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Achieving health through diet: A joint event of the Sabri Ülker Foundation and The Nutrition Society of UK and Ireland, May 2022

C.E.L. Evans¹, H.T. Besler², Ö. Dinç³, M. Lean⁴, J.A. Lovegrove^{5,6}, N.M. Lowe⁷, J.C. Mathers⁸, B. Mutuş³, I. Satman⁹, M. D. Tanriover^{10,11}, A. E. Tedstone¹², C. Theobald¹³, S. Unal^{11,14}, E. Vartiainen¹⁵, R. Wall¹², N. Yardim¹⁶, J.D. Stowell³

¹University of Leeds, Leeds, UK

²Istanbul Kent University, Istanbul, Türkiye

³Sabri Ülker Foundation, Istanbul, Türkiye

⁴University of Glasgow, Glasgow, UK

⁵University of Reading, Hugh Sinclair Unit of Human Nutrition, Department of Food and Nutritional Sciences, Reading, UK

⁶The Nutrition Society of UK and Ireland, London, UK

⁷University of Central Lancashire, Preston, UK

⁸University of Newcastle, Newcastle, UK

⁹Istanbul University, Istanbul Faculty of Medicine, Dept. Internal Medicine, Istanbul, Türkiye

¹⁰Hacettepe University, Faculty of Medicine, Department of Internal Medicine, Ankara, Türkiye

¹¹Hacettepe University, Vaccine Institute, Department of Immunization Policies, Ankara, Türkiye

¹²Department of Health and Social Care, London, UK (until March 2022)

¹³The British Nutrition Foundation, London, UK

¹⁴Hacettepe University Faculty of Medicine, Department of Infectious Diseases and Clinical Microbiology, Ankara, Türkiye

¹⁵Finnish Institute for Health and Welfare, Helsinki, Finland

¹⁶Turkish Ministry of Health, GD Public Health, Ankara, Türkiye



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Abstract

Optimum nutrition plays a major role in the achievement and maintenance of good health. The Nutrition Society of the UK and Ireland and the Sabri Ülker Foundation, a charity based in Türkiye and focused on improving public health, combined forces to highlight this important subject. A hybrid conference was held in Istanbul, with over 4,000 delegates from 62 countries joining the proceedings live online in addition to those attending in person. The primary purpose was to inspire healthcare professionals and nutrition policy makers to better consider the role of nutrition in their interactions with patients and the public at large to reduce the prevalence of non-communicable diseases such as obesity and type 2 diabetes. The event provided an opportunity to share and learn from different approaches in the UK, Türkiye and Finland, highlighting initiatives to strengthen research in the nutritional sciences and translation of that research into nutrition policy. The presenters provided evidence of the links between nutrition and disease risk and emphasised the importance of minimising risk and implementing early treatment of diet related disease. Suggestions were made including improving health literacy and strengthening policies to improve the quality of food production and dietary behaviour. A multidisciplinary approach is needed whereby Governments, the food industry, non-governmental groups and consumer groups collaborate to develop evidence-based recommendations and appropriate joined up policies that do not widen inequalities. This summary of the proceedings will serve as a gateway for those seeking to access additional information on nutrition and health across the globe.

Keywords: nutrition education, health literacy, nutrition policy, disease prevention

Introduction

Optimum nutrition plays a major role in the achievement and maintenance of good health and wellbeing. However, the current situation in many countries in terms of dietary behaviour is far from optimal. The Sabri Ülker Foundation (<https://www.sabriulkerfoundation.org/en>) was established as a charity in Türkiye in 2009 in the name of a leading entrepreneur and philanthropist. It recently combined forces with the Nutrition Society of the UK and Ireland (<https://www.nutritionsocty.org/>) to highlight this important subject. A hybrid conference was held in Istanbul, with over 4,000 delegates from 62 countries joining the proceedings live online in addition to those attending in person. The event provided an opportunity to share and learn from experiences of nutrition related regulation, policy and research from the UK, Türkiye and Finland, highlighting different approaches and focusing on a range of initiatives to strengthen research in the nutritional sciences and translation of that research into nutrition policy. The primary purpose was to inspire healthcare professionals and nutrition policy makers to better consider the role of nutrition in their interactions with patients and the public to improve the management and reduce the incidence of diet related diseases including obesity and type 2 diabetes. The presenters provided evidence of the links between nutrition and disease, highlighted the importance of reducing the risk and early treatment of diet related disease and made suggestions for improving health literacy and strengthening policies to improve the quality of food production and dietary behaviour.

