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Conference on 'Diet and lifestyle strategies for prevention and management of multimorbidity'

Plenary Lecture

Improving diets and multimorbidity prevention

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In 2023, the UK government announced a Major Conditions Strategy, publishing 'The case for change and our strategic framework', which set out the focus on cancers, diabetes, dementia, mental ill health, musculoskeletal disorders, CVD and chronic respiratory diseases. Together, these conditions account for 60% of total disability-adjusted life years lost to early death or ill health in England, and one in four adults has at least two (multimorbidity). This review considers some of the key dietary risks for these major conditions and population policies that may improve diets and reduce risks. UK Government dietary recommendations, based on independent risk assessment and advice from the Scientific Advisory Committee on Nutrition, are encapsulated in the national food model, the Eatwell Guide. Based on key sources of dietary data – chiefly consumption data from the National Diet and Nutrition Survey and consumer purchase data from Kantar – most people do not meet dietary recommendations. This review considers how science and evidence inform health improvement policy. This includes policies that encourage healthier food choices, such as labelling and public procurement standards to those that minimise the impact of the less healthy choice such as sugar and salt reduction and reformulation. The review also considers nutritional approaches to managing some non-communicable diseases. Given the role nutrition and excess weight play in the onset, prognosis and quality of life for those living with one or more of the major conditions, there are huge potential gains from even small dietary improvements across population groups.

Keywords: Multimorbidity prevention: Dietary risk factors: Diet: Excess weight: Dietary policies

While health improvements mean that most people in the UK now live into older age, the key is helping them to age well. The Office for National Statistics estimated that a female born in 2022 has a 1 in 4 (25%) chance of living 99 years[1]. In 1948, when the National Health Service Act came into effect, there were 1.5 million people aged 75 years and over in England and Wales (3% of the population). Seventy-five years later, according to the 2021 census, this number has more than tripled to 5.2 million people aged 75 years and over (almost 8% of the population). This trend is projected to continue in the future, with the number of people aged over 80 being the fastest-growing segment of the population[2].

However, as life expectancy has increased, so has the number of years lived in poor health. The proportions of life in poorer health have remained relatively stable, but the number of years spent in ill health has increased over time[3]. Those who enter older age in good health and maintain it to the end have a very different experience to those who accumulate multiple debilitating or degenerative conditions, living with them for many years. There are inequalities in the number of years lived in good health *v.* poorer health. Females living in the 10% most deprived areas of England have a shorter life expectancy and spend around a third of their lives in poorer health. Females in the most affluent areas of the country live longer lives and

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spend less than a fifth of their lives living in poorer health[4]. The Chief Medical Officer for England's 2023 Annual Report focuses on healthy ageing, improving the quality of life in an adult's later years, rather than the quantity[5].

With older age comes an increasing probability of an accumulation of chronic diseases, called multimorbidity. Multimorbidity is defined as the presence of two or more conditions. One in four adults is now living with at least two health conditions, and that proportion is expected to rise over time[6]. Chronic diseases are not restricted to older people; one in four 16–24 years olds live with at least one long-term condition[5,7]. Poor diet and excess weight increase the risk and earlier onset of these chronic, non-communicable diseases (NCD). Modelling estimates that a dietary pattern in line with the Eatwell Guide is associated with 8.9 and 8.6 years of gain in life expectancy for 40-year-old males and females, respectively[8]. A combination of risky behaviours can have a negative synergistic effect, not just a cumulative effect; for example, the combined effect of excess weight and alcohol intake on the risk of liver disease has been found to be 1.55 times greater than the additive effect of each[9]. The physiological and social impacts of NCD can be irreversible and can generate a cycle of clinical and social deterioration, hence the importance of intervening early and upstream, not waiting until people are living with excess weight[10]. Primary or secondary prevention across the life course delays disease onset, enabling adults to live for a much shorter proportion of life with significant disability.

It is never too late to take preventative action; there are benefits even if action is taken in later life. A life course approach means identifying opportunities for minimising risk factors and enhancing protective factors at important life stages. It can also enable the delivery of inter-generational health improvement interventions and reduce health inequalities from generation to generation[11]. This paper sets out the development of dietary recommendations and dietary policies to address (multi-)morbidity in the UK.

