Max Rubner Conference 2017

Nutrition Monitoring – Challenges and Developments

October 9-11, 2017
Karlsruhe, Germany

MRI
Max Rubner-Institut

Speaker Abstracts

Poster Abstracts

Speaker Abstracts

MRI
Max Rubner-Institut

Nutrition Monitoring – Experiences from NHANES

Alanna J. Moshfegh
Food Surveys Research Group, Beltsville Human Nutrition Research Center,
Agricultural Research Service, US Department of Agriculture
Beltsville, Maryland, USA

Continuous monitoring of the dietary patterns of the United States population is critical to evaluate dietary status and diet-related health characteristics and to identify future nutrition and related regulatory and program needs. National dietary data collection in the US is accomplished by one national food and nutrition survey, What We Eat In America (WWEIA), launched in 2002 through the collection mechanism of the National Health and Nutrition Examination Survey (NHANES). WWEIA consists of 2 recalls on 5,000 respondents per year, one in-person and the second by telephone.

Dietary data collection is conducted using USDA's validated 24-hour dietary recall instrument, the Automated Multiple-Pass Method (AMPM).   The design of the AMPM, based on the guiding principles of enhancing accuracy and reducing respondent burden, includes multiple recall strategies and memory cues within its structure of 5 steps that progress in logical order. More than 25,000 possible standardized questions and response options are available, and each option is programmed to be followed by the next appropriate question. Beyond foods and amounts reported by survey participants, other data captured include time of consumption, name of eating occasion, where obtained, if consumed at home, extent of salt use at the table.   USDA's AMPM, and its related data processing programs and databases are made available for use by other government agencies and by partial support from outside research institutions through collaborative agreements.

The WWEIA, NHANES data are made publically available, providing the critical linkage of data on food and beverage intakes to data on health status. Survey products including data tables, data briefs, and research papers summarize major findings.   Additional specialized survey databases provide detailed characteristics to evaluate dietary intakes based on dietary guidance or retail food commodities.   The survey data and research products are available at the Food Surveys Research Group website at www.ars.usda.gov/nea/bhnrc/fsrg.

The AMPM, dietary data collection methodology and instrumentation, dietary databases, data review and public release, and data reporting will be detailed.   Advancements in dietary data collection and related food/beverage databases to meet data user needs will be highlighted.

Developments and perspectives in European nutrition surveys

Marga Ocké
RIVM (National Institute for Public Health and the Environment)
Bilthoven, the Netherlands

National nutrition surveys provide important insights to prioritize food policies and to evaluate the effects of food policies and other developments on food consumption of populations. In Europe, food consumption surveys are organised at the national level. The need for reliable and comparable dietary monitoring data across European countries was the rationale for various European projects. In the EFCOSUM-project recommendations for harmonisation of national food consumption surveys were formulated. For dietary assessment, the use of repeated 24-h dietary recalls using GloboDiet® software (formerly EpicSoft) in combination with food frequency questionnaires was recommended. In the EFCOVAL-project, the GloboDiet® software was improved for monitoring purposes and validated. Moreover, for children, an adapted method was developed and tested. The GloboDiet® software is currently in use in nutrition surveys of seven European countries, and is in line with the 2014 EFSA guidelines for food consumption surveys. Since the EFSA guidelines do not prescribe the use of GloboDiet®, various European countries use other software for 24-h dietary recalls. The EFSA guidelines therefore lead to more harmonised, but not fully standardised, food consumption data.

The GloboDiet® software collects food consumption data in a highly standardised and systematic way. Food description is done in detail by using food names in combination with a series of food descriptors. Such an approach results in food consumption data that are suitable to address many research questions. These include questions on fortified foods and food additives that need details up to the brandname of foods. GloboDiet® has no direct link to food composition databases and the European food classification FoodEx2. Moreover, the food market is very dynamic with increasing number of foods that are being introduced and disappear from the market. And many consumers cannot describe their consumed foods accurately. This combination makes it very time consuming and challenging to handle the collected food consumption data and to link them to food composition databases and Foodex2 classification.

Future reliable and comparable national food consumption surveys in Europe need to address these challenges. Various interesting developments require further exploration on their usability as possible solutions. These include a European food list based on Foodex2 which can be used in any dietary assessment method, consumer-friendly food diary apps, food barcode scanning for product identification, and self-learning algorithms for linkage of food consumption and composition data. In the Netherlands, several of these options are being explored. We would like to collaborate on this topic with other responsible institutions in Europe, both involving innovative partners and applying lessons learned from the past. Only through collaboration and sharing experiences, we can work towards renewed and more harmonised future food consumption surveys in Europe rather than returning to a heterogeneous way of data collection.

Experiences from German National Nutrition Monitoring

Carolin Krems
Max Rubner-Institut
Karlsruhe, Germany

The German national nutrition monitoring comprises so far the cross-sectional studies National Nutrition Survey (NVS) I and II, the German Nutrition Survey (GeNuS) 1998 as well as the longitudinal NEMONIT study. These studies were carried out between 1985 and 2015 and covered mainly the adult population. Additionally, specific studies on children were conducted.

The NEMONIT study provides the latest information on food consumption, nutrient intake as well as other aspects of nutritional behaviour on a nationwide basis. For this longitudinal survey, a subgroup of about 2,000 NVS II participants (18-80 years) was recruited and annual data collection took place from 2008 to 2015. Time trend analysis of food consumption and macronutrient intake over a 6-year period (2006-2012) shows that consumption of fruit and fruit juices decreased among women and men, whereas consumption of water, soft drinks and coffee/tea increased (Gose et al. 2016). Furthermore, increased consumption of confectionery and animal fats was observed among women. There were no changes in energy and protein intakes, but carbohydrate intake declined while fat intake increased over time. Therefore, food consumption remained relatively stable within this study group.

Due to the experiences of NEMONIT and NVS II, some conclusions for the next representative assessment of the nutritional behaviour of the German population can be drawn:
1. For the assessment of current food consumption data, it is sufficient to conduct representative nutrition studies in intervals of about 8 years.
2. To provide results on food consumption with a sufficient statistical accuracy and a detailed description of the nutritional behavior of the German population a sample size of 10,000 participants is appropriate.
3. For statements on the nutritional status, especially on critical nutrients the determination of physiological samples (blood and urine) is crucial.

The studies conducted so far within the German national nutrition monitoring show some differences with regard to study design, e. g. recruitments procedures or dietary assessment methods. European recommendations with regard to study design and methods as guidance are needed to support comparisons at national level and across countries. For the comparison of studies over the years methodological developments also need to be considered.

For the next German national nutrition survey experiences from the national nutrition monitoring as well as European recommendations will be taken into account to provide representative and precise data on food consumption and other nutritional behaviour which can be used for comparisons at national and European level.

References
Gose M, Krems C, Heuer T, Hoffmann I. Trends in food consumption and nutrient intake in Germany between 2006 and 2012: results of the German National Nutrition Monitoring (NEMONIT). Br J Nutr 115 (8), 1498-1507, 2016.

Health Monitoring in Germany: New challenges for population based Health Examination Surveys

Dr. Baerbel-Maria Kurth
Robert Koch Institute
Berlin, Germany

The Robert Koch Institute (RKI) as German Public Health Institute ranks among his main tasks the health monitoring of the people living in Germany over all ages. Starting in January 2008, the Robert Koch Institute administrates a Health Monitoring System based alternating on either health examination surveys or on health interview surveys with longitudinal components. These surveys are continuously accompanied by annual cross sectional interview surveys. Strategies of the institute are described for offering information about the health behavior, the health care and the health status of the population living in Germany. The main intent consists in identifying needs for action and in evaluation of Public Health measures. All the data of the health monitoring are analyzed, interpreted and available for different user groups. Results obtained by longitudinal and cross-sectional analyses of the monitoring data give input for health reporting, health policies as well as for health sciences and are utilized in the European context. Therefore representativeness, validity and reliability are important criteria for the quality of monitoring data. It will be explained how these criteria are achieved.

Representativeness is required with regard to the socio-demographic characteristics of gender, age, region, and social status which are known to have an influence on the health status and risk factors. Three major components of representativeness and their implementation within the health surveys are depicted: sampling methods, measures to achieve a high response rate, adapting these measures continuously and adjusting for people not taking part in the survey. It is described how these components were changing over the last years and how the health monitoring system meets these new challenges by new methods and by adapting the whole monitoring concept.

Experiences from the Portuguese National Food, Nutrition and Physical Activity Survey 2015-2016

Carla Lopes,
Faculty of Medicine/Institute of Public Health
University of Porto, Portugal

The National Food, Nutrition and Physical Activity Survey, 2015-2016 collected national and regional representative data on dietary habits and physical activity for the Portuguese general population, aged 3 months to 84 years, in accordance with European methodologies/guidelines (EU-MENU, EFSA).

The study design has derived several methodological challenges, mainly related with the sampling process and the development of infrastructures to assist data collection.

The sampling frame was the National Health Registry. Although this link with the health services may favor participation rates, it also preclude some constrains related with longstanding ethical approvals from all Regional Administrations of Health (n=7) and difficulties in having facilitated access to physical infrastructures in all week days (lack of commodities, and close of some during weekends), forcing to alternative spaces, which have introduced difficulties in the resource's allocation and maintenance of initial randomized day of the week.

The sampling was performed in consecutive recruitment waves during the 12 months collection period, in order to use the most updated versions of the National Health Registry lists. Even though, in some cases, such as small children and pregnant women, this was not enough to reach them accurately (when contacted, some were already stepped up to another age range and pregnant had already given birth).

We have also faced some constrains related with the sampling process (delays in receiving lists, changes in list's codes, incomplete lists, etc.) with impact in the field work planning, and causing an initial delay on data collection. This has derived some financial constrains because fieldworkers were already recruited and trained. Moreover, we have selected 99 Health Care Units to participate across the country, including islands, which involved many human resources, constant training and quality control challenges and technical aspects related with transportation fees, undervalued in the estimated budget.

Overall, response rates were lower than expected, particularly among adults and the elderly. Although we had as examination site one of two options: the Primary Health Care Unit they belong to or the participant's home, less than 1% preferred the latter, most were suspicious about visiting them. Several dissemination activities (e.g. through regional media) were undertaken to promote the Survey close to the population.

An e-platform was specifically developed to assist field work management and data collection. The complexity of this software has demanded constant challenges. Since the Survey included children from 3 months up to adults of 84 years-old, different versions of the same questionnaires had to be constructed and integrated. Difficulties in deciding the appropriated foods to be included in the food propensity questionnaire or the decision of how many detail it should be included in the eAt24 software (which food facets and descriptors) had to be overcome, and represented a complex methodological challenge.

New devices to assess diet – applicable for nutrition monitoring?

Janet Cade
University of Leeds
Leeds, UK

There is potential for important changes in the way we measure dietary intake. Apps now make it possible for us to rapidly assess diet in large populations in real time. The variety of foods available is now more varied and complex than ever before with standard food composition tables generally lacking this detail. New technologies support the capture of detailed dietary data on large numbers of individuals without the need for costly and time-consuming manual nutrition coding. These new approaches may help to reduce measurement error and advance our understanding of nutritional determinants of disease.

