrition-related health status across any age group, documents focused on persons living in Ghana, and published within 10 years (beginning from January 2010), were eligible for inclusion. Documents were excluded if they were published within the 10 years, but the evidence was older than the 10 years.

Search strategy

A systematic search was conducted in four electronic databases (Google Scholar, PubMed, ScienceDirect, and JSTOR) to identify peer-reviewed journal articles. In addition, nationally representative survey reports were identified from multiple sources including the web pages of the Ghana Statistical Service, and the Demographic and Health Survey program. University databases and repositories were also searched for relevant documents/publications (including theses). The search strategy included keywords or their appropriate combinations for each database (Table 1). Some documents were unavailable online and, thus, were obtained through personal networks, including officials of government and other key stakeholder institutions. All electronic databases and repository searches were carried out between May 4th and 26th, 2020.

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Screening of papers and Data extraction

All documents obtained through the online search were screened for eligibility using the inclusion criteria indicated above, first by title and abstract, and subsequently, the full-text. Duplicates were removed, before the screening. Data extracted included author name, year of publication, region or district in which studies were conducted, sample size, socio-demographic characteristics of study participants, study methods, and key findings related to nutrition and nutrition-related health outcomes (particularly diet-related non-communicable diseases).

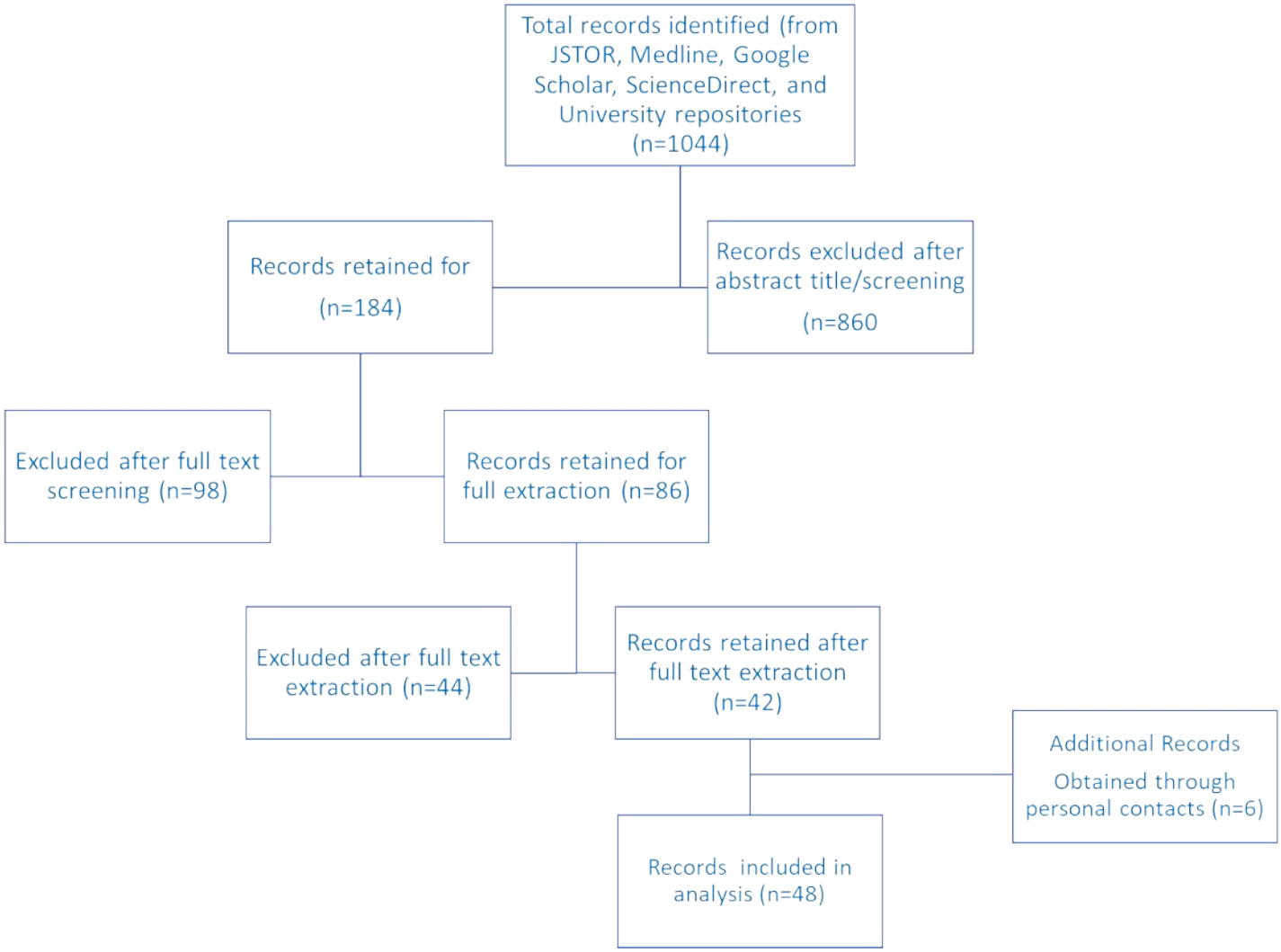

Figure 1: Flow diagram of the study selection process

Synthesis of findings

Data extracted from the documents were analyzed, thematically, and synthesized for narrative presentation. Evidence was organized using a life-cycle perspective (infancy through to aged). Nationally-representative data, where available, were prioritized in reporting nutrition status. Unusual outcomes, reported in sub-national or disaggregated data, were highlighted to demonstrate non-homogeneity of reported outcomes, where they existed.