English Government strategy for tackling long-term conditions and multimorbidity (until June 2024)

In 2018, the English Government outlined an ambition to ensure that people can enjoy at least five extra healthy, independent years of life by 2035 while narrowing the gap between the experience of the richest and poorest[12]. It highlighted that investing in the same service models or continuing 'business as usual' would not achieve this ambition. The 2019 Prevention Green paper recognised the need for greater investment in prevention compared with the past[13]. The NHS *Long-Term Plan* set out its role, including that of integrated care systems, in making funding decisions that meet the needs of the whole local population and prevent ill health[14].

In 2023, the Department of Health and Social Care in England published 'A case for change and our strategic framework', outlining the elements of a 'Major Conditions Strategy' and the need to focus on improving outcomes from the conditions that contribute the most to the burden of disease in England[15]. The most common NCD account for around 60% of total disability-adjusted life years (DALYs) in England. Long-term illness is also the most common reason for being economically inactive[16]. The strategy aimed to increase healthy life expectancy by addressing the common behavioural risk factors, of which poor diet and excess weight are one of the most important.

The role of diet and excess weight

The Global Burden of Disease (GBD) 2019 estimates that excess weight, poor diet and physical inactivity risk factors accounted for over 2.0 million years lived with disability and almost 4.5 million preventable years of life lost[17]. High BMI and high fasting plasma glucose were the most significant modifiable risk factors for years lived in disability, higher than tobacco[17]. Poor diet is one of the most important modifiable risks when preventing years of life loss. GBD estimates that obesity-related DALYs rose globally by 0.48% annually from 2000 to 2019 and predicts an increase of 39.8% from 2020 to 2030[18]. While there remains some uncertainty around the relative contribution different foods and nutrients make to specific health outcomes, the results clearly highlight the importance of avoiding excess energy intakes, reducing high consumption of saturated fat, salt, free sugars and red and processed meats and the need to increase our consumption of whole grains, fruits and vegetables.

Assessment and translation of dietary risk and recommendations

National datasets in the UK, in particular the National Diet and Nutrition Survey (NDNS)[19], and the Health Survey for England (HSE)[20], are fundamental to the dietary risk assessment process, as well as policy development and monitoring. Field work for the latest NDNS contract will start in 2024. The larger sample size, enabled by the use of the digital dietary recall tool Intake24[21], will allow for more frequent reporting and sub-group analysis. NDNS will also collect data from 12 months of age, rather than 18 months. In combination with the currently running infant feeding survey in England[22], this will further bridge the dietary data gap in infants[22]. There is also an opportunity for improvements in digital infrastructure to make a linkage between our dietary data and other UK national data sets more feasible, including the National Child Measurement Programme surveillance data[23], once its IT system is upgraded, and part of the Digital Personal Child Health Record[24]. Stronger data on consumption and health outcomes support a more robust and granular dietary risk assessment.

The NDNS years 12–15 will be published later in 2024. Years 9–11 (2016/17–2018/19) demonstrate that as a population, we are generally not meeting dietary recommendations[25]. In addition, we are consuming too many calories. Under-reporting on energy consumed in dietary recall studies means that excess energy

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Fig. 1. The UK national food model, the Eatwell guide

consumption is estimated from the HSE BMI surveillance. Recent estimates, using 2017–2019 HSE data, suggest that on average, male adults consume between 168 and 304 kcal excess energy per day, and female adults consume between 89 and 171 kcal excess energy per day[26]. When analysis is restricted to those with existing excess weight, it is estimated that adults living with overweight or obesity consumed between approximately 250 and 450 kcal excess energy per day, dependent on age and gender[26]. Compared to those living with a healthy weight, it is estimated that children living with overweight or obesity consumed between approximately 180 and 560 kcal excess energy per day for boys and between 180 and 330 kcal excess energy per day for girls, depending on their age[26]. Given that overweight and obesity are the result of habitual consumption of excess calories and the slow accumulation of adiposity across the life course, these estimates emphasise the need for a population shift in consumption behaviour and dietary norms.