Results from reviews of new technologies for measuring diet to be used in national diet and nutrition surveys and for research will be presented. This will include new and emerging technologies, including web-based, apps and camera methods that could have the potential to improve, complement or replace existing methods. The main focus of the talk will be on web-based dietary assessment tools and popular nutrition apps for weight loss. Limitations and further work needed will be described, including the need for usability testing, validation and ethical issues. There are concerns around the accuracy and variety of foods available and nutrient outputs linked to the scope of the food database. Portion size estimation is a challenge, along with the searchability of the database and technology readiness of the user. A practical example of the development of a web-based tool to assess diet 'myfood24' will be given; including the creation of a new food composition database using back-of-pack information for around 45,000 foods. German, Danish and Australian versions of the tool are now available with other language versions planned. Results from ongoing validation studies comparing the online tools to other self-report measures and biomarkers will be presented.

In addition, the potential for new forms of big data as a platform for contributing to estimates of food behaviour and food safety will be explored. This will include social media, wearable devices and supermarket loyalty cards. New methodologies applied to dietary assessment could provide us with a step-change in our ability to reliably characterise food and nutrient intake in population studies. In this fast-paced field of development, it is recommended that progress in technology development, validity and acceptability is monitored.

MRI
Max Rubner-Institut

Web-based dietary assessment- experiences from the national dietary surveys in Sweden

Eva Warensjö Lemming, Anna Karin Lindroos
National Food Agency
Uppsala, Sweden

A major challenge when collecting dietary intake data is to have a valid method that is cost effective, easy for participants and provides high quality data. Sweden has a long tradition of performing dietary surveys and has performed five larger national dietary surveys. In the latest two surveys, diet data have been collected with web-based methods, the *Riksmaten method* and *RiksmatenFlex*. The first step toward web-based technologies was taken in 2003 when the need for a version-controlled IT system for storage, administration and management of nutrient values of foods in the food composition database (db) and dietary surveys was identified. Before 2003, the compiling of the food composition db involved a lot of excel file handling. Calculation of composite dishes for the db as well as energy and nutrient calculations in dietary surveys were carried out by single user software. Thus, new additions or updates had to be applied for all single users. Between 2004 and 2006 this version controlled system was developed. In 2007, the decision to stop using a hand coded menu book to collect diet data in national dietary surveys was taken. This together with financial constraints and new advances in IT technology led to the development of a web-based method for the collection of dietary data. The *Riksmaten method* enables prospective diet data recording and the user interface (www website) contains a search engine connected to the food list as well as the possibility to record dietary supplements. When foods and drinks are recorded on the website the information is automatically stored in a database connected to the system. Automatic calculation of energy and nutrient intakes is enabled by the incorporated picture portion guide and direct link to the food list of 1909 different foods and dishes. The *Riksmaten method* was used in the survey in adults in 2010-11 and has been validated against doubly labelled water and biomarkers (carotenoids, alkylresorcinols and fatty acids) and was found to be reasonable valid. During the planning of the Riksmaten adolescent survey the need for a new user interface, up-to-date with current IT and web technology, was identified. *RiksmatenFlex* was developed in 2014-15 and contains a food list of 778 foods and dishes. The portion guide in *RiksmatenFlex* is more comprehensive than in the *Riksmaten method* and also enables automatic calculation of energy and nutrient intakes. New features of *RiksmatenFlex* include the possibility to be used for both retrospective and prospective surveys, access node to web-based questionnaires and an administration interface. RiksmatenFlex has been validated against classic 2 x 24h recall methodology and biomarkers, and was found as least as valid as the classic technique. *RiksmatenFlex* was used in the national dietary survey in adolescents, carried out in 2016-17.

Exploring dietary intake markers – chances and limitations of metabolomics

Sabine E. Kulling
Max Rubner-Institut, Department of Safety and Quality of Fruit and Vegetables,
Karlsruhe, Germany

Studies investigating diet-disease associations strongly depend on reliable data of food consumption. Classical dietary assessment instruments such as 24-hour recalls, food frequency questionnaires or dietary history questionnaires are well established and widely used in nutritional epidemiology. However, they bear known limitations, mainly related to the subjectivity of self-reported data.

Current research aims to improve the accuracy of dietary assessments and the development of objective instruments is highly desirable. One promising future tool might be the measurement of (bio)markers for the intake of certain food groups (type and amount of food consumed) as well as for nutrients or -more challenging- for specific dietary habits. Untargeted metabolomics approaches are increasingly used to discover and identify such markers. In recent years, a number of potential markers were described, but in most cases they remain to be sufficiently validated. Validation of dietary intake markers is essential but represents a particular challenge: Detailed information about the markers are needed, including their chemical stability during analysis and sample storage, their potential modification or degradation during food processing, their biokinetic behavior in the human body, their occurrence and distribution in food in general as well as within the food group of interest.

The presentation will provide an overview of different types of marker metabolites. The challenges of marker identification and validation will be illustrated by examples selected from the literature and from own studies. Furthermore, new sample collection devices for biofluids will be introduced. An analytical and personal conclusion will be drawn about the benefit and solutions metabolomics may provide in the medium- and long-term perspective.

Experiences from observational and intervention studies

Weinert CH
Max Rubner-Institut, Department of Safety and Quality of Fruit and Vegetables,
Karlsruhe, Germany

During the last two decades, metabolomics has developed into a technically mature approach and a vital complement to other scientific tools in the life sciences. For these reasons, there are great expectations that, with the help of metabolomics, it might be possible to push dietary assessment to a higher level of reliability and quantitative precision. While this in justified in principle, it is crucial to know the technical and conceptual strengths, weaknesses, pitfalls, bottlenecks, challenges and potentialities of nutri-metabolomics in order to get a realistic picture of what nutritionists and epidemiologists can achieve with this approach.

Based on the experiences of the metabolomics workgroup at MRI obtained with the observational KarMeN study, the intervention studies performed within the scope of the JPI project FOODBALL (Food Biomarkers Alliance) as well as diverse food metabolomics projects, the aim of this talk is to discuss, amongst others, the following practical aspects concerning nutri-metabolomics studies:

- What are the benefits of a multi-platform nutri-metabolomics approach?
- Why can it be complicated to validate intake markers identified in intervention studies using data of observational studies?
- Why it is important to gather comprehensive data about the composition of our foods?
- What are the major practical challenges and bottlenecks of nutri-metabolomics?

Infrastructural developments in nutrition and health research

Karin Zimmermann
Wageningen Economic Research (WR)
Wageningen, Netherlands

Preamble

Based on the roadmap developed in EuroDISH (EU FP7; 2012-15 – www.eurodish.eu) and European Strategy Forum on Research Infrastructures (ESFRI) recommendations (2015) for a food and health research infrastructure (RI), the Food, Nutrition and Health Research Infrastructure (FNH-RI) will bring together existing food- and health-related RIs at different stages of development and maturity including RIs originating from previous EU-funded projects (e.g. EuroFIR, NuGO, GloboDiet, ISEKI-Food, Food4me, Quisper), on-going EU-funded projects (e.g. iFAAM, REFRESH, SUSFANS and RICHFIELDS), the Joint Programming Initiative Agriculture, Food Security and Climate Change (JPI-FACCE) and A Healthy Diet for a Healthy Life (JPI-HDHL with Knowledge Hubs DEDIPAC & ENPADASI). The Food, Nutrition and Health Research Infrastructure supports the scientific analysis of the relations between the food supply chain, food innovation, food behaviour and its determinants, food consumption as related to nutrients and food constituents, nutritional status, bodily functions and mechanisms and the maintenance and promotion of healthy diets and lifestyles and prevention of disease and how these relations are or can be influenced by policy and industry.

Goal

The objective of Food, Nutrition and Health Research Infrastructure is to:
- realise and sustain an European research infrastructure in the domain of food, nutrition security and health, which enhance collaboration and translation of know-how along the food chain and consumer including policy and civil society organisations.
- facilitate quality, cost effectiveness, and availability of resources in the research system, and enhance in novation capacity, integrate new knowledge, and deliver environmental and socially important innovations to address research challenges in food, nutrition and health research.
- bring together expertise across disciplines (trans-disciplinary approaches) and geographical borders (trans-national basis) to support scientific researchers in scientific institutes, civil and policy organizations and businesses and to foster top-level science, innovative research, industrial competitiveness and policies to achieve key societal targets.

State of the Art of Food, Nutrition and Health Research Infrastructure

- To be a foundation in 2017, which enables us to sign memorandum of Understandings (MoU) with ELIXER and BBMR and apply for an EU Personal Identification Code (PIC).
- 4 member states involved (DK, UK, IT and NL), 2 are rewarded on the national roadmaps for research infra structures (DK and NL). UK will apply for this status in 2017, Italy in 2018.
- Food industry and facilitating industry co-create a business platform within the FNH-RI.
- New nodes are expected in 2017 in France, Norway, Sweden, Finland as in
- Slovakia and Slovenia. Preparatory action is ongoing.
- The science case of the Food, Nutrition and Health Research Infrastructure will be launched by the end of 2017.
- Full application for the ESFRI roadmap is expected in 2019-2020
- Building blocks are: www.eudodisch.eu, www.richfields.eu, www.eurofir.com, www.dedipac.eu, www.enpadasi.eu, www.epic.iarc.fr.

Impact

- European and global top level research on food-nutrition-health: The Food, Nutrition and Health Research Infrastructure focuses on food and nutrition security and health and govern data, tools and services to facilitate top level research on food chain, food behaviour and consumption, nutrition and health by standardization and harmonization of data, data interoperability and –management, e-interfaces, data access policy, ethical and IPR requirements and governance trans-disciplinary and trans-national. This fosters cooperation with aligned RIs as ELIXER and BBMRI and stimulates participation of third countries e.g. Australia, Kenya and Ghana as food industry.
- Addressing user needs: The Food, Nutrition and Health Research Infrastructure will enable researchers and other users to address key research challenges, encompassing the wider the food and health challenges security under framework research programmes as FOOD 2030, as well as helping to contributing to the proposed KICs, which will support research, training and entrepreneurship in Europe.
- Paradigm shift in food research: The Food, Nutrition and Health Research Infrastructure will facilitate new data collection tools as e.g. sensors, wearable tech, to stimulate citizens' data collection and science by using e-science to link data sets. The European citizen will be the main data provider and, excitingly, the main user, enabled by a data platform for researchers to generate new insights from the data.

European food composition databases – experiences and perspectives

Mark Roe[1], Sian Astley[2] and Paul Finglas[1,2]
[1]Quadram Institute Biosciences, Norwich, UK;
[2]EuroFIR AISBL, Brussels, BE

Food composition tables (FCT) were developed in many countries throughout the 20th century to provide information on energy and nutrient contents of typically consumed foods. Tables were initially published as hard copy publications but computer, especially internet technology, has enabled wider use and exchange of data. Over the last decade or so, several European and international projects have developed methods for the production, management and use of food composition data. In particular, European Food Information Resource (EuroFIR) projects (EU; 2005-2011) built on and further developed outcomes with the aim of facilitating collaboration on development and application of unified, reliable, sustainable and accessible food information.