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RESULTS

The evidence has been synthesized and presented separately for young children, school-age children, adolescents, women of reproductive age, other adults, and the elderly.

Nutrition status and body composition

Infants and young children (0-5 years)

Birth Weight: Weight at birth is determined by maternal health and nutritional status and can predict a newborn's odds of survival, and long-term health.. Two nationally representative surveys reported LBW prevalence : 10% and 15% (8,16). LBW was highest among the poorest households (11%), teenage mothers (12%), and in the Eastern region (13%), There was no evidence of remarkable change in the trend of LBW prevalence over time (8,16).

Growth Faltering: The key indicators of growth faltering among young children are stunting, wasting, and underweight. An estimated 19% (regional range: 10.4% – 33.1%) of children below age 5 years were stunted (8,13,16). Between 2008 and 2017, there was an impressive and consistent decline in stunting (from 28% to 19%). Stunting rates were higher among males, rural dwellers, poor families, and children with less-educated mothers. Wasting among children below 5 years (indicating acute undernutrition), was estimated at between 5% and 7%, in previous surveys. Unlike stunting, there was no consistent pattern of change in wasting, over time.(15,16).

Underweight prevalence ranged between 11% and 13% in nationally-representative survey (8,13,16). The underweight prevalence of 11% reported in 2014 represented a decline from 13% in 2008, but the estimate in 2017 suggests a slight increase in the rate (to 13%). Table 2 below, shows the level and distribution of growth faltering among young children across regions in Ghana; the table highlights the wide inequity in growth faltering rates across regions. A study on concurrent forms of malnutrition among children in Ghana reported that only 1.2% of children had concurrent overweight and stunting (17).

Overweight and obesity:Among young children under five years in Ghana, overweight prevalence was low (3%). There was no remarkable difference in overweight rates across subgroups and over time (13).

Nutrition status and body composition of school-age children in Ghana

Growth faltering : There were no nationally representative monitoring of growth faltering among children in this age group; localized surveys with small sample-sizes were utilized. In a survey of 359 basic school-age children (5-12 years), participating in the Ghana School feeding program (GSFP) in the Eastern Region, 16.2% were stunted, and 9.3% were wasted. The rate of stunting and wasting among those not enrolled in the Ghana School Feeding Program (GSFP) -participating schools were 17% and 5%, respectively, (22). Among rural- and urban-dwelling pupils between ages 3 and 12 years in the Volta Region, prevalence of underweight, stunting, and wasting were

9.3%, 8.5%, and 5.7%, respectively (23). Across all three growth indicators, undernutrition was higher by several orders among children attending public, versus private schools. Pupils in the rural areas were twice as likely to be stunted (AOR = 2.6; 95 % CI = 1.0–6.4; $p = 0.043$). Consumption of two meals a day was associated with the likelihood of underweight (AOR = 6.8; 95 % CI = 1.4–32.2; $p = 0.016$), stunting (AOR = 7.2; 95 % CI = 1.2–43.7; $p = 0.033$), and thinness (RR = 9.4; 95 % CI = 2.0–47.8; $p = 0.007$) compared to those who had at least three meals daily (23). In a study from the Eastern Region, sub-district, sex, age of the pupil, area of residence, and community type were significantly associated with school-age child stunting (22).

Overweight and obesity: No nationally representative studies on overweight existed for this age group. Thus, only evidence from small, localized studies, were included. Among 543 urban-dwelling primary school children in the Adentan Municipality between ages 8 and 11 years, 16.4% were overweight or obese, that is overweight (9.2%) and obesity (7.2%). This was significantly higher in children from middle to high socioeconomic status (SES) households, and also higher among children attending private schools compared to those from low socioeconomic status households and those attending public schools (24)]. Attendance of private school (AOR = 2.44, 1.39–4.29) and long duration of television viewing (AOR = 1.72, 1.05–2.82) were significantly linked with the likelihood of overweight/obese (24)]. Overweight prevalence is about 2% among children exposed to GSFP [22]. From a study in the Volta Region, the overweight prevalence was 4.6%; the overweight rate was higher among urban (7%) compared to rural-dwelling children (1%). As observed earlier, children attending a private school in this study, also had a higher overweight rate (9%) than those who attended public school (3 %) [23].