The Scientific Advisory Committee on Nutrition (SACN) has advised the UK government on nutrition-related matters since 2001, superseding the UK Committee on Medical Aspects of Food and Nutrition Policy (COMA)[27]. SACN[28] is a committee of the Office for Health Improvement and Disparities (OHID). It provides independent scientific advice on, and risk assessment of, nutrition and related health issues. SACN advises the four UK governments and is supported by an OHID secretariat. Clinical and policy risk management is outside the SACN remit, unless asked to do so, for example, assessing the use of lower carbohydrate diets for type 2 diabetes[29]. The evidence on clinical management is the remit of the National Institute for Health and Care Excellence[30] and the evidence on policy effectiveness to achieve dietary recommendations is the remit of a range of public health organisations. However, the majority of SACN reports and statements are relevant for multimorbidity primary and secondary prevention policies and interventions, for example, in relation to salt and hypertension, vitamin D and bone health, saturated fat and CVD[31].

The UK national food model, the Eatwell Guide (see Fig. 1), encapsulates government dietary advice, based on SACN and COMA recommendations[32]. A diet in line with the Eatwell Guide has been shown to be associated with a reduced risk of chronic disease, an increase in life expectancy and a reduced environmental footprint[8,33].

In 2021, SACN published a position statement on nutrition in older adults[34]. It concluded that older adults who are largely healthy tend to have similar eating habits to the rest of the population, are not meeting dietary recommendations and that the prevalence of overweight

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Table 1. Examples of diet and obesity policies and government action in England, categorised according to the Nuffield Balanced Intervention Ladder

Intervention type	Examples of policies and government action in England
Providing information	Government social marketing campaigns, Eatwell Guide[a], NHS.uk website[b]
Enabling healthier choices through information	Labelling – Front of Pack[c], calorie menu labelling[d]
Changing the default	Voluntary salt, sugar and calorie reduction and reformulation programme[e]
Incentives	Healthy Start Vouchers[f]
Disincentives	Modifying the cost, for example, Soft Drinks Industry Levy[g]
Restricting choice	Local planning and licensing controls for new hot food takeaways near schools
Restrict the influence of less healthy choices	Location promotion restrictions on HFSS products, local HFSS advertising bans, for example, On Transport for London

Abbreviation: HFSS, foods high in saturated fat, salt and sugar.
[a]The Eatwell Guide – GOV.UK (www.gov.uk)
[b]The NHS website – NHS (www.nhs.uk)
[c]Front of Pack nutrition labelling guidance – GOV.UK (www.gov.uk)
[d]Calorie labelling in the out-of-home sector – GOV.UK (www.gov.uk)
[e]Sugar, salt and calorie reduction and reformulation – GOV.UK (www.gov.uk)
[f]Healthy Start – GOV.UK (www.gov.uk)
[g]Soft Drinks Industry Levy – GOV.UK (www.gov.uk)

and obesity remains high in this group[34]. Government advice for older adults is largely the same as for other adults, namely, to follow a healthy, balanced diet as depicted by the Eatwell Guide. However, SACN highlighted that older adults can have multiple physical and functional challenges to achieving a healthy, balanced diet[34]. Of note is a reduction in appetite and functional gastro-intestinal tract decline impacting digestion and absorption of foods; 30% of people over 75 years have no teeth, and ill-fitting dentures alone can have a significant negative impact on diet; and people's functional ability to cook and shop for themselves reduces with age[34]. Analysis of dietary data demonstrated that while mean protein intakes met the UK Reference Nutrient Intake (RNI; 0.75g per kg body weight) for all age and sex groups, 27% of the 65–74 years age group and 33% of the 75 years and over age group had protein intakes below the RNI[34]. However, no significant benefit was found for older adults from taking protein supplements on musculoskeletal health or mortality[34]. On nutrition, cognition and dementia, SACN has previously concluded that greater adherence to a Mediterranean dietary pattern may reduce the risk of mild cognitive impairment and dementia (though the available evidence is largely observational and may be subject to residual confounding and reverse causality)[35]. While there is no single Mediterranean diet, the dietary components that are characteristic of Mediterranean dietary patterns broadly align with UK dietary recommendations as depicted in the Eatwell Guide[32]. SACN also concluded that there is insufficient evidence to draw any conclusions on the association between individual nutrients and risk of cognitive decline or cognitive impairment[35].

Primary prevention policies to reduce dietary risk factors and prevent multimorbidity

There are now a wide range of voluntary and mandatory dietary policies implemented in England, from policies that inform and support healthier choices through to policies that restrict or disincentivise unhealthy choices. Examples, framed against the Nuffield Balanced Intervention Ladder[36], are included in Table 1.