Diet and disease

The Global Burden of Disease analysis estimates that poor diet is responsible for approximately 11 million deaths and 255 million disability-adjusted life years (DALYs) annually around the world ⁽¹⁾. Both over and under nutrition are common. In many countries diets are too low in fruits, vegetables and wholegrain and too high in fats, sugars and sodium leading to higher rates of overweight and obesity. Rising rates of obesity over the past 3 to 4 decades have contributed to increased risk of common non-communicable diseases that are the major causes of morbidity and mortality globally including type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), some cancers, and mental health issues ⁽²⁾. In 2021 the World Health Organization (WHO) declared that over 1.9 billion people aged 18+ years were overweight with 650 million of these being obese ⁽³⁾. In the WHO European Region, overweight and obesity affect almost 60% of adults. In higher income countries, overweight and obesity are more common among less advantaged sections of the community. However,

in contrast, in most countries of sub-Saharan Africa, obesity prevalence increases with wealth ⁽⁴⁾ and therefore requires different approaches. The rise in childhood obesity is of particular concern as it increases the risk of adulthood obesity ⁽⁵⁾, cardio-metabolic diseases and premature mortality. Nearly one in three children (29% of boys and 27% of girls) in the WHO European Region are overweight or obese ⁽⁶⁾ although there are huge variations by country.

Related to high obesity rates is the concomitant high rate of type 2 diabetes mellitus (T2DM) in many countries. In 2021, 537 million people were living with any type of diabetes, estimated to be one-in-ten people aged 20-79 years, and similar numbers were living with impaired glucose tolerance (IGT) ⁽⁷⁾. This prevalence varies substantially by ethnicity ⁽⁸⁾ with high prevalence in South Asians ⁽⁹⁾. The increase in prevalence of T2DM is mainly due to populations gaining weight, at younger ages. T2DM is a nutritional disease of fat storage, and just one of many chronic disease outcomes which commonly coexist as ‘multi-morbidity’. Its disabling, painful, life-shortening complications (in increasingly younger populations) now dominate many healthcare budgets as highly expensive drugs are prescribed to try to modify complications ⁽¹⁰⁾.

Hidden hunger, which refers to micronutrient deficiencies, is also common and may be present with or without a deficit in total energy intake and is therefore present in both over and undernutrition. Micronutrient deficiencies affect growth as well as physical and cognitive development in children, and impaired immune function in adults, leading to increased morbidity and susceptibility to communicable as well as non-communicable diseases ^{(11) (12)}.

Specific micronutrients have well-known antioxidant and immunomodulatory properties and specific deficiencies in vitamins A, B12, C, D, E, folic acid, and minerals including iron, zinc, selenium, magnesium and copper can lead to immune dysfunction and increased susceptibility to microbial infections ⁽¹³⁾. In addition, metabolites of omega-3 fatty acids play important in immune function based on their anti-inflammatory properties ^(12; 14). The COVID-19 pandemic has further highlighted the importance of good nutrition for health in relation to communicable diseases identifying inflammation, hyperglycaemia, hyperlipidaemia, obesity and chronic disease as risk factors for more serious infection, more invasive procedures and a higher mortality rate in patients ⁽¹⁵⁾, and these outcomes may be independently predicted by malnutrition ⁽¹⁶⁾. Research is ongoing into specific nutrients and COVID-19. Immune-boosting properties of vitamins C, D, E, zinc, selenium and omega-3

fatty acids ⁽¹⁷⁾ and healthy diet patterns such as the Mediterranean diet ⁽¹⁸⁾ could provide possible benefits to patients with COVID-19, particularly in elderly people, but results are inconsistent. A review of the evidence by the UK Scientific Advisory Committee on Nutrition (SACN) supports following a balanced diet and complying with dietary recommendations to achieve optimal immune function, but not the intake of any specific nutrients, including vitamin D, above current recommendations ⁽¹⁹⁾. More research is needed to better understand the clinical importance of diet and micronutrient supplementations in prevention and management of SARS-CoV-2 patients ^(20; 21).

Global action to improve diet and health

WHO and the World Cancer Research Fund (WCRF) have both recommended actions to improve dietary behaviour. The EAT-Lancet report ⁽²²⁾ took into account planetary boundaries as well as health-related factors, and strongly recommended improvements to the food system in order to optimise diet and planetary health, to feed 10 billion people sustainably whilst saving an estimated 11 million lives per year. WHO have put forward the best value (in health economic terms) national policies for countries to follow named ‘best buys’, which include taxes on sugary drinks and reformulation to eliminate trans fats; ⁽²³⁾ while the changing behaviour framework from WCRF for healthy populations recommends a range of actions from education to labelling, fiscal policies, marketing and food supply ⁽²⁴⁾. However, these policies generally are not implemented well enough ⁽²⁵⁾.

For population scale interventions to improve under nutrition, fortification and bio-fortification offer the most practical solutions. Fortification of salt with iodine has been a global success story in terms of international reach and the global impact on iodine deficiency disorders ⁽²⁶⁾. However, effective national or regional monitoring of the fortification process is needed to ensure that the target level of added micronutrient in the food product is consistently achieved. Bio-fortification involves the enhancement of the nutrient content of the staple crops through traditional selective breeding techniques, genetic modification, and/or agronomic methods such as the application of micronutrient fertilizers. It has the potential to be sustainable and highly cost effective because the high nutrient varieties can be released to farmers, replacing standard varieties over time, and thus raising the micronutrient intakes of the population. Some success has already been demonstrated around the world, for example the release of vitamin A rich maize in Zimbabwe, iron rich beans in Uganda and zinc rich wheat and rice in Bangladesh ⁽²⁷⁾.

