total causal effect (i.e. an 'additive' effect) but only provides unbiased estimates in the absence of confounding or when all individual nutrients have equal effects on the outcome. The 'nutrient density model' does not target a causally meaningful estimand but can provide extremely biased estimates of the average relative causal effect of the exposure rescaled as a percentage of total energy intake. Accurate estimates of both the total and average relative causal effects were obtained with the 'all-components model'.

Conclusion Only the 'all-components model' produces unbiased estimates of different causal effects. Lack of awareness of the estimand differences and accuracy of the different modelling approaches may explain some of the apparent heterogeneity among existing nutritional studies. Serious questions may be raised regarding the validity of meta-analyses where different strategies returning different estimands have been inappropriately pooled.

OP82 **PERFORMANCE OF SUBSTITUTION MODELS IN NUTRITIONAL EPIDEMIOLOGY**

[1,2,3]Georgia Tomova*, [1,4]Kellyn Arnold, [1,2,3]Mark Gilthorpe, [1,2,3]Peter Tennant. [1]*Leeds Institute for Data Analytics, University of Leeds, Leeds, UK;* [2]*Faculty of Medicine and Health, University of Leeds, Leeds, UK;* [3]*The Alan Turing Institute, London, UK;* [4]*Faculty of Environment, University of Leeds, Leeds, UK*

Background Dietary guidelines often recommend substituting certain nutrients or foods with healthier alternatives, based on the available evidence from nutritional epidemiology. The effects of food substitutions can be examined by conducting isocaloric dietary interventions, but experimental studies are often not practical or sufficiently generalisable. Therefore, nutritional epidemiology is highly reliant on observational data, in which food substitutions can be explored using mathematical modelling. The two modelling approaches commonly used for estimating substitution effects are known as (1) the 'leave-one-out' model, in which total energy intake and all dietary components are included as covariates, excluding the nutrient(s) that the exposure should be substituted with; and (2) the energy partition model, in which all dietary components are included as covariates, without further adjustment for total energy intake. It remains underappreciated that these approaches do not perform equally well for estimating substitution effects, and that there is limited evidence on whether they produce unbiased estimates.

Methods Semi-parametric directed acyclic graphs and Monte Carlo data simulations were used to explore the performance of the two approaches for estimating the following estimands: 1) the average relative causal effect (i.e. the joint effect of increasing intake of the exposure and decreasing the intake of all other nutrients, while keeping total energy intake constant), 2) the relative effect of increasing the exposure nutrient and decreasing the intake of one other nutrient, and 3) the relative effect of increasing the exposure nutrient and decreasing the intake of a combination of other nutrients. The approaches were explored both in the absence and presence of confounding that acts through diet.

Results The 'leave-one-out' model produced a biased estimate of the average relative causal effect even in the absence of any confounding. It robustly estimated substituting the exposure with another specific nutrient regardless of whether confounding was present but produced biased estimates of substituting the exposure for a combination of other nutrients even in the absence of confounding. The energy partition model robustly estimated all three estimands of interest, producing unbiased estimates regardless of whether confounding was present or not.

Conclusion Only the energy partition model produces unbiased estimates of different substitution effects in the context of nutritional epidemiology. It performs equally well even in the presence of confounding that acts through diet. Substitution analyses using the 'leave-one-out' approach might not be robust and any existing studies using this model might suffer from bias.

OP83 **DEVELOPING A MEASURE OF DIETARY QUALITY FOR THE UK BIOBANK**

[1,2]Chloe Montague*, [1]Stefania D'Angelo, [1,3]Nicholas C Harvey, [1,3]Christina Vogel, [1,3]Janis Baird. [1]*MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK;* [2]*Health Education England – Wessex, Health Education England, Winchester, UK;* [3]*NIHR Southampton Biomedical Research Centre, University Hospital Southampton NHS Foundation Trust, Southampton, UK*

Background The UK Biobank (UKB) has assessed diet among participants using a food frequency questionnaire (FFQ). Studies of UKB have tended to examine the association of intake of single foods with health outcomes. We used the FFQ data to develop a diet quality score that could be used to examine the relationship of dietary patterns with markers of cardiometabolic health.