One of the main aims of EuroFIR was to build and exploit a single-point-of-access authoritative source of food composition data for nutrients and bioactive compounds, as a tool for underpinning food and health research. Sustainability of the project partner network and the experience gained was also an important aim that was achieved by additional EU funding and the creation of EuroFIR AISBL, an international non-profit association based in Brussels. National FCT vary in scope and may include different foods and nutrients and data may be produced and managed in different ways. EuroFIR created a quality management framework for European food composition database compiler organisations that is flexible and allows users to create and maintain systems that are fit-for-purpose, while ensuring comparability and reliability of data. Tools were developed or adapted with the aim of harmonising data exchange, food description, component identification, value documentation, calculation procedures and data quality assessment. The Committee European de Normalisation Standard for food data, based on the EuroFIR technical standard, was published in 2012 and is the basis of tools including the FoodCASE database management system and the FoodExplorer tool that allows simultaneous search of 30 national datasets. EuroFIR also curates the eBASIS and ePlantLibra databases of composition and health effects of bioactive compounds in plant based foods and plant food supplements. EuroFIR and partner organisations have provided training opportunities for international researchers to promote the use of EuroFIR tools and standards and integration with other international organisations, such as FAO INFOODS, EFSA and WHO.

The flexibility of datasets and tools has been demonstrated by their use in a range of projects, including producing a harmonised food composition dataset for EFSA and use in commercial applications. Efficient use of data and tools is an important feature of programmes to develop future research infrastructures related to nutrition and health. However, despite the advances made, there are still significant challenges; including increasing the consistent use of standards and thesauri to enable data integration with user applications and the need for continued financial support and sustainability of expertise.

EU Menu – experiences and perspectives

Davide Arcella
European Food Safety Authority (EFSA)
Parma, Italy

Since 2005, the European Food Safety Authority (EFSA) has worked, in close cooperation with all organisations operating in the field, towards harmonising dietary survey methodology and building of a common European Union (EU) food consumption database. Harmonised food consumption data are the basis for improving accuracy of EU wide exposure assessments. Improved risk assessments can assure more targeted risk management and permit more accurate risk communication resulting in increased consumer confidence. Harmonised and detailed food consumption data can also assist in serving the needs of nutrition surveillance and of further studies on diet and health related conditions causing high financial burden in Europe.

Food consumption information has been collected by EFSA over the last years at an increasing level of detail. In particular, the EFSA Comprehensive European Food Consumption Database is a compilation of existing national dietary information and currently includes individual food consumption data for different population groups from the large majority of Member States. EU Member States used different methods to collect food consumption data, which sometimes makes it difficult to carry out EU-wide analyses or country-to-country comparisons. Therefore, EFSA launched the EU Menu project "What's on the Menu in Europe?" (EU Menu). Since 2011, EFSA provides financial and technical support to EU Member States and pre-accession countries which have a governmental mandate to carry out a dietary survey at national level.

The methodology used in the national food consumption survey is expected to follow the general principles described in the EFSA Guidance on the EU Menu methodology, published in December 2014. This guidance was based on the 2009 EFSA guidance and provides recommendations for the collection of more harmonised food consumption data among EU Member States for use in dietary exposure assessments of food-borne hazards and nutrient intake. It focuses on collecting data from population groups, ranging in age from 3 months to 74 years and has been endorsed by the EU institutions operating in the field through the EFSA Network on Food Consumption Data. The information collected under the EU Menu project, will be available for EFSA's scientific activities without restrictions on its use. EFSA is currently supporting dietary surveys on children and/or adults from 21 countries (Austria, Belgium, Bosnia & Herzegovina, Croatia, Cyprus, Estonia, Finland, France, Former Yugoslav Republic of Macedonia, Greece, Hungary, Italy, Latvia, Montenegro, the Netherlands, Poland, Portugal, Romania, Serbia, Slovenia and Spain). The seventh and last call has been launched in July 2017. All EU Menu projects are expected to be finalised by 2023.
The collaboration between all national and international institutions working in the area of dietary surveys should continue to further develop methodologies, tools and strategies for the collection of harmonised and detailed food consumption data.

Big Data – ethical, epistemological and political considerations

Judith Simon
University of Hamburg
Hamburg, Germany

From industry over science to public policy, Big Data has sparked immense interest, raising both hopes and fears. While it has been hailed for its promises of economic prosperity, techno-scientific progress and societal advances by some, others have stressed new and emerging ethical, societal and political challenges related to the widespread adoption of data analytics in many public and private sectors.

In my presentation I will argue that in order to apprehend Big Data as a socio-technical phenomenon, a combination of ethical and epistemological analysis is needed, as certain ethical implications – e.g., related to privacy or discrimination – can only be properly addressed if the underlying epistemic practices – e.g., related to possibilities for re-identification and de-anonymization – are recognized and taken into account. In addition, the presentation considers the dual significance of Big Data for public policy. On the one hand, I examine the increasing emphasis on Big Data and predictive analytics as a rationale for political action and decision making. On the other hand, I argue that such governance through and with Big Data, in order to be epistemologically, ethically and politically justified, also requires a solid governance of Big Data practices.

Research data – legal perspective on public and private interest

Steffen Augsberg
Justus Liebig University
Giessen, Germany

Big Data – understood as the computer-based collection, processing and analysis of huge and exponentially growing data-sets – provides enormous opportunities for research. However, it also contains specific risks and thus challenges the traditional concept of data protection. If we want to make proper use of these possibilities, we have, therefore, to ensure that basic individual and group civil rights are not undermined, e.g. by unacceptable profiling, discrimination, or economic exclusion. The given legal requirements are still – even after the implementation of both the EU General Data Protection Regulation (GDPR) and the new German Federal Data Protection Act (GFDPA) – not adequately structured towards the specifics of Big Data. I.a., while Big Data is characterised by the constant rearrangement, decontextualisiation and recontextualisation of data, the existing regulation stipulates that consent must be given with regard to a specific intended usage. Where (research) data can be captured without an explicit consent, based solely on considerations of proportionality (public v. private interests), the law as it stands relies heavily on the idea of anonymisation and pseudonymisation even though that has become highly problematic as modern computing allows for the reidentification of the respective persons. Furthermore, in many cases the question of who "owns" the data remains unanswered. While it is obvious from a legal point of view that there can be no ownership of data in a technical sense, a sufficiently clear and transparent legal concept for the economics of data is still to be developed fully. In general, what is needed is a normative framework that is both realistic with regard to the factual developments of Big Data as well as robust with regard to the protection of the basic principles it has to uphold. To achieve this aim, we do not have to have a comprehensive overhaul of the given regulatory approach. However, it should be altered and transformed into a more dynamic learning system that centres on the individual but also recognises the importance of structural innovation. Big Data calls for a complex governance system that does not focus on a fixed set of mechanisms, but addresses the multi-actor responsibilities typical for the Big Data environment with a variety of context-specific instruments.

MRI
Max Rubner-Institut

Experiences from the DataSHIELD Research Project

Paul R Burton
Institute of Health and Society, Newcastle University
Newcastle Upon Tyne, United Kingdom

Research in modern biomedicine and social science often requires sample sizes so large that they can only be achieved through a pooled co-analysis of data from several studies. But the pooling of information from individuals in a central database that may be queried by researchers raises important governance questions and can be controversial. These reflect important societal and professional concerns about privacy, confidentiality and intellectual property. There is a particular challenge when the data to be made available are detailed, vary markedly from person-to-person and potentially involve repeated measures over a series of identified times. Under such circumstances, which apply to many datasets in nutritional science, the risks of disclosure of identity are higher than usual.

DataSHIELD provides a novel technological solution that circumvents some of the most basic challenges in facilitating the access of researchers and other healthcare professionals to individual-level data. Commands are sent from a central analysis computer (AC) to several data computers (DCs) that store the data to be co-analysed. Each DC is located at one of the studies contributing data to the analysis. The data sets are analysed simultaneously but in parallel. The separate parallelized analyses are linked by non-disclosive summary statistics and commands that are transmitted back and forth between the DCs and the AC. Technical implementation of DataSHIELD employs a specially modified R statistical environment embedded in an Opal database deployed behind the computer firewall of each DC. Analysis is then controlled through a standard R environment at the AC. Crucially, the individual-level data themselves remain invisible and unobtainable from the perspective of the research user: they cannot be copied, screen dumped or even seen. In addition, embedded disclosure controls are set by the data custodian – but cannot be reset by the analyst – that can greatly mitigate the risk of inferential disclosure.

DataSHIELD is most often configured to carry out a – typically fully-efficient – analysis that is mathematically equivalent to placing all data from all studies in one central database and analysing them all together (with centre-effects where required). Alternatively, it can be set up for study-level meta-analysis: estimates and standard errors are derived independently from each study and are subject to centralized random effects meta-analysis at the AC. DataSHIELD is also being developed as a flexible, easily extendible, open-source solution to provide secure data access to a single study or data repository as well as for settings involving the co-analysis of several studies.

MRI
Max Rubner-Institut

Poster Abstracts

High meat consumption is stable between 2006 and 2014 in the NEMONIT study

Karin Römer, Franziska Koch, Erika Claupein, Thorsten Heuer
Department of Nutritional Behaviour, Max Rubner-Institut, Federal Research Institute of Nutrition and Food, Karlsruhe, Germany

Background
Meat is an important food for human nutrition containing protein and other essential micronutrients such as minerals and vitamins. However, high intake of meat has been linked to chronic diseases. In comparison with the recommendations of the German Society for Nutrition (300-600 g per week), the consumption of meat, meat products and sausages is too high in Germany, especially in men (Krems et al. 2012, DGE 2014). Moreover, the environmental sustainability of meat consumption has become a concern for several reasons like climate change, resource inefficiency and animal welfare.
The aim of this study is to analyse the trend in consumption of total meat as well as poultry, red meat, and meat products and sausages over the last years in the Germany National Nutrition Monitoring (NEMONIT).

Methods
A sample of 2.837 participants (baseline age: 14-80 years) was recruited from the nationally representative German National Nutrition Survey II (2005-2007). Food consumption was assessed annually by two telephone 24-h recalls in the NVS II and the 6 years of NEMONIT (2008-2014/2015), respectively. In the trend analysis 1.617 individuals who participate in the NVS II and in least three of the six NEMONIT study years were included. Time trends of meat consumption were analysed by generalised estimating equation (GEE) model.

Results
Total meat consumption remained unaltered between 2006 and 2014 in men and women of the NEMONIT cohort. Also poultry consumption showed no trend in both sexes. The consumption of red meat decreased slightly in men (-0.91 g/year; 95 %-CI: -1.64/-0.19), but not in women. Meat products and sausages consumption increased slightly over the eight-year study period in women (0.57 g/year; 95 %-CI: 0.14/1.00), but not in men. The stratified analysis for age, school education, urban/rural region and attitudes towards animal welfare and organic production showed no different trends in meat consumption, exception in men less than 60 years (red meat consumption: -1.38 g/year; 95 %-CI: -2.29/-0.47).

Conclusion
Meat and meat products consumption remains stable on a high level over the eight-year study period within the NEMONIT cohort. Even for people who attach importance to organic production and animal welfare, no different trends have been identified. Due to the adverse effects of high meat consumption on health and sustainability, a shift to diets with less meat is necessary.

