addressing dietary shortfalls. Information on foods provided at breakfast clubs was obtained from local organizers in a number of European countries. Macronutrient and micronutrient composition of foods was accessed using local food composition databases.

**Results**: A positive association was found between socioeconomic status and macronutrient and fruit and vegetable intake and daily breakfast consumption. Foods routinely provided at breakfast clubs (e.g., ready to eat breakfast cereals, fruit, and vegetables, bread) can provide important contributions (17–50% of Dietary Reference Values) to intakes of key nutrients e.g. vitamin D, folate, vitamin B2, iron, and iodine. Evidence of low intakes of these nutrients exists among lower socioeconomic groups in Europe.

**Conclusion**: These findings may warrant further research and have implications for public health policy in addressing socioeconomic dietary inequalities in Europe. School based breakfast clubs may form part of a multi-pronged approach to address nutritional and health inequalities between people with different socioeconomic status.

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**Poster presentation no. P449**

**Dietary habits across the lifespan and risk of monoclonal gammopathy of undetermined significance**

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**Background and aims**: All multiple myeloma (MM) cases are preceded by the premalignant state, monoclonal gammapathy of undetermined significance (MGUS). The etiology of MGUS and MM is to a large extent unknown. Few studies on the effect of diet on MM have been conducted, and the results have been inconclusive. No studies have been conducted on the effect of diet on MGUS. Our aim was to explore the effect of high versus low intake of fish, fish oil, meat, milk, fruits, vegetables, potatoes, rye bread, whole wheat bread, and oatmeal and muesli on MGUS and MM.

**Methods**: This study was based on participants from the AGES-Reykjavik Study (n = 5,764). We performed serum protein electrophoresis on all subjects to identify MGUS. Participants answered questionnaires about lifetime dietary habits. Data on MM diagnosis was collected through the Icelandic Cancer Registry. Logistic regression and Cox regression models were used to analyze the risk of MGUS and MM; adjustments were made for age and gender.

**Results**: A total of 300 MGUS (5.2%) cases were identified. We found that high intake of fruits in adolescence and high intake of whole wheat bread in midlife were inversely associated with MGUS (odds ratio (OR) = 0.63, 95% confidence interval (CI) 0.52–0.97 and OR = 0.76, 95% CI 0.59–1.00, respectively). We also found that high intake of rye bread and potatoes in both adolescence and midlife was inversely associated with MGUS (OR = 0.70, 95% CI 0.55–0.95 and OR = 0.63, 95% CI 0.45–0.96, respectively). A total of 18 individuals were diagnosed with MM during a mean follow-up of 8.2 years. We found that high fruit intake in late life reduced the risk of progression to MM (hazard ratio (HR) = 0.30, 95% CI 0.11–0.82).

**Conclusion**: Our findings suggest that high intake of fruits, rye and whole wheat bread, and potatoes in adolescence and/or midlife may reduce the risk of MGUS, and that high fruit intake in late life may reduce the risk of progression to MM.

**Disclosure of interest**: None to declare.

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**Poster presentation no. P450**

**Development of a scoring system to quantify the intake of animal versus vegetable protein and the association with HbA1c and eGFR – a sub-study of the PREVIEW project**

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**Background and aims**: To assess the impact of a high versus low protein intake in relation to diabetes risk and safety aspects, we developed a scoring tool, in particular on animal versus vegetable protein. Analyses were based on observational study populations included in the PREVIEW project.

**Methods**: We analyzed cross-sectional data from two Dutch observational studies conducted among general adult populations: NQplus (n = 1,048) and Lifelines (n = 57,349). Dietary intake data from food-frequency questionnaires were used to develop a protein score, which consisted of two components: percentage of energy from total protein and the ratio of animal to vegetable (A:V) protein. Subjects were divided into 11 strata of total protein intake (en%) and 11 strata of the A:V ratio. A subject could receive a combined score of 0–20 points, where a higher score reflected a higher intake of total protein, and a lower A:V ratio. The associations between the protein score and HbA1c and renal function calculated as eGFR, using the CKD-EPI equation, were examined using multiple linear regression with adjustment for age, sex, education, BMI, prevalent hypertension or hypercholesterolemia, smoking status, alcohol consumption, and physical activity.

**Results**: We found a negative association between the protein score and HbA1c levels in Lifelines (β = −0.037 ± 0.005, p < 0.001) but not in NQplus. In both Lifelines (β = 0.17 ± 0.02, p < 0.001) and NQplus (β = 0.44 ± 0.12, p < 0.001), there was a positive association between the protein score and eGFR.

**Conclusion**: Our preliminary analyses suggest that a diet rich in protein and with a lower ratio of animal to vegetable (A:V) protein may be associated with a lower risk of diabetes and an increased eGFR.

**Disclosure of interest**: G. M. Poulsen: None to declare; D. Siuk: None to declare; L. C. Dragsted: None to declare; J. Brand-Miller: President of the Glycemic Index Foundation, a non-for-profit food endorsement program, Manager of a GI testing service at the University of Sydney and the co-author of books about the GI foods; T. M. Larsen: None to declare; S. Poppiti: None to declare; M. Silvestre: None to declare; E. J. M. Feksens: None to declare; A. Raben: None to declare.

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**Poster presentation no. P451**

**Sweet weekend? Intake of added sugar according to day of the week in Norwegian 4th and 8th graders**

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**Background and aims**: The intake of added sugar in Norwegian children and adolescents has previously been found to be higher than desirable. Saturday has traditionally been the day when sweets are consumed; commonly known as “Saturday-sweets.” In the present study, we examined if intake of added sugar was higher on Saturdays than on the other days of the week among 4th and 8th graders.

**Methods**: In the national Ungkost-3 survey, 1,322 participants (636, 4th graders, and 686, 8th graders) recorded their diet for 3–4 days using a web-based food record (WebFR) based on the Danish application WebDASC. The WebFR is structured by meals and includes about 570

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