Methods We applied principal components analysis to the FFQ data for participants from the Foodscapes section of UKB (n=52,345). The first component was transformed using Fisher-Yates normal scores, mapping it onto a Normal distribution with a mean of 0 and a standard deviation of 1. The median value was used to categorise diet as healthy or unhealthy. We examined the relationship of the diet scores with markers of cardiometabolic health (blood pressure, serum lipids, BMI) in linear regression analyses, adjusting for confounding factors identified in a Directed Acyclic Graph: sex, age, ethnicity, educational attainment, smoking, Index of Multiple Deprivation.

Results Of the 52,345 potential participants, 33,149 (63%) had complete dietary data. Just under half (45%) were men. The average age was 56.2 years (SD=8.2). Most (84%) were white and almost half had a college/university degree (49.5%). The first component explained 14% of the variation in the diet data. It was characterised by high consumption of beef, any type of meat, white bread and low fibre cereals, and low intake of fresh/dried fruit, salad and cooked vegetables and was defined as an 'unhealthy diet score'. Coefficients were multiplied by -1, so a positive value of the score indicated a healthy diet. A higher score, indicative of healthier diet, was associated with lower systolic and diastolic blood pressure (β -0.81, 95% CI -1.0, -0.62; β -0.61, 95% CI -0.72, -0.05), lower BMI (β -0.67, 95% CI -0.73, -0.62) and with healthier lipid profile (lower levels of cholesterol β -0.05, 95% CI -0.06, -0.04, triglycerides β -0.05, 95% CI -0.06, -0.03, and higher HDL cholesterol β 0.01, 95% CI 0.0, 0.01). Participants with healthier diet scores (>1) were less likely to be current smokers and more likely to be physically active (>1/day vigorous activity) (both P<0.001).

Conclusion The diet score was a good approximation of dietary quality and demonstrated a positive relationship between an unhealthy diet and markers of poorer cardiometabolic health. The measure can be used to examine dietary patterns within the UKB and explore their relationship with a range of outcomes.

OP84 **ADAPTING THE ONLINE DIETARY ASSESSMENT TOOL (*MYFOOD24*) FOR INDIGENOUS COMMUNITIES IN THE PERUVIAN AMAZON TO RESEARCH FOOD BIODIVERSITY AND CLIMATE CHANGE RESILIENCE**

[1]Carol Zavaleta-Cortijo*, [1]Rosalia Montero, [1]Rosa Silvera, [1]Andrea Valdivia-Gago, [2]Delfina Catip, [2]Rocilda Nunta, [3]Connie Fernandez, [4]Guillermo Lancha, [4]Pedro Pizango, [5]Juan-Pablo Aparco. [1]*Facultad de Salud Publica (FASPA), Universidad Peruana Cayetano Heredia, Lima, Peru*; [2]*Programa Mujer, Asociación Interétnica de Desarrollo de la Selva Peruana (AIDESEP), Lima, Peru*; [3]*Hospital Santa Gema, Direccion Regional de Salud Loreto, Yurimaguas, Peru*; [4]*Pueblo Shawi, Yurimaguas, Peru*; [5]*Centro Nacional de Alimentación y Nutrición (CENAN), INS, Lima, Peru*

Background Over the past ten years Amazon region has experienced multiple environmental changes including high rates of deforestation, and more frequent 'once in a century' extreme weather events. Despite this it is still not clear how these events effect food biodiversity, local diets and nutrition of Amazon Indigenous people. Information on food consumption is urgently needed, especially to identify key Amazonian Indigenous foods which may increase nutritional resilience to extreme climate events. Technological tools represent a potential feasible solution to measure diet for population studies. We have partnered with International researchers, local nutritionist, Indigenous leaders and community members to adapt a digital tool to support dietary measurement in Amazonian Indigenous communities.

