



## Nutrition and public health in Georgia: reviewing the current status and inspiring improvements: a joint event of the Georgian Nutrition Society, The Nutrition Society of the UK and Ireland and the Sabri Ülker Foundation, October 2023

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### Abstract

Georgia lies to the northeast of Türkiye, having a western border on the Black Sea. With a population of some 3.73 million, Georgia has a tradition of gastronomic excellence dating back millennia. However, changing lifestyles and external influences have, as elsewhere, led to problems of suboptimal nutrition, and lifestyle-related diseases and disorders prevail. There is considerable scope for improving the focus on public health (PH) and nutrition in Georgia. With this in mind, the Georgian Nutrition Society teamed up with The Nutrition Society of the UK and Ireland and the Sabri Ülker Foundation, a PH charity based in Istanbul, Türkiye, to host a conference and workshops in Tbilisi, Georgia. The primary purpose was to review the current status of PH and nutrition in Georgia with reference to the situation elsewhere, to share examples of best practice and to identify opportunities for improvement. A particular highlight was the presentation of a programme of nutrition education for family physicians recently implemented in Türkiye. This summary of the proceedings is intended as a blueprint for action in Georgia and also to inspire others to consider how PH might be improved via a focus on balanced nutrition.

**Keywords:** Nutrition education: Nutrition policy: Health literacy: Disease risk reduction: Physicians nutrition education

The contribution of optimum nutrition to public health (PH) has been brought into sharp focus as the disparity between overall life expectancy and healthy life expectancy increases in many countries around the world. Georgia has a rich gastronomic tradition, and during the latter part of the 20th century, the Scientific Research Institute of Sanitation, Hygiene and Medical Ecology in Tbilisi took a lead in food hygiene research and

teaching. However, circumstances have changed, and today Georgia has a lower life expectancy than that of neighbouring Türkiye and throughout Europe. The country does not currently have the infrastructure required to offer formal qualifications in dietetics or nutrition, nor does it have an accreditation procedure for practitioners. The Georgian Nutrition Society, the Nutrition Society of Great Britain and Ireland and Sabri Ülker Foundation

**Abbreviations:** AfN, Association for Nutrition; BDA, British Dietetic Association; DALY, disability-adjusted life year; NCD, non-communicable disease; PH, public health; SÜF, Sabri Ülker Foundation.

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(SÜF) came together in Tbilisi on 3–4 October 2023 to review opportunities to make a positive difference. Inspiration was derived from a variety of sources including the highlights of a conference held in Istanbul, Türkiye, in 2022 on the theme '*Achieving health through diet*'<sup>(1)</sup>, and examples of best practice from the UK and Türkiye.

Eka Bobokhidze and Manana Stanley provided an overview of the health and nutrition status of the Georgian population and highlighted opportunities for improvement.

According to the Global Health Observatory data repository, in 2023, average life expectancy and healthy life expectancy of Georgians were 73.3 and 64.2 years, respectively<sup>(2)</sup>. Hence, almost a decade of the latter years is spent with one or more chronic diseases. The prevalence of diabetes was estimated to be 6.8% in 2021 by the International Diabetes Federation<sup>(3)</sup>.

The top five leading causes of death in 2019 were ischaemic heart disease (400.69 deaths per 100 000 population), stroke (299.47), hypertensive heart disease (109.77), cirrhosis of the liver (46.82) and Alzheimer's diseases and other dementias (45.7)<sup>(4)</sup>.

The top five leading causes of disability-adjusted life years (DALY) in Georgia for both sexes were ischaemic heart disease (6982.06 DALY per 100 000 population), stroke (5429.25 DALY), diabetes mellitus (1787.08 DALY), hypertensive heart disease (1603 DALY) and cirrhosis of the liver (1420.35 DALY)<sup>(5)</sup>.

According to the most recent statistical yearbook from the National Centre for Disease Control and Public Health, in Georgia between 2000 and 2018, there was an increasing trend of circulatory system diseases among the population. However, in 2019, there appeared to be a shift in this trend, and the recorded incidence rate for these diseases decreased sharply from 277.0 per 100 000 in 2018 to 92.1 in 2019<sup>(6)</sup>. This observation could be due to a change in the method of disease registration, and clarification is needed.

The Western diet has a significant influence on Georgia's current dietary pattern, reshaping traditional eating habits and introducing a variety of processed foods and convenience-oriented choices. With the increasing availability of fast-food chains, sugary beverages and pre-packaged snacks, Georgian cuisine has witnessed a shift towards a more Westernised pattern. This transition has been marked by an increased consumption of refined sugars, saturated fats and processed meats, contributing to a rise in health concerns such as obesity and related diseases. The cultural exchange facilitated by globalisation has not only altered the nutritional landscape but has also demonstrated a need for increased awareness about the potential health repercussions associated with adopting a Westernised diet.

Surveillance of non-communicable diseases (NCD) risk factors showed that majority of the adult population (92.4%) have one or more risk factors associated with developing NCD<sup>(7)</sup>. More than a third of the population (36.1%) have three to five risk factors<sup>(7)</sup>. Diet-related risk factors included in this study were low consumption of fruits and vegetables, high consumption of salt and being overweight.

Georgia is currently missing national food intake data, and this hinders decision-making processes in planning and implementing PH policies. The following assessment of the

nation's nutritional status is a summary from various international sources that are based on modelling and may not reflect the reality.

The health status among infants and children under 5 years old has shown significant improvement during the last couple of decades. Between 2005 and 2018, rates for overweight, wasting and stunting have decreased from 20.8, 3.0 and 14.6% to 6, 0.6 and 5.8%, respectively<sup>(8)</sup>. Conversely, the prevalence of overweight and obesity among older children (>5 years) and adolescents is increasing. Since 2000, the prevalence of excess weight among children and adolescents has increased from 12 and 14% to 22.9 and 20.2% for boys and girls, respectively<sup>(9)</sup>. The prevalence of overweight and obesity among the adult population shows alarming rates with more than half of the population estimated to be overweight or obese (56.8% male; 55.4% female)<sup>(10)</sup>. Information about malnutrition is not available.

Nutrition research is at an early stage of development in Georgia. Hence, the opportunity exists to implement best practices from around the world.

Many Georgian health professionals and academics, in particular from the younger generation, are very keen to contribute to developing nutrition and nutrition science in Georgia.

The wide variety of foods, eating habits and lifestyles in Georgia deserve investigation with the collaboration of our international partners with a view to highlighting best practice and hopefully reducing disease risk and maintaining good health.

John Mathers introduced the global challenges for nutrition and health including the adverse effects of both under- and overnutrition and the importance of considering the wider environment when developing interventions.