References
Deutsche Gesellschaft für Ernährung (DGE) (2014): Lebensmittelbezogene Ernährungsempfehlungen in Deutschland (Food-related recommendations in Germany), 1st ed. Bonn, DGE.
Krems C, Walter C, Heuer T, Hoffmann I (2012): Lebensmittelverzehr und Nährstoffzufuhr – Ergebnisse der Nationalen Verzehrsstudie II (Food consumption and nutrient intake – Results of the German National Nutrition Survey II). In: Deutsche Gesellschaft für Ernährung (Hrsg.): 12. Ernährungsbericht 2012. Bonn, S. 40-85.

Estimation of "free" sugar intake in Germany based on the data of the German National Nutrition Survey II

Thorsten Heuer
Department of Nutritional Behaviour, Max Rubner-Institut, Federal Research Institute of Nutrition and Food, Karlsruhe, Germany

Background
The sugar intake from sugar containing foods contributes additionally to the daily energy intake. In Europe, scientific and political discussions of the last years focused on actions to reduce the high sugar intake in the general population. The aim of this analysis was to estimate the sugar intake of the German population considering the recommendation of the WHO (2015) to consume less than 10 % of total energy intake by "free" sugars.

Methods
Data from the German National Nutrition Survey II (2005-2007) were used based on two 24h-recalls from 13,753 participants (15-80 years). For the calculation of "free" sugar intake according to the definition of WHO (2015), all mono- and disaccharides from the food groups confectionery (sweet spreads, sweets, dessert, and sweetener), soft drinks, pastries, milk and dairy products (without lactose), cereal products, sauces, fruit juices, and nectars were considered. Intakes of mono- and disaccharides were calculated using the German Nutrient Database (BLS) 3.01.

Results
Mean intake of total sugars (mono- and disaccharides) was 107 g/d for women and 120 g/d for men. Total sugar contributed to 24 % of daily energy intake for women and 20 % for men. The estimation of "free" sugars resulted in intakes of 61 g/d for women and 78 g/d for men on average with higher intakes in younger people. This corresponds to 14 % of the daily energy intake for women and 13 % for men exceeding the threshold of 10 % for "free" sugars recommended by the WHO. Important contributors to "free" sugar intake were confectionery (36 %), fruit juices and nectars (26 %), pastries (14 %) and soft drinks (12 %).

Conclusion
According to the data of the NVS II, the sugar intake of German adults is too high corresponding to the estimated "free" sugar intake defined by WHO. This estimation of "free" sugar intake is based on the calculation of mono- and disaccharides from selected food groups. To provide more detailed information about sugar intake of the German population with the upcoming national nutrition survey, the German Nutrient Database will be extended to allow distinction between naturally occurring sugars and sugars added to foods by the manufacturer, cook or consumer.

Reference
WHO (2015) Guideline: Sugars intake for adults and children. World Health Organization, Geneva, Switzerland, pp. 1-49.

Trends in sugar sweetened beverages among adults in Germany, 1990-2011

Anja Schienkiewitz, Marjolein Haftenberger, Gert B. M. Mensink
Robert Koch Institute, Department of Epidemiology and Health Monitoring,
Berlin, Germany

Introduction

Sugar sweetened beverages (SSB) can be an important source of individual energy intake. The consumption of SSB has been positively associated with increased body weight and risk of obesity [1]. Exploring SSB intake over time is important to help design better targeted prevention measures. The aim of this analysis is to describe trends in SSB intake among adults living in Germany between 1990 and 2011 with special focus on gender, age and education level.

Methods

We used reported data from food frequency questionnaires from 25-69 year old participants of the three German National Health Interview and Examination Surveys conducted in 1990-1992 (n=7466), 1997-1999 (n=5825) and 2008-2011 (n=5375). The outcome variable, a high SSB intake was defined as an intake of almost daily and more. Analyses were stratified according to gender, age and education level. Education level was defined following the International Standard Classification of Education (ISCED, 1997) and categorized into low (9 or 10 years education), medium (11-13 years) and high (14 or more years). Prevalence estimates and 95%-CI were weighted to better reflect the German population on Dec 31st 2010 using SAS 9.4 survey procedures for complex sample designs. P values <0.05 were considered statistically significant.

Results

From 1990-1992 to 1997-1999 the prevalence of high SSB intake increased from 10.0% (9.0%-11.1%) to 19.4% (17.8%-21.0%) and remained with 18.7% (17.3%-20.3%) similar in 2008-2011. The prevalence increased from 8.5% (7.3%-9.8%) in 1990-1992 to 25.2% (22.9%-27.7%) in 2008-2011 among men and was nearly unchanged among women (1990-1992: 11.6%; 10.3%-13.1%; 2008-11: 12.1%; 10.5%-13.9%). In 2008-11, proportionally, double as many men compared to women consume SSB almost daily or more. Between 1990-1992 and 2008-11 the prevalence of high SSB intake increases among men in all age groups and all education levels, but among women only in the youngest age group (24-34 years) and in the low education group. Among women, the SSB intake in the high education group decreases significantly from 8.2% (6.5%-10.3%) to 3.7% (2.5%-5.5%).

Conclusion

Between 1990 and 2011 the prevalence of high SSB intake increased among adults in Germany, especially among men and the low educated groups. This should be considered in policies to reduce or prevent obesity.

[1] Malik et al. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. Am J Clin Nutr. 2013 Oct;98(4):1084-102.

Trends in food consumption according to indicators of socio-economic status – Results of the NEMONIT study (2006-2012)

Maria Gose, Carolin Krems, Ingrid Hoffmann
Max Rubner-Institut
Karlsruhe, Germany

Introduction

The NEMONIT study is a longitudinal and nationwide study with the overall aim to assess the nutritional behaviour in Germany. This longitudinal data allow for the analysis of factors associated with changes in food consumption. The objectives of the present study were to investigate the relationship between trends in food consumption and educational level and to analyse whether changes in occupational status and net household income were associated with changes in food consumption.

Methods

The study sample consisted of 1,840 individuals (age: 14-80 years at baseline) who participated in the German National Nutrition Survey (NVS) II (2005-07) and the subsequent NEMONIT study (2008-2012). Food consumption and socio-economic characteristics were collected annually by telephone using two 24-h recalls. Socio-economic data included age, sex, educational level, occupational status, monthly net household income and number of persons living permanently in the household. Diet quality was defined by the Healthy Eating Index-NVS (HEI-NVS) II. For data analyses generalised estimating equations were used.

Results

At baseline, a higher educational level was associated with higher fruit/vegetable consumption and HEI-NVS II scores as well as lower meat consumption. In general, fruit consumption and HEI-NVS II score decreased and soft drink consumption increased in all educational groups, while vegetable consumption did not change over the study period. Changes in income were positively related to changes in herbal/fruit tea consumption. An increase in occupational status was associated with a decrease in confectionary and coffee/tea consumption and a tendential increase in wine/sparkling wine consumption.

Conclusion

The educational gradient in food consumption remained quite stable over the study period. The weak relationship found between changes in occupational status/net household income and changes in food consumption suggests that other individual or external factors are more influential on food consumption.

Maximum use and reuse of dietary monitoring data

Caroline van Rossum, Elly Buurma, Loes Hartman, Marga Ocké
Centre for Nutrition, Prevention and Health Services
RIVM National Institute for Public Health and the Environment
Bilthoven, The Netherlands

Background
Dietary monitoring data can be used to effectively formulate and evaluate health, nutrition, food safety, and food environmental policy. Furthermore, consumption surveys provide information that is useful for nutrition education programs, scientific research in the field of nutrition and health, and stimulation of healthier food development. However, the different (potential) users have different needs.

Aim
To improve the use and reuse of food consumption data at a national and international level.
Method: Define the users of the data of food consumption surveys and their needs. Subsequently, develop a communication plan for the dissemination of the results.

Results
The current main users of the food consumption data are defined: national and international policy makers, scientists, journalists, food counselors, stakeholders from nongovernmental organizations and food industry. All of them have different needs for the data. The needs differ in content, level of detail, accessibility and level of background information.

Based on the Dutch situation, we defined the following formats to disseminate the results:
- Website, with the main findings, and findings by topic, including downloadable graphics and a very brief interpretation
- Printed factsheets with main findings
- Online background report(s)
- Online database with statistical information on food consumption in the form of tables
- Database with individual data
- Part of European comprehensive database.
- Scientific articles
- Tailor-made results on demand
- Video's with main messages on social media
- Short messages on social media with main findings.
- Other?

Conclusion
To improve the use and reuse of the food consumption data it is worthwhile to publish the food consumption data for different target groups and in different formats, like factsheets, datasets, slides, infographics, et cetera.

What We Eat in America: Monitoring Changes in Dietary Patterns

Donna G. Rhodes
U.S. Department of Agriculture, Agricultural Research Service
Beltsville, Maryland, USA

What We Eat in America (WWEIA) is the nutrition portion of the National Health and Nutrition Examination Survey (NHANES) and provides complete dietary intake from foods, beverages, and dietary supplements at the national level for U.S. persons of all ages. NHANES is conducted on a continuous basis with data releases every two years. Continuous monitoring of dietary intake enables assessment of current status as well as changes in dietary patterns. It also creates challenges for updating collection methods and databases that also support continuity between survey cycles.

This presentation will highlight changes between 2003-2004 and 2013-2014 in U.S dietary intake patterns and analytical tools developed by the U.S. Department of Agriculture (USDA) that enhance nutrition monitoring research.

As part of WWEIA, two 24-hour recalls are collected from approximately 5,000 respondents each year using the USDA 5-step Automated Multiple-Pass Method. The USDA Food and Nutrient Database for Dietary Studies (FNDDS) is used to convert food and beverages consumed into gram amounts and to determine their nutrient values. FNDDS is updated to capture market trends and a new version is released to accompany each 2-year cycle of WWEIA, NHANES. Between 2003-2004 and 2013-2014, almost 3000 new food/beverage codes were added; this included beverages such as smoothies and almond milk and foods such as sushi and Greek yogurt. The percentage of the U.S. population (2 years and older) who consumed yogurt on any day doubled between 2003-2004 and 2013-2014; 4.3% vs. 8.7%, respectively.

To facilitate the analysis of food and beverage intake in addition to nutrient intake, the WWEIA Food Categories were developed and released for each 2-year cycle of NHANES. This database enables analysis of foods and beverages as consumed in the American diet. Given the continuous design of NHANES it is possible to examine trends in dietary patterns during the last decade.   The percentage of children (2-19 years) who consumed fruit on any day increased from 38% (2003-2004) to 50% (2013-2014). During the same time, the percentage of children who consumed any sugar-sweetened beverage decreased from 76% to 56%, respectively.

The WWEIA, NHANES data and documentation, as well as additional specialized databases are available at the Food Surveys Research Group website: www.ars.usda.gov/nea/bhnrc/fsrg.   In parallel with each 2-year cycle, summarized data tables on nutrient intakes and eating patterns are produced. For the 2013-2014 release, 56 data tables are publically available, an increase from 8 tables in 2003-2004.

Data from WWEIA, NHANES are critical to nutrition monitoring; therefore, the analytical tools that support dietary collection have been enhanced to capture changes in dietary patterns.