Methods The adaptation had three stages. First working with an international multidisciplinary committee, we identified and compiled existing food composition databases to create a database for the Peruvian *myfood24* version to use with communities of Shawi ethnicity. Seven food composition tables were identified, and permission was requested for two cases where information was not public. Six food composition tables, one academic publication and one peruvian report about amazon food species, were used for generating a food composition database. Second, using *myfood24* guidelines, we completed a data base using Access software. This process involved cleaning and removing duplicate food items, including conversion values (from raw to cooked foods) and calculations for potential nutrient losses on cooking. We used a series of six online focus groups meetings with three peruvian nutritionists, including one nutritionist expert on the Shawi diet, to identify portions, and combinations. Finally, during a workshop with five local community members, a list of Shawi foods were validated, and food preparation was characterised to develop recipes and to take pictures for use in the online tool.

Results The peruvian food composition database to be used with the Shawi communities included a total of 1042 food items, with information for 14 key nutrients. These foods were split into fourteen food categories. Seventy-six possible options on how food is eaten together, and 43 portion measurements were validated in the focus groups. 114 food items were identified in the workshop as commonly consumed by

Shawi, with five forest animal foods proving the highest level of iron per 100 g: palm larvae (3.6mg), armadillo (3.5mg), deer (3.5mg), paca (3.4mg) and agouti (3.4mg).

Conclusion A comprehensive Peruvian Food Composition Database with a focus on Shawi diet has been created. This data has been incorporated within the online dietary assessment tool, *myfood24*. A photo Album and recipes will be completed over the next weeks. The new tool with be useful to understand how food and nutrient intakes in this vulnerable population are affected by climate change events.

Friday 17 September

Primary Care, 13.00 – 15.30

OP85 **GENERAL PRACTITIONERS WORKING IN OR ALONGSIDE EMERGENCY DEPARTMENTS IN ENGLAND: A QUALITATIVE STUDY OF GENERAL PRACTITIONERS' PERSPECTIVES**

[1]Helen Anderson*, [1]Arabella Scantlebury, [1]Heather Leggett, [2]Heather Brant, [2]Sarah Voss, [2]Jonathan Benger, [1]Joy Adamson. [1]*Department of Health Sciences, University of York, York, UK*; [2]*Factulty of Health and Applied Sciences, University of the West of England, Bristol, UK*

Background Up to 40% of Emergency Department attendances could be managed in primary care. In response, policies have led to the introduction of General Practitioner Services in/ alongside Emergency Departments in England. Our aim was to capture General Practitioners' perspectives of the service and their experiences in order to identify factors which may support or hinder General Practitioners working in Emergency Departments.

Methods Qualitative study of 10 case sites where GPs were working in/alongside Emergency Departments at NHS sites in England. Data consisted of 186 direct non-participant observations and 226 semi-structured interviews with 191 health professionals, 42 of which were General Practitioners. This paper reports on a thematic analysis of 42 GP interviews and observations relating to GP practice.

Results Both system issues and individual characteristics influenced how General Practitioners viewed and experienced working within or alongside Emergency Departments. Themes identified were: A different kind of GP; Disillusionment with primary care; New ways of 'doing' general practice - portfolio working; A reciprocal relationship; Practical barriers and facilitators; Unintended consequences – impact on primary care. General Practitioners working in Emergency Departments saw personal benefits (flexible and portfolio working; less stressful and more supportive environment than traditional general practice; broadening of skills and experience) and systems benefits (sharing their knowledge and skills with secondary care; taking secondary care skills learned into primary care work; prolonging experienced General Practitioners' working life and enthusing younger General practitioners). They also identified negative aspects. General Practitioners working in Emergency Departments saw themselves as different to 'usual' General Practitioners and were sceptical that a critical mass of General Practitioners willing and able to staff Emergency Departments effectively could be reached and sustained. There were remuneration and practical employment issues such as dysfunctional IT systems and