In a typical year, poor diet is responsible on a worldwide basis for 11 million deaths and significant morbidity, equivalent to over 250 million DALY<sup>(11)</sup>. This diet-related burden of ill health is shared by those in higher and in lower-income countries. Although the focus has shifted recently towards diseases associated with overnutrition, undernutrition remains a significant PH issue. For example, a recent survey of eleven different countries with different levels of economic development showed that deficiency of micronutrients was common in both non-pregnant women of childbearing age and in preschool children<sup>(12)</sup> and affected a majority of individuals in several countries. There is a close relationship between nutrition and immune function and good understanding of some of the mechanisms through which undernutrition impairs immune function<sup>(13)</sup>. When combined with poverty that increases exposure to infections, undernutrition leads to more severe/prolonged infections and greater mortality<sup>(14)</sup>.

For the past 3–4 decades, the prevalence of obesity has been increasing globally with particularly rapid increases in countries including China<sup>(15)</sup> and India<sup>(16)</sup> that have been undergoing rapid economic development. Importantly, this rise in adiposity has occurred in both urban and rural areas in both adults<sup>(16)</sup> and children<sup>(17)</sup>. Obesity is a driver of common NCD including CVD, type 2 diabetes, fatty liver disease, age-related dementia and multiple cancers. NCD are major causes of morbidity and mortality globally, for example, 6.7 million deaths were due to



type 2 diabetes in 2021<sup>(18)</sup>. In the absence of effective interventions, it is predicted that 1.27 billion people will be living with type 2 diabetes in 2050<sup>(19)</sup>.

There are well-established healthy eating guidelines to reduce NCD risk<sup>(20)</sup>, but the continuing rise in obesity prevalence cautions against reliance on individual-level actions to improve dietary choices. The global obesogenic environment is complex and is shaped by commercial actors that have major influences on food availability and food choice. For example, the Westernisation of the Chinese diet, including more meat and industrially prepared foods, has been linked with adverse effects on PH<sup>(21)</sup>. There is an urgent need for a greater understanding of the commercial determinants of health<sup>(22)</sup> and the use of this understanding to develop effective interventions nationally and, globally, to improve dietary choices and to improve health at all stages of the life course.

Diána Bánáti provided an overview of the obesity epidemic in Europe. Obesity is a complex multifactorial disease. Abnormal or excessive accumulation of fat is a serious PH challenge globally, being a major determinant of disability and death. Overweight and obesity are the fourth most common risk factors for NCD after high blood pressure, dietary risks and tobacco. The burden of NCD has increased continuously over recent years worldwide. In Europe, NCD caused 90 % of deaths in 2021 and 85 % of years lived with disabilities<sup>(23)</sup>. Numerous medical conditions are associated with obesity including CVD, diabetes mellitus, musculoskeletal complications, chronic respiratory diseases and mental health problems. Excess body weight increases the risk of thirteen types of cancer<sup>(24)</sup>.

More than 50 % of adults in fifty out of fifty-three member states in the WHO European Region live with overweight or obesity. Nearly one-third of children (29 % of boys and 27 % of girls) are also affected<sup>(24)</sup>.

The highest levels of overweight (including obesity) in Europe are found in Mediterranean and eastern countries. The highest rate is in Türkiye where more than 60 % of both sexes are affected, followed by Malta, Israel, UK, Andorra, Greece, Czechia, Bulgaria, Spain, Hungary and Ireland. The highest levels of obesity are also found in Mediterranean and eastern countries. More than 25 % of both sexes are obese in Türkiye, followed by Malta, UK, Hungary, Lithuania, Israel, Czechia, Andorra, Ireland, Bulgaria and Greece<sup>(24)</sup>. Obesity in Europe has risen by 138 % since 1975.

Unhealthy body weight in early life can affect the risk of obesity later in life<sup>(24)</sup>. Obesity is linked to greater morbidity and mortality from COVID-19<sup>(25,26)</sup>. Increases in the consumption of foods high in fat, sugar and salt have been observed during the pandemic<sup>(27–29)</sup>. Obesogenic (digital) food environments increase the likelihood of overconsumption of energy-dense, nutrient-poor foods.

Several policy frameworks and action plans have been designed to halt the rise in obesity in Europe<sup>(30–33)</sup>. However, PH systems are still failing to slow the increase in risk factors. The WHO European Programme of Work<sup>(30)</sup> calls for united action for better health. The three core priorities are (1) moving towards universal health coverage, (2) protecting people better against health emergencies and (3) promoting health and well-being.

One of the flagship initiatives focuses on healthier behaviours, including how to incorporate behavioural and cultural insights. With this, WHO/Europe intends to invest in new insights that can help to build a culture of health in which everyone is enabled to make healthy choices. The initiative will promote the use of insights into social, behavioural and cultural factors to improve health literacy.

In 2014, the WHO launched its healthy diet guidelines, and FAO-WHO documented the concept of healthy diets<sup>(34)</sup>. Poor diet is a leading risk factor for the development of NCD and premature mortality. Poor diets impede healthy growth and development and affect many body functions. Over 8 million lives every year could be saved by the adoption of a healthy diet. There is a great diversity of healthy dietary patterns, reflecting different cultures, traditions, preferences and practices, all sharing the key characteristic of supporting the highest level of health and well-being. FAO and WHO are updating their concept of healthy diets to reflect the latest scientific evidence for the relationship between diet and human health but also recognise the intricate linkages between human and planetary health through sustainable agrifood systems<sup>(35)</sup>.

In its latest report on *The State of Food Security and Nutrition in the World 2023*<sup>(36)</sup>, FAO also discusses healthy diets in the light of urbanisation and food system transformation. In an urbanising world, technology and innovation are key enablers for agrifood systems transformation.

Oliver Shannon discussed the impact of a Mediterranean-like diet on cognitive function and dementia risk and the potential to adopt this healthy dietary pattern in non-Mediterranean settings such as the UK.

Dementia is a leading cause of morbidity and mortality, with considerable social and economic costs<sup>(37)</sup>. While promising pharmacological treatment options for Alzheimer's disease – the most common cause of dementia – are beginning to emerge<sup>(38,39)</sup>, these drugs are expensive, have potentially severe side effects and may not be accessible to all<sup>(40)</sup>. Consequently, the identification and implementation of feasible, acceptable and effective strategies to prevent dementia remain a priority.

Modification of diet represents a potential strategy to help maintain better cognitive function in later life and to reduce dementia risk<sup>(41)</sup>. In particular, research suggests that the adoption of a Mediterranean-like diet could lead to better cognition and lower dementia incidence in older adults<sup>(42)</sup>. Hallmark features of the Mediterranean diet include high intake of plant-based foods, abundant use of olive oil, moderate intake of fish and wine and low intake of red/processed meat and sugar-rich drinks, cakes and pastries<sup>(43)</sup>.