Further challenges relate to evaluation of intervention programmes. Iron is a “type 1” nutrient, meaning that a deficiency results in specific, measurable biochemical and metabolic consequences. As such, the diagnostic criteria for iron deficiency (and similarly for iodine) is well defined, and provide a robust indicator of an individual’s iron (or iodine) status ⁽²⁸⁾. In contrast, zinc is a type 2 nutrient, meaning that the consequences of deficiency are general and non-specific, making diagnosis challenging ⁽²⁹⁾. The identification of novel, sensitive biomarkers of zinc status is a research priority, and recent studies suggest that blood fatty acid ratios ⁽³⁰⁾, indices of oxidative stress, such as DNA damage ⁽³¹⁾, may be responsive to small changes in dietary zinc intake.

Despite extensive recommendations and action from global organisations such as WHO and the Food and Agriculture Organization of the United Nations (FAO), countries struggle to optimise dietary behaviour. Sadly, global malnutrition is on the rise due to conflict and climate change ⁽³²⁾, despite the United Nations (UN) decade of action for nutrition (2016-2025), and the drive to meet the UN sustainable development goal (SDG) for zero hunger ⁽³³⁾. The current situation in Türkiye and learnings from approaches in the UK and Finland are discussed in the next sections.

The current status of nutrition and health in Türkiye

In common with many countries, Türkiye is focused on improving the health and nutritional status of its population. Türkiye is suffering a larger burden of disease than most countries in Europe in terms of T2DM ⁽⁷⁾ and obesity ⁽⁶⁾ and major causes of death are CVD and lung cancer ⁽³⁴⁾. Furthermore, the population is younger than elsewhere and therefore the burden is likely to increase in the future. TURDEP-I (1997-8) and TURDEP-II (2010) are two comprehensive population-based field surveys conducted by Istanbul University in collaboration with the Ministry of Health (MoH) and under the monitoring of WHO in the same 540 centres throughout Türkiye and providing key information on diet and health ^(35; 36). In addition, in 2019 the Republic of Türkiye MoH published a comprehensive report on the Türkiye Nutrition and Health Survey (TNHS) undertaken in 2017, highlighting areas of concern ⁽³⁷⁾. The key public health priorities in Türkiye are to reduce tobacco and alcohol use, to increase physical activity, and to improve poor diets.

Obesity and diabetes in Türkiye

In 2016, Türkiye was ranked number one across the WHO European Region in terms of prevalence of overweight and obesity in adults ⁽⁶⁾. The mean age standardized prevalence of combined overweight and obesity was 66.8% of whom 32.1% were obese ⁽⁶⁾ (using data from the STEPS survey ⁽³⁸⁾). The results from the 2017 TNHS using different age ranges reported that the frequency of individuals aged 15 years and over who were overweight was 35.6% (males: 41.2%; females:30.1%), and the frequency of those who were obese was 28.8% (males: 21.6%; females: 35.9%). The situation is worsening and a 44% overall increase in obesity was observed between TURDEP-1 (1998) and TURDEP-II (2010) ⁽³⁹⁾. Obesity is more common in young and middle-age women than in men. However, the rate of increase in obesity was higher in men than in women (107% versus 34%). The estimated obesity prevalence in the elderly (65+) is 36.8% whilst 4.4 million children under 5 years old (7.9%) are overweight or obese ⁽⁶⁾.

High rates of obesity increase the risk of T2DM and Türkiye ranks first in Europe with a diabetes prevalence of 14.5% and a diabetes population of over 9 million according to 2020 data ⁽⁷⁾. Age-adjusted diabetes prevalence increased by 90% from 6.6% in 1998 to 14.1% in 2010, with 44% undiagnosed. According to TURDEP-II, in 2010 approximately 30% of the adult Turkish population had some degree of prediabetes (IGT and/or IFG) ⁽³⁶⁾. These rates are likely to worsen with an ageing population and the need for preventative action is urgent.

Nutrient deficiencies and dietary behaviour in Türkiye

Dietary intakes are currently not optimal for health in Türkiye with under and over consumption identified. Specific nutrient deficiencies include iron deficiency anaemia which remains an important public health problem. All age groups, but particularly preschool and school age children, adolescents, and pregnant and lactating women are at risk. Severe vitamin D deficiency (<10 ng/mL) was found in 3.1% of men and 12.7% of women. Furthermore, according to the most recent data, 27.8% of the population has iodine deficiency. Niacin, and vitamin B₁₂ status is also low in sectors of the population ⁽³⁷⁾.

Over consumption of some nutrients is an issue as it is in many countries. Salt consumption is twice that recommended by the WHO ⁽³⁷⁾ although it has significantly decreased. Mean intakes of saturated fats are also above recommended and daily intakes have increased from 9.4g in 2010 to 11.4g in 2017 ⁽³⁷⁾. However, total sugar consumption decreased from 33.0 to 30.6g in the same time period ⁽³⁷⁾. Although Türkiye is one of those rare countries where the

four seasons can be experienced simultaneously, consumption of fruits and vegetables is low⁽³⁷⁾. As elsewhere, food waste is also an issue at an estimated 18 million tonnes per annum according to one source⁽⁴⁰⁾. Future policy action must aim to improve nutrient density of the diet and not solely focus on reducing fats, sugars and salt.