National Nutrition Survey menuCH: Design and Methods

Esther Camenzind-Frey, Christine Anne Zuberbuehler
Federal Food Safety and Veterinary Office,
Bern, Switzerland

Background

To perform dietary risk analyses and exposure assessments as well as for the establishment of health related strategies and guidelines, Switzerland had to rely until 2015 primarily on regional or foreign survey results. To improve this situation a first National Nutrition Survey (menuCH) was planned by the Swiss Federal Food Safety and Veterinary Office (FSVO). The Institute of Social and Preventive Medicine (IUMPS), Lausanne conducted it between January 2014 and February 2015.

Setting

menuCH is a cross-sectional nutrition survey conducted in 10 study centers. The Swiss Federal Statistical Office (FSO) established the sampling frame. The survey sample aimed to be representative of the three main linguistic regions of Switzerland (German, French and Italian), gender and age within each linguistic region. In order to recruit a final sample of 2000 women and men aged between 18 and 75 years (not living in any institution), the selected individuals received a personal letter in the corresponding language of the canton of residence. It contained information about the purpose of and the voluntary participation in the survey, as well as a prepaid response card to allow specification of contact details (alternative telephone numbers, preferred time for contact). The letters were sent in five waves within the 13 months period of the survey.

Methods

Food consumption was recorded by 24-hour dietary recall interviews on two non-consecutive days. The first interview was performed face-to-face in one of the 10 study centers while the second took place two to six weeks later by telephone. Interviews were carried out by trained dietitians in one of the three main languages, using the multiple-pass software GloboDiet®. A Swiss specific picture book with 119 series of six graduated food portion-size pictures helped the participants estimating their portions sizes. Before attending the first interview, participants received detailed information about the procedures, a written informed consent and a questionnaire with 49 questions compiled by the FSVO. The self-administered paper-and-pencil questionnaire was filled out at home by every participant and handed over at the first interview. It included questions on socio-demographic and -economic characteristics, health-related issues as well as self-reported body weight and height. In addition, questions concerning knowledge about nutrition as well as about eating and physical activity behavior were asked. Body weight, height and waist circumference were also measured in the study center right before the face-to-face interview. Data were cleaned and linked with the Swiss nutrition data base. A three-stage data weighting strategy was established, considering the sampling frame (7 major regions, 5 age groups), correcting for non-response and calibrating regarding age group, gender, marital status, major region, nationality, household size as well as season and weekdays. Thus, the survey results can be extrapolated to the target population, representing 4'622'018 women and men aged between 18 and 75 years residing in Switzerland.

Results

Data about food consumption was collected for 2085 participants aged between 18 to 75 years (49.9% men and 50.1% women) residing in the three main linguistic regions of Switzerland. A net response rate of 38% (5496 net sample) was achieved, which is similar to the results of other nutrition surveys using 24h dietary recalls.

Acknowledgement

Infant feeding practices in Norway – the Spedkost 3 pilot studies

Kristiansen AL, Borch Myhre J and Andersen LF
**Department of Nutrition, Institute of Basic Medical Sciences, Faculty of Medicine,
University of Oslo, Norway**

Background
In the last few decades, there has been a tendency towards decreasing response rates in most national dietary surveys in Norway. This pattern has also been observed in many other studies world-wide. A low participation rate is a threat to the generalizability of the obtained results.

National dietary surveys among Norwegian infants aged 6 and 12 months (the Spedkost studies) have been conducted twice. The first study was conducted in 1998-99 with a participation rate of 80% among children of 6 months of age and a participation rate of 66% among children of 12 months of age. In 2006-07 the second Spedkost study was conducted and participation rates among children of 6 and 12 months of age had fallen to 67% and 57%, respectively.

In 2018-19 the third Spedkost studies are to be conducted. Prior to these studies three pilot studies are to be carried out to study which invitation arrangement and what monetary incentives are the most effective to obtain a higher response rate.

Methods
The mothers of the infants receive an invitation (either postal or electronic, see Table 1) to participate in pilot study 1, 2 or 3. Participants complete an electronic semi-quantitative food frequency questionnaire (FFQ) designed to describe feeding practices at 6 or 12 months of age, and also to retrospectively describe feeding practices from birth up to the given age. After 1-2 weeks, non-responders are contacted by telephone while after about 3 weeks non-responders receive a postal reminder with a paper based questionnaire enclosed.

Table 1 Overview of methods that will be used to in the Spedkost 3 pilot studies to increase participation rate.

	Pilot study 1	Pilot study 2	Pilot study 3
Age of infants	6 months	6 months	12 months
Invited participants (*n*)	200	200	300
Invitation	Postal invitation: 100 with hand-written address 100 with printed labels	Postal invitation: 100 with hand-written address 100 with printed labels	Postal invitation: 150 with hand-written address **Electronic invitation:** 150 with e-mail invitation
Monetary incentives for those completing the study	Lottery of two gift vouchers: one of 540 € and one of 1080 €	Reward: all participants receive 54 €	Reward: all participants receive 32 €

To increase participation rate among children of 6 months of age two different monetary incentives will be tested (Table 1). Moreover, within each of the two pilot studies, the effect of personalized hand-written address on the envelope with the invitation enclosed will be tested compared to invitations using printed labels. In pilot study 3, the effect of recruiting participants by postal versus electronic invitation will be tested.

Results
The data collection in the pilot studies started in September 2017, hence no results are yet available.

Summary
Finding methods to increase response rates in dietary surveys is important to improve the generalizability of the data obtained.

MRI
Max Rubner-Institut

Smartphone-app with automated personalized nutrition recommendations -Results from a pilot study-

Mira Madenach[1], Hanna Schäfer [2], Nadja Leipold [2], Markus Böhm [2], Georg Groh [2], Kurt Gedrich [1] und Hannelore Daniel[1]
[1] Nutritional Physiology, Technical University of Munich (TUM), Freising
[2] TUM Department of Informatics, Garching

Introduction
In a subproject of the BMBF-sponsored *enable* cluster in Munich, the prototype of a nutrition app ("Nutrilize") was developed, with which users can record their nutritional behavior and receive automated, personalized nutrition recommendations. In a pilot study, various aspects of the app were evaluated, including usage and functionality.

Material and Methods
The nutrition app records various personal data (food consumption and preferences, phenotypic data such as BMI, physical activity, and selected blood values). These data are processed in an algorithm so that the individual energy and nutrient requirements as well as nutritional status can be determined and subsequently personalized nutrition recommendations can be generated. The recommendations consist of personalized recipes and nutrient intake recommendations. Furthermore, the nutrient status and its course over time can be monitored in the app. After a 3-week pilot study, 20 participants were interviewed on the use and functionality of the app, using an online questionnaire.

Results
Overall, 44% of respondents said they wanted to continue using the app after the end of the pilot study; 28% were indifferent to continues use, the rest was negative. The food diary was used by two-thirds of the participants at least once a day. Only 11% said they were using the food diary less than once a week. Most participants rated the following functions as positive: visualization of the homepage, the overview of the nutrient status and the progress of the nutrient status over time. Most participants did not rate the following features positively: Entering a personal goal set and the app notifications.

Conclusion
The results of this study on the use and functionality of the newly developed app "Nutrilize" are comparable to those of other nutrition apps. Although the app already has quite high acceptance, it also shows potential for improvement, e.g. in relation to the search for food items, which has to be made even easier if possible. Since the food diary is a central element of the app and must be used regularly to derive valid dietary recommendations, it is an encouraging finding that the vast majority of the participants used the food diary at least once a day.

MRI
Max Rubner-Institut

RiksmatenFlex – a new web-based dietary assessment method for national dietary surveys in Sweden

Anna Karin Lindroos, **Eva Warensjö Lemming**
National Food Agency
Uppsala, Sweden

Background

A new web-based, self-administered dietary assessment method, RiksmatenFlex, was developed for the Swedish national dietary survey on adolescents 2016-17. The aim of this poster is to describe RiksmatenFlex and present preliminary results from the validation study.

Methods

RiksmatenFlex: diet is reported through a web-page using a computer, tablet or smartphone. The method includes 778 generic foods. Photos help participant to choose foods and describe portions sizes. RiksmatenFlex is administered in the National Food Agency's food system which makes it possible to automatically calculate energy- and nutrient intake as well as intake of food groups. Questionnaires, including a food propensity questionnaire, are also added to the web-page.

Subjects: The study was carried out within the pilot study preceding the main survey. Adolescents 11-12, 14-15 and 17-18 years were recruited through schools and 432 students were invited. 233 students participated in at least one part of the pilot. In total 78 students with complete dietary information are included in these analyses. *Design:* Diet was reported at two school visits a few weeks apart with either RiksmatenFlex (the day before the visit, the school day, one random day later) or 24-hour recall interviews (24h recall) (face-to-face at school visit, random day later by phone) in a cross-over random design. Students also completed on-line questionnaires and wore an accelerometer for 7 days. Weight and height was measured and blood and urine sampled at the first school visit. Biomarkers for fruit and vegetables (carotenoids) and wholegrains (alkylresorcinoles) were analysed.

Results

Mean intake from day 1 and 3 with RiksmatenFlex was 9.0 MJ and mean intake for the two 24h recalls was 8.1 ($P<0.01$). Mean fruit and vegetable intake was around 200 grams with both methods and the spearman correlation r_s between intake and the carotenoids Lutein/Zeaxanthin was 0.47 ($P<0.001$) for RiksmatenFlex and 0.28 ($P<0.05$) for 24h recalls. Mean wholegrain intake was around 1 g/ 10 MJ for both methods. The r_s between wholegrain intake and alkylresorcinoles was for RiksmatenFlex 0.36 ($P<0.01$) and for 24h recalls 0.30 ($P<0.05$).

Conclusions

RiksmatenFlex provides information on intake of energy, fruit and vegetables and wholegrains that is at least as valid as that from 24h recalls. The method has been received well by the adolescent.

Simulation study on estimating usual intake distributions of rarely consumed foods

Sven Knüppel[1], Oliver Lindtner[2], Heiner Boeing[1], Gerhard Heinemeyer[2]
[1] Department of Epidemiology, German Institute of Human Nutrition Potsdam-Rehbruecke (DIfE)
[2] Department Exposure, German Federal Institute for Risk Assessment (BfR)

Background
Suitable statistical methods are necessary to assess usual daily intake of potentially hazardous substances via food intake. Especially, studying rarely consumed foods comes with statistical challenges due to the (very) low consumption frequencies.

Objective
A simulation study was carried out to examine statistical methods to estimate the usual daily intake of rarely consumed foods from repeated short-term measurements. It was investigated whether the frequency information from a food frequency questionnaire (FFQ) could improve the estimation of the usual intake distribution of a population.

Methods
The simulation study comprised four scenarios: (1) rarely consumed foods (5% consumption probability), (2) a food that is rarely consumed by many participants and is often consumed by some participants, (3) a food with 50% never consumers, and (4) Fish intake approximated by an empirical distribution using data from the German National Nutrition Survey II. We simulated two and four 24h dietary recalls (24hDR). The simulation was limited to 10 repetitions per scenario due to the required computing time. We applied the National Cancer Institute Method.