While much of the data supporting the adoption of a Mediterranean-like diet comes from studies conducted in the Mediterranean Basin<sup>(42)</sup>, evidence from two recent large-scale observational studies<sup>(44,45)</sup> suggests similar beneficial associations may also be apparent in the UK. First, in an analysis of >8000 older adults from the European Prospective Investigation into Cancer-Norfolk cohort, higher adherence to the Mediterranean diet was associated with better global cognition, verbal episodic memory and simple processing speed<sup>(44)</sup>. Second, in an analysis of >60 000 older adults from the UK Biobank cohort, individuals in the highest *v.* lowest tertile of



adherence to the Mediterranean diet had a 23 % lower risk of dementia<sup>(45)</sup>. Promisingly, recent data from a small ( $n$  104) randomised controlled trial<sup>(46)</sup> – the MedEx-UK study – show that adoption of a Mediterranean-like diet for at least 6 months is feasible and acceptable in older adults in the UK and improves both general cognition and memory<sup>(47)</sup>. Therefore, consumption of a Mediterranean-like diet could represent a potential strategy to improve cognitive function/reduce dementia risk in older adults, and adoption of a Mediterranean-like diet in a UK setting appears to be both feasible and acceptable. Large-scale randomised controlled trials are now required to explore the potential to adopt a Mediterranean-like diet for dementia risk reduction on a population scale.

Julian Stowell provided an overview of the health and nutrition status of the Turkish and UK populations, highlighting a selection of initiatives designed to improve the situation.

The average life expectancy is 78 years in Türkiye and 81 years in the UK. However, the average *healthy* life expectancy is just 68.4 years in Türkiye and 70.1 years in the UK, and chronic disorders and diseases are common in later life<sup>(1,48)</sup>. The main causes of death are CVD and cancers, and cases of dementia are increasing<sup>(49)</sup>. Some 66.8 % of the adult Turkish population and 64 % of the UK population are overweight or obese<sup>(50,51)</sup>. In 2021, age-adjusted diabetes prevalence was 14.5 % in Türkiye and 6.3 % in the UK<sup>(52)</sup>.

In both Türkiye and the UK, salt intake, saturated fat consumption and energy intake are excessive. Micronutrient deficiencies persist including Fe, vitamin D and iodine (27.8 % of the Turkish population). Fruit, vegetable and dietary fibre intakes are suboptimal<sup>(1)</sup>. In Türkiye, a National Obesity Action Plan encompasses food standards for school children, increased physical activity, updated National Dietary Guidelines and many initiatives to raise awareness about lifestyle-related diseases<sup>(53)</sup>. The Turkish and World Diabetes Foundations have together implemented a diabetes education programme with promising results<sup>(53)</sup>. A healthy eating and obesity prevention programme in Istanbul includes the provision of 35 000 bicycles and publicly available sports trainers<sup>(1)</sup>. The SÜF has championed nutrition education in schools.

Average life expectancy in Türkiye has increased from 41 years in 1950 to 75 years in 2015, an impressive improvement<sup>(54)</sup>.

In the UK, the *Eatwell Guide* offers a clear depiction of food-based dietary guidelines<sup>(55)</sup>. A recent English Government plan to tackle obesity includes restrictions on less healthy foods, wider energy labelling and investment in school sports<sup>(56)</sup>. A soft drinks industry levy, implemented in 2018, has resulted in a 35 % reduction in sugar sold via soft drinks, but overall *per capita* consumption has remained constant<sup>(57)</sup>. On a positive note, the Diabetes Remission Clinical Trial reported a 46 % remission of Type 2 Diabetes Mellitus following a 12-week energy-restricted diet, sustained after 5 years when weight loss was maintained<sup>(58)</sup>.

In conclusion, life expectancy has increased over the last 75 years in both Türkiye and the UK. However, healthy life expectancy is at best static, and there is much still to be done to reduce the burden of NCD in later life. Interventions are more likely to be successful if they adopt a multistakeholder approach.

Avril Aslett-Bentley provided an overview of the role of PH nutritionists and dietitians in the UK where there are clear paths

for obtaining accredited qualifications and registration with well-developed support structures in place. It is envisaged that aspects of the UK system could be established elsewhere in order to address diet-related PH issues.

The Academy of Nutrition Sciences<sup>(59)</sup> was founded in the UK in 2019 as a joint initiative between the Association for Nutrition (AfN)<sup>(60)</sup>, the British Dietetic Association (BDA)<sup>(61)</sup>, the British Nutrition Foundation<sup>(62)</sup> and The Nutrition Society of Great Britain and Ireland<sup>(63)</sup>. The Academy of Nutrition Sciences works to improve PH and well-being by supporting excellence in research, education and associated activities to advance the knowledge and application of evidence-based nutrition science. Since its inception, the Academy of Nutrition Sciences produced position papers on Evidence for Dietary Recommendations and Evidence for Health Claims with a paper on Evidence for Nutrition Interventions for Individuals due later in 2023.

The BDA lists the universities in the UK offering a wide range of pre-registration degree courses in dietetics<sup>(64)</sup>.

UK registrars and regulators of professional standards and conduct for PH nutritionists and dietitians, respectively, are

- The UK Voluntary Register of Nutritionists, held by the AfN. New registration competencies and standards and degree accreditation will apply to all AfN registrants and degrees by April 2024. Currently, there are about 2500 registrants, including approved PH specialists, that is, R Nutr (PH)<sup>(65)</sup>, and
- The Health and Care Professions Council, conferring statutory (generic registered dietitian) dietetic registration, with protection of title and currently with approximately 11 000 registrants. PH dietitians are specialists, but PH is embedded across dietetic practice<sup>(66)</sup>.

The various groups representing nutritionists and dietitians in the UK offer a wide range of supporting materials, many of which are freely available to all via their individual websites.

For example, the Public Health Specialist Group, one of twenty-two BDA specialisms, spans the lifespan addressing NCD, vulnerable groups and food insecurity and embeds dietary sustainability<sup>(67,68)</sup>. The AfN also has some useful PH resources<sup>(69)</sup>. Regulation of both nutritionists and dietitians is based on evidence-based practice, as promoted by the Academy of Nutrition Sciences and featured in the AfN's comparative summary, which distinguishes between UK registered nutritionists, dietitians, associate nutritionists and nutritional therapists<sup>(70)</sup>.

The BDA also offers a series of Food Fact Sheets that have been prepared by dietitians to highlight best practice. The most popular PH-focused ones cover folic acid and menopause and diet<sup>(71)</sup>. The Royal Society for Public Health launched a 5-year strategic plan in 2022 with the goal of facilitating all members of the population to lead healthier and more equal lives for longer<sup>(72)</sup>. The role of dietitians in PH is clearly summarised in a new infographic developed by the UK Government Office of Health Improvement and Disparities and Royal Society for Public Health, with a personal contribution from the BDA Public Health Specialist Group. The key headings are health protection, population healthcare, wider determinants and health improvement<sup>(73)</sup>.

The AfN provides career and job information for registered nutritionists, including for PH specialists<sup>(74)</sup>.

Overall, the work of PH nutritionists and dietitians supported by the best use of resources has the potential to improve dietary habits and to create a healthier society.

F. Nur Baran Aksakal presented a summary of the programme of nutrition education for family physicians implemented in Türkiye in 2022 with follow-up ongoing.