Health literacy in Türkiye

A further concern in Türkiye is the low level of health literacy (HL), that is, the ability to accurately interpret health information. Modern healthcare systems can be difficult to navigate especially for those who are disadvantaged, vulnerable and elderly. Recently, personal HL has been defined as the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others^(41; 42; 43).

In 2014 a Health Literacy Survey devised by the European Union (HLS-EU) was translated into Turkish⁽⁴⁴⁾ and used to investigate the HL level of the adult population⁽⁴²⁾. The mean general HL index of the adult population was estimated as 30.4 over a scale of 50 points. It was determined that 64.6% of the population fell into the “inadequate” (24.5%) or “problematic” (40.1%) HL category, which corresponded to almost 35 million adults. The level of HL was inversely correlated with age, and directly correlated with educational level. Furthermore, higher use of health care services and a higher incidence of disease were associated with lower HL levels. According to the data, 43.5% of those with inadequate health literacy level, 22.6% of those with problematic health literacy, 19.7% of those with adequate health literacy and only 13.5% of those with excellent health literacy have a diagnosed disease.

Strategies to increase the HL in Türkiye should focus on improving the general literacy level of the population, empowering women and establishing a social structure which protects the vulnerable and disadvantaged people; and which attains socio-economic justice.

Actions to improve diet and health in Türkiye

Public Health actions in Türkiye

A number of different policies and programmes are currently being implemented in Türkiye to improve diet and health, indicating strong political will to improve health. An awareness that tackling obesity needs to involve multisector collaboration has led to a wide range of

voluntary and mandatory policies. The 2010 “Turkish Healthy Eating and Active Life Program”, updated for 2019-2023, covers the following objectives: evaluating the current status of obesity, halting childhood obesity, increasing physical activity, and monitoring, evaluation and research. The action plan aims for a wide reach and is being implemented under the following headings:

- Awareness studies, campaigns, public education and in-service trainings
- Developing standards, guidelines, and legislation especially focusing on children, including the Nutrition-Friendly School Program, the School Milk Program, Raisins Program, School Canteens Foods and Beverage standards, School Food Logo, Restriction of junk-food advertising for children on TV, Curriculum changes to improve health literacy and increasing physical activity at school) and
- Reorganization of health services ⁽⁴⁵⁾.

The following interventions have been implemented.

Public awareness, public education and education in schools' campaigns: School physical activity videos have been made with the involvement of the Ministry of Education (MoE), MoH and General Directorate of Public Health. Social media has been used to disseminate information (<https://hsgm.saglik.gov.tr/tr/beslenmehareket-anasayfa>).

Standards and guidelines: The following have been published and implemented:

- Food and Beverage Standards for School Canteens (2015) ⁽⁴⁶⁾
- FitnessGram Test for secondary and high schools including anthropometric measurements (2017) ⁽⁴⁷⁾
- Turkish Dietary Guidelines ⁽⁴⁸⁾ updated for 2023⁽⁴⁸⁾
- Food Profile Guide (FPG) to reduce marketing pressure on children ⁽⁴⁹⁾
- Obesity and Diabetes Clinical Guideline for Primary Health Care ⁽⁵⁰⁾
- Weight Control and Monitoring Guide for dieticians ⁽⁵¹⁾
- Adult and Child Physical Activity Guidelines for Physicians ^(52; 53)
- Health Promotion Municipalities, specifically supporting healthy nutrition and improving the environment, and,
- Work Place Programmes in collaboration with Health Province Directorates ^(54; 55).

Regulations: The sale of foods and beverages with high calorie, fat, sugar, and salt contents including chips, chocolates, candies, confectionery, and sugar sweetened beverages have

been banned in schools. A School Foods Logo and compositional criteria have been developed for packaged cakes, biscuits, sugary milk, yogurt, and ice cream in collaboration with industry, the MoE and the Ministry of Agriculture (MoA) ^(56; 57). Advertising of ‘red list’ foods aimed at children has been prohibited since 2018. These include chocolates, candies, biscuits, cakes, chips, fruit juices, carbonated drinks, energy drinks and edible ices ^(58; 59). Trans fatty acids have also been banned. In addition, the MoA has implemented salt reduction regulations to include bread, tomato paste, cheese and olives. Salt packages must carry the following message: “Reduce salt, maintain your health”⁽⁶⁰⁾. Industry is collaborating on salt reduction and taxes have been introduced for a range of products deemed to be contrary to optimum nutrition.⁽⁶¹⁾ The School Lunch Programme has been included in the 11th Development Plan (2019-2023) ⁽⁶²⁾

Reorganised health services: Healthy Living Centres (HLC) have been established as an element of Primary Health Care. Obesity Centres have been established in 121 hospitals.

In addition to the official activities listed above, Turkish scientists, institutes and authorities are actively engaged in a variety of relevant European Union projects. These actions have contributed to improvements in salt and sugars intake with reported daily salt consumption in adults decreasing from 17.5 grams in 2008 to 10.2 grams in 2017, and the reported consumption of added sugar decreasing from 33 grams to 30.6 grams ^(63; 64; 65).