Results
The simulation of very rarely consumed foods (with less than 5% consumption probability) showed estimation problems due to the very low number of participants with at least two consumption days when only a few number of short-term measurements are available per participant. Using four instead of two 24hDRs and the consideration of the frequency information during the modeling process improved the estimation of the lower percentiles and not the upper percentiles. The status of a participant indicating that the participant is a usual or a never consumer should be taken into account in the analysis.

Conclusion
The estimation of usual intake distributions of very rarely consumed foods was crucial. The estimation of rarely consumed foods should take into account the consumption status of participant.

KiESEL – A children´s nutrition survey focusing on risk assessment

Friederike Diouf[1], Nicole Nowak[1], <u>Oliver Lindtner</u>[1]
[1]Department Exposure, German Federal Institute for Risk Assessment

Background
KiESEL is a representative cross-sectional study conducted by the German Federal Institute for Risk Assessment (BfR). The field phase is from 2014 to the end of 2017. KiESEL is a module of KiGGS Wave 2, the German Health Interview and Examination Survey for Children and Adolescents, conducted by the Robert Koch-Institute. The last representative national survey for children of this age group was conducted in 2001/2002 (VELS study). The KiESEL study now provides up-to-date data and the study results will be incorporated in the BfR risk assessments to improve the safety of foods.

Methods
KiESEL collected data on the food consumption of 1000 children aged six month up to five years. The families used a weighing record documenting all foods and beverages consumed by their children over a total of four days (3 consecutive days and 1 independent day). An interviewer measured the height and body weight of the children. As a third part, the families filled out a questionnaire about dietary habits of their child and a food propensity questionnaire with focus on special food items. This design was chosen based on the requirements for dietary exposure assessment.

Results
We present first results of the questionnaire from KiESEL and focus on food items from the food propensity questionnaire (FPQ) to illustrate the importance of FPQ for risk assessment.
For example, about 30% of the participants from KiESEL answered that they have eaten tuna (as a conserve) in the last 12 month. Whereas only 2.5% of the participants in 24h-Recalls of the NVS II reported consumption of tuna (as a conserve) (MRI, 2008). In comparison, nearly 70% of the participants of a special survey for seldom eaten foods confirmed having eaten tuna (as a conserve) in the last twelve month (Ehlscheid et al, 2014).

Conclusion
For dietary exposure assessment it is important to have very detailed information of the food and to generate also sound data for special food items such as seldom eaten foods. As shown in the example the proportion of consumers of seldom eaten foods can differ due to the survey method. To avoid underestimation of exposure, valid estimates of the real proportion of consumers are required which can only be obtained using instruments for long-term intakes such as food propensity questionnaires in addition to weighing records (as used in the KiESEL Study) or 24h-Recalls (as used in the NVS II). By combining information from weighing records, questionnaires on dietary habits and food propensity questionnaires, the results of the KiESEL Study will allow better exposure assessments in particular for seldom eaten foods.

Joint data analysis in nutritional epidemiology: Identification of observational studies and minimal requirements

Mariona Pinart[1], Katharina Nimptsch[1], Jildau Bouwman[2], Lars O Dragsted[3], Chen Yang[4], Carl Lachat[4], Giuditta Perozzi[5], Raffaella Canali[5], Rosario Lombardo[6], Massimo D'Archivio[7], Michèle Guillaume[8], Anne-Françoise Donneau[8], Stephanie Jeran[1], Jakob Linseisen[9,10], Christina Kleiser[9], Ute Nöthlings[11], Janett Barbaresko[11], Heiner Boeing[12], Marta Stelmach-Mardas[12,13], Thorsten Heuer[14], Eamon Laird[15,] Janette Walton[16], Paolo Gasparini[17,18], Antonietta Robino[18], Luis Castaño[19] , Gemma Rojo-Martínez[20,21], Jordi Merino[22,23], Luis Masana[22], Marie Standl[24], Holger Schulz[24], Elena Biagi[25], Eha Nurk[26], Christophe Matthys[27], Marco Gobbetti[28], Maria de Angelis[29], Eberhard Windler[30], Birgit-Christiane Zyriax[31], Jean Tafforeau[32], Tobias Pischon[1,33,34,35]

[1]Molecular Epidemiology Research Group, Max Delbrück Center for Molecular Medicine, Berlin, Germany; [2]TNO, Microbiology and Systems Biology Group, Zeist, The Netherlands; [3]Department of Nutrition, Exercised and Sports, University of Copenhagen, Denmark; [4]Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium; [5]CREA-NUT, Food & Nutrition Research Centre, Roma, Italy [6]The Microsoft Research - University of Trento Centre for Computational and Systems Biology (COSBI); [7]Center for Gender-specific Medicine, Istituto Superiore di Sanità, Rome, Italy; [8]Department of Public Health, University of Liège, Liège, Belgium; [9]Helmholtz Zentrum München, Institute of Epidemiology, Neuherberg, Germany; [10]Ludwig-Maximilians-Universität München, Chair of Epidemiology, Augsburg, Germany; [11]Department of Nutrition and Food Sciences, University of Bonn, Bonn, Germany [12]Department of Epidemiology German Institute of Human Nutrition Potsdam-Rehbrücke, Nuthetal, Germany; [13]Department of Pediatric Gastroenterology and Metabolic Diseases, Poznan University of Medical Sciences, Poland; [14]Department of Nutritional Behaviour, Max Rubner-Institut, Federal Research Institute of Nutrition and Food, Karlsruhe, Germany; [15]Centre For Medical Gerontology, School of Medicine, Trinity College Dublin, Ireland; [16]School of Food and Nutritional Sciences, University College Cork, Cork, Republic of Ireland; [17]Department of Medical Sciences, University of Trieste, Trieste, Italy; [18]Institute for Maternal and Child Health - IRCCS "Burlo Garofolo", Trieste, Italy; [19]CIBERDEM – CIEBERER – BIOCRUCES - Hospital Universitario Cruces – UPV/EHU, Barakaldo, Spain; [20]Spanish Biomedical Research Centre in Diabetes and Associated Metabolic Disorders (CIBERDEM), Madrid, Spain; [21]UGC Endocrinology and Nutrition. Hospital Regional Universitario de Málaga (IBIMA), Málaga, Spain; [22]Research Unit on Lipids and Atherosclerosis, Universitat Rovira i Virgili, Reus, Spain [23]Diabetes Unit and Center for Human Genetic Research, Massachusetts General Hospital, Boston, MA, USA; [24]Helmholtz Zentrum München – German Research Center for Environmental Health, Institute of Epidemiology I, Neuherberg, Germany; [25]Department of Pharmacy and Biotechnology, Alma Mater Studiorum - University of Bologna, Bologna, Italy; [26]National Institute for Health Development, Tallinn, Estonia; [27]Department of Clinical and Experimental Medicine, KU Leuven and Department of Endocrinology, University Hospitals Leuven, Belgium; [28]Faculty of Science and Technology, Free University of Bozen, Italy; [29]Department of Soil, Plant and Food Sciences, University of Bari Aldo Moro, Italy; [30]Preventive Medicine, University Heart Center, University Hospital Hamburg-Eppendorf, Hamburg, Germany;[31]Institute for Health Services Research in Dermatology and Nursing (IVDP), University Medical Center Hamburg-Eppendorf, Hamburg, Germany; [32]Scientific Institute of Public Health, Brussels, Belgium; [33]Charité Universitätsmedizin Berlin, Germany; [34]MDC/BIH Biobank, Max Delbrück Center for Molecular Medicine and Berlin Institute of Health (BIH), Berlin, Germany; [35]DZHK (German Centre for Cardiovascular Research), partner site Berlin

Background
Joint analysis of nutritional data from multiple studies may improve the ability to answer complex questions regarding the role of nutritional status and diet in health and disease.

Objective
To identify nutritional observational studies and minimal requirements for joint data analysis.

Methods
A pre-defined template containing information on study design, exposure measurements (dietary intake, alcohol and tobacco consumption, physical activity, sedentary behaviour, anthropometry, sociodemographic and health status), main health-related outcomes, and laboratory measurements (traditional and omics biomarkers) was developed and circulated to those European research groups participating in the European Nutritional Phenotype Assessment and Data Sharing Initiative (ENPADASI) under the strategic research area of "Diet-related chronic diseases". Information about raw data disposition and metadata sharing were requested. A set of minimal requirements were abstracted from the gathered information.

Results
Studies (12 cohort, 12 cross-sectional, 2 cases-control) with dietary intake data were identified. Two studies recruited children only and the rest recruited adults. Twenty studies collected at least blood samples. Data on traditional biomarkers were available in 20 studies, of which 17 measured lipoproteins, glucose, insulin and 13 measured inflammatory biomarkers. Metabolomics, proteomics, and genomics or transcriptomics data were available in 5, 3, and 12 studies, respectively. While the studies wish to share metadata, most refuse/are hesitant/ have legal or ethical issues to share raw data. Forty one descriptors of minimal requirements for study data were identified to facilitate data integration.

Conclusion
Combining study datasets will enable sufficiently powered refined investigations to increase the knowledge and understanding of the relationship between food, nutrition and human health. Furthermore, the minimal requirements for study data may provide sufficient information for researchers to draft future research proposals in nutrition.

Importance of Food Description Characteristics in Estimating Population Nutrient Intake Distribution

Liangzi Zhang[1,2], **Anouk Geelen**[2], **José Ferreira**[1], **Hendriek Boshuizen**[1], **Marga Ocké**[1,2]
[1]National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands;
[2]Division of Human Nutrition, Wageningen University, Wageningen, The Netherlands

Food consumption data with much detail in food description enable the use of these data for many purposes. However, such data also require huge efforts in data collection and handling. The aim of the paper was to identify the less important characteristics of food description (facets) in multiple-pass 24-h dietary recalls (24HRs) regarding the estimation of energy and nutrient intakes of the Dutch population, with a view towards dispensing with them in the future and thereby lightning data collection.

In Dutch National Food Consumption Surveys (DNFCS), food consumption and nutrient intakes of the participants were collected through two non-consecutive 24HRs using the software called Globodiet (© IARC). During the survey period of 2007 to 2010, a total of 3819 children and adults aged 7 to 69 years participated in the data collection. Globodiet allocates a total of 16 categories of facets to one or more of 17 food groups. Within each food group, the applicability of these facets was determined at the food level. During the Globodiet interview, systematic questions on food description were asked for each reported food according to the applicable facets. The data collection during the 2007-2010 period resulted in 28000 unique combinations of foods and descriptors, which were linked to 1599 food codes in the Dutch National Food Composition Database (NEVO table 2011/3.0). The importance of facets in terms of their contribution in predicting each of the 37 nutrients was estimated by the random forest algorithm, as expressed by the percent increase in mean-square error (%IncMSE) that results from randomly permuting the data on a facet while keeping the data on all other predictor variables fixed. This was done separately for each food group, and then a facet's overall importance was assessed in terms of its performance across the various nutrients being predicted. More precisely, facets were considered less predictive if they had a lower normalized %IncMSEs across all nutrients within a food group. A simulation study will be performed to determine the influence of the omission of certain facets on the estimates of the nutrient intake distribution. The simulation study consists of several steps. To begin with, foods with omitted facets are relinked to the food composition database. Then, the two-day average energy and nutrient intakes are calculated per participant. Finally, the difference between the population nutrient intake distribution before and after facets deletion will be tested. Final decisions on facets deletion will be made according to both the statistical results, and the characteristics of facets and food groups. This is an ongoing study of which some preliminary results will be presented.