As elsewhere, family physicians in Türkiye are generally lacking in nutrition knowledge<sup>(75–86)</sup>. This is, perhaps, to be expected as the curriculum of medical students and other healthcare professionals is already highly intensive, and nutrition education is typically not a formal part of it. However, it is important that the potential of balanced nutrition to reduce disease risk and contribute to the maintenance of good health is understood by those who have the potential to make a positive difference. With this in mind, in 2022, the SÜF teamed up with the Turkish Federation of Family Physicians Associations to implement a programme of nutrition education for family physicians.

As a first step, an online survey was conducted to identify areas where family physicians most feel the lack of knowledge. Based on the feedback of 1300 respondents, Professor Serhat Ünal of Hacettepe University and Professor F. Nur Baran Aksakal of Gazi University took the lead in developing a programme together with an expert group consisting of nutritionists, dietitians and family physicians. This has now been the subject of eight online lectures and interactive sessions of 2 h. The following subjects have been covered by experts in the various topics:

- What is included in nutrition? How is it defined?
- What are prebiotics and probiotics? What is their role?
- How can vitamin and mineral levels be monitored? How can deficiencies be identified and rectified?
- Energy content v. nutrients. The distinction and its implications
- Nutrient: Medicines interactions and their significance in the clinical setting
- What role do food supplements play in health and well-being?
- A review of popular diets
- Achieving a healthy lifestyle

The target audience was over 26 000 family physicians, all of whom were invited online. Some 8900 have now taken the course. More than 200 questions were raised by the participants, and initial feedback has been consistently excellent. However, measuring the long-term impact of this programme provides a difficult challenge. The next step is planned to include more family physicians together with specialist physicians, starting with internal medicine and paediatrics.

A lively workshop following the conference in Tbilisi fully endorsed this programme of nutrition education, and it is hoped that it might serve as an inspiration for others.

Caroline Saunders presented examples of how the food industry contributes to consumers' quest for an optimum diet and lifestyle. Many initiatives are active under the auspices of trade associations and relevant charities such as the British Nutrition Foundation, the focus being to improve the health of consumers. For example, a large number of food companies

have supported the British Nutrition Foundation's Healthy Eating Week, an annual celebration aimed at encouraging the nation to eat and drink more healthily as well as getting more active<sup>(87)</sup>. Over twenty food and drink companies also pledged their support to increase the amount of fibre in consumers' diets after backing the Action on Fibre initiative launched by the Food and Drink Federation in the UK<sup>(88)</sup>. This has been an important initiative as only 9% of UK adults currently meet the recommended intake. Dietitians working in the food industry also support many initiatives such as the BDA Food Fact Sheet on how to 'Eat well, Spend less'<sup>(89)</sup>.

In addition, many companies have their own programmes and approaches to improving the healthfulness of their existing products and future innovations. These approaches are typically either based on reducing nutrients to limit intake (such as energy, saturated fat, added sugars and/or Na) or enhancing nutrients to encourage increased intake (including fibre, protein, fruits, vegetables, legumes and/or nuts). Examples of these approaches include:

- Reducing nutrients to limit intake
- Silent reduction through gradual reduction of sugar, Na and/or saturated fat reduction through the use of healthier oils
- Portion control
- Greater than 30% reduction using new technologies such as sugar reduction through replacement with fibres
- Approaches to increasing nutrients to encourage higher intake
- Replacing nutrients on the list to be limited with nutrients to be encouraged, such as sugar replacement with fibre
- Using more nutrient-dense ingredients such as protein-rich pulse flours to replace wheat flour.

It is also common for food companies to partner with universities to advance their technical solutions or through collaborations such as that with the Biotechnology and Biological Sciences Research Council, a major funder of world-leading bioscience in the UK<sup>(90)</sup>.

Begüm Mutuş, Özge Dinç and Özlem Üliç Çatar provided an overview of a programme of nutrition education implemented in Turkish schools since 2011 and, as background, summarised recent research to determine the level of health literacy in Türkiye. In addition to the urgent PH issue of obesity referred to above, a Türkiye Demographic and Health Survey highlighted that 10% of Turkish children under 5 years old were stunted and 2% exhibited wasting<sup>(91)</sup>.

A recent review highlights the importance of optimum nutrition in childhood and adolescence on long-term health including cognitive function and the prevalence of nutrition-related diseases<sup>(92)</sup>.

The Balanced Nutrition Education Programme was initially developed by the SÜF in collaboration with the British Nutrition Foundation and Hacettepe University. It has, since 2011, been implemented in schools in cooperation with the Republic of Türkiye Ministry of National Education, Directorate General for Basic Education. It is currently active in twenty-two provinces throughout Türkiye and has now reached an estimated seven million students, parents and teachers with educational and



entertaining materials. The primary goal is to emphasise the importance of balanced healthy eating combined with physical activity.

A team of trainers provides essential input to teachers in each province, and the programme is then rolled out in individual schools. It runs for 38 weeks with 2 h of input per week. Also included is a 10-min exercise routine before classes begin. Children from pre-kindergarten to sixth grade are now included. The curriculum is constantly being upgraded based on feedback and new ideas. In an evaluation of the impact of the programme, SÜF worked with the universities of Ege, Erciyes and Marmara to evaluate 618 primary school participants in the programme. The results were encouraging in that, following intervention, students' total energy intakes decreased, physical activity levels increased, age-based BMI dropped in the case of female students and the frequency of obesity decreased for both male and female students<sup>(93)</sup>.

Health literacy is an essential factor in ensuring that health and nutrition information is understood and utilised effectively. The proliferation of misinformation necessitates accessible, evidence-based resources to enhance individual health literacy. In Türkiye, 35 million out of 53 million adults lack sufficient knowledge in health literacy, which inversely correlates with disease rates. According to the Turkish Health Literacy Level and Related Factors research, 24.5 % of the adult population in Türkiye has inadequate knowledge, and 40.1 % has a problematic level of knowledge about health literacy. Unfortunately, as the level of knowledge decreases, the rate of disease increases – 22.6 % of those with problematic health literacy, 19.7 % of those with adequate health literacy and 13.5 % of those with excellent health literacy have a diagnosed disease<sup>(94)</sup>.

The Balanced Nutrition Education Programme has been held up as an example of best practice, and it is hoped that it will inspire others to implement similar programmes where nutrition education in schools is lacking.

Rusudan Gvamichava and Ihab Tewfik provided an overview of the Georgian parents' nutrition education programme, highlighting the issue of malnutrition in children.

The problem of insufficient and imbalanced nutrition, and particularly malnutrition, is widely recognised as a significant challenge to children's development at a global level<sup>(96–98)</sup>. Malnutrition in children has been linked to poor mental health and academic performance as well as behaviours that increase the risk of several chronic diseases in later life<sup>(99,100)</sup>.