There is increasing evidence that there is no one solution to improving diets and reducing overweight and obesity. A comprehensive, multi-pronged approach is required combining individual behavioural interventions, which cost financially and are less politically controversial, and policies that reshape the obesogenic environment, which do not financial implications for the public sector but require a lot of political capital to get through Parliament[37].

Policies at the bottom of the ladder, such as nutrition messaging and campaigns, are less controversial than policies further up the ladder. There is, therefore, less demand for evidence of effectiveness. As policymakers move up the ladder and augment the individual behaviour change interventions with potentially more impactful structural policies that address the food environment, the political cost of these interventions is greater, and therefore the demand for evidence of effectiveness increases. This means the certainty and strength of the evidence of intervention effectiveness and feasibility of delivery needs to be stronger, coupled with strong public concern and support for action.

As policymakers weigh up the benefits *v.* trade-offs of individual policy options, evidence reviews of what works to achieve SACN dietary recommendations are very helpful. A clear example of this is the Public Health England review of policies to reduce sugar consumption and bring population consumption more in line with dietary recommendations[38]. Policies included in the evidence review have formed the basis of the Government Childhood Obesity Plan chapters[39,40] and the 2020 Government Strategy to Tackle Obesity[41]. Monitoring the impact of these environmental policies therefore plays an important role in improving them, defending them, and in the design of more targeted policy. Department of Health and Social Care uses third-party purchase data, such as Kantar[42] purchasing panel data, to monitor the impact of policies at a household level and

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commissions post-implementation evaluation on its regulations.

The Soft Drinks Industry Levy (SDIL), announced in 2016 and implemented in 2018, is an example of a successful policy that has been extensively monitored and evaluated[43]. The SDIL brought together the design thinking of more than one UK government department, ensured that it resulted in health benefits but not at a commercial cost, had public momentum behind it generated through campaigns raising concern over 'sugary' products and managed to elude the influence of lobbyists; these were some of the factors that made it successful[44]. There is emerging evidence that suggests that the SDIL has reduced UK population free sugar intakes with a greater effect in those from a lower income group and that there has been an associated reduction in obesity prevalence in girls leaving primary school[45], reduction in hospital admissions for tooth extraction[46] and reduction in incidence of asthma admissions[47].

It can be challenging to simplify complex dietary recommendations for policy use. The creation of the UK Nutrient Profile Model (NPM) succeeded to overcome this challenge by providing a composite healthiness score[48]; the lower the score, the healthier the food or drink. The model was developed by Oxford University and overseen by an Expert Group. It has been subject to rigorous scientific and now judicial scrutiny[49] and extensive consultation. In 2007, Ofcom announced its intention to use the NPM in its restriction of unhealthy food advertising during children's programming. In 2017, Outsmart expanded the Ofcom advertising restrictions to non-broadcast media (e.g. Internet, billboards/posters within 100 metres of schools). The London Food Strategy used the NPM in advertising restrictions on the Transport for London Estate[50]. The NPM is now also used to define high saturated fat, salt and sugar (HFSS) foods in the regulations restricting the promotion of less healthy products in key selling locations in-store and online that came into force in October 2022. An updated NPM model has been in development. A draft was consulted in 2018, but the final version has not yet been published[51]. Analysis indicates that both models are likely to have significant benefits and align well with existing UK advice[52].

Secondary prevention policies to reduce dietary risk factors and prevent multimorbidity

Primary prevention strategies address suboptimal diet quality at a population level, both by encouraging the consumption of healthier foods and discouraging the consumption of less healthy foods. Secondary prevention emphasises early disease detection, and its target is healthy individuals with subclinical forms of the disease, which is not yet apparent to them, or those at high risk of the disease. *Secondary prevention* interventions are directed at *diseases* where there are measurable *risk factors* or an abnormal condition that precedes *the* emergence of *disease*. It aims to intervene before the disease arises either by reducing the risk factors or by treating the underlying abnormality[53]. Increasingly, screening tests are undertaken for nutrient inadequacies and deficiencies in asymptomatic individuals, for example, iron deficiency anaemia in pregnant women, low vitamin D status in people with musculoskeletal disease or low vitamin B_{12} status in older adults. Clinical pathologies can directly result in nutrient deficiencies and affect dietary intakes; these are often recognised and treated at a late stage[54].