Implementation of the Austrian Version of GloboDiet for food consumption assessment within the Austrian Nutrition Survey 2014/2016

Verena Hasenegger, **Jürgen König, Petra Rust**
Department of Nutritional Sciences, University of Vienna, Vienna, Austria

Since 1998 the nutritional status and certain health aspects of the Austrian population have been assessed periodically as a basis for health policies. The Austrian Nutrition Survey 2014/2016 continues the assessment, analysis and monitoring of food consumption in Austrian adults to provide a scientific basis for public health programs.

The Austrian Nutrition Survey 2014/2016 is a cross-sectional survey. The quota sample was composed of 2129 Austrian adults between 18 and 64 years (782 men and 1347 women). Fieldwork was conducted between July 2014 and June 2016 to capture seasonal variation. Written informed consent was obtained from all participants. After data collection, the sample was weighted for a better representativeness of the Austrian adult population in regard to sex and age according to population data from 2016.

Dietary intake was assessed with repeated 24-h-recalls on two non-consecutive days using the Austrian version of the software GloboDiet. Initially, GloboDiet was developed within the European Prospective Investigation into Cancer and Nutrition Study (EPIC-Study) from the International Agency for Research on Cancer (IARC) to conduct standardized and validated 24-h-recalls. At present, there are country-specific versions of GloboDiet in 18 European countries which are used in numerous surveys. Therefore, GloboDiet is currently a unique dietary intake assessment tool that allows the comparison of food consumption data across Europe. The adaptation of the software for the development of the Austrian version included the customization of about 70 interrelated files. First, the common files were adapted according to the study aims. In a second step, country-specific files had to be modified to Austrian needs. For an accurate assessment of portion sizes and quantities, a standardized picture book also was adapted to Austrian customs.

After data collection and cleaning, the interviews were linked to the German food composition database Bundeslebensmittelschlüssel 3.02. Linking was done using a software specifically developed for this purpose – Dietary Assessment (Dita), a tool to calculate energy and nutrient intake. Additionally, Dita enables to link food consumption data with the standardized food classification and description system FoodEx2 from the European Food Safety Authority.

In addition, data on socio-economic status, certain health aspects, supplement intake and physical activity were assessed using a self-administered, web-based questionnaire. Anthropometric measurements were conducted according to standardized procedures using calibrated measuring devices. These information allows a better interpretation of dietary intake data.

We consider GloboDiet a useful tool for nutritional monitoring allowing reliable and comparable trans-national data collection. However, based on our experience, the mandatory implementation of the national version of GloboDiet requires substantial resources and expertise for the adaptation of the relevant backend databases which should not be underestimated.

The third French Individual and National Food Consumption Survey (INCA3): the challenge of matching food consumption and food composition data

Ariane Dufour, Sandrine Carrillo, Gloria Calamassi, Soline Chaumont, Laure Du Chaffaut, Sabrina Havard, Martial Ledoux, Céline Ménard, Marine Oseredczuk, Peggy Pinard, Jean-Luc Volatier, Carine Dubuisson
French Agency for food, environmental and occupational health safety (Anses), Risk assessment department, Maisons-Alfort, France

Introduction
The third Individual and National Food Consumption Study (INCA3) was conducted in France in 2014-2015. Its main objective was to update the consumption data on foods and beverages as well as the nutrient intakes for individuals living in mainland France. To assess the nutritional intakes, it is first necessary to link food consumption data (INCA3) and food composition data (Ciqual table) with different food classifications and a substantial amount of data to match. To our knowledge, no tool is currently available to make an automatic matching between such differing classifications.

Objectives
To describe a semi-automatic method for matching INCA3 food items (consumption data) with Ciqual food items (composition data).

Methods
Quantitative data on consumption were collected in a representative sample of 4114 individuals (1993 children and 2121 adults), based on 3 non-consecutive 24h-recalls, using GloboDiet software. Each food consumed was described by a food item code associated to a basic food name and by several facets, specifying for example the cooking method, the sugar content, the brand, the preservation method or the packaging material. In order to assess the nutrient intakes, a survey-specific food composition table with no missing values was used to assign a food composition to the INCA3 dietary data. This table was derived from the French food composition table Ciqual, updated in 2016 and containing about 2 600 food items. To make the matching easier, a semi-automatic method was developed and implemented. First, the Ciqual food items were described using the food codes and facets from GloboDiet. The facets were prioritised according to their impact on the nutritional content. Then, an algorithm was developed using a computerised STATA program to compare the priority facets between the composition data and the consumption data. For those food descriptions that did not match perfectly, further specific matching rules, depending on the number of common facets and their priorities, were used to assign the most suitable composition code to the consumption data.

Results
The consumption table contained around 300 000 lines including duplicates in terms of combinations of food items and facets. After deletion of the duplicates, approximately 57 000 lines of unique food-facets combinations remained. At the end of the process, they were linked to about 1 900 food items of the composition table. Almost half of the consumption lines without duplicates matched with a unique composition code in the Ciqual table, regardless of the facets. About 25% were perfectly linked to a composition code, taking into account the priority facets. For the remaining lines (25%), a manual coding was necessary.

Conclusion
Implementing a semi-automated matching tool allowed to link every reported food and beverage in the INCA3 consumption survey to the most appropriate Ciqual composition food item, in a standardised way and in a limited period of time. It also ensures replicability in case of future updates of the composition data.

The Norwegian Seafood database

Maria Wik Markhus, Rita Hannisdal, Marian Kjellevold and Lisbeth Dahl
NIFES, National Institute of Nutrition and Seafood Research,
Bergen, Norway

Having relevant, reliable and up-to-date food composition data are the basis for assessing nutrient intake. Inadequate food composition data is a challenge in nutrition monitoring, which may lead to incorrect results.
We have recently analysed iodine concentration in several lean fish species. The results showed large variation between and within fish species, and deviation with The Norwegian Food Composition Table, which include only the mean value of the nutrient content.

In early 2017, NIFES launched Seafood data (https://sjomatdata.nifes.no) a database containing results for both nutrients and contaminants in fish, shellfish and seafood products. The database contains data from 2006 until 2017, and new data are included regularly. The database contains data from about 30 fish species, 15 different shellfish and almost 40 seafood products. More than 70 nutrients, including fatty acids, vitamin D and iodine are present in the database. Included in the database is also relevant contaminants such as dioxins and dioxin like PCBs, mercury and cadmium together with more than 70 other undesirable substances.

In conclusion, the level of both nutrients and contaminants can vary extencly between and within species. Databases including time trends, mean, median and range could be an important contribution to assessing intake of both nutrients and contaminants. Such databases could also contribute to food based dietary guidelines, in addition to research on dietary intake and health.

Calculating the content of Bioactive Plant Compounds in foods using data from eBASIS linked to the BLS

Frank Forner[1,2], Toni Meier[1,2], Gabriele Stangl[1,2], Olaf Christen[1,2]
[1] Institute of Agriculture and Nutritional Sciences, Martin-Luther-University Halle-Wittenberg, Germany
[2] Competence Cluster for Nutrition and Cardiovascular Health (nutriCARD), Halle-Jena-Leipzig, Germany

Background
Bioactive plant compounds (BPCs) are a valuable part of a healthy diet. The organization EuroFIR AISBL maintains the database eBASIS (BioActive Substances in Food Information System) which contains a structured summary of available studies on this topic. The integration of this data into the German food code database (BLS) would be useful to calculate the BPC-content of common foods and recipes.

Methods
The eBASIS-database was checked systematically for content and quality of information. eBASIS contains information about 266 unique plants such as fruits, vegetables, herbs, nuts, and grains. 37.596 data points from 1.185 single studies and publications, were searched, aggregated and transferred into a self-developed database coded with Microsoft Access®. Further, we used this data to expand the BLS-database and to calculate the BPC-content of three different meal plans underlying the recommendations of the German Nutrition Society (DGE) with 1600 kcal/d, 2000 kcal/d, and 2400 kcal/d.

Results
We scanned eBASIS for data on plant species like fruits, vegetables, herbs, nuts, grains. Data was selected with a focus on data availability and data quality. BPCs were assigned to five main categories: Carotenoids, Phenolic acids, Polyphenols, Glucosinolates, and Phytosterols. We calculated arithmetic means for single compounds and summed up for the main categories. The resulting values of 129 plant products were linked via BLS-code with the BLS-database. Among the three meal plans of the German Nutrition Society (DGE) the BPC-uptake varied from 924 mg to 1162 mg per day.

Conclusion
The expansion of the BLS – as described in this outline - allows the calculation of BPC-content for many staple foods. It can serve as a basis for the integration of further BPC-categories and the extension to processed foods. The linkage of the data via BLS-code with corresponding BLS-entries allows for the estimation of BPC-content in complex menus.

Contribution of fish to nutrient intakes in a cohort of pregnant women in the Republic of Seychelles

M.C. Conway, E.M. McSorley, M.S Mulhern, J.J. Strain, A.J Yeates
Nutrition Innovation Centre for Food and Health, Ulster University Coleraine, Cromore Road, Coleraine BT52 1SA.

Introduction

The benefits of fish consumption are largely associated with reduced risk of disease including cardiovascular disease (CVD) and inflammatory disease[1]. Fish consumption is also an important source of nutrients in the diet and in developing countries, where fish is often the primary source of protein. During pregnancy fish consumption supplies nutrients which are particularly important for the developing foetus[2]. The current study aims to examine the contribution of fish to nutrient intakes in a cohort of pregnant women in the Republic of Seychelles. This is a population with high fish consumption, with an average fish consumption of 12 meals per week[3].

Methods

This study forms part of the Seychelles Child Development Study (SCDS) Nutrition Cohort 2 (NC2). A food frequency questionnaire (FFQ) specifically tailored to the Seychellois diet was administered to pregnant women at 28 weeks gestation. FFQs were entered on QBuilder (Tinuviel, version 4.0) allowing for participant food and nutrient intake to be analysed. The percentage (%) contribution of food groups to daily nutrient intakes was also determined using QBuilder.

Results

A total of 280 participants were included in the current analysis, after excluding misreporters (n=143). The mean age of participants was 27 years old (SD 5.96). Median fish intake for the white fish group was 113.57g (IQR 107.02), and median intake of fatty fish was 98.43g (IQR 92.57). QBuilder software produced 17 food groups, including two fish groups "White fish/crustacean and dishes" and "Fatty fish/fatty fish dishes". Table 1 outlines how the fish food groups contribute to daily nutrient intake in this cohort.