According to the WHO, around 45 % of deaths among children under 5 years are linked to undernutrition<sup>(101)</sup>. Currently, there are no professional nutrition guidelines for children and parents in Georgia<sup>(102)</sup>. According to studies conducted in Georgia in 2018, schoolchildren experience serious problems of malnutrition with 35 % at grade 4 feeling hungry at school<sup>(96,103)</sup>. As noted previously, the incidence of overweight and obesity is also high. A nationwide survey of year 7 children found 22 % of girls and 26 % of boys were overweight or obese<sup>(104)</sup>. Thus, in Georgia, studies have highlighted the coexistence of obesity and undernutrition, exemplifying a double burden of diseases<sup>(105)</sup>.

A recent study undertaken under the auspices of the University of Westminster sought to assess the efficacy of

family-based nutrition interventions to address childhood malnutrition in Georgia. This study represents the first attempt in Georgia to use a family-based approach to promoting healthy eating via science-based nutrition education for parents. A total of 328 parents of schoolchildren, recruited from the capital city, Tbilisi, participated in the intervention. This sample, which included children from both the private and public sector schools, was considered to be representative of the city as a whole. Parents completed two online questionnaires both before and after intervention: knowledge, attitude and practice and a semi-qualitative FFQ. The duration of the intervention was 10 weeks, and it included a series of nutrition education webinars.

Preliminary, as yet unpublished, results demonstrated a decrease in BMI-for-age following intervention, giving a reduction in the numbers of overweight and obese children. Numbers eating a regular breakfast significantly increased as did the parents' awareness about nutrient deficiencies. The nutrition education webinars enabled parents to become acquainted with relevant information and, as a result, they started to make healthier food choices for their children. Previous studies have shown a positive correlation between the use of educational webinars and increased nutritional awareness and improved health habits and diet<sup>(106,107)</sup>.

All activities within the framework of the current research have been focused on the goal of supporting sustainable, long-term improvement of children's health in Georgia.

### Concluding remarks

This event in Tbilisi attracted a lively participation with a full conference room and additional delegates joining online. A wide cross-section of participants included government officials, academic scientists, healthcare professionals, medical students, media representatives and food industry specialists, among others. Most were from Georgia which was very encouraging as clearly the motivation exists to improve nutrition and PH in Georgia. A compelling overview was provided on the current global crisis in nutrition and PH, with poor diet estimated to be responsible for 11 million premature deaths annually. Delegates learnt about the current status in Georgia including the prevalence of lifestyle-related diseases and disorders. The lack of formal nutrition and dietetics training was highlighted as was the absence of food intake data. Neighbouring Türkiye, faced with similar challenges, has responded with an impressive programme of initiatives including nutrition education for healthcare professionals and school children, incentives to increase physical activity and government legislation and programmes to encourage best practice among consumers. All these have contributed to a dramatic increase in life expectancy over the last 70 years. In the UK, the government has championed sugar and salt reduction, and throughout Europe, the emphasis has been on reducing the incidence of overweight and obesity, so far without perceptible success. The potential to reverse type 2 diabetes has been clearly demonstrated, and a Mediterranean style of diet has been shown to be associated with better cognitive function in later life. But there is still much to be





done to improve the prognosis for long-term good health. Georgia has both the motivation and the wherewithal to make a positive difference. This conference and workshops provided a platform for all stakeholders to share knowledge and consider opportunities for improving PH for the benefit of all. It is hoped that it will also inspire other countries and regions to take up the challenge.

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### References

- Evans CEL, Besler HT, Diñç Ö, *et al.* (2023) Achieving health through diet: a joint event of the Sabri Ülker Foundation and The Nutrition Society of UK and Ireland, May 2022. *Br J Nutr* **130**, 1228–1238.
- World Health Organization (2023) Country Data, Georgia. <https://data.who.int/countries/268> (accessed November 2023).
- International Diabetes Federation (2021) Diabetes in Europe. [https://www.mepinterestgroupdiabetes.eu/wp-content/uploads/2021/11/IDF-Atlas-Factsheet-2021\\_EUR.pdf](https://www.mepinterestgroupdiabetes.eu/wp-content/uploads/2021/11/IDF-Atlas-Factsheet-2021_EUR.pdf) (accessed November 2023).
- World Health Organization (2020) Global Health Estimates 2020: Deaths by Cause, Age, Sex, by Country and by Region, 2000–2019. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-of-death> (accessed November 2023).
- World Health Organization (2020) Global Health Estimates 2020: Disease Burden by Cause, Age, Sex, by Country and by Region, 2000–2019. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-dalys> (accessed November 2023).
- National Centre for Disease Control and Public Health (2019) Health Care Statistical Yearbook. <https://www.ncdc.gov/#/pages/file/a257e535-6967-4e6c-bee5-fe4ad714b702> (accessed November 2023).
- Gamkrelidze A, Mebonia N, Sturua L, *et al.* (2018) Non-Communicable Diseases Risk-factor STEPS Survey, Georgia, 2016: Executive Summary. <https://extranet.who.int/ncdsmicrodata/index.php/catalog/223/study-description> (accessed November 2023).
- UNICEF, WHO & World Bank (2022) Joint Child Malnutrition Estimates Expanded Database: Stunting, Wasting and Overweight. <https://data.unicef.org/resources/dataset/malnutrition-data/> (accessed November 2023).
- NCD Risk Factor Collaboration (2022) Child and Adolescent Body-Mass Index. <https://ncdrisc.org/data-downloads-adiposity-ado.html> (accessed November 2023).
- NCD Risk Factor Collaboration (2022) National Adult Body-Mass Index. <https://ncdrisc.org/data-downloads-adiposity.html> (accessed November 2023).
- Diet Collaborators (2019) Health effects of dietary risks in 195 countries, 1990–2017. *Lancet* **393**, 1958–1972.
- Stevens GA, Beal T, Mbuya MNN, *et al.* (2022) Micronutrient deficiencies among preschool-aged children and women of reproductive age worldwide: a pooled analysis of individual-level data from population-representative surveys. *Lancet Glob Health* **10**, E1590–E1599.
- Calder PC (2020) Nutrition, immunity and COVID-19. *BMJ Nutr Prev Health* **3**, e000085.
- Rytter MJH, Kolte L, Briend A, *et al.* (2014) The immune system in children with malnutrition—a systematic review. *PLoS ONE* **9**, e105017.
- Ma S, Xi B, Yang L, *et al.* (2021) Trends in the prevalence of overweight, obesity, and abdominal obesity among Chinese adults between 1993 and 2015. *Int J Obes* **45**, 427–437.
- Anjana RM, Unnikrishnan R, Deepa M, *et al.* (2023) Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). *Lancet Diabet Endocrinol* **11**, 474–489.
- Wake SK, Zewotir T, Mekebo GG, *et al.* (2023) Rural-urban differentials in child body mass index over time. *BMC Pediatr* **23**, 412.
- IDF Diabetes Atlas (2022) Diabetes around the World in 2021. <https://diabetesatlas.org/> (accessed October 2023).
- GBD 2021 Diabetes Collaborators (2023) Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet* **402**, P203–P234.
- Lichtenstein AH, Appel LJ, Vadiveloo M, *et al.* (2021) 2021 dietary guidance to improve cardiovascular health: a scientific statement from the American Heart Association. *Circulation* **144**, e472–e487.
- Ye Y & Leeming J (2023) Why China's changing diet is a bellyache for public health. *Nature* **618**, S13–S15.
- Gilmore AB, Fabbri A, Baum F, *et al.* (2023) Defining and conceptualising the commercial determinants of health. *Lancet* **401**, 1194–1213.
- WHO (2021) *Global Health Estimates: Life Expectancy and Leading Causes of Death and Disability*. Global Health Observatory. Geneva: World Health Organization. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates> (accessed October 2023).
- WHO (2022) WHO European Regional Obesity Report. 2 May 2022. ISBN: 9789289057738. <https://www.who.int/europe/publications/i/item/9789289057738> (accessed October 2023).
- ONS (2022) Obesity and Mortality During the Coronavirus (COVID-19) Pandemic, England: January 2020 to August 2022. The Risk of Death during the Coronavirus (COVID-19) Pandemic among People aged 30 to 64 years with and without Obesity. Office for National Statistics. 14 October 2022. England. <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/obesityandmortalityduringthecoronaviruscovid19pandemicengland24january2020to30august2022/24january2020to30august2022#:~:text=After%20further%20adjusting%20for%20comorbidities,may%20be%20attributed%20to%20comorbidities> (accessed October 2023).
- Singh R, Rathore SS, Khan H, *et al.* (2022) Association of obesity with COVID-19 severity and mortality: an updated systematic review, meta-analysis, and meta-regression. *Front Endocrinol* **13**, 780872.