Nutrition Status and body composition of adolescents (10-18 years)

The key indicators of adolescent malnutrition are underweight, stunting, and overweight (estimated using BMI-for-age). Two large, wide-coverage surveys (but not nationally representative) were synthesized in this section.

Growth faltering: A relatively large survey of more than 3,000 adolescents (average age -12 years) sampled from urban settings in Accra and Kumasi reported an underweight rate of 12.4% among school children between ages 9 and 15 years [27]. In smaller localized studies, the underweight prevalence ranged between 4% and 46% (Table 3). Also, among rural-dwelling adolescents in the Ashanti region of Ghana, 46% were underweight; the underweight rate was higher among males (60% compared to females (32%) [28]. Among peri-urban SAC between ages 9 and 15 years old in Accra, underweight rate was 4% [29]. On the other hand, a study among 650 rural-dwelling school children with average age of 13 years reported underweight rate of 19.4% [30]. In the Asante-Bekwai Municipality, 9% and 11% of basic and high school students, respectively, were underweight [31].

Two localized studies among urban-dwelling adolescents reported stunting prevalence ranging between 3% and 57% [28, 29]. A study of rural-dwelling adolescents with average age: 13 years) reported 50% stunting prevalence. The prevalence of stunting was higher among children in schools participating in the GSFP [31]. Wasting among

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adolescents aged 10-14 years was 30% in Northern Ghana (38% among boys, and 24% among girls) [32]. Although there is no clear pattern from these studies regarding distribution and trends in undernutrition among adolescents, the evidence points to the existence of malnutrition in all its forms among adolescents in Ghana.

Overweight: The 2014 Demographic and Health Survey (DHS), reported BMI for girls between ages 15 and 19 years. In 2014, 21% of adolescent girls were overweight [8]. This represents a large increase from 10.3% in 2008 (Figure 2). These estimates were, however, not standardized by age, for children below 19 years. In 2012, the Global School-based Student Health Survey (GSBSHS) reported an overweight prevalence of 8% among adolescents (13-17 years), similar to 7% observed in 2007 [33, 34]. Sub-national studies among urban-dwelling adolescents reported a higher overweight prevalence (between 12% and 18%) [28, 30].

Nutrition status and body composition of Adults (>18 years)

Overweight and obesity among adults: Nationally-representative overweight and obesity data for adults are routinely gathered as part of the nationally-representative Demographic and Health Survey (DHS) in Ghana. In 2014, an estimated 16% of males and 40% of females in Ghana between ages 15-49 years were over overweight or obese (BMI$\geq$ 25kg/m^2) [8]. Urban women had substantially higher rates of overweight and obesity (49%) compared to rural women (28%); similar patterns were observed for overweight and obesity among urban-dwelling males (23%) versus females (8%). Across regions, the rate of overweight was highest in Greater Accra (57% for females), compared to 12% among females in the Northern region. There was no data available on overweight status for males in the Demographic and Health Surveys (DHS) conducted in 2008; among females, the overweight rate was 30% in 2008.

A recent systematic review reported an overweight rate of 43% among Ghanaian adults [35]; this estimate was consistent with 2014 DHS findings, in terms of estimating higher prevalence among urban-dwellers, women, and more urbanized regions, (Ashanti, Central, Northern, and Greater Accra regions). The Accra women's health studies in 2003 and 2012, indicate a trend of increasing overweight and obesity prevalence among women ore reproductive age [36, 37, 38].

Perceptions of body weight: Three sub-national studies reported data on body image. In a qualitative study among women of reproductive age,some respondents preferred heavier body weight and linked moderate weight gain with a positive outlook among family and friends. However, excessive weight gain is not perceived favourably[39]. There is a cultural perception that linksbeauty and an acceptable body image; 'beauty' is associated with moderate body weight. Also, weight that is gained "naturally" was considered beautiful; medicinally-induced weight gain was not admired. In another qualitative study, one-third of women who perceived their weight as normal wanted to gain or maintain their weight, to be socially accepted [40]. Women who were overweight reported experiencing stigmatizationi and derogatory name-calling [39, 40]. Overweight and obese participants expressed feelings of dislike, shame, and anger when they experience catcalls and derogatory name-calling because of their body weight [39, 40]. In addition, overweight women reported poor self-image, declining

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social lifestyle, increased disease risk, and feeling tired always as a result of being overweight [39]. In a quantitative study, an estimated 72% of women were dissatisfied with their current body size, and 41.8% of women preferred having a smaller figure [41]. Misperception about body weight was observed among some overweight or obese women. More than 50% of obese study respondents perceived themselves to be overweight; some of the obese women expressed desire to gain some more weight.

Nutrition of the Elderly

Overweight and obesity among the elderly: There were no nationally representative data on the nutritional status of the elderly, except for BMI data of older adult males (50-59 years) in the 2014 DHS. Among this group, overweight and obesity prevalence were estimated at 20.1% and 4.9%, respectively. [8]. The relatively large World Health Organisation (WHO) Study on Global Ageing and Adult Health (SAGE) in 2007-2008, and also in 2014/2015 [42] reported a trend of increasing overweight and obesity among the elderly (Figure 3*).*

The 2014 DHS estimated an underweight prevalence of 10.1 % among males between ages 50 and 59 years [8]. Smaller-sized studies reported increasing rates of underweight and overweight among the elderly (figure 3).