Actions for prevention and management of diabetes

The objectives of the Türkiye Diabetes Prevention and Control Programme 2011-2014 and the Türkiye Diabetes Programme 2015-2020 included the following:

- Policy development and implementation of effective diabetes management
- Prevention and early diagnosis of diabetes
- Ensuring effective treatment of diabetes and its complications
- Improving the care and treatment of type 1 diabetes in childhood
- Preventing obesity and T2DM; and
- Monitoring and evaluation of the diabetes program.

In DE-PLAN Türkiye (a joint project conducted in 18 European countries aiming to prevent diabetes and funded by the European Commission Sixth Framework Program), focusing on low-fat and high-fibre diets together with increased physical activity, has reported some success in the prevention of T2DM with 21% of participants returning to normal glucose

tolerance levels and a 76% reduction in hyperinsulinemia ⁽⁶⁶⁾. However, given the current statistics and the aging population there is still much to be done. Currently the Türkiye Diabetes Programme 2023-2027 Action Plan is under preparation.

The Sabri Ülker Foundation initiatives in Türkiye

In addition to government funded nutrition programmes in Türkiye, charities also make an important contribution to nutrition and public health. The primary purpose of the Sabri Ülker foundation is to make a positive contribution towards improving public health in Türkiye and beyond. The programme of the Foundation is managed by a Science Committee under the headings: Research, Education and Communications. The activities of SUF are summarised in the Foundation website (<https://sabriulkerfoundation.org/EN/>). A major initiative has been underway in Türkiye to emphasise the role of nutrition in achieving and maintaining health, and target audiences have included schoolchildren, healthcare professionals and media representatives. In 2011, the Foundation initiated its '*Balanced Nutrition Education Project*'; a programme provided to primary school children, supported by a wide range of materials aimed at inspiring the children to improve their nutrition and lifestyle. It has been implemented across Türkiye in conjunction with the Turkish MoE and has so far reached over 6 million students, their teachers and families. The impact of the intervention was evaluated by researchers in Turkish universities and identified positive trends, both in terms of nutrition and physical activity ⁽⁶⁷⁾. The Sabri Ülker Foundation has also addressed the question of health literacy via a range of activities including workshops for media and healthcare professionals and collaboration with the European Food Information Council (EUFIC) and the British Nutrition Foundation (BNF).

Every country in Europe has taken a unique approach to improving nutrition and health over the last 50 years. Here we discuss two examples of policies and actions in Finland and in the UK that are relevant to nutrition policy in Türkiye and elsewhere.

Finland – An example of the power of interventions

In the 1960s, Finland, and especially North Karelia in the eastern part of the country, had the highest rate of cardiovascular mortality in the world. The decision was made to target the whole community to address whether risk factors and behaviours can be changed on a population level and if so, what happens to mortality rates. The North Karelia Project was started as a comprehensive preventive programme to reduce serum cholesterol levels, high

blood pressure and smoking. The main aims related to diet were to reduce intake of saturated fats, mainly coming from dairy and meats, and replace them with polyunsaturated fats, as well as to reduce salt intake in the whole population ⁽⁶⁸⁾.

Based on established theoretical frameworks for behaviour modification practical interventions were implemented which included improving knowledge and skills, incorporating social and environmental support and involving community organisations including lay opinion leaders, to promote health innovations in the community. Specific strategies were developed for schools and workplaces ⁽⁶⁹⁾.

Cross-sectional population surveys were completed every 5 years starting in 1972. Results of the surveys indicated that saturated fats reduced from 20% of energy intake to 12-14% from 2007 to 2017 mainly by substitution with polyunsaturated fats ⁽⁷⁰⁾. Salt intake was reduced from 14 grams to 9 grams in men and from 11 grams to 7 grams in women. There was a substantial shift in the concept of what constitutes a healthy diet and smoking also declined from 52% to 25% in men.

Both risk factors and health outcomes improved substantially. Between 1972 and 2012, serum cholesterol was reduced from 6.9 mmol/L to 5.5 mmol/L (21%) in men and from 6.8 mmol/L to 5.4 mmol/L (21%) in women. Adults were invited once per year to have their blood pressure taken and get advice. Systolic blood pressure reduced from 148 mmHg to 135 mmHg in men and from 153 mmHg to 129 mmHg in women. Premature cardiovascular mortality in men declined by 84%. After the 1980s, improvement in treatment explained a significant part of the decline ⁽⁷¹⁾. Many activities were expanded to the rest of the country. The only factor that is worsening is obesity; mean body mass index (BMI) has increased since 1972.

The medical community reached consensus on the role of dietary fats on serum cholesterol and coronary heart disease. Political consensus was achieved and the Finnish Parliament agreed a health policy statement where prevention was key. After that agriculture policy and legislation were developed to support a healthy diet, with farmers encouraged to change from dairy to berry and rapeseed oil production. Animal feed was also improved to reduce the saturated fat in milk.