27. UNICEF, WHO & World Bank (2021) UNICEF/WHO/World Bank Joint Child Malnutrition Estimates: 2021 Edition Interactive Dashboard. New York (NY): United Nations Children's Fund. <https://data.unicef.org/resources/joint-child-malnutrition-estimates-interactive-dashboard-2021> (accessed November 2023).
28. Maltoni G, Zioutas M, Deiana G, *et al.* (2021) Gender differences in weight gain during lockdown due to COVID-19 pandemic in adolescents with obesity. *Nutr Metab Cardiovasc Dis* **31**, 2181–2185.
29. Pietrobelli A, Pecoraro L, Ferruzzi A, *et al.* (2020). Effects of COVID-19 lockdown on lifestyle behaviors in children with obesity living in Verona, Italy: a longitudinal study. *Obesity (Silver Spring)* **28**, 1382–1385.
30. Kovacs VA, Brandes M, Suesse T, *et al.* (2022) Are we underestimating the impact of COVID-19 on children's physical activity in Europe?—a study of 24 302 children. *Eur J Public Health* **32**, 494–496.
31. WHO (2021) *European Programme of Work 2020–2025: United Action for Better Health*. Copenhagen: WHO Regional Office for Europe. <https://apps.who.int/iris/handle/10665/339209> (accessed October 2023).
32. WHO (2016) Report of the Commission on Ending Childhood Obesity. Geneva: World Health Organization. <https://www.who.int/publications-detail-redirect/9789241510066> (accessed October 2023).
33. WHO (2006) *European Charter on Counteracting Obesity. WHO European Ministerial Conference on Counteracting Obesity, Istanbul, Turkey, 15–17 November 2006*. Copenhagen: WHO Regional Office for Europe. <https://apps.who.int/iris/handle/10665/107801> (accessed October 2023).
34. WHO (2014) *Global Nutrition Targets 2025: Childhood Overweight Policy Brief*. Geneva: World Health Organization. <https://www.who.int/publications-detail-redirect/WHO-NMH-NHD-14.6> (accessed October 2023).
35. WHO (2023) Defining Healthy Diets: The FAO-WHO Approach. 13/07/2023. <https://www.who.int/news-room/events/detail/2023/07/13/default-calendar/launch-event-for-who-healthy-diet-guidelines-and-fao-who-concept-of-healthy-diets> (accessed November 2023).
36. FAO (2023) *The State of Food Security and Nutrition in the World 2023*. In Collaboration with IFAD, UNICEF, World Food Programme, WHO. pp. 1–316. ISBN 978–92–5–137226–5. <https://www.fao.org/3/cc3017en/cc3017en.pdf> (accessed November 2023).
37. Livingston G, Huntley J, Sommerlad A, *et al.* (2020) Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet* **396**, 413–446.
38. van Dyck CH, Swanson CJ, Aisen P, *et al.* (2023) Lecanemab in early Alzheimer's disease. *N Engl J Med* **388**, 9–21.
39. Sims JR, Zimmer JA, Evans CD, *et al.* (2023) Donanemab in early symptomatic Alzheimer disease: the TRAILBLAZER-ALZ 2 randomized clinical trial. *JAMA* **330**, 512–527.
40. Shi M, Chu F, Zhu F, *et al.* (2022) Impact of anti-amyloid- $\beta$  monoclonal antibodies on the pathology and clinical profile of Alzheimer's disease: a focus on aducanumab and lecanemab. *Front Aging Neurosci* **14**, 870517.
41. Yassine HN, Samieri C, Livingston G, *et al.* (2022) Nutrition state of science and dementia prevention: recommendations of the nutrition for dementia prevention working group. *Lancet Healthy Longev* **3**, 501–512.
42. Siervo M, Shannon OM, Llewellyn DJ, *et al.* (2021) Mediterranean diet and cognitive function: from methodology to mechanisms of action. *Free Radic Biol Med* **176**, 105–117.
43. Trichopoulou A, Martínez-González MA, Tong TY, *et al.* (2014) Definitions and potential health benefits of the Mediterranean diet: views from experts around the world. *BMC Med* **12**, 112.
44. Shannon OM, Stephan BCM, Granic A, *et al.* (2019) Mediterranean diet adherence and cognitive function in older UK adults: the European Prospective Investigation into Cancer and Nutrition-Norfolk (EPIC-Norfolk) study. *Am J Clin Nutr* **110**, 938–948.
45. Shannon OM, Ranson JM, Gregory S, *et al.* (2023) Mediterranean diet adherence is associated with lower dementia risk, independent of genetic predisposition: findings from the UK Biobank prospective cohort study. *BMC Med* **21**, 81.
46. Shannon OM, Lee V, Bundy R, *et al.* (2021) Feasibility and acceptability of a multi-domain intervention to increase Mediterranean diet adherence and physical activity in older UK adults at risk of dementia: protocol for the MedEx-UK randomised controlled trial. *BMJ Open* **11**, 042823.
47. Jennings A, Shannon OM, Gillings R, *et al.* (2023) Feasibility, acceptability, and cognitive benefits of a theory-informed intervention to increase Mediterranean diet adherence and physical activity in older adults at risk of dementia: the MedEx-UK randomised controlled trial. *medRxiv* <https://doi.org/10.1101/2023.07.04.23292172>.
48. World Health Organization Data (2020) Life Expectancy and Healthy Life Expectancy. Data by Country. <https://apps.who.int/gho/data/node.main.688> (accessed October 2023).
49. Alzheimer's Research UK (2023) Dementia Leading Cause of Death in 2022. <https://www.alzheimersresearchuk.org/dementia-leading-cause-of-death-in-2022> (accessed September 2023).
50. World Obesity (2022) Turkey Policies, Interventions and Actions. <https://data.worldobesity.org/country/turkey-219/actions.pdf> (accessed October 2023).
51. NuffieldTrust (2022) Obesity. [https://www.nuffieldtrust.org.uk/resource/obesity?gclid=EAIaIQobChMI9KarucSxgQMVRuftCh0UIAhPEAAyAAEg15gfD\\_BwE](https://www.nuffieldtrust.org.uk/resource/obesity?gclid=EAIaIQobChMI9KarucSxgQMVRuftCh0UIAhPEAAyAAEg15gfD_BwE) (accessed September 2023).
52. IDF-Atlas-Factsheet EUR (2021) Diabetes in Europe – 2021. [https://www.mepinterestgroupdiabetes.eu/wp-content/uploads/2021/11/IDF-Atlas-Factsheet-2021\\_EUR.pdf](https://www.mepinterestgroupdiabetes.eu/wp-content/uploads/2021/11/IDF-Atlas-Factsheet-2021_EUR.pdf) (accessed October 2023).
53. World Diabetes Foundation: Türkiye (2019) Peer to Peer Diabetes Education Programme. <https://www.worlddiabetesfoundation.org/sites/default/files/DiabetesEducation-Final.pdf> (accessed October 2023).
54. Wikipedia (2017) List of Countries by Past Life Expectancy. [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_past\\_life\\_expectancy](https://en.wikipedia.org/wiki/List_of_countries_by_past_life_expectancy) (accessed September 2023).
55. Public Health England (2018) The Eatwell Guide. [https://assets.publishing.service.gov.uk/media/5ba8a50540f0b605084c9501/Eatwell\\_Guide\\_booklet\\_2018v4.pdf](https://assets.publishing.service.gov.uk/media/5ba8a50540f0b605084c9501/Eatwell_Guide_booklet_2018v4.pdf) (accessed October 2023).
56. UK Department of Health and Social Care (2023) Government Plans to Tackle Obesity in England. <https://healthmedia.blog.gov.uk/2023/06/07/government-plans-to-tackle-obesity-in-england/> (accessed October 2023).
57. Office for Health Improvements & Disparities (2022) Sugar Reduction – Industry Progress 2015–2020. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1121444/Sugar-reduction-and-reformulation-progress-report-2015-to-2020.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1121444/Sugar-reduction-and-reformulation-progress-report-2015-to-2020.pdf) (accessed October 2023).
58. DIRECT (2021) Diabetes Remission Clinical Trial. <https://www.directclinicaltrial.org.uk/> (accessed October 2023).