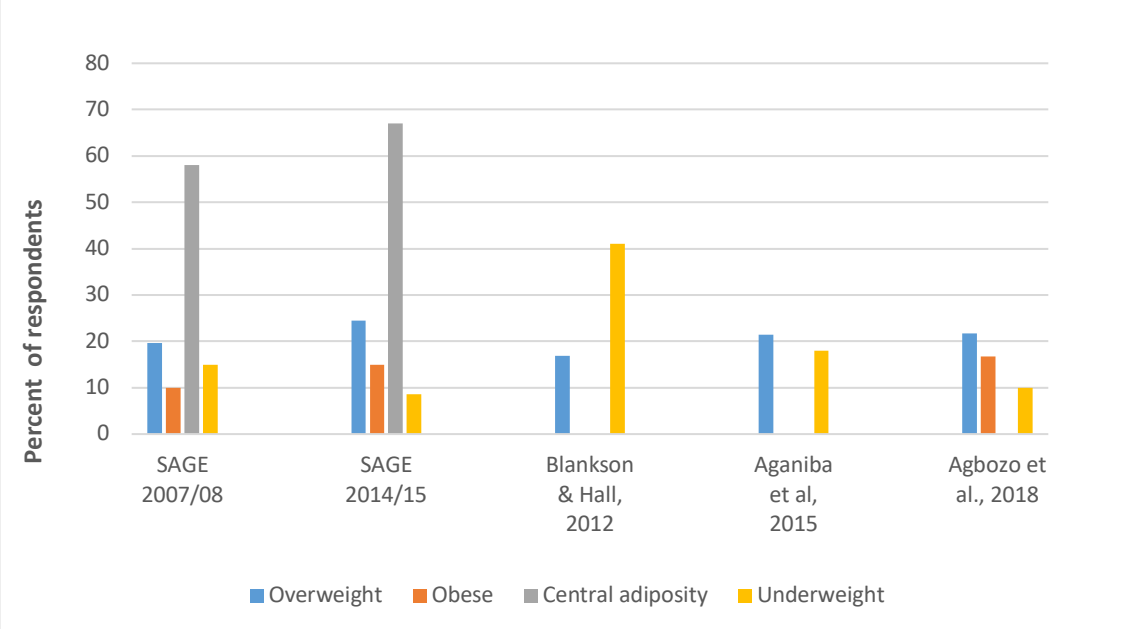

Figure 3: Nutritional status of elderly in Ghana

Anemia status

Infants and young children: Anemia is a proxy for micronutrient deficiency. The 2014 DHS estimated 66% of young Ghanaian children (<5 years) were anemic (Hb< 11g/dL); about 40% were either moderately (7< Hb<9.9 g/dL) or severely (Hb <7g/dL) anemic [8]. Anemia rate was highest among children who were urban-dwelling, younger than 2 years, living in northern Ghana, having parents with lower education, or living in households with fewer assets [43]. In a sub-national study among children 4-9 years old, anemia prevalence of 53.3% was reported [44]. The evidence suggested a declining prevalence at the national level, although at a slow rate.

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School-age children and adolescents: There was limited evidence of anemia among school-age children and adolescents in Ghana, however, three studies were included in this section. The 2014 DHS reported 48% anemia among female adolescents aged 15-19 years [8]. Smaller studies, however, reported lower anemia prevalence. Among urban-dwelling school children in Kumasi and Accra (ages 9 - 11 years), 20.4% anemia was reported [45]. In a rural community in the Volta Region, 31% anemia was reported among children 6-12 years; anemia among girls was twice the estimate for boys [46].

Adults: The 2014 DHS reported anemia prevalence of 42% among females between ages 15 and 49 years; no data was found on anemia among adult males. About one-third of anemia (32%) among women was mild, and 10% was moderate. Prevalence of anemia was highest among women ages 15-19 years (48%), and the estimate was lowest among 30-39 year-olds [8]. About 54% of pregnant women were anemic in 2016 [47]. A more recent national-level survey reported 22% anemia among non-pregnant women; 7% was moderate and 14% was mild anemia. No significant differences were observed in the prevalence of anemia among pregnant women by age, residence, educational status, or household wealth [16]. In a localized study in four districts in the Ashanti Region of Ghana, the prevalence of anemia was 56% among pregnant women [48]. Anemia prevalence was higher among rural, compared to urban-dwelling women. The majority of women also had inadequate intakes of iron, zinc, folate, calcium, and vitamin A. A scoping review in 2016 reported that Iron Deficiency Anemia (IDA) prevalence ranged from 4% to 68% [43]

Iron Status

Infants and young children: The 2017 micronutrient survey reported that about one-fifth of children in Ghana (21.5%) were iron-deficient (ID); IDA affected about 12% of children ages 6-59 months [16]. The prevalence of ID and IDA was higher in boys than girls. Similar to the trends of anemia, the prevalence of ID and IDA was substantially higher in Northern Ghana where the IDA rate was nearly 30% IDA [16]. There was no evidence demonstrating the trend of ID and IDA among young children in Ghana.

