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A school-based, peer-led, social marketing intervention to engage Spanish adolescents in a healthy lifestyle («We Are Cool»-Som la Pera study): a parallel-cluster randomized controlled study

Background: Encouraging adolescents to adopt healthy lifestyles can be challenging.

Objective: The aim of the «Som la Pera» study was to engage adolescents by applying new strategies to increase both their fruit and vegetable consumption and their physical activity (PA) while reducing their sedentary behavior.

Methods: In disadvantaged neighborhoods of Reus (Spain), two high schools were randomly assigned to the intervention (IG) (n=170 13- 16-year-olds) and two were assigned to the control group (CG) (n=223 13- 16-year-olds). The intervention, lasted 12 months spanning 2 academic years (2013-2015), and used social marketing (SM) to improve healthy choices. The peer-led strategy involved 5 adolescents who designed and implemented 10 activities as challenges for their 165 school-aged peers. The CG received no intervention. To assess self-reported lifestyles in both groups, the Health Behavior in School-Aged Children Survey was used at baseline (T0) and at the end of study (T1). Generalized linear models were used to analyze differences from the baseline to the end of the study of the intervention and control groups.

Results: The number of adolescents consuming ≥ 1 fruit/day significantly increased in the IG from T0 to T1 (28.6% to 51.2%; $p < 0.01$), whereas a non-significant drop occurred in the CG (33.7 to 27.4%; $p = 0.14$), resulting in a significant difference between both groups at the end of the study ($p < 0.01$). Similarly, the number of adolescents engaged in ≥ 6 hours/week of PA significantly increased in the IG from T0 to T1 (29% to 50%; $p < 0.01$) whereas a non-significant increase occurred in the CG (21.2 to 23.7%; $p = 0.51$), resulting in a significant difference between both groups at the end of the study ($p < 0.01$). Only in males, those consuming ≥ 1 vegetable/day significantly increased in the IG from T0 to T1 (12.8% to 40.7%; $p < 0.01$) whereas a non-significant drop occurred in the CG (16% to 15.1%; $p = 1.00$), resulting in a significant difference between both groups at the end-of-study ($p < 0.01$). In addition, the number of males reporting ≤ 2 hours/day of sedentary activity increased significantly in the IG (11.7% to 39.5%; $p < 0.01$) and in the CG (5.7% to 17.9%; $p < 0.01$), with a significant difference in favor of IG at the end of the study ($p = 0.01$).

Conclusions: A school-based, peer-led, SM intervention developed by adolescents attending high schools in low-income neighborhoods effectively improved fruit consumption and PA in adolescent students of both genders. Increased in vegetable consumption and decreased sedentary behavior were only observed in males.

P 1

ACEVES-MARTINS Magaly¹**LLAURADÓ Elisabet¹**TARRO Lucia^{1,2}MORIÑA David³PAPELL-GARCIA Ignasi²PRADES-TENA Jordi⁴KETTNER-HOEBERG Helle⁴PUIGGRÒS Francesc²AROLA Lluís^{2,5}DAVIES Amy⁶GIRALT Montse^{1,7}SOLÀ Rosa^{1,2,8}

¹ Universitat Rovira i Virgili, Facultat de Medicina i Ciències de la Salut, Functional Nutrition, Oxidation, and Cardiovascular Diseases Group (NFOC-Salut), Health Education and Promotion, C/ Sant Llorenç, 21, Reus (43201), Spain

² Eurecat, Centre Tecnològic de Catalunya, Unitat de Nutrició i Salut, Av. Universitat 1, Reus (43204), Spain

³ Unit of Infections and Cancer - Information and Interventions (UNIC-I&I), Catalan Institute of Oncology (ICO)-IDIBELL, L'Hospitalet de Llobregat, Barcelona, Spain

⁴ Universitat Rovira i Virgili, Departament d'Estudis de Comunicació, Tarragona, Spain

⁵ Universitat Rovira i Virgili, Departament de Bioquímica i Biotecnologia, Nutrigenomics Research Group, C/ Marcel·lí Domingo, 1, Tarragona (43007), Spain

⁶ National Children's Bureau, Health & Social Care, London, United Kingdom

⁷ Universitat Rovira i Virgili, Facultat de Medicina i Ciències de la Salut, Unit of Pharmacology, C/ Sant Llorenç, 21, Reus (43204), Spain

⁸ Hospital Universitari Sant Joan de Reus, Reus, Spain

Corresponding author:

LLAURADÓ Elisabet

Facultat de Medicina i Ciències de la Salut

NFOC group Eurecat-Reus

Centre Tecnològic de Catalunya

C/ Sant Llorenç 21

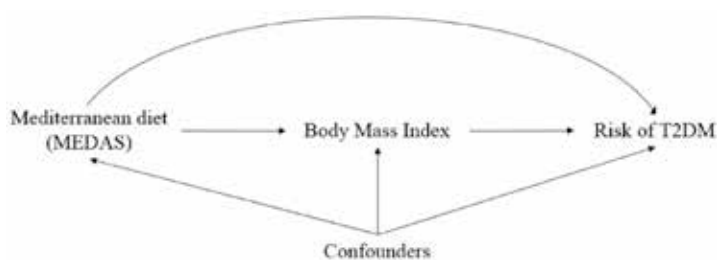
43201-Reus, Spain

elisabet.laurado@urv.cat

Adherence to a mediterranean diet, body mass index and risk of type 2 diabetes mellitus: results from the UKBiobank

Context: The incidence of type 2 Diabetes Mellitus (T2DM) has significantly increased worldwide, as has the T2DM-related morbidity and mortality. Regarding T2DM prevention, accumulating evidence suggests an association between a greater adherence to a Mediterranean-type diet and a lower risk of T2DM. To deeper investigate underlying mechanisms, we focused on the potentially mediating effect of the body mass index (BMI) on this relationship.

Methods: UKBiobank participants with T2DM clinical data and who answered at least one dietary survey were included. Diabetic status was self-reported and participants with prevalent, gestational, or uncertain diagnosis were excluded. The MEDAS score was used to assess the baseline adherence to a Mediterranean-type diet, based on 11 food groups (olive oil, vegetables, fruits, red meat, butter or cream, sweet beverages, wine, legumes, fish, pastries and nuts) and an additional question about the preferred meat (white or red). A causal mediation analysis based on a Cox proportional hazards model was performed to assess the relationships between MEDAS score and the risk of T2DM.



Results: From the initial cohort of 6,362 participants, 113 individuals developed incident diabetes during a mean follow-up time of 4.6 years. At baseline, the mean MEDAS score was 4.6, range from 0 to 11. Regarding the total effect, the incidence of T2DM was reduced by 12% in individuals with higher MEDAS score. However, there was no significant direct effect of the MEDAS score on the risk of T2DM after adjustment for potential confounders, including BMI, (HR 0.91 95%CI [0.82 – 1.02]). Mediation analyses suggested that BMI explained around 3% of the relationship between MEDAS score and risk of diabetes (HR 0.97; 95%CI [0.96 – 0.97]).

Conclusion: The well-known beneficial effects of a higher adherence to a Mediterranean-type diet on the risk of T2DM may be partly mediated by level of BMI among the UKBiobank participants.

P 2

ANDRE Perrine¹PROTOR Gordon²RODRIGUEZ-ARTALEJO Fernando^{3,4}LOPEZ-GARCIA Esther^{3,4}GOMEZ-CABRERO David²NEYRAUD Eric⁵BROS Pauline⁵GARCIA-ESQUINAS Esther³MORZEL Martine⁵FEART Catherine¹

¹ Univ. Bordeaux, Inserm, Bordeaux Population Health Research Center, UMR 1219, F-33000 Bordeaux, France

² Mucosal & Salivary Biology Division, Floor 17 Tower Wing, King's College London, London SE1 9RT, UK

³ CIBERESP and Department of Preventive Medicine and Public Health, School of Medicine, Universidad Autónoma de Madrid/Idipaz, Arzobispo Morcillo, 4, 28029 Madrid, Spain

⁴ IMDEA-Food Institute. CEI UAM+CSIC, Madrid. Spain

⁵ Centre des Sciences du Goût et de l'Alimentation, AgroSup Dijon, CNRS, INRA, Université de Bourgogne Franche-Comté, F-21000 Dijon, France

Corresponding author:

ANDRE Perrine

INSERM U1219

Bordeaux Population Health Research

Center Bordeaux University, ISPED

146 rue Léo-Saignat, CS 61292

33076 Bordeaux Cedex, France

perrine.andre@u-bordeaux.fr

Fruit and vegetable intake and its relationship to dietary antioxidant capacity and markers of oxidative stress. A gender-related study

Objectives: We investigated gender differences in dietary intake of fruit and vegetable (F&V) and relationship with plasma levels of carotenoids and total antioxidant capacity (pTAC). Moreover, we studied the gender differences in the relationship between F&V intake and plasma levels of lipid hydroperoxides and oxidized low-density lipoprotein (ox-LDL).