59. Academy of Nutrition Sciences (2023) About. <https://www.academynutritionsciences.org.uk/about> (accessed November 2023).
60. Association for Nutrition (AfN) (2023) Welcome to the Association for Nutrition. <https://www.associationfornutrition.org/> (accessed November 2023).
61. British Dietetic Association (BDA) (2023) What is a Dietitian? <https://www.bda.uk.com/> (accessed November 2023).
62. British Nutrition Foundation (BNF) (2023) British Nutrition Foundation. <https://www.nutrition.org.uk/> (accessed November 2023).
63. The Nutrition Society (NS) (2023) The Home of Evidence-Based Nutritional Science. <https://www.nutritionociety.org/> (accessed November 2023).
64. British Dietetic Association (BDA) (2023) Where to Study Dietetics. <https://www.bda.uk.com/about-dietetics/how-become-a-dietitian/where-to-study-dietetics.html> (accessed November 2023).
65. New AfN (2023) Registration Competencies & Standards and Degree Accreditation (Replacing All Current Stipulations from April 2024). <https://www.associationfornutrition.org/latest-news/new-registration-competencies-standards-and-degree-accreditation-standards-published> (accessed November 2023).
66. HCPC (2023) Registration Information. <https://www.hcpc-uk.org/registration/> (accessed November 2023).
67. BDA (2023) Public Health Specialist Group (PHSG) Information. <https://www.bda.uk.com/specialist-groups-and-branches/public-health-specialist-group.html> (accessed November 2023).
68. BDA (2022) Environmentally Sustainable Diets Information (Contribution to BDA Policy Statement from Avril Aslett-Bentley representing PHSG). <https://www.bda.uk.com/static/9e8a51df-4954-496a-aadec4d0b73d77f9/c899cfa5-9b19-41a3-b221d34af6ec1f7e/policystatementsustainablefood.pdf#:~:text=The%20BDA%20believes%20that%3A&text=high%2Dquality%20diet%20that%20is,environmentally%20sustainable%20and%20varied%20diet> (accessed March 2024).
69. AfN (2023) Nutrition Resource Hub. <https://www.associationfornutrition.org/about/resources> (accessed November 2023).
70. AfN (2023) Registered Nutritionists Dietitians, Associate Nutritionists and Nutritional Therapists: A Comparative Summary (Table). <https://www.associationfornutrition.org/wp-content/uploads/2020/06/Nutrition-Professions-Comparison-Document-02.2018.pdf> (accessed November 2023).
71. BDA (2023) Food Facts (ND). <https://www.bda.uk.com/food-health/food-facts.html> (accessed November 2023).
72. RSPH (2022) Royal Society for Public Health Strategic Plan 2022–2027. <https://www.rsph.org.uk/static/953cc500-b186-4a43-af9fb7a2434645f/RSPH-strategic-plan-2022-2027.pdf> (accessed November 2023).
73. RSPH (Royal Society for Public Health) (2023) Infographic: Dietitians Role in Public Health. <https://www.rsph.org.uk/our-work/resources/allied-health-professionals-hub/handbook-of-profession-specific-descriptors-for-public-health/dietitian.htm> (accessed November 2023).
74. AfN (2023) Careers in Nutrition. <https://www.associationfornutrition.org/careers-nutrition> (accessed November 2023).
75. Ministry of Health General Directorate of Health Promotion (SGGM) (2018) Türkiye Health Literacy Level and Related Factors Research, Ankara. <https://pubmed.ncbi.nlm.nih.gov/34380974/> (accessed November 2023).
76. Kiraly LN, McClave SA, Neel D, *et al.* (2014) Physician nutrition education. *Nutr Clin Pract* **29**, 332–337.
77. Bassin SR, Al-Nimr RI, Allen K, *et al.* (2020) The state of nutrition in medical education in the United States. *Nutr Rev* **78**, 764–780.
78. Devries S & Freeman AM (2017) Nutrition education for cardiologists: the time has come. *Curr Cardiol Rep* **19**, 77.
79. Kris-Etherton PM, Akabas SR, Douglas P, *et al.* (2015) Nutrition competencies in health professionals' education and training: a new paradigm. *Adv Nutr* **6**, 83–87.
80. Aggarwal M, Devries S, Freeman AM, *et al.* (2018) The deficit of nutrition education of physicians. *Am J Med* **131**, 339–345.
81. Johnston E, Mathews T, Aspary K, *et al.* (2019) Strategies to fill the gaps in nutrition education for health professionals through continuing medical education. *Curr Atheroscler Rep* **21**, 13.
82. Touger-Decker R, Barracato JM & O'Sullivan-Maillet J (2001) Nutrition education in health professions programs: a survey of dental, physician assistant, nurse practitioner, and nurse midwifery programs. *J Am Diet Assoc* **101**, 63–69.
83. Brill JV, August D, Delegge MH, *et al.* (2010) A vision of the future for physician practice in nutrition. *J Parenter Enteral Nutr* **34**, 86S–96S.
84. Adams KM, Kohlmeier M, Powell M, *et al.* (2010) Nutrition in medicine: nutrition education for medical students and residents. *Nutr Clin Pract* **25**, 471–480.
85. Heimburger DC, McClave SA, Gramlich LM, *et al.* (2010) The intersociety professional nutrition education consortium and American board of physician nutrition specialists: what have we learned? *J Parenter Enteral Nutr* **34**, 21S–29S.
86. Devries SA (2019) global deficiency of nutrition education in physician training: the low hanging fruit in medicine remains on the vine. *Lancet Planet Health* **3**, e371–e372.
87. British Nutrition Foundation (2023) Healthy Eating Week. <https://www.nutrition.org.uk/our-work/what-we-do/healthy-eating-week/> (accessed November 2023).
88. Food and Drink Federation (2023) Action on Fibre. <https://www.fdf.org.uk/fdf/what-we-do/diet-and-health/action-on-fibre/> (accessed November 2023).
89. British Dietetic Association (2023) Eat Well, Spend Less. <https://www.bda.uk.com/resource/food-facts-eat-well-spend-less.html> (accessed November 2023).
90. Biotechnology and Biological Sciences Research Council (2023) Who we are (BBSRC). <https://www.ukri.org/councils/bbsrc/> (accessed November 2023).
91. Hacettepe University Institute of Population Studies (2019) 2018 Population and Health Research. Hacettepe University Institute of Population Studies, T.R. Presidency of Strategy and Budget and TÜBİTAK, Ankara, Türkiye. [https://fs.hacettepe.edu.tr/hips/dosyalar/Ara%C5%9Ft%C4%B1rmalar%20%20raporlar/2018%20TNSA/TNSA2018\\_ana\\_Rapor\\_compressed.pdf](https://fs.hacettepe.edu.tr/hips/dosyalar/Ara%C5%9Ft%C4%B1rmalar%20%20raporlar/2018%20TNSA/TNSA2018_ana_Rapor_compressed.pdf) (accessed November 2023).
92. Saavedra JM & Prentice AM (2023) Nutrition in school-age children: a rationale for revisiting priorities *Nutr Rev* **81**, 823–843.
93. Besler HT, Meseri R, Küçükerdönmez Ö, *et al.* (2018) Implementation of a Balanced Nutrition Education Program among primary school children in Turkey. *Nutrition* **55**, S18–S21.
94. Tanrıöver MD, Yildirim HH, Ready FN, *et al.* (2014) *Turkey Health Literacy Research, First Edition*. Ankara: Sağlık-Sen Publications. <https://www.sagliksen.org.tr/cdn/uploads/gallery/pdf/8dccc50aa18c21cda86a2b33001a409.pdf> (accessed November 2023).
95. Cal A, Ünal N, Öztaş B, *et al.* (2022) Health literacy level of first-year university students: a foundation university study. *Erciyes Med J* **44**, 216–221.
96. Global Nutrition Report (2019) Global Nutrition Report. [https://globalnutritionreport.org/documents/352/2018\\_Global\\_Nutrition\\_Report.pdf](https://globalnutritionreport.org/documents/352/2018_Global_Nutrition_Report.pdf) (accessed November 2023).