Adults: The rate of ID and IDA was about 14% and 9%, respectively among non-pregnant women. Among women with anemia, 41% had concurrent ID [16]. No significant differences in the prevalence of ID or IDA were observed by age, residence, educational status, or household wealth [16].

Vitamin A Status

Infants and young children: About one-fifth (21%) of young children in Ghana were estimated to be vitamin A deficient [16]. There were no significant differences in the prevalence across age groups, sex, residence, and supplementation in the six months before the study. Significant differences were, however, observed by the wealth quintile. A higher Vitamin A deficiency rate was observed among children in Northern Ghana (31%) [16].

School-age children and adolescents: Only two studies reported vitamin A deficiency among adolescents in the studied 10 years. The 2017 micronutrient survey reported a

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low rate (<1%) of Vitamin A deficiency (that is low retinol-binding protein) [16]. In the Volta region, a small survey of 101 children (2-10 years) reported that 36% were Vitamin A deficient (serum retinol<20µg/dl) [49].

Adults: Vitamin A deficiency was rare among adult women in Ghana. Only an estimated 1.5% of non-pregnant women of reproductive age (15-49 years) in Ghana were Vitamin A deficient (Retinol Binding Protein). Vitamin A deficiency among women in Northern Ghana was only slightly higher (4%) than the national average. Vitamin A deficiencywas also relatively elevated among women in the lowest (3.2%) and fourth (3.0%) wealth quintiles. [16, 50].

Iodine Status

An estimated 500,000 children in Ghana were at risk of permanent brain damage due to Iodine Deficiency Disorders (IDD) [51]. At the national level, 5.2% of the entire population had Urinary Iodine Concentration <50µg/L, indicating mild iodine deficiency [51]. Following the introduction of mandatory salt iodization program in Ghana, in 1994, household use of iodized salt gradually increased, from 27.1% in 1998 to 55.0% in 2006 and then to 100% in 2011, although for many households sampled, the level of iodine was low (≤8 parts per million) compared to the national fortification standard of 50 parts per million [52, 53]. Nationally, only 29.3% of households used adequately iodized salt (>15ppm iodine) in 2015. The use of adequately iodized salt was higher (31.4%) among urban compared to rural (25.2%) households [51].

School-age children and adolescents: Four studies reported on iodine deficiency among young children and adolescents in the studied 10 years. Prevalence (based on urinary iodine concentration (UIC) <100 µg/dl) ranged between 94% (rural community) to 12.8% (among males and 19.5% among females) in an urban area [49, 54]. One scoping review reported concerns about excess intake of iodine [55]. In one urban study, about 34% of male and 28% of female children (ages 6-12 years) were at risk of excessive iodine nutrition (≥300 μg/L) [54].

Adults: The median Urinary Iodine Concentration (201.6µg/L) reported in the National iodine survey of 2015 indicated that optimal iodine status had been achieved among women of reproductive age in Ghana, at the national level [51]. In a localized study, a wide variation in UIC (5.2– 1165.9_g/L) was observed, and a 42.5% prevalence of iodine deficiency was reported among pregnant women [56]. Among women who reported the use of iodized salt in their homes, only 16.2% had mild iodine deficiency. About a quarter (27%) of pregnant iodized salt consumers had excess UICs (≥500 µg/L), indicative of excessive iodine consumption. Among women who reported no iodized salt use, 35%, 30%, and 30% were diagnosed with severe, moderate, or mild iodine deficiency, respectively [56]. Evidence showed that fortified processed foods (including condiments) may be a significant source of dietary iodine [50]. This was suggestive of possible household exposure to excessive dietary iodine (>15 parts per million) from other sources, rather than iodized salt [57].

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Zinc Status

School-age children: Among school-age children, low zinc status had been reported among 30-50% of them [49, 58]. About 44% of young children had inadequate zinc intake and more than 30% were zinc deficient (70µg/g), based on hair and serum sample testing [49]. In Northern Ghana, 64.9% of children had inadequate zinc intake; this estimate exceeds the threshold of high risk (25%) in the population, which necessitates interventions to increase dietary zinc intake [59].

Adults: There was limited evidence on zinc deficiency among adults. Two studies in a rural setting in Ghana reported zinc deficiency rating from 4%-15% among pregnant women and non-pregnant women, respectively [60, 61].