Population policies and individual interventions to improve diet and physical activity have a key role in supporting those accessing weight management services, including the new obesity drugs. These drugs can help people living with obesity to lose those first kilos, give them the capability to be more active, encourage them towards a healthier diet and reduce disability in later life. It is yet to be determined if the weight loss can be maintained without continuation of drug treatment long term. Currently, the NHS is making these drugs available to people who have health problems resulting from their weight or for people living with a BMI over 35 kg/m^2 (or 32.5 kg/m^2 if you are of certain ethnic minorities). When considering multimorbidity, it is not clear what role these drugs could play in reducing disability in older adults. Even with the help of drugs, maintenance of weight loss requires a continued healthy diet, physical activity and an enabling, healthy environment.

Where next on reducing dietary risk factors and preventing multimorbidity?

To date, policies in England have yet to significantly shift dietary patterns and turn the obesity prevalence trajectory. There is hope, the National Child Measurement Programme reception (age 4–5 years) prevalence rate, even when accounting for the sharp rise in prevalence during the COVID-19 pandemic, has plateaued and may be starting to reduce, but is still at too high a level[55]. While it is well-recognised that the country needs a comprehensive package of interventions, ranging from individual to environmental, policies struggle to keep pace with shifting environments and behaviours.

The last decades have seen an increasing amount of our food being supplied out of home. Evidence suggests that eating out including takeaways accounts for up to 25% of all adult energy intake[56], and portions of food and drink in takeaway meals contain on average twice as much energy as equivalent retail substitutes. These foods are typically high in energy, saturated fat, and salt[57,58]. When someone consumes a takeaway meal, on average they will eat 200 kilocalories more per day than if they ate food prepared at home[59]. The pandemic fuelled a desire for home delivery that has not reversed to pre-pandemic levels[60]. Meal delivery apps (MDA) are now a feature of the food landscape, increasing the access, use and reach of restaurants and other out-of-home businesses[61]. Advertising of less healthy foods, digital penetration and takeaway usage are all higher in low-income groups[61]. Since 2021, England has experienced increasing household food insecurity and use of food banks[62,63]. We have yet to fully understand the impact of the

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pandemic lockdown measures and the recent food inflation on the dietary patterns and behaviours of different population groups.

There is a growing body of scientific research on ultra-processed foods (UPF) and health outcomes. An estimated 51–68% of dietary energy in the UK comes from UPF, varying by age and socio-economic group[64]. In July 2023, SACN published a position statement that concluded that published systematic reviews consistently report that increased consumption of (ultra-) processed foods was associated with increased risks of adverse health outcomes[55]. However, there are uncertainties around the quality of the available evidence[65]. It went on to state that it is unclear whether these foods are inherently unhealthy due to processing or because a large majority of the UPF are energy dense and HFSS. We should not underestimate the complexity and challenges involved in understanding the mechanism of this association. There are significant gaps in the evidence base and SACN made several research recommendations. The Committee has this topic on its watching brief and continues to review. Government dietary advice, as depicted within the Eatwell Guide[25], already shows that many foods that would be classified as UPF are not part of a healthy, balanced diet. Most UPF are also captured by the government policies to create a healthier food environment to help people achieve and maintain a healthy weight, such as the regulations which restrict the placement of HFSS foods, calorie labelling in large restaurants and the voluntary reformulation programmes to reduce salt, sugar and energy density of everyday foods.

Conclusion

Nutrition and dietary patterns are key determinants of healthy ageing and multimorbidity. The public health challenge is to not only extend life but even more importantly improve the quality of years lived. Most people in the UK do not meet government dietary recommendations and crucially in recent years energy intakes have steadily increased in the UK. Poor diets and excess weight increase the likelihood of multimorbidity, contributing to the increasing gap in healthy life expectancy between the most and least deprived. Even a small shift towards these dietary recommendations will have a significant impact on health at a population level. The food environment continues to evolve resulting in behavioural shifts and our scientific understanding of dietary risks continues to develop; nutrition policy will need to adapt and keep pace with this changing landscape.

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T.B. and A.C. contributed equally to this work.

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