The changes in policy also provided an incentive for the food industry to develop healthier products such as transferring to rapeseed oil to reduce trans fats in baked goods. Plant stanol

esters, which can lower cholesterol, were incorporated into spreads as a replacement for butter and the use of rapeseed oil for cooking increased. The project continues through the implementation of innovative approaches including village competitions and reality TV programmes.

In conclusion, improved health by dietary changes is feasible at a population level but requires active work and large-scale cooperation between all meaningful sectors in society sustained over long periods of time.

The current status of nutrition and health in the UK

Prevalence of excess weight has increased over the last three decades: in England approximately 28% children aged 4-5 years are living with overweight or obesity increasing to 41% by aged 10-11 years⁽⁷²⁾ which worsened during the COVID-19 pandemic. In England deprivation and obesity are strongly associated^(73; 74) however failure to meet dietary recommendations is seen across all income groups. UK diets generally do not meet evidence based recommendations as depicted in the Eatwell guide⁽⁷⁵⁾ and are high in saturated fat and free sugars and low in fruit and vegetables, fibre and oily fish^(76; 77) Average energy intakes exceed those for a healthy body weight for adults by an estimated 300-1200 kilojoules/day (70-300 kilocalories), for adults living with overweight and obesity by an estimated 1000-1800 kilojoules/day (250-400 kilocalories), for children by an estimated 84-418 kilojoules/day (20-100 kilocalories) and for children living with overweight and obesity, by an estimated 586-2092 kilojoules/day (140-500 kilocalories)⁽⁷⁸⁾.

UK policies and strategies to improve diet and health

Tackling obesity has remained on the UK's health agenda for three decades and involves many organisations in the four regions of the UK (health is devolved to the four regions of England, Scotland, Wales and Northern Ireland in the UK). In England it includes Office for Health Improvement and Disparities (OHID, formerly part of Public Health England) based in the Department of Health and Social Care, community-based health services and charities.

The UK Scientific Advisory Committee on Nutrition (SACN) established in 2000⁽⁷⁹⁾ provides independent scientific evidence-based advice to UK government organisations including OHID in England, the Food Standards Agency in Scotland and health agencies in Wales and Northern Ireland, on nutrition and related health matters. Suggestions for nutrition priorities for risk assessment come from a variety of sources, including new evidence on

possible diet-health interactions, requests from government ministers, UK Health Departments, Non-Government Organisations, Industry and SACN members. SACN must also respond to unexpected nutritional issues of concern, a recent example of which is the COVID-19 pandemic. SACN's terms of reference include: i) nutrient content of individual foods, and diet as a whole, and the nutritional status of people; ii) how nutritional status of people in the UK may be monitored; iii) nutritional issues which affect wider public health policy issues; iv) nutrition of vulnerable groups and health inequality issues; and v) research requirements for these areas.

SACN publishes reports (<https://www.gov.uk/government/groups/scientific-advisory-committee-on-nutrition>) which have led to the formation of numerous Government policies on nutrition. For example, in 2015 these include the redefinition and new dietary reference values for dietary fibre (30 g/day) and free sugars (<5% total energy/day)⁽⁸⁰⁾; establishing dietary reference values for the intake of vitamin D (10 µg/day or 400 IU/day) for the general population aged 4 years and older in 2016⁽⁸¹⁾, and saturated fat (less than 10% total energy/day), with guidance for its replacement with unsaturated fats for those 5 years and older in 2019⁽⁸²⁾. In 2017, SACN recommended mandatory fortification of flour with folic acid to reduce the risk of neural tube defects in babies⁽⁸³⁾ but this has yet to be implemented. Data from the cross-sectional National Diet and Nutrition Survey (NDNS) rolling programme, is used by SACN to identify dietary intake and nutritional status of a representative UK population, and to model and develop new dietary recommendations.

New dietary recommendations by SACN are considered and acted upon by government departments leading on public health in the four devolved nations within the UK. Education and health promotion has been a central component of UK Government strategies to improve diet and reduce obesity. Campaigns promoting salt reduction⁽⁸⁴⁾ and sugar reduction⁽⁸⁵⁾, increasing fruit, vegetable and fibre consumption through '5-a-day'⁽⁸⁶⁾ and front-of-pack 'traffic light' labelling⁽⁸⁷⁾ have received significant investment and have focused on empowering the population to make healthier choices. Food and nutrition education for children in primary and secondary schools has formed part of the curriculum since 1990⁽⁸⁸⁾ and adherence to standards for school food is mandatory in all four devolved nations of the UK (although the standards vary by region)⁽⁸⁹⁾.

While public health campaigns have achieved high levels of awareness and engagement, knowledge of a healthy diet is only one of many factors influencing food choices. The food

environment has changed dramatically as obesity prevalence has increased. Less healthy foods, high in saturated fat, salt and sugar are highly accessible and heavily marketed and promoted ⁽⁹⁰⁾. In recent years the marketing of food delivery apps has become ubiquitous, catalysing a rapid increase in fast food delivery ⁽⁹¹⁾. In the UK, similar food products brought from the out of home sector tend to contain more energy than those from retail ^(92; 93).