Other micronutrients

Evidence was available on the status of folate and vitamin B12 deficiencies in Ghana. The 2017 micronutrient survey reported 54% folate deficiency among non-pregnant women (15-49 years); no differences were found in prevalence by age, urban/rural residence, or across other groups [15]. Folate supplementation in the previous 6 months slightly reduced the likelihood of developing folate deficiency, p-value-0.05). A smaller localized study also reported a 71% prevalence of folate deficiency among the rural adult population in Asesewa, Upper Manya Krobo District of Ghana [62]. The study also reported a 7% prevalence of vitamin B12 deficiency. No significant differences were reported across subgroups [15]. No evidence was found on micronutrient deficiencies among the elderly in Ghana.

Diet-Related Diseases in Ghana

About 86,200 non-communicable disease (NCDs) deaths occured annually, in Ghana, [63]. Over 55% of reported NCDs occured among individuals <70 years. In 2016, NCDs accounted for 37% of all deaths and 43% of deaths in 2010. [64]. Non-communicable diseases were more common among men, compared to women. Diet and alcohol were important risk factors of NCDs in Ghana. Main diet-related NCDs in Ghana included hypertension, diabetes, and obesity.

Hypertension: Hypertension was identified among the top 10 causes of admission to hospitals in Ghana. It was also among the leading causes of mortality among adults in Ghana [65]. A review of studies published on hypertension between 1973 and 2009 showed that the prevalence of hypertension was increasing over time as well as with age. The increasewas especially high in urban (54.6%) areas [66]. The 2014 DHS reported a 13% prevalence of hypertension among women and men aged 15-49 years [8]. It also reported that 63% of women and 86% of men had undiagnosed high blood pressure. Hypertension prevalence was highest among urban dwellers, overweight individuals, or those living in the wealthiest households [8]. About 70% of persons with hypertension were not receiving treatment [64]. Salt consumption had been linked positively with both systolic and diastolic blood pressure [66, 67]. In Ghana, median salt intake had been estimated at 8.3g/day [68, 69], higher than WHO's recommended daily intake of <5 grams/day to prevent hypertension [62].

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Diabetes: Type II diabetes is common in adults and accounts for almost 90% of all diabetes cases [70]. There were six documents identified on diabetes. The prevalence of adult diabetes was about 9% in Ghana [64]. The weighted prevalence of diabetes among adults 50 years and above in Ghana was 3.9% [71]. A meta-analysis reported a diabetes prevalence of 6.5%, [72]. Studies in the general population estimated between 3% and 7% diabetes prevalence. Diabetes prevalence increased with age and was higher in urban areas [70, 72, 73]

Cancers in Ghana: In 2012, the global cancer observatory estimated that 16,600 cases of cancer occured annually in Ghana, yielding an age-standardized rate of 109 cases per 100,000 persons [74]. The most frequent cancers in men were prostate and Non-Hodgkin's Lymphoma. Cancers of the cervix, breast, and liver were the most frequently observed cancers in women [74]. In Ghana, attempts have been made at providing data on cancers but these have largely been hospital-based data [75]. In 2018, a total of 22,823 new cases of cancer were recorded in Ghana; breast (20.4%) and cervical (13.8%) cancers were most common (Figure 4). An estimated 15,089 cancer deaths occurred in 2018 [76].

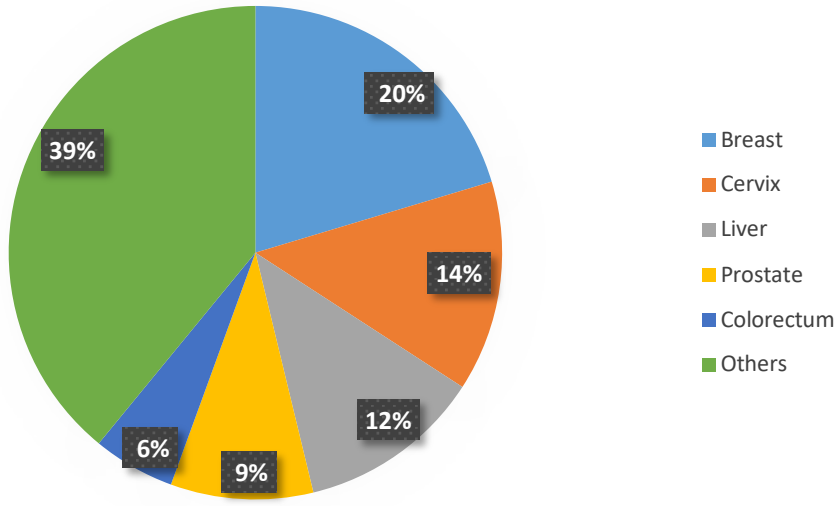

Figure 4: Incidence of cancers in Ghana, 2018, (76)

All age groups are affected by cancer in Ghana. However, the prevalence is highest among the elderly with a mean age of 52 years for those affected [75, 77].

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DISCUSSION

This review showed that although undernutrition has declined substantially in the past decade, chronic undernutrition among young children remains unacceptably high, and demands attention to be addressed, together with the persistently high rates of maternal and child anemia [8]. Unaddressed undernutrition among these vulnerable groups of society will continue to precipitate a wide range of adverse health and wellbeing effects including poor cognition and educational performance among children, low adult earning, productivity and capacity, increased risk of excessive weight gain later in childhood/adulthood, and increased risk of nutrition-related chronic diseases in adult life [78].