97. Hanson MA & Gluckman PD (2014) Early developmental conditioning of later health and disease: physiology or pathophysiology? *Physiol Rev* **94**, 1027–1076.
98. Bucholz EM, Desai MM & Rosenthal MS (2011) Dietary intake in head start *v.* non-head start preschool-aged children: results from the 1999–2004 national health and nutrition examination survey *J Am Dietetic Assoc* **111**, 1021–1030.
99. Chuang HH, Lin RH, Chen J, *et al.* (2019) Effectiveness of a multifaceted intervention among elementary school children. *Medicine* **98**, e15079.
100. Morrison AK, Glick A & Yin HS (2019) Health literacy: implications for child health. *Pediatr Rev* **40**, 263–277.
101. World Health Organization (2023) Levels and Trends in Child Malnutrition. <https://www.who.int/publications/i/item/9789240073791> (accessed November 2023).
102. Todua N (2018) Georgian consumers awareness about the benefits associated with healthy nutrition. *Int J Bus* **1**, 11–18.
103. Dapkviashvili E (2017) Progress in International Reading literacy study (PIRLS) importance for further development of Georgia's educational system. AC-EITAI 2017, pp. 473. [https://books.google.ge/books?hl=en&lr=&id=WV4wDwAAQBAJ&oi=fnd&pg=PA473&dq=dapkviashvili+2017&ots=bpakrYFTpA&sig=KF2JJFxe5Akis5\\_cscOQauKn4dQ&redir\\_esc=y#v=onepage&q=dapkviashvili%202017&f=false](https://books.google.ge/books?hl=en&lr=&id=WV4wDwAAQBAJ&oi=fnd&pg=PA473&dq=dapkviashvili+2017&ots=bpakrYFTpA&sig=KF2JJFxe5Akis5_cscOQauKn4dQ&redir_esc=y#v=onepage&q=dapkviashvili%202017&f=false) (accessed October 2023).
104. Andguladze N, Gagoshidze T & Kutaladze I (2020) Early Childhood Development and Education in Georgia. [https://www.unicef.org/georgia/media/5796/file/Early\\_Development\\_Report\\_EN.pdf](https://www.unicef.org/georgia/media/5796/file/Early_Development_Report_EN.pdf) (accessed November 2023).
105. UNICEF (2007) Community-Based Management of Severe Acute Malnutrition; A Joint Statement by the World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition and the United Nations Children's Fund. <https://www.who.int/publications/i/item/9789280641479> (accessed November 2023).
106. Schalkwijk AA, Bot SD, de Vries L, *et al.* (2015) Perspectives of obese children and their parents on lifestyle behavior change: a qualitative study. *Int J Behav Nutr Phys Act* **12**, 102.
107. Rankin A, Blood-Siegfried J, Vorderstrasse A, *et al.* (2015) Implementation of childhood obesity identification and prevention strategies in primary care: a quality improvement project. *Int J Pediatr Adolesc Med* **2**, 59–63.