Methodology: No smokers and normopese subjects (35 men and 48 women, mean age was 40 ± 10 years) were included in the study. Dietary habits, intake of carotenoids and total antioxidant capacity (dTAC) were evaluated on the basis of a 15-day food frequency questionnaire. Alcohol intake was not significantly different in males and females. Plasma levels of β -carotene, lutein and pTAC were studied. Moreover levels of plasma lipid hydroperoxides and ox-LDL were evaluated using ferrous oxidation-xylene orange 2 (FOX2) assay and a monoclonal antibody-based ELISA procedure, respectively. Gender-related differences were studied using a multivariate statistical analysis.

Results: Dietary habits were gender-related with a higher intake of β -carotene ($p < 0.002$) in women with respect to men. Mean values of β -carotene were higher in women compared with men. Mean values of ox-LDL and hydroperoxides were higher in men than in women ($p < 0.02$ and $p < 0.05$ respectively). Significant negative correlations were established between the individual values of ox-LDL vs levels of lutein, vs β -carotene and vs pTAC values in both group of subjects. Male or female subjects belonging to tertile with highest daily F&V intake or highest daily d-TAC showed lowest levels of plasma ox-LDL.

Conclusions: We confirm that a high F&V consumption exerts a positive effect on antioxidant defenses and decreases oxidative damage of plasma lipoproteins. The protective effect realizes at a higher extent in women with respect to men. Dietary recommendation towards higher consumption of F&V antioxidants should be highlighted in prevention of diseases in which gender-related differences in oxidative stress play a role.

P 3

Tiziana BACCHETTI
Imma TURCO
Camilla MORRESI
Gianna FERRETTI

Centro di Ricerca e Servizio di Educazione Sanitaria e Promozione della Salute (C.I.E.S.S.), Università Politecnica delle Marche, Ancona, Italy

Corresponding author:
FERRETTI Gianna
Centro di Ricerca e Servizio di Educazione Sanitaria e Promozione della Salute (C.I.E.S.S.)
Faculty of Medicine, Via Tronto
Università Politecnica delle Marche Ancona, Italy
g.ferretti@univpm.it

Access to healthy food in a university restaurant of a Brazilian public university

The University's Restaurants (UR) integrate the policy of student assistance to public universities that aim to provide adequate and healthy food at affordable prices to students.

Objective: The goal of this study was to characterize the UR of a Brazilian public university according to the dimensions of access to healthy food.

Methods: Data collection was performed with the application of a questionnaire and direct observation to identify the dimensions of healthy food access (availability, accommodation and accessibility). The availability was verified by the frequency of the monthly supply of fruit and vegetables (healthy food) and ultra-processed foods (unhealthy food) according to the food guide for the Brazilian population.

P 4

BARBOSA Roseane Moreira Sampaio¹
HENRIQUES Patrícia²
FERREIRA Daniele Mendonça³
SOARES Daniele da Silva Bastos⁴
DIAS Patrícia Camacho⁵
CHARTIER Jérôme Franck⁶

¹⁻⁶ Faculdade de Nutrição – Universidade Federal Fluminense - Niterói, Rio de Janeiro, Brasil.

The accommodation was verified by the description of the days of operation and local structure (drinker or free water, tables and chairs for the meal). The accessibility was determined by the students moving from the academic units to the UR. The university has a central UR and four canteens serving all students.

Results: Regarding the availability of healthy foods, it was found that the UR menus (n=20) offered daily fruits and vegetables (100%) however it was observed the presence of ultra-processed foods (100%), of which the processed juices were offered every day. The UR provides two meals a day (lunch and dinner) from Monday to Friday and has a location with appropriate furniture and free water supply. The students' moving to the UR, and their respective canteens is done by a free university shuttle.

Conclusion: It is concluded that the UR represents an opportunity for adequate and healthy food for the student community, although it still needs to improve the quality of the food offered. For this, it is fundamental the students' awareness and the greater commitment of the managers in the promotion of healthy food environments.

Corresponding author:
CHARTIER Jérôme Franck
Address: Rua Conselheiro Lafaiete
38 Copacabana CEP 2208
020 Rio de Janeiro – RJ – Brazil
jefracha@gmail.com

Fruit and vegetables at home (FLAM): a randomized controlled trial of the impact of fruit and vegetables vouchers in children from low-income families in an urban district of France

Background: Fruit and Vegetable (F&V) consumption is considered a marker of social inequalities in health since it is considerably decreased in disadvantaged populations. The main objective of this trial was to evaluate the impact of vouchers for F&V purchase on the consumption of F&V among children living in disadvantaged families in a French urban district.

Methods: The FLAM study was a controlled randomized intervention trial, performed in Saint-Denis (North suburbs of Paris). The study group (intervention or control) was randomly attributed to parent-child pairs at inclusion. The intervention group received vouchers exchangeable for F&V over a 1 year period. Nutritional education through workshops was available for both groups. F&V consumption was assessed through face-to-face food frequency questionnaires. Participants who reported eating less than 3.5 F&V per day were considered low F&V consumers.

Results: A total of 92 parent-child pairs were included, in which 45 were allocated to the intervention group and 47 to the control group. Amongst them, 64 completed the final follow-up questionnaire (30% lost to follow-up). After one year, the proportion of low F&V consumers in children was significantly lower in the intervention group (29.4%) compared to the control group (66.7%, $p = 0.005$). Overall, 82% of the vouchers were used by the families, and 64% families participated in at least one workshop over the study period.

Conclusions: This study found a decreased proportion of small consumers in children after 1 year of distribution of F&V vouchers compared to the control group. F&V vouchers could be an effective lever to increase F&V consumption among children from disadvantaged households.

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BUSCAIL Camille¹

BRAUER Paula¹
MARGAT Aurore³
PETIT Stéphanie¹
GENDREAU Judith^{1,2}
DAVAL Paul⁴
LOMBRAIL Pierre^{2,3}
HERCBERG Serge^{1,2}
LATINO-MARTEL Paule¹
MAURICE Aurélie³
JULIA Chantal^{1,2}

¹ Equipe de Recherche en Epidémiologie Nutritionnelle (EREN), Université Paris 13, INSERM U1153, Inra U1125, Cnam, Centre de Recherche en Epidémiologie et Biostatistiques (CRESS) Sorbonne Paris Cité- 74 rue Marcel Cachin - 93017 Bobigny cedex, France

² Département de Santé Publique, Hôpital Avicenne (APHP) - 125 rue de Stalingrad F-93000 Bobigny, France

³ Laboratoire Educations et Pratiques en Santé (LEPS) EA3412, Université Paris 13, Sorbonne Paris Cité, Campus Condorcet, 74 rue Marcel Cachin F-93017 Bobigny cedex, France

⁴ Maison de la Santé de Saint-Denis, 6 rue des Boucheries, F-93200 Saint-Denis, France

Corresponding author:
Camille Buscail
EREN, Université Paris 13
Bâtiment SMBH
74 rue Marcel Cachin F
93017 Bobigny cedex, France
Phone number: +33148388977
c.buscail@eren.smbh.univ-paris13.fr

Dietary intakes and risk of periodontitis: the Nutrinet-Santé e-cohort study

Background and Aims: Periodontitis is a common inflammatory disease of the tooth supportive tissues due to a microbial dysbiosis in the oral cavity. Recent evidence suggested that nutritional habits might influence the development and severity of periodontitis. The present study aims to evaluate the association between dietary intakes and risk of periodontitis in a French adult population.