There is, currently, no existing national implementation plan with targets for reducing undernutrition. However, policies and programs across multiple sectors have prioritized stunting reduction and undernutrition as important health and human development issues [79, 80]. Thus, for Ghana to achieve further reductions in undernutrition rates, there is a need for a national-level implementation plan that is adequately funded and coordinated, with adequate coherence across relevant sectors and also across sub-national hierarchies. Lack of coordinated response has been identified as a key barrier to achieving improved nutrition programing in Ghana [81]. This review also revealed important sub-group differences in undernutrition among children and women. Thus, to be effective, an effective national nutrition implementation plan needs to recognize the important inequities in undernutrition across various subgroups (location, gender, access to amenities/services, and household characteristics) [82].

In addition to undernutrition, the review has identified the co-existence of undernutrition with high and rapidly increasing rates of overweight/obesity and diet-related non-communicable diseases (DR-NCD). This is characteristic of the global situation of double-burden of malnutrition, characterized by co-existing undernutrition and overnutrition [4] which is especially prevalent in developing country settings [83, 84]. As reported in other settings, overweight rates were, remarkably higher among adult females, compared to males. Although DR-NCD rates are relatively low, the 2014 DHS suggests that the majority of the population have undiagnosed NCD conditions [8]. At the time of this review,there were no population-based public health interventions to address overnutrition in Ghana. Thus, interventions are needed to simultaneously address undernutrition, and overnutrition, and associated health and wellbeing outcomes.

The current health system in Ghana and many other developing countries have been designed to respond to infectious diseases and undernutrition, the so-called diseases of poverty [85]. To be able to address co-existing undernutrition and overnutrition, there is a need for systemic re-orientation of health system capacity and focus. Overweight and DR-NCDs are the result of factors originating from defective food systems, dysfunctional city design, inappropriate use of technologies, and unhealthy work behavior and lifestyles, and human lifestyles and situations that increase the risk of DR-NCDs [86]. Because malnutrition is multifactorial, the solutions needed to prevent and control malnutrition and DR-NCDs must be harnessed across a restructured multi-

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sectoral response system that includes multiple sectors including health, agriculture, social protection, education, and local government. This response system needs to also effectively and ethically engage key stakeholders in the media, research/academia, and industry [87, 88, 89].

Currently, several cross-sectoral actions are ongoing in Ghana and are aimed at addressing malnutrition and DR-NCDs in Ghana. The Ghana Health Service' NCD Unit is leading a process for updating the National NCD strategy. The Women in Agriculture and Development Directorate of the Ministry of Food and Agriculture is also leading a process for the development of Food-Based Dietary guidelines for Ghana. In addition to these, there is a need for increased political will, adequate financial investment, and coherent implementation across all relevant agencies to achieve the best outcomes from these initiatives [90].

CONCLUSION

The findings from this review indicated that both undernutrition and overnutrition across various population subgroups in Ghana remain a major problem. Multidisciplinary population-level interventions are needed to prevent exposure of the population from becoming malnourished.

Limitations of the study

This review used evidence originating mostly from national surveys complemented by localized cross-sectional studies. Thus, the findings are not generalizable for all outcomes. Nationally representative studies are warranted for estimating the burden of malnutrition and especially DR-NCDs.

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Table 1: Keywords used in searching literature databases

Database	Issue of interest	Keywords	Date of search
Pubmed	Growth faltering Nutritional status	Child, School-age, children, adolescents, adults, elderly, Under–fives, Preschool, stunting, wasting, underweight, Overweight, Obesity.	06-09/05/2020
JSTOR	Micronutrient malnutrition / deficiency Perception of body image/overweight Diet-Related Non communicable Diseases	Anemia Iron Deficiency Anemia Iodine / Zinc /Vitamin A/ Folate Deficiency	10-16/05/2020
Google Scholar		Body image, perception, obesity, Ghana	07-20/05/2020
Science Direct		Non-communicable, High blood pressure, Hypertension, High blood sugar, diabetes, cancers, diseases, Ghana	10-14/05/2020
University repositories			20-29/05/2020

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Table 2: Subnational Child stunting, underweight, wasting and anemia trends in Ghana (2003-2014)