Table 1: Median (IQR) daily intake of fish food groups and median percentage (%) contributions to intake of various nutrients in a cohort of pregnant women (*n*280)

	White fish, crustaceans and dishes							
	Energy (kJ)	Protein (g)	PUFA (g)	Fe (mg)	Se (µg)	Riboflavin (mg)	Vit B6 (mg)	Folate (µg)
Nutrient intake	100.94 (246.81)	0.55 (1.27)	0.25 (0.27)	0.17 (0.28)	2.51 (3.13)	0.04 (0.11)	0.09 (0.07)	17.43 (16.73)
%contri.	1.00 (2.10)	0.60 (1.08)	1.80 (1.80)	1.55 (2.08)	2.00 (1.90)	2.00 (5.18)	4.00 (2.38)	5.55 (6.60)

	Fatty fish, fatty fish dishes							
	Energy (kJ)	Protein (g)	PUFA (g)	Fe (mg)	Se (µg)	Riboflavin (mg)	Vit B6 (mg)	Folate (µg)
Nutrient intake	704.72 (675.84)	14.26 (12.75)	0.40 (0.61)	0.76 (1.23)	0.86 (2.21)	0.15 (0.14)	0.01 (0.03)	2.06 (3.17)
%contri.	7.60 (5.40)	15.30 (10.60)	2.90 (3.80)	6.10 (10.25)	0.70 (1.60)	7.55 (7.15)	0.50 (1.40)	0.70 (0.90)

% contri.= % contribution; PUFA = polyunsaturated fatty acids; Fe = iron; Se = selenium; Vit B6 = vitamin B6

Discussion

These results indicate that fatty fish consumption is an important source of protein, iron and riboflavin contributing to 15.3%, 6.1% and 7.15% of overall intake respectively. Contribution of fish to iron intake in this cohort is similar to

that previously reported by Bonham *et al*, however contribution to selenium intakes is lower than previously reported in a similar high fish eating cohort[4]. Given the importance of these nutrients for health with respective roles in growth, production of red blood cells and energy production, fish is an important food to include in the diet.

References

(1) Calder P (2013) British Journal of Clinical Pharmacology 75(3): 645-662
(2) Starling P *et al* (2015) Nutrients 7: 2001-2014
(3) Yeates AJ *et al* (2015) Prostaglandins, Leukotrienes and Essential Fatty Acids 102-103: 12-20
(4) Bonham MP, Duffy EM, Robson PJ et al (2009) Public Health Nutrition 12(9): 1312-1320

Nutrition and Allergies: Key findings from the GINIplus and LISA Birth Cohorts

<u>C Harris</u>[1,2], A von Berg[3], Iana Markevych[1,4], D Berdel[3], CP Bauer[5], T Schikowski[6], I Lehmann[7,8], J Heinrich[1,4], S Koletzko[2], Marie Standl[1]

[1]Institute of Epidemiology I, Helmholtz Zentrum München – German Research Centre for Environmental Health, Neuherberg, Germany; [2]Ludwig-Maximilians-University of Munich, Dr. von Hauner Children's Hospital, Munich, Germany; [3]Department of Pediatrics, Marien-Hospital Wesel, Wesel, Germany; [4]Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine, Inner City Clinic, University Hospital of Munich (LMU), Munich, Germany; [5]Technical University of Munich, Department of Pediatrics, Munich, Germany; [6]IUF-Leibniz Research Institute for Environmental Medicine (IUF), Düsseldorf, Germany; [7]Core Facility ‚Studies', Helmholtz Zentrum für Umweltforschung UFZ, Leipzig, Germany; 8Department of Environmental Immunology, Helmholtz Zentrum für Umweltforschung UFZ, Leipzig, Germany

Background
Allergic diseases are among the most common and earliest-onset noncommunicable diseases (NCDs). Nutrition is a modifiable lifestyle factor considered to play an important role in early allergy prevention, even in utero. We aim to summarize key findings (published and in progress) on nutrition - as assessed by various different methods - and allergies in children from two large German birth cohorts.

Methods
Using data from the ongoing GINIplus and LISA birth cohorts, studies were carried out to evaluate different nutritional exposures in relation to a range of outcomes. The first study (I) assessed allergy prevention by early nutritional intervention in new-borns at risk of allergy. Blinded hydrolysate formulas (partial whey (pHF-W), extensive whey (eHF-W), extensive casein (eHF-C)) or regular cow's milk formula were randomly allocated at birth, and incidence of allergic conditions recorded until the age of 15 years. In the second study (II), food diversity during the first year of life (parental-reported intakes of up to 8 food groups) was assessed in association with allergies from 2 to 15 years, stratified by early skin symptoms. The third study (III) involved longitudinal analyses of the association of long-chain polyunsaturated fatty acids (LC-PUFA) in cord-blood with allergic diseases during the first 10 years of life. The last study (IV) was a cross-sectional study in 15-year old children of the association between dietary saturated fatty acids (SFA) measured by a food frequency questionnaire (developed by our group and validated specifically for fatty acid intakes in 10-year-olds), and low-grade inflammation assessed by high-sensitivity C-reactive protein (hsCRP), stratified by tertiles of objectively-measured lifestyle physical activity (PA).

Results
(I) For asthma and allergic rhinitis, preventive effects emerged between 11 and 15 years (mainly with eHF-C). Preventive effects for eczema were seen with eHF-C and pHF-W. (II) Higher food diversity decreased prevalence of aeroallergen sensitisation up to 15 years in children with early skin symptoms, whereas associations in children without early symptoms were inconsistent. (III) Children with asthma and eczema had significantly lower serum n-6 and n-3 LC-PUFA, respectively, at follow-up assessments; but no association of cord blood n-3 or n-6 LC-PUFA was observed with any outcomes. (IV) Dietary SFA was not associated with higher inflammation in adolescents; rather, an inverse association was observed, driven by males in the highest tertile of lifestyle PA.

Conclusion
The various methods of nutritional assessment performed within the GINIplus and LISA cohorts have allowed the investigation of different dietary aspects at specific life stages. While associations are complex and often reverse causation cannot be excluded, the presented results support the notion that nutrition plays a relevant role in the development of allergic diseases.

Food introduction styles in the first year of life revealed by a FFQ and a Latent Class Analysis and risk of allergic diseases in the PASTURE birth cohort

Alexander J. Hose[1], Juha Pekkanen[2], Caroline Roduit[3], Josef Riedler[4], Jean-Charles Dalphin[5], Erika von Mutius[1], and Markus J. Ege[1]

[1] Dr. von Hauner Children's Hospital, Ludwig Maximilians University Munich; Munich, Germany
[2] Department of Health Security, National Institute for Health and Welfare (THL); Kuopio, Finland; Department of Public Health, University of Helsinki; Helsinki, Finland
[3] Christine Kühne Center for Allergy Research and Education (CK-CARE); Davos, Switzerland; Children's Hospital, University of Zürich; Zürich, Switzerland
[4] Children's Hospital Schwarzach; Schwarzach, Austria
[5] University of Besançon, Department of Respiratory Disease, Univ. Hospital; Besançon, France

Background
There is growing evidence that specific feeding practices and dietary habits early in life (e. g. farm milk consumption) have protective effects on allergic diseases like asthma [6]. Feeding styles and their evolvement in early infancy have so far not been explored by unsupervised, hypothesis-free clustering approaches.

Objective
To determine food introduction styles monitored by a monthly Food Frequency Questionnaire (FFQ) in the first year of life and analyzed by means of Latent Class Analysis (LCA) and to relate these to the lifetime prevalence of asthma at age 6 years.

Methods
PASTURE is a prospective birth cohort study involving children from rural areas in 5 European countries (Austria, Finland, France, Germany, and Switzerland) designed to evaluate risk factors and preventive factors for atopic diseases, including the potential effects of dietary patterns of the children over time. Feeding practices were reported by parents in monthly diaries between the 3rd and 12th months of life. Parents indicated for each of 17 most common feed food items whether it was given to the child in the last 4 weeks and, if so, how often in 4 categories (never/less than once a week/1-6 times a week/daily). The resulting 153 4-staged ordinal variables were entered in a LCA. Asthma (lifetime prevalence) and potential confounders were assessed by a parental questionnaire at age 6.

Results
Data with at least one reported feeding practice over time was available for 1042 of the recruited 1133 PASTURE children. The best model fit was achieved by the 4-class solution of the LCA. Latent Class 1 (N=165) included mostly French children and class 2 (N=173) mostly Finnish children. Classes 3 (N=414) and 4 (N=290) including mostly children from the other countries, clearly distinguished between parents preferring an early (class 3) versus late (class 4) introduction. The difference in asthma prevalence between classes 3 and 4 (7.61% vs. 4.31%) was fully explained by parental history of atopic diseases and a resulting avoidance strategy. In contrast, the elevated risk in the Finnish class versus all other classes ($OR_{adjusted}$=8.83; $P_{adjusted}$=0.0006) was genuinely attributable to this particular food introduction style and explained more than a half of asthma cases in the birth cohort. This style was characterized by very early introduction of fruits and vegetables, early introduction of meat and cereals on a daily basis, and low diversity of introduced food items in the first year of life.

Conclusions
The food introduction pattern as practiced ten years ago in Finland may strongly increase the asthma risk at age 6 years. Assessing complex FFQs data by unsupervised clustering methods such as LCA may help unravel hidden nutrition-related behavioral or biological patterns with high impact on public health.

[6] Loss, G. et al.. The protective effect of farm milk consumption on childhood asthma and atopy: the GABRIELA study. J Allergy Clin Immunol. 2011 Oct;128(4):766-773.

MRI

Max Rubner-Institut

Eat healthy? Attitudes of the German population towards functional cardioprotective food

Jung Franziska UCE[1,2], Luck-Sikorski Claudia[2,3], Krüger, Marcus[3], Wiacek, Claudia[1,4]; Braun, Peggy G [1,4], Engeli, S[5], Riedel-Heller Steffi G[6]
[1] Competence Cluster for Nutrition and Cardiovascular Health (nutriCARD), Halle-Jena-Leipzig, Germany; [2]Integrated Research and Treatment Center AdiposityDiseases (IFB), University of Leipzig, Leipzig, Germany; [3]SRH University of Applied Sciences, Neue Str. 28–30, 07548 Gera, Germany [4]Institute of Food Hygiene, Center of Veterinary Public Health, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany; [5]Institute of Clinical Pharmacology, Hannover Medical School, Hannover, Germany; [6]Institute of Social Medicine, Occupational Health and Public Health (ISAP), University of Leipzig, Germany

Nutrition associated diseases such as cardiovascular diseases (CVD) increase in incidence. 40 % of all deaths are attributed to CV causes. The reasons are our dietary habits as well as low levels of physical activity. Prevention can be delivered by changing lifestyle especially our eating behavior. Changes in the composition of food could be one option. This includes e.g. the restriction of saturated fatty acids and salt and/or an increase consumption of dietary fibre or polyunsaturated fatty acids.

Foods with so called cardioprotective effects, e.g. functional food, could reduce CVD risk factors and hence CVD incidence. The aim of this study was to determine attitudes of consumers in Germany towards potentially cardioprotective food using cluster analyses.

The overall sample consisted of 1,007 consumers from the general public. Consumers were contacted via telephone and interviewed using questionnaires. Apart from sozio-demographic information, the questions focused on knowledge on as well as previous consumption of food with cardioprotective effects. Attitudes towards these foods were surveyed using specific arguments that might hinder or promote purchase.

Overall insufficient knowledge about cardioprotective food was found across all identified subsamples. Our analysis revealed a small but determined group of consumers who think very skeptical about these products, but we also identified a favorable group. These two groups only differed in age, with the skeptical group being ten years older.

Potential health benefits of cardioprotective food need to be better communicated to German customers in order to address possible doubts or concerns and to encourage healthy eating habits in consumer eating behavior.