Methods: The study included 35,390 subjects from the Nutrinet-Santé e-cohort study, who completed a questionnaire pertaining oral health between 2011 and 2012. The risk of periodontitis was assessed by calculating the Periodontal Screening Score (PESS) on 4 selected questions, with a score ≥ 5 indicating a high risk of having severe periodontitis. Dietary data were obtained from at least three self-administered 24h records via the internet. Association between PESS and diet was evaluated by univariate and multivariate analyses (ANCOVA tests).

Results: The study population had a mean age of 49.04 ± 13.94 years and was composed mainly by women (75.8%). Overall, 7263 (20.5%) presented with a high risk of severe periodontitis. After adjustment for potential confounders (e.g., age, gender, BMI, socioeconomic status), high-risk PESS had significantly lower consumption of milk and dairy products (2.49 versus 2.57 portions/day; $p=0.007$), and a lower intake of water (1.24 versus 1.31 L/day; $p<0.0001$) compared to low-risk PESS. Conversely, they had higher intakes of proteins (17.5% versus 16.9% of total energy intake; $p=0.005$), and alcohol (10.38 versus 7.42 mg/day; $p<0.0001$). The consumption of fruit and vegetables was similar between the two groups after adjustment for possible confounders (6.17 vs. 5.59 portions per day; $p=0.520$). Concerning the micronutrients, high-risk PESS individuals had a significantly lower intake of calcium (934.6 versus 957.9 mg/day; $p=0.019$).

Conclusion: The present findings support an association between dietary habits and risk of periodontitis particularly related to calcium intakes.

P 6

CARRA Maria Clotilde¹
 DETZEN Laurent¹
 HAMDJ Zeineb¹
FESSI Sabine¹
 HERCBERG Serge²
 JULIA Chantal²
 BOUCHARD Philippe¹
 ANDREEVA Valentina²

¹ Department of Periodontology, Service of Odontology, Rothschild Hospital, AP-HP, Paris 7- Denis Diderot University, U.F.R. of Odontology, Paris, France

² Equipe de Recherche en Epidémiologie Nutritionnelle (EREN), Centre de Recherche en Epidémiologie et Statistiques, Université Paris 13/ INSERM U1153/INRA U1125/CNAM

Corresponding author:
 Valentina Andreeva
 Equipe de Recherche en Epidémiologie Nutritionnelle (EREN)
 Centre de Recherche en Epidémiologie et Statistiques
 Université Paris 13/INSERM U1153/
 INRA U1125/CNAM
 COMUE Sorbonne Paris Cité F
 93017 Bobigny, France
 v.andreeva@eren.smbh.univ-paris13.fr

Does diet quality explain socio-economic differences in metabolic syndrome in French West Indies?

Introduction and objective: Obesity and chronic diseases represent a major health burden in the Caribbean, particularly since a large part of the population is disadvantaged. However, socioeconomic inequalities in chronic diseases are poorly explored in the Caribbean and the contribution of diet to explain these inequalities has not been studied yet. We therefore investigated the association between socioeconomic position and the prevalence of the metabolic syndrome (MetS) and the mediating effect of diet quality.

Methods: This cross-sectional analysis included 1144 Guadeloupean and Martinican adults from the Kannari study. Dietary intakes were estimated from 24h dietary records and the diet quality was assessed using the Diet Quality Index-International (DQI-I). MetS was defined according to the 2009 harmonized definition, from biological data.

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COLOMBET Zoé¹
 PÉRIGNON Marlène¹
 SALANAVE Benoît²
 LANDAIS Edwige³
 MARTIN-PRÉVEL Yves³
 AMIOT-CARLIN Marie-Josèphe¹
 MÉJEAN Caroline¹

¹ MOISA, Univ Montpellier, CIRAD, CIHEAM-IAMM, INRA, Montpellier SupAgro, Montpellier, France

² Nutritional Surveillance and Epidemiology Team (ESEN), French Public Health Agency, Paris-13 University, Centre de recherche en épidémiologie et statistiques, COMUE Sorbonne Paris Cité, Bobigny, France

Associations between socioeconomic indicators (education, employment status, social assistance benefits, single-parent household, presence of child in the household) and prevalence of MetS, and the mediating effect of diet quality were assessed using multivariate logistic regression models, adjusted for area of residence (Guadeloupe or Martinique), age, sex and body mass index.

Results: Among Guadeloupean and Martinican adults, MetS prevalence was 25%. Low and middle educated subjects (OR_{low} vs. high=1.9; 95%CI=[1.0-3.6] and OR_{middle} vs. high=2.7; 95%CI=[1.4-5.1]) and recipients of social assistance benefits (OR=2.2; CI95%=[1.1-4.2]) were more likely to be at risk of MetS compared with individuals with high education level and non-recipients. DQI-I explained 11% of the overall educational variation in MetS and only 1.3% of the overall variation due to social assistance benefits.

Conclusions: Diet quality contributes little to explain the socioeconomic inequalities in MetS in these Caribbean populations. Mediating effect of other lifestyle factors such as smoking status and physical activity are needed to be investigated to better understand mechanisms of socioeconomic inequalities in MetS and therefore to guide future public health measures.

³UMR204-Nutripass, French National Research Institute for Sustainable Development (IRD), Université de Montpellier, Montpellier, France

Corresponding author:
COLOMBET Zoé
INRA, UMR 1110 MOISA
2 place Pierre Viala
F-34000 Montpellier, France
zoe.colombet@inra.fr

Socioeconomic disparities in diet quality in the French West Indies

Introduction and objective: In the Caribbean context, high prevalence of obesity and chronic diseases coexist with high rate of poverty. Socioeconomic disparities in diet may be involved in social health inequalities. We therefore investigated the association between socioeconomic indicators and diet quality.

Methods: Dietary intakes were estimated from 24h dietary records in 1144 adults from the Kannari study, a cross-sectional survey based on a multistage stratified random sample of the Guadeloupean and Martinican populations. Diet quality was assessed using the mPNNS-GS [range -1 to 13.5 points], measuring adherence to French recommendations, and Diet Quality Index-International (DQI-I) [range 0 to 100 points], assessing several aspects of diet quality (variety, adequacy, moderation, overall balance). Associations between diet quality scores and socioeconomic indicators (education, employment status, social assistance benefits, single-parent household, presence of child in the household) were assessed using multivariate linear regression models, adjusted for area of residence (Martinique or Guadeloupe), age, sex and marital status.

Results: The mean mPNNS-GS was 7.5 points (range 4-10.5 points) and the mean DQI-I was 60.8 points (range 39-82 points). Compared with high educated subjects, no significant difference was found for mPNNS-GS in low educated individuals while middle educated participants had lower mPNNS-GS (7.3 (SEM:0.2) vs. 7.7 points (SEM:0.05); p=0.1). No association was found between DQI-I and education, however unemployed or never employed subjects had lower DQI-I compared with employed participants (60.6 (SEM:0.7) vs. 62.5 points (SEM:0.4); p=0.02). No association between employment status and mPNNS-GS was found.

Conclusion: Few socioeconomic differences in diet quality were found in the sample. However, our sample included low rates of disadvantaged participants and therefore new studies focusing on these subjects are necessary. Identifying sub-populations most at risk of having an unhealthy diet remains a main challenge in the Caribbean context, in order to help targeting nutrition and public health actions.

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COLOMBET Zoé¹
PÉRIGNON Marlène¹
SALANAVE Benoît²
LANDAIS Edwige³
MARTIN-PRÉVEL Yves³
AMIOT-CARLIN Marie-Josèphe¹
DARMON Nicole¹
MÉJEAN Caroline¹

¹ MOISA, Univ Montpellier, CIRAD, CIHEAM-IAMM, INRA, Montpellier SupAgro, Montpellier, France

² Nutritional Surveillance and Epidemiology Team (ESEN), French Public Health Agency, Paris-13 University, Centre de recherche en épidémiologie et statistiques, COMUE Sorbonne Paris Cité, Bobigny, France.

³ UMR204-Nutripass, French National Research Institute for Sustainable Development (IRD), Université de Montpellier, Montpellier, France

Corresponding author:
COLOMBET Zoé
INRA, UMR 1110 MOISA
2 place Pierre Viala
F-34000 Montpellier, France
zoe.colombet@inra.fr

Mediterranean diet in complementary feeding: a new approach to teaching children to eat fruit and vegetables

Objectives: The primary endpoint was the percentage of children with an optimal adherence to the Mediterranean Diet (MD) (kidmed score ≥ 8). The secondary endpoint was the longitudinal evaluation of the BMI. A further objective was to verify how many changes in familial eating habits may come from an early education of the infant towards a Mediterranean eating style.

Methodology: A randomized controlled trial was carried out by 18 general paediatricians affiliated to the Italian Federation of Medical Paediatrics (FIMP) of Naples. Infants were weaned between 4 and 6 months of age, according to current guidelines. The weaning scheme was characterized either by industrial foods (controls) or by natural foods (cases). Randomization was done at children level using a block randomization schema: An adequate amount of fresh green vegetables and seasonal fruit was early offered to the case group. Mothers received a questionnaire before the weaning and at 36 months of age of the child to monitor variations in family eating habits. The manual "MD in the first year of life" was freely given to all cases' mothers. Data about MD adherence were collected by using questionnaires both for adult and for children (kidmed score).

Results: 325 children (163 cases and 162 controls) have been enrolled. The two groups are homogeneous with respect to baseline characteristics, as shown in Figure 1. Preliminary results show a statistically significant association between mothers' degree and their adherence to the MD (Figure 2). No correlation was observed between mothers adherence to MD and birth weight of children (Figure 3). Of note, only 40% of mothers at T0 consumed at least three fruits per day. At 12 months of age, the kidmed score of the case group showed that 73,4% had a value between 8 and 12 (good adherence); 2,7% between 1 and 3 (bad adherence); 23.9% between 4 and 7 (Figure 4).

Conclusion: MD at weaning is useful to have healthy habits at 12 months of age. We will analyze the usefulness of an early introduction of natural foods, in order to verify long term eating habits and health outcome.

	Cases (200)	Controls (203)
Age at enrollment(days)	145 +/-17	143 +/-20
Gender (female)	108 (54)	103 (50.7)
Birth weight (kg)	3.16 +/- 0.48	3.18 +/- 0.44
Weight at enrollment (kg)	7.61 +/- 4.99	7.17 +/- 0.96
Brothers/ sisters in the house (yes)	101 (50.5)	112 (55.2)
Breastmilk	62 (31.2)	50 (24.6)
Formula	109 (54.8)	116 (57.1)
Mixed	28 (14.1)	37 (18.2)
Mother's educational level		
Elementary/Middle school	52 (26.1)	71 (35)
High school	87 (43.7)	84 (41.4)
University	60 (30.2)	48 (23.6)
Mothers adherence to MD (%)	63 +/- 13	61 +/- 15

Fig 1

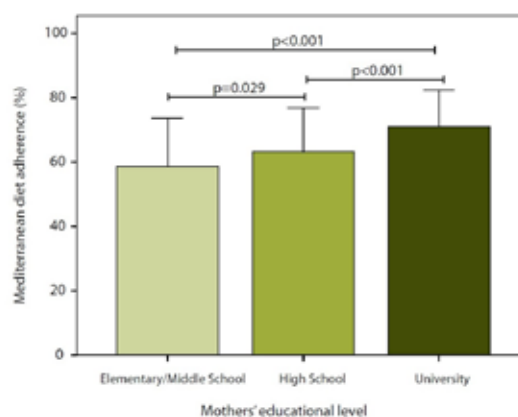


Fig 2

P 9

DE FRANCHIS Raffaella¹

ALBANO Fabio¹
 ANTIGNANI Angelo⁴
 BOZZA Luigi¹
 CANALE Pasquale¹
 CHIACCHIO Maria¹
 CORTESE Paolo¹
 D'AVINO Antonio¹
 DE GIOVANNI Maria¹
 DELLO IACOVO Mirella¹
 D'ONOFRIO Antonietta¹
 FEDERICO Aniello¹
 GASPARINI Nicoletta¹
 IACCARINO Felicia¹
 ROMANO Giuseppe¹
 SPADARO Raffaella¹
 TEDESCO Mariangela¹
 TOSCANO Porfirio¹
 VITIELLO Giuseppe¹
 AURICCHIO Salvatore²
 BRUZZESE Dario³

¹ Italian Federation of Medical Paediatrics (FIMP), Naples, Italy

² European Laboratory Food Induced Disease (ELFID) and ³ Dipartimento di Sanità Pubblica, University of Naples "Federico II", Italy

⁴ Dipartimento di Medicina Clinica e Chirurgia, University of Naples "Federico II", Italy

Corresponding author:
 DE FRANCHIS Raffaella
 Corso A. Lucci 121
 80142 Naples, Italy
 info@fimpnapoli.it

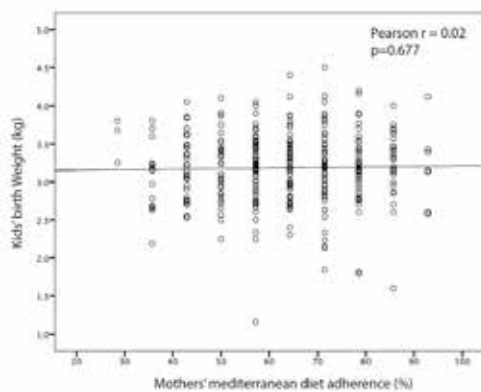


Fig 3

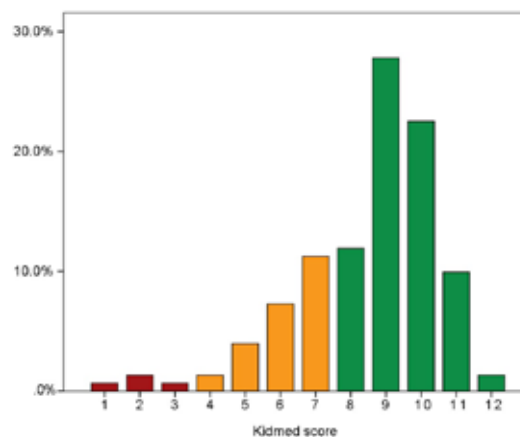


Fig 4

Cisplatin chemotherapy induces culinary and dietary habits changes in bronchial cancer patients

Background and objective: Malnutrition is a common side effect of cancer and has a multifactorial etiology, including metabolic changes induced by the pathology and food behavior modifications through chemotherapy treatment. Previous studies showed modifications in patients' food preferences during chemotherapy (Coa, 2015; Guerdoux-Ninot, 2016). Thus, the aim of this study was to explore food behavior modifications during cancer treatment, based on self-reports of lung cancer patients.

Methods: In this randomized case-control study, forty four bronchial cancer patients receiving cisplatin and 44 age and gender matched healthy participants (controls) completed a food behavior questionnaire related to culinary habits, eating habits, and food preferences. Patients and controls completed the questionnaire before the beginning of the chemotherapy treatment (T0), and 6 weeks later, corresponding to the completion of 2 cycles of chemotherapy (T1).

Results: Approximately 32% of patients reported modifications in their eating habits after 2 cycles of chemotherapy; 39% removed food and/or beverage from their usual diet and 27% declared the intake of dietary supplements. However, no such changes were observed in the control group. When asked about their food preferences at (T0), only 27% of patients mention at least one fruit or vegetable whereas 54,5% of controls did. This percentage increased for patients at (T1).

Conclusion: These findings show that cancer treatments affect eating and drinking behavior in a substantial subset of patients. Patients tend to modify their dietary habits by adding or removing food and beverage. This could be considered as an opportunity to use positively in order to introduce healthy food recommendations and improve patients' nutritional status and quality of life through the continuum of cancer care.

P 10

DRARENI Kenza^{1,2}
 BENSAFI Moustafa²
 GIBOREAU Agnes¹
 LAVILLE Martine³
 SOUQUET Pierre Jean³
 NAZARE Julie Anne⁴
 DOUGKAS Anestis¹

¹ Research Center of the Institut Paul Bocuse, Ecully, France

² CNRS, UMR5292, INSERM U1028, Lyon Neuroscience Research Center, University Lyon, F-69000, France

³ CH Lyon Sud, Hospices Civils de Lyon, 69310 Pierre Bénite, France

⁴ Centre de Recherche en Nutrition Humaine Rhone-Alpes and CENS, University of Lyon 1, CH Lyon Sud, Hospices Civils de Lyon, 69310 Pierre Bénite, France

Corresponding author:
 DRARENI Kenza
 Research Center of the Institut Paul Bocuse
 1 Cheûin de Calabert
 69130, Ecully, France
 kenza.drareni@institutpaulbocuse.com

Relationship between occupational sitting and BMI among workers of a higher education institution

Background: Compared to our ancestors, there is an increase in time in environments that not only limit physical activity, but also require prolonged sitting times at work, at home, in our cars, and in the communities in which we live. The adoption of a sedentary lifestyle has taken on an increasingly real world dimension, posing a serious problem in terms of public health, especially in North America and Europe

Sedentary behaviour was associated with an increased risk of developing chronic diseases such as overweight/obesity, type II diabetes, cardiovascular diseases, and these diseases are the main cause of mortality and morbidity in Portugal.

Objective: This study aims to evaluate the relationship between occupational sitting and body mass index (BMI) in teaching and non-teaching workers.

Methods: The questionnaires - Occupational Sitting and Physical Activity Questionnaire (OSPAQ) and the International Physical Activity Questionnaire - Short version (IPAQ - S) were applied. Data on age, gender and body mass index were collected from a sample of 59 adult men and women between December 2017 and January 2018, work full time. The anthropometric evaluation was effected with a stadiometer and bioimpedance equipment. The statistical treatment, the authors analyzed the information with SPSS Statistics.

Results: In the present study, 39 of the individuals were females and 19 males, aged 31-62 years. Was reported that 54.3% of the workers had a BMI ≥ 25 kg/m² and on-teachers are more sedentary in their occupational activity. Spearman's correlation revealed that there was no association between sitting time and anthropometric parameters ($p > 0.05$).

Conclusions: With this study it was verified that more than half of the workers was overweight/obese and there are individuals with sedentary behavior at work. There was no association between sedentary work and BMI; however measures must be taken to create conditions for a healthy working environment.

P 11

FIALHO Sónia¹MARTINS Anabela Correia²
ALMEIDA João³¹IPC, ESTeSC - Coimbra Health School, Dietetics and Nutrition Dept. Portugal²IPC, ESTeSC - Coimbra Health School, Physiotherapy Dept. Portugal³IPC, ESTeSC - Coimbra Health School, Environmental Health Dept. Portugal*Corresponding author:*FIALHO Sónia
IPC, ESTeSC
Coimbra Health School,
Dietetics and Nutrition Dept.
Portugal
sonia.fialho@estescoimbra.pt

Satiety quotients but not appetite feelings are reduced after intensive exercise in healthy adults

Background: Appetite sensations are an accurate method of measuring subjective states of motivation to eat before and in response to meals (Flint et al., 2000). Measured before and after a meal, appetite feelings can also provide information about the satiating capacity of food, which can be expressed as Satiety Quotient (SQ). Yet exercise has been found to affect subsequent ad libitum energy intake, it remains to our knowledge unknown whether exercise can also affect the individuals' satiating capacity. The aim of the current study was to compare the effect of iso-caloric low and high intensity exercises on the Satiety quotients in response to a fixed meal in healthy adults.

P 12

FILLON Alicia^{1,2}METZ Lore¹GENIN Pauline¹MIGUET Maud¹KHAMMASSI Marwa¹PEREIRA Bruno³DUCLOS Martine^{4,5,6,7}BOIRIE Yves^{4,6,7,8}BLUNDELL John⁹TREMBLAY Angelo¹⁰DRAPEAU Vicky¹⁰FINLAYSON Graham⁹MATHIEU Marie-Eve¹¹THIVEL David^{1,7,9}

Methods: Nineteen (21.5 (0.5) years, 10 males) healthy adults were included. Anthropometric measurements, body composition (BIA), aerobic capacity (VO₂ max) and dietary profile (TFEQ) were assessed. They randomly completed 3 experimental sessions: i) Control (CON); ii) High Intensity exercise (HIE-75% VO₂max-30min); iii) low intensity exercise (LIE-50%VO₂max-45min). Appetite feelings were assessed using Visual Analogue Scales at regular intervals and Satiety quotients calculated in response to a fixed lunch meal 30 minutes after rest (CON) or the two cycling exercises (HIE and LIE).

Results: Fasting and pre-meal Hunger, Fullness, Prospective Food Consumption and Desire to Eat (DTE) were not significantly different between conditions neither were their post-meal Areas Under the Curve (60 minutes). SQ for Satiety and DTE were not different between conditions while SQ for hunger was significantly higher on CON (12.8±5.0) than HIE (10.4±4.5) and LIE (10.1±5.9) (p<0.05) and SQ for DTE was significantly higher on CON (13.2±9.7) than HIE (4.5±6.4) (p<0.05).

Conclusion: These preliminary findings suggest that the satiating capacity of food might be affected by intensive exercise in healthy adults. Further analyses are needed to assess whether this might be accompanied by subsequent nutritional compensations.

¹ Clermont Auvergne University, EA 3533, Laboratory of the Metabolic Adaptations to Exercise under Physiological and Pathological Conditions (AME2P), Clermont-Ferrand, France

² UGECAM Nutrition Obesity Ambulatory Hospital, Clermont-Ferrand, France

³ Clermont-Ferrand University hospital, Biostatistics unit (DRCI), Clermont-Ferrand, France

⁴ CRNH-Auvergne, Clermont-Ferrand, France

⁵ Department of Sport Medicine and Functional Explorations, Clermont-Ferrand University Hospital, G. Montpied Hospital, Clermont-Ferrand, France

⁶ INRA, UMR 1019, Clermont-Ferrand, France

⁷ University Clermont 1, UFR Medicine, Clermont-Ferrand, France

⁸ Department of Human Nutrition, Clermont-Ferrand University Hospital, G. Montpied Hospital, Clermont-Ferrand, France

⁹ Appetite Control and Energy Balance Research Group, University of Leeds, Leeds, UK

¹⁰ University of Laval, Quebec City, Québec, Canada

¹¹ Université de Montréal, Montréal, Québec, Canada

Corresponding author:

Fillon Alicia
AME2P 24 Avenue des Landais
63170 Aubière
fillonalicia@gmail.com

“Mon Alimentation Sur-Mesure”, a tailored nutrition counselling web application based on mathematical diet optimization

Introduction: By definition, messages in tailored approaches are built to reach a specific person, based on its specific characteristics and needs. Tailored dietary behavior change interventions have a small but significant effect on dietary behavior change. The majority of these interventions target a few food groups or nutrients, without evaluating the overall diet. Diet optimization is a powerful mathematical method to translate nutrient recommendations into individual-specific food choices. This method is increasingly used in nutrition research, in the fields of public health and diet sustainability.

Objectif: The aim of this work was to combine tailored approaches and diet optimization in a web application of tailored nutrition counselling.

P 13

GAZAN Rozenn¹

VIEUX Florent¹

DARMON Nicole²

MAILLOT Matthieu¹

¹ MS-Nutrition, Marseille, France

² MOISA, INRA, CIHEAM-IAMM, CIRAD, Montpellier SupAgro, Univ Montpellier, Montpellier, France

Corresponding author:

GAZAN Rozenn
MS-Nutrition
Faculté de médecine de la Timone
27, boulevard Jean Moulin
13005 Marseille
rozenn.gazan@ms-nutrition.com

Method and results: The web application, called « Mon Alimentation Sur Mesure », was developed based on techniques of behaviors changes, such as: self-monitoring, self-regulatory, tailored feedback and engaging communication techniques. In a first feature, based on user's data collected online (including answers to a food frequency questionnaire), the user can obtain a picture of the nutritional quality of their diet, their diet cost and their own level of physical activity. In a second feature, « Mon Alimentation Sur Mesure » suggests to the user a list of tailored dietary advices to have a healthier diet (i.e., a nutritionally adequate diet), adapted to their specific needs and food preferences. With the application, the user is actor in their own dietary changes: he specifies their food preferences and; chooses dietary suggestions that he considers achievable.

Conclusion: This prototype could be a future online health promotion tool which could help individuals to improve their diet or serve as a decision-support tool for health professionals. The evaluation of the tool (e.g. whether the use of the tool results in changes of dietary habits) is warranted before use on health promotion.

Effect of the “5 portions of vegetables, fruit or juice” campaign on nutritional awareness of mothers of 3-10 year olds with regard to vegetables, fruit and juice consumption

Objectives: The consumption of fruit and vegetables in Poland is lower than recommended. In order to increase consumption, various educational activities and social campaigns have been organized. The aim of this paper is to present the results of the «5 portions of vegetables, fruit or juice» program launched by the Polish Association of Juice Producers (KUPS) in 2008.

Methodology: Periodical studies commissioned by KUPS during the campaign – measurement of the «5 portions of vegetables, fruit or juice» campaign objectives achievement with use of computer-assisted telephone interviews in December 2008 by IQS Research and in September 2014 by GFK Polonia and DriverR.

Results: The analysis revealed that:

- 1) knowledge of the project and its aim among 25-45 year old mothers of 3-10 year old children has improved - from 45% (2008) to 76% (2014);
- 2) awareness of experts' recommendations to consume five portions of fruit and vegetables per day increased from 49 % (2008) to 74 % (2014);
- 3) interest in promoting the '5-a-day' idea, nutritional value of fruit, vegetables and juices and the definition of a portion among online portals, newspapers, schools, public administration increased noticeably;
- 4) awareness among 300 surveyed mothers increased - 31% of mothers stated that fruit and vegetables should be consumed 5 times a day (a significant increase from 21% in the first year of the study), while almost 40% of mothers consume at least 5 portions of fruit and/or vegetables daily themselves, significantly more than at the beginning of the program (26%).

Conclusion: The «5 portions of vegetables, fruit or juice» promotion and information campaign was successful in raising both awareness of the recommended portions of vegetables and fruit and actual adherence to these recommendations. However, a discrepancy continues to exist between what consumers know about dietary recommendations on the one hand and their eating habits on the other.

P 14

GUTKOWSKA Krystyna¹

GROELE Barbara²

GŁĘBSKA Dominika¹

¹ Warsaw School of Life Sciences, Poland

² Polish Association of Juice Producers, Warsaw, Poland

Corresponding author:

GUTKOWSKA Krystyna
Warsaw University of Life Sciences
Nowoursynowska 159c / 320
776 Warsaw
krystyna_gutkowska@sggw.pl

Families' thoughts about vegetables and fruit

The aim was to investigate 11-12 year old children's and their parents' experiences and thoughts about vegetables and fruit (V&F).

Method: During the summer of 2018, semi structured individual interviews were conducted with 11 children (5 girls and 6 boys), attending 5th grade in 6 different schools in a large Swedish city. One of each child's parents (10 mothers and 1 father) was also interviewed. The interviews, lasting 35-70 minutes, were conducted by a paediatric dietician at a place where the family felt comfortable. They were recorded and later transcribed verbatim.

Results: Both children and parents named health and especially the content of vitamins and minerals as a major reason to eat V&F. Words such as "tasty" and "sweet" were more often used to describe fruit, whereas the general word "healthy" was used when speaking of vegetables. All children could give detailed description on their preferred V&F serving style. Varieties of V&F that children or parents had never tried and didn't want to try were described as probably having an unpleasant texture or that they would taste bitter e.g. butternut squash, aubergine, water chestnut or gooseberries. None but one of the parents knew the recommendation for V&F and their guesses ranged from 250 -1000 g (see table 1). When asked to translate what they thought the recommendations were in actual servings two parents used the phrase "5 a day".

Conclusion: There was a consensus that V&F is healthy and important for growth, whereas the properties of V&F connected to preventing cardiovascular disease, cancer etc. was very seldom mentioned. When communicating recommendations concerning V&F more emphasis should perhaps be on making the recommendation understandable, less abstract and more "ready to be applied in everyday meals".

Table 1. Parents answered questions about what they believed the Swedish recommendation of V&F intake is for adults and children above the age of 10 years (in fact 500 g), how happy they are with their family's current intake of V&F and how many days per week some kind of vegetable is being served at a meal at home.

Family	Estimated recommendation of V&F, grams per day	How satisfied parent is with own family's fruit consumption *	How satisfied parent is with own family's vegetable consumption*	How many days per week vegetables are served at a meal at home
1	x	8,5	6	7
2	500	6	8	7
3	350	4 -10	4 -10	7
4	x	8	10	7
5	275	3	10	5-6
6	350	7	7	4-7
7	x	8	8	7
8	x	7	7	5
9	1000	10	10	7
10	400	10	10	7
11	250	8	8	7

*On a scale of 1-10 where 1 is not satisfied at all and 10 is most satisfied x Parents choosing not to guess the recommendation

P 15

HELLEGREN Hannah¹
LARSSON Christel¹

¹ Department of Food and Nutrition, and Sport Science. University of Gothenburg, Sweden

Corresponding author:
Hannah Hellegren
Department of Food and Nutrition and Sport Science
PO Box 300
SE404 30 Göteborg
Hannah.Hellegren@gu.se

Assessing the frequency of fruit and vegetables on school menus in Rio de Janeiro - Brazil

Background: The daily supply of fruits, vegetables and leafy vegetables (F&V) school food constitutes a health promotion strategy since the regular consumption of these foods is related to the low risk of obesity, hypertension, and dyslipidemia in children and adolescents. In this context, the National School Feeding Program (PNAE) plays an essential role in the building of healthy habits of children, through the provision of meals that cover their nutritional needs and food and nutritional education actions.

Objective: To analyze the quality of the menus of school feeding in the state of Rio de Janeiro, regarding the supply of (F&V).

Methods: A cross-sectional and descriptive study was carried out for two months, based on the school menus available at electronic sites of the city halls of the 92 municipalities of the state of Rio de Janeiro. The menus were analyzed regarding the monthly frequency of F&V and classified by the percentage of F&V occurrence considering the following cut-off points: "optimal" $\geq 90\%$; "good" between 75 to 89%; "regular" between 50 and 74%; "poor" from 25 to 49% and "very bad" $<25\%$. Results: Only 23 available menus were identified during the survey period of which only seven presented a "good" or "optimal" classification for fruit. Regarding vegetables, half of the menus presented a "good" or "optimal" classification. As for the frequency of leafy vegetables, all presented a classification between "regular", "bad" and "very bad".

Conclusions: The low supply of fruit and vegetables in school meals does not comply with the recommendations of a healthy diet under the PNAE. Consequently, there is a need to reformulate the menus, which will be very important for the promotion of healthy food, and as a strategic tool for actions of food and nutritional education with schoolchildren.

P 16

HENRIQUES Patrícia

SOARES Daniele da Silva Bastos

DIAS Patrícia Camacho

FERREIRA Daniele Mendonça

BARBOSA Roseane Moreira Sampaio

Faculdade de Nutrição – Universidade Federal Fluminense – Niterói, Rio de Janeiro, Brasil.

Corresponding author:

HENRIQUES Patrícia

Tavares de Macedo, street,

89/1402 – Icaraí – Niterói

Rio de Janeiro, Brasil

patihenriques@gmail.com

Longitudinal associations of physical activity and screen time with food fussiness in Finnish children – the PANIC Study

Objectives: Fussy eating is associated with poor diet quality, such as low willingness to taste and consume vegetables and fruit, and a low intake of several nutrients, such as vitamin C, vitamin E, and fiber. However, the determinants and factors which may affect food fussiness are less known. We therefore investigated the cross-sectional and longitudinal associations of physical activity and screen time with food fussiness.

Methodology: The participants were a population sample of 204 girls and 215 boys aged 6–8 years at baseline. We assessed food fussiness using the Children's Eating Behaviour Questionnaire (CEBQ) and physical activity and screen time using questionnaires at baseline and after 2-year follow-up. Data were analysed using linear regression models, baseline analyses adjusted for age and gender and longitudinal analyses adjusted for age at baseline, gender, and the explanatory and outcome variables at baseline. We further adjusted the data separately for lean body mass and fat mass measured by dual-energy x-ray absorptiometry (DXA).

P 17

JALKANEN Henna¹SCHWAB Ursula^{2,3}VENÄLÄINEN Taisa^{1,2}KIISKINEN Sanna¹VÄISTÖ Juuso¹LAKKA Timo^{1,4,5}LINDI Virpi⁶ELORANTA Aino-Maija^{1,2}

¹ Institute of Biomedicine, School of Medicine, University of Eastern Finland, Kuopio, Finland

² Institute of Public Health and Clinical Nutrition, University of Eastern Finland, Kuopio, Finland

³ Department of Medicine, Endocrinology and Clinical Nutrition, Kuopio University Hospital, Kuopio, Finland

⁴ Kuopio Research Institute of Exercise Medicine, Kuopio, Finland

Results: Physical activity was inversely associated with food fussiness ($\beta=-0.229$, $p<0.001$) and screen time was directly associated with food fussiness ($\beta=0.128$, $p=0.010$) at baseline. Change in physical activity was inversely associated with change in food fussiness ($\beta=-0.142$, $p=0.007$) and change in screen time was directly associated with change in food fussiness ($\beta=0.134$, $p=0.014$). Further adjustments for lean body mass and fat mass had no effect on these associations.

Conclusions: Higher physical activity and shorter screen time were associated with lower food fussiness. Our findings suggest that increasing physical activity and decreasing screen time decrease fussy eating in children.

⁵ Department of Clinical Physiology and Nuclear Medicine, Kuopio University Hospital, Kuopio, Finland

⁶ University of Eastern Finland Library, Kuopio, Finland

Corresponding author:

JALKANEN Henna
Institute of Biomedicine
University of Eastern Finland
Yliopistonranta 1
70210 Kuopio, Finland
henna.jalkanen@uef.fi

The changing role of convenience stores in South Korea

Objectives: This study aimed to develop policy recommendations for creating a healthy food environment involving convenience stores which have been recently promoted as an extension of food retailing and indeed of the foodservice market in South Korea.

Methodology: This study was based on case studies evaluating the nutritional quality of lunch box products sold by the Korean big 3 convenience store brands (CU, GS25, and 7-Eleven) as meal replacements. Samples of all lunch box products sold during October 2016 in Asan city, South Korea were collected for nutritional quality evaluation. A total of 36 different kinds of lunch box products were collected, and among these, 27 products that followed the traditional Korean meal structure (CU: 8, GS25: 10, 7-Eleven: 9) were included in the final analysis.

Results: The food items in the "Meats/Fish/Eggs/Legume" food group was 2.4 times the recommended intake of around 60g, while that in the "Vegetables" food group was even less than one serving size of 70g. The most frequent cooking method both for the animal- and plant-based food groups was stir-frying. The average calories fell short of the reference value for men but exceeded it for women. The percentage energy contribution from fats exceeded the reference range (15%-30%). The average amounts of protein, saturated fat, cholesterol and sodium were higher than recommended.

Conclusions: Overall, the nutritional quality of lunch box products sold by the Korean big 3 convenience store brands was evaluated to be inadequate as meal replacements. This study calls attention to the necessity and importance of establishing healthy food standards for meal replacements in convenience stores, given the ever-growing reliance on these establishments as a go-to spot for a convenient meal. The results may also provide useful insights for developing countries in Asia, which are being targeted as an emerging market for convenience stores.

P 18

KIM So-young¹

CHOI Jiyu²

¹ Department of Food Science and Nutrition, Soonchunhyang University, 22 Soonchunhyang-ro, Asan, 31538 South Korea

² Department of Culinary Arts, Woosong University, 171 Dongdaejon-ro, Daejeon, 34606 South Korea

Corresponding author:

KIM So-young
Department of Food Science and Nutrition
Soonchunhyang University 22
Soonchunhyang-ro
Asan 31538 South Korea
sonyah@sch.ac.kr

Evaluating the nutritional quality of ready meals in South Korea: can they be healthy alternatives?

Objectives: The current study analysed and compared the nutritional quality of private brand (PB) and national brand (NB) ready meal (RM) products in South Korea.

Methodology: Data on RM products were collected via the food information database (EatSight) of Daesang Information Technology between February and May of 2017. For PB, data on all RM products by Peacock, a PB by the chain store (Emart) with the largest market share in South Korea, were extracted to compare the nutritional qualities with NB products. A total of 91 PB and 415 NB products were selected and categorized into four main categories of "soup/stew", "refrigerated noodles", "frozen rice/noodles", and "dumplings". Basic and nutritional information was extracted for each product, and analyses were performed to compare difference between PB and NB products.

Results: The study results showed that PB products accounted for the highest percentage of refrigerated products while NB products occupied the highest percentage of frozen products, and that their main products showed evident nutritional problems. Soup/stew PB products were shown to be significantly higher in nutrients that should be limited in consumption such as calories, fats, sodium, saturated fats, and trans-fats than NB products. Likewise, in the case of frozen rice/noodles, NB products were significantly higher in sodium and saturated fats than PB products. In particular, sodium contents were high and even close to the daily recommended intake as in the case of refrigerated noodles. When the Korean guidance for traffic light labelling was applied, a mere 0.2% and 5.9% of the total RM products showed all four and three green lights, respectively. Meanwhile, RM products with no green light took up 42.3%, while one green light accounted for 33.2%.

Conclusions: Though it is difficult to draw a definitive conclusion on the comparative nutritional qualities of PB and NB RM products due to the lack of consistency in the results, this study suggests that there is room to improve the nutritional quality of RM products in general.

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KIM So-young¹
SUYOUN Kim²

1 Department of Food Science and Nutrition, Soonchunhyang University, 22 Soonchunhyang-ro, Asan, 31538 South Korea

2 Department of Food and Nutrition, Seoul National University, Seoul 08826, South Korea

Corresponding author:

KIM So-young
Department of Food Science and Nutrition
Soonchunhyang University 22
Soonchunhyang-ro
Asan 31538 South Korea
sonyah@sch.ac.kr

Food habits of the teens when free of charge school meals are provided – baseline study for EU school fruit, vegetables and milk scheme in Finland

Objectives: All school children under the compulsory education are served a warm lunch free of charge every school day in Finland. The recommended ("Eating and learning together – recommendations for school meals" by National Nutrition Council in Finland, 2017) model of school meal includes main course, fresh vegetables/fruits, bread, bread spread and milk/sour milk and should provide 1/3 of daily energy needs. In this study we investigated how the almost 3000 pupils aged 12 to 14 years (6th and 8th graders) chose fruits, vegetables and milk to their school meal.

P 20

KUUSIPALO Heli¹
TAPANAINEN Heli¹
RAULIO Susanna¹
VIRTANEN Suvi M.^{1,2}

¹ National Institute for Health and Welfare (THL); ²University of Tampere and Tampere University Hospital

Corresponding author:

KUUSIPALO Heli
National Institute for Health and Welfare (THL), P.O. Box 30
00270 Helsinki Finland
heli.kuusipalo@thl.fi

Methodology: The data of this study are derived from questionnaires filled in by 1078 participants in 6th and 1808 participants in 8th grades in 20 municipalities across Finland. The back ground data included sex, length, weight, parents' education and smoking, and amount of pocket money. There were questions on health behavior (physical activity, sleep) and food habits.

Results: In the 6th grade 87% of pupils participated to school meal every day but in the 8th grade only 68% participated. Of the girls 7% and of the boys 12% in the 6th grade and of the 8th graders 4% and 8%, respectively, chose all the components of the meal every day. Milk is commonly used at meals in Finland but only 38% of the girls in 6th and 51% of boys in 6th and 26% of girls in 8th and 45% of boys in the 8th grade selected milk to their school meal. Most commonly used milk was skimmed milk. Vegetables were chosen to school meal by half of the 6th graders and only by about 1/3 of the 8th graders. The 6th graders eat together with their teachers and as teachers are an example, the meal is more according to the recommendations. The 8th graders tend to follow more the example of their school-mates, thus the sometimes "choosy" opinion leaders. Some 65% of the pupils reported that they had eaten the breakfast at home every school day.

Conclusion: Despite the detailed nutrition recommendations, very few pupils chose the recommended varied and healthy school meal. Although, over 50% of the pupils were reporting that their diet is healthy.

Screening of multiple bacterial strains from dairy products and human feces identifies Lb102, Bf141 and P35 as probiotic strains that improve intestinal health and host metabolism in a mouse model of obesity

The gastro-intestinal tract and the gut microbiota represent the interface between diet and host organism. Given the growing evidence that gut dysfunction plays a critical role in the development of metabolic diseases, the identification of new probiotic bacteria has attracted more attention. In fact, using probiotics to improve gastro-intestinal health may help prevent obesity-linked metabolic syndrome and inflammation.

Objective: To determine, in vivo, the potential anti-obesity effects of bacterial strains isolated from dairy products and human feces.

Methods: Bacterial strains were selected in vitro for their ability to modulate inflammation and then tested in a mouse model of diet-induced obesity. C57BL/6 mice were divided into 8 groups: 2 control groups (chow and high-fat high-sucrose diet(HFHS)) gavaged with skim milk (vehicle) and 6 treated groups fed under HFHS diet and gavaged with one of the 6 strains: P35 (Propionibacterium), Lb38, Lb79, Lb102 (*Lactobacillus*), Bf26, Bf141(*Bifidobacterium*) at 10⁹cfu/day during 8 weeks.

Results: While three strains showed only modest (Lb38, Bf26) or no (L79) effects, P35, Lb102 and Bf141 significantly reduced HFHS-induced obesity, visceral fat accumulation and associated inflammation, concomitant with improved glucose tolerance and insulin sensitivity. Further analysis revealed beneficial but strain-specific effects of P35, Lb102 and Bf141 on intestinal barrier homeostasis, without reversing HFHS diet-induced gut microbiota dysbiosis.

P 21

LE BARZ Mélanie^{1,2,3*}
 DANIEL Noémie^{1,2*}
 VARIN Thibault²
 NAIMI Sabine^{1,2,4}
 DEMERS-MATHIEU Véronique^{2,4,5}
 PILON Geneviève^{1,2}
 AUDY Julie⁶
 LAURIN Émilie⁷
 ROY Denis²
 URDACI Maria C.³
 ST-GELAIS Daniel^{2,4,5}
 FLISS Ismail^{2,4}
MARETTE André^{1,2}

¹ Department of Medecine, CRIUCPQ, Laval University, Quebec, Canada

² Institute of Nutrition and Functional Foods (INAF), Quebec, Canada

³ University of Bordeaux, Laboratory of microbiology, Gradignan, France

⁴ Dairy Science and Technology Centre (STELA), Quebec, Canada

⁵ Ste-Hyacinthe Research Development Centre, Agriculture and Agri-Food Canada

⁶ Agropur Cooperative, St-Hubert, Canada

⁷ Ultima Foods, Granby, Canada

* These authors contributed equally to this work.

Corresponding author:

MARETTE André
 Pavillon Marguerite d'Youville
 local Y4340 - 2725 chemin de Ste-Foy
 Québec, Canada
 andre.marette@cricupq.ulaval.ca

Conclusion: Using a combination of *in vitro* and *in vivo* screenings, we have thus identified three new potential probiotics that prevent diet-induced metabolic disturbances. Since parallel experiments demonstrated that Lb102 and Bf141 are compatible with their integration into fermented dairy products, our data are paving the way towards the development of novel probiotic yogurt and cheese that may help to prevent body weight gain and related metabolic disorders.

Where are we having lunch? Eating-out location choices during the workday

Background: Increased selection and consumption of fruits and vegetables are associated with better access and availability (Appleton et al. 2016; Hakim & Meissen, 2013). Therefore, the eating-out location is decisive in the type of food consumers are likely to choose. This is especially true for the working population, whose choices of location may be constrained by workplace organization. Workplaces are considered a promising place to promote healthy eating (Wanjek, 2005), mainly because of the recurrence of eating occasions. However, while research suggests that workers rarely attend the same location throughout the workweek (Mathé & Francou, 2014; Poulain, 2002), it is unclear what drives location selection.

Objectives: The first objective is to describe the perceived eating-out environment and habits of French workers. The second objective is to study the relationship between work constraints and selection location for lunch during the workday.

Methodology: 1,000 French wage-earning workers recruited from an online survey panel answered an ad-hoc questionnaire regarding the food environment around their workplace, their actual location selection, their workplace organization, and their job characteristics.

Results: The majority of respondents perceive that many location options are available to them for buying lunch, regardless of SES, sex or region. Over 50% attended several lunch locations in the two-week period before they took the survey. Preliminary analysis of workplace constraints indicates that perceived control over schedule, proximity, and rapidity in service are all associated with location choice.

Conclusion: Workplace organization drives employees' lunchtime strategies, and thus their food choices. A better understanding of the determinants of place selection under constraints can contribute to the promotion of healthier diets through increased access to fruits and vegetables.

P 22

MASSEY Camille^{1,2}
SAULAIS Laure^{1,3}

¹ Institut Paul Bocuse Centre for Food and Hospitality Research

² Laboratory "Systemic Health Care", EA4129, University Lyon 1 UCBL

³ INRA GAEL, Grenoble (associate researcher)

Corresponding author:

MASSEY Camille
Institut Paul Bocuse Centre for Food and Hospitality Research
Château du Vivier, BP 25
69131 ECULLY Cedex, France
camille.massey@institutpaulbocuse.com

Higher energy intake following a 10-month multidisciplinary weight loss program is influenced by the level of initial dietary restriction in adolescents with obesity

Background: Multidisciplinary interventions have shown some merits in weight reduction strategies in youth; however, their impact on subsequent daily energy intake remains largely unknown. The aim of the present study was to evaluate the nutritional responses to a 10-month multidisciplinary intervention among adolescents with obesity, in relation to their eating behavior characteristics at baseline.

Methods: Thirty-five adolescents (mean age: 13.4 (\pm 1.2) years) with obesity took part in a 10-month residential multidisciplinary weight loss program. Anthropometric measurements, body composition (DXA), 24-hour ad libitum energy intake (weighted test meals), eating behaviors profile (DEBQ) and appetite sensations (Visual Analogue Scales) were assessed on three occasions: During the first week of their arrival in the institution (T0), after 5 months (T1), and at the end of the 10-month program (T2). Repeated measures ANOVA were performed to evaluate the evolution between T0, T1 and T2. Unpaired t-tests were used to compare baseline parameters (e.g., weight, body composition) and their variation at the end of the 10-month intervention between restrained and unrestrained eaters, emotional and non-emotional eaters, and external and non-external eaters. Linear regressions were used to examine the association between baseline eating behavior scores and weight and body composition variations.

Results: The adolescents lost 10.7 (\pm 7) kg of body weight ($12.0 \pm 7\%$ of their initial weight) at T2 compared to T0. Weight loss was accompanied by a modification in eating behaviors profile, with a significant decrease in emotional (-8.3%, $p < 0.05$) and external (-14.8%, $p < 0.001$) eating scores. 24-hour ad libitum energy intake increased significantly at T2, compared to T0 (+246 kcal, $p < 0.001$). The observed subsequent increased 24-hour ad libitum energy intake at T2 compared to T0 was significantly higher in restrained (+492 kcal) compared to unrestrained (+115 kcal) eaters ($p < 0.05$). Dietary restraint score at baseline was inversely correlated with the percentage of weight loss ($r = -0.44$, $p < 0.01$). Cognitively restrained eaters lost 8% of their initial weight at T2 compared to T0, whereas non-restrained eaters lost 13% of their initial weight ($p = 0.07$).

Conclusion: A 10-month multidisciplinary weight loss intervention induced an increase in 24-hour ad libitum energy intake compared to baseline, especially in cognitively restrained eaters. Moreover, cognitively restrained eaters at baseline tended to lose less body weight compared to unrestrained ones at T2 compared with T0. These findings suggest that baseline dietary restraint may be a useful eating behavior characteristic to consider as a screening tool for identifying adverse responders to weight loss interventions in youth.

P 23

MIGUET Maud¹

MASURIER Julie²

CHAPUT Jean Philippe^{3,4}

PEREIRA Bruno⁵

LAMBERT Céline⁵

DÂMASO Ana Raimunda⁶

COURTEIX Daniel^{1,7}

DUCLO Martine^{7,8,9,10}

BOIRIE Yves^{7,9,10,11}

THIVEL David^{1,7}

¹ Clermont Auvergne