	Stunting			Underweight			Wasting			Anemia		
	2003	**2008**	**2014**	**2003**	**2008**	**2014**	**2003**	**2008**	**2014**	**2003**	**2008**	**2014**
Greater Accra	13.9	14.2	10.4	11.5	6.5	3.7	7.2	5.9	8.7	61.3	62.1	59.6
Ashanti	29.1	26.5	16.1	20.8	12.1	3.5	6.7	9.2	9.4	79.0	77.9	53.7
Brong-Ahafo	29.4	25.2	17.2	20.4	13.5	4.5	5.7	5.4	5.9	74.9	78.3	62.5
Eastern	27.4	37.9	17	17.3	8.7	3.2	6.2	6.4	7.9	74.4	73.1	66.1
Volta	23.3	26.8	19.3	25.7	13.6	2.5	13.9	5.2	10.5	72.7	78.7	69.9
Central	31.6	33.7	22	22.0	17.2	7.7	3.0	12.0	13.9	76.8	84.5	70.2
Western	28.4	27.0	17.7	16.5	10.3	3.9	5.3	5.6	10.6	80.4	80.4	64.6
Upper East	31.7	36.0	14.4	32.4	27.0	9.4	12.9	10.8	10.8	79.1	88.5	73.8
Upper West	34.1	24.6	22.2	25.9	13.1	4.4	11.0	13.9	13.5	78.3	88.2	73.8
Northern	48.8	32.4	33.1	35.5	21.8	6.3	6.6	12.9	20.0	82.5	81.4	82.1
National	29.9	28.0	18.8	22.1	13.3	11.0	7.1	8.5	4.7	76.1	77.9	65.7

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Table 3: Nutritional status and body composition of children, adolescents, and adults in Ghana

Outcome	Summary rate	Subgroups	Indication of trend	Source of evidence
Young children				
Stunting	18.8%	• Av. 24% in Northern Ghana • NR=33% • VR=19%	Decreasing Prevalence (28% in 2008 (DHS) & 22.7% in 2011 (MICS	GSS, 2018, DHS, 2014 Kwabla et al., 2018) Agbozo et al., 2016 MNS 2017
Underweight	11%	UER=9.4% NR=6.3%	2003 (22.1%) 2008 (13.3%)	DHS, 2014
Wasting	5%	NR= 20%	2008(8.5%)	DHS, 2014
Overweight	<5%			
School-age children	2 studies in Eastern region and Urban volta region among 3-12 years old children.			
Stunting		16.2% (GSFP) & 17% (None GSFP) in ER 8.5% in Volta region	No clear trend	Kwabla *et al*., 2018 Agbozo *et al*., 2016
Thinness		9.3% (GSFP) 5% (None GSFP) – in rural (ER) , 5.7% in VR (Urban)	No clear trend	Kwabla *et al.,* 2018 Agbozo *et al*., 2016
Underweight		9.3% (VR)		
Overweight		Accra primary school children (Urban) 16.4%(7.2% obese) 2% (rural ER) & 7% in Volta (urban)	No clear trend	(Adom *et al*., 2019 Kwabla *et al*., 2018 Agbozo *et al*., 2016

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Adolescents Overweight	21% (13-19 years) in 2014	Accra/Kumasi basic Sch children (urban)=18% Accra basic school children=12% GSBSHS - 8%.	Increasing – 10.3 in 2008	DHS, 2014 Alangea, 2014; Aryeetey *et al*., 2017 WHO, 2012
Underweight		Accra/Kumasi basic Sch children (9-15years) (urban)=12.4% Rural-dwelling school children (19.4%)		Aryeetey *et al*., 2017 Appiah & Laar, 2014

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Table 4: Micronutrient deficiency across the lifecycle

Outcome	Summary rate	Subgroups	Indication of trend	Source of evidence
Young children	Anemia: 66% (DHS); 35.7% (MNS)	Av. Northern GH= 77% NR= 82.1%	Slight decrease- (77.9% in 2008)	DHS 2014, 2008
	Iron deficiency: 21.5%	Higher in boys, IDA- 30% in Northern Ghana.		MNS, 2017.
	Vitamin A deficiency - 20.8%	9% in wealthier households 31% in Northern Ghana		MNS, 2017
Adolescents	Anemia: female adolescents aged 15-19 years -48% Iodine deficiency:	Urban pupils (20.4%) Rural pupils (31%) 12.8% of male and 19.5% of female children (2-10)		Lartey *et al.,* unpublished). Egbi *et a.l,* (2014)
	Vitamin A deficiency - <1% among non-pregnant adolescents	36% in Volta region (2-10 year olds)	Vitamin A deficiency - <1% among non-pregnant adolescents	MNS, 2017
Adults	Anemia: WIFA -42% (32% Mild and 10% Moderate Anemia)	Highest among 15-19 years-48% Pregnant women -54.3% in 2016 Non- pregnant women - 22% Among rural dwelling adults – 56.5%	Unclear	DHS 2014, MNS, 2017 World bank, 2020 Ayensu *et al.*, 2020

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Iron deficiency- 14% among non-pregnant women	Iron deficiency anemia among non-pregnant women- 9%	MNS, 2017
Vitamin A deficiency 1.5% of non-pregnant women 15-49 years	4.1% in northern Ghana Lowest wealth quintile- (3.2%)	MNS, 2017
Iodine deficiency- National level -5.2%	Women who use iodized salt- 16.25 % mild deficiency. Women with no iodized salt use – 35 % severe deficiency.	Simpong *et al.*, 2016 National Iodine Survey, 2017

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