Tackling obesity requires meaningful reductions in population energy purchases and intakes. Following the SACN report on carbohydrates and health ⁽⁸⁰⁾, Public Health England (PHE) recommended a broad, cohesive programme ⁽⁹⁴⁾ to simultaneously reduce the sugar and energy content of foods and drinks, and the effect of environmental drivers of poor diets. Many of these were structural policies that aimed to improve dietary choices at a population level without requiring personal agency or behaviour change.

In 2016, the voluntary sugar reduction and reformulation programme ⁽⁹⁵⁾ announced the ambition to reduce the sugar content of foods contributing most to children's sugar intakes by 20% by 2020. The programme has had mixed results ⁽⁹³⁾ achieving an overall 3% sugar reduction in retailers and manufacturers food categories. Breakfast cereals and yogurts and fromage frais achieved a 13% average sugar reduction, but this has been negated by sales increases in high sugar products like chocolate confectionery. Progress has been more mixed in the eating out of home sector for all products. There is more work to be done to drive reformulation and to encourage industry to deliver greater results.

Conversely the soft drinks industry levy ⁽⁹⁶⁾ legislated in 2018 has been successful ⁽⁹³⁾. Analysis demonstrates a 43.7% reduction in total sugar content of drinks per 100mLs between 2015 and 2019. The positive effect of this policy on dietary behaviour is equally distributed across all socio-economic groups, however no reductions in rates of childhood obesity have been detected in the UK.

The existence of an independent committee, in addition to health-related government departments, strengthens the nutrition evidence base and ensures a robust system is in place to identify needs, inform nutrition policies and evaluate improvements in diet behaviour. However, the evidence on improvements in health such as reductions in the prevalence of obesity remain elusive, despite concerted efforts, particularly for more vulnerable groups.

Evidence-based weight management and remission of type 2 diabetes in the UK

T2DM has been ‘associated’ with overweight and obesity for many years: the misleading word ‘comorbidity’ has been used. It has astronomical relative risks at high BMI, but even knowing that prediabetes progression to diabetes can be prevented by weight loss did not immediately trigger recognition that T2DM is actually *caused* by weight gain with age – and thus a potentially reversible disease-process.

The DiRECT trial was designed to establish whether T2DM remission could be achieved, within routine primary-care, by weight loss using an evidence-based structured diet programme (Counterweight-Plus). Background information and links to publications from the DiRECT trial can be found on the website: <https://www.directclinicaltrial.org.uk/>

Intervention participants lost a mean 13.5 kg with 850 kcal/day for approximately 12 weeks. New-style meals with around 50% of energy from carbohydrate were then introduced stepwise, to maintain a mean of around 10 kg loss at 12 months. Overall, almost half (46%) were no longer diabetic, and not requiring medication for diabetes, that is, in remission. Some regained weight, but with weight loss of more than 10 kg, over 70% achieved remission, at both 12 and 24 months.

About a third of participants were also able to stop their antihypertensive medications, and fatty liver disease was similarly resolved. With reduced prescriptions and medical consultations and admissions, health economics analysis showed that the intervention would pay for itself in 5-6 years. Patients were estimated to live longer, feel better, and cost less.

A subset of DiRECT participants underwent detailed metabolic and MRI investigations, which showed that people with T2DM (despite good treatment with UK guidelines) have excess fat in liver and pancreas, and that seems to be driving T2DM. With weight loss and remission, liver and pancreas fat falls to normal, the ragged sick-looking pancreas returns to a normal size and morphology, and maximal insulin production doubles, to become normal again.

DiRECT has thus confirmed that T2DM is a disease of ectopic fat accumulation, within the disease-process of ‘obesity’ at almost any BMI level. It is reversible *for the majority of people*, with weight loss soon after diagnosis, results now repeated for Arab and North African people in the DIADEM-1 trial, and in RETUNE with BMI below 27 kg/m². Questions remain, but remission is now a key T2DM management target, and weight loss of

more than 10-15 kg should be encouraged for all, using self-help or professionally-supported diet programmes. The COVID-19 experience showed that remote and face-to-face support are equally effective for Counterweight-Plus. Efforts are now being made to scale up this type of intervention so it is more widely available across the UK.

The British Nutrition Foundation

The British Nutrition Foundation (BNF), established in 1967, is a public-facing charity which exists to give people, educators and organisations access to reliable information on nutrition. The mission of the BNF is to translate evidence-based nutrition science in engaging and actionable ways for a wide range of audiences, including the general public and health professionals. The website www.nutrition.org.uk provides a wealth of information on different aspects of nutrition, training through online courses and webinars, and practical resources such as downloadable factsheets, booklets and posters – with the majority of these available free of charge. In the financial year 2020 – 2021, www.nutrition.org.uk had 2.3 million users, over 12 million pages viewed and over 260,000 resources downloaded. The three most downloaded resources were the *7-day meal plan*, *Portion size guide* and *Nutrition requirements*.

In addition to its main website, the BNF has an official, peer reviewed journal, *Nutrition Bulletin*, (impact factor 3.6) aimed at academics and health professionals; and for over 30 years has run a dedicated education programme, *Food – a fact of life*, aimed at school teachers and early year practitioners. The programme's website www.foodafactoflife.org.uk houses free resources for those educating young people aged 3 to 16 years about food and nutrition and webinars and online workshops, courses and conferences are offered. Resources focus on the key areas of healthy eating, cooking and food origins. Frameworks include the *Characteristics of good practice in teaching food and nutrition education* and *Guidelines for producers and users of school education resources about food*.

Nutrition based charities such as the British Nutrition Foundation and the Sabri Ülker Foundation provide valuable additional resources to government and medical services in many countries.

Conclusions

Nutrition has a profound effect on health, impacting both communicable and non-communicable diseases and disorders. However, there is widespread acknowledgement that medical practitioners do not receive adequate input on nutrition during their training and subsequent practice ⁽⁹⁷⁾. In both Türkiye and the UK obesity and type 2 diabetes have increased at an alarming rate during recent decades. Hidden hunger and overt micronutrient deficiencies remain critical issues for many, especially among disadvantaged sectors of the population.

This conference highlighted the wide range of factors to consider when aiming to improve diet and health of populations. Many initiatives are underway in different countries to prevent and manage poor health. At the heart of these is the need to achieve and maintain an optimum body weight and to consume a balanced diet sufficient but not excessive in both macro- and micronutrients.

The North Karelia project in Finland is a shining example of a success story whereby a community-based multidisciplinary and multifactorial approach resulted in an 84% reduction in premature CVD deaths in males. In the UK the sugary drinks industry levy led to substantial reductions in the consumption of free sugars and in the DiRECT trial substantial weight loss led to a 70% remission in T2DM, providing important health benefits. These and other examples are inspirational. They give us the confidence to know that dramatic improvements in health *are* achievable.

Success has also been seen in programmes to reduce hidden hunger, although measuring impact on micronutrient status is not always straightforward. Successful scale-up of national bio-fortification programmes is dependent upon producer and consumer acceptance of the nutrient enhanced staple, and evidence of effectiveness of consuming the bio-fortified staple on micronutrient status and health outcomes.

Globally, success in terms of increased life expectancy is clear. From 1960 to 2022 life expectancy increased from 45 to 78 years in Türkiye and 71 to 82 years in the UK (Macrotrends.net/countries). However, morbidity has increased substantially (<https://www.un.org/development/desa/disabilities/disability-and-ageing.html>). Education is critical as a first step to improve knowledge and awareness and health literacy, but education alone does not guarantee change in eating behaviours. A multidisciplinary approach is needed whereby Governments, the food industry, non-governmental groups and consumer groups

among others come together to develop evidence-based recommendations and appropriate joined up policies that do not widen inequalities. These include dissemination of accurate and relevant information in an easy to understand format to all sectors of the population, healthy environments that provide easy access to affordable, healthy food and encourage increased levels of physical activity and legislation to ensure production of healthy foods and to avoid advertising inappropriate foods, especially to children. It is clear that no single policy or programme can reverse the trend in obesity prevalence. A whole systems approach is required with deeper engagement at all levels of society to reduce obesity and diet-related ill health.

Contributions of authors

JS conceived the original idea for the conference and led the conference organising committee. Individual contributions to the manuscript were as follows: JS - Introduction and conclusions; JM – Global overview; EV – The North Karelia Project; SU – Communicable diseases; AT/RW – UK nutrition status, initiatives to address; TB - Türkiye nutrition status; IS Türkiye initiatives to address obesity and diabetes; ML – DiRECT trial; NL – hidden hunger; MDT – Health literacy; NY – Türkiye Ministry of Health initiatives; JL – UK Scientific Advisory Committee for Foods; CT – British Nutrition Foundation; BM/OD – Sabri Ülker Foundation; CE compiled the first draft of the manuscript and contributed to all subsequent versions. All remaining authors presented at the conference, submitted summaries of their presentations with references and approved their section of the final version of the manuscript.

Declarations of interest

Please provide details of all known financial, professional and personal relationships with the potential to bias the work. Where no known conflicts of interest exist, please include the following statement: "None."

For more information on what constitutes a conflict of interest, please see the International Committee of Medical Journal Editors (ICMJE) guidelines.

CELE is a committee member of The Nutrition Society of UK and Ireland.

HTB none to declare

ÖD Nutrition and Scientific Communication Executive at the Sabri Ülker Foundation

ML none to declare

JAL is the President of The Nutrition Society of UK and Ireland; Deputy Chair of the Scientific Committee for Nutrition (SACN) and Chair of SACN's subgroup 'Framework and Methods for Evidence Evaluation'.

NML none to declare

JCM is the Editor-in-Chief of the British Journal of Nutrition. In addition, he is Chair of the Board of Trustees of the British Nutrition Foundation and a Trustee of the Rank Prize Funds.

BM Board Member of the Sabri Ülker Foundation

IS none to declare

MDT none to declare

AET None to declare

CT none to declare

SU none to declare

EV none to declare

RW none to declare

NY none to declare

JDS is a Science Committee member of the Sabri Ülker Foundation and a Council Member of the Royal Society of Medicine Forum on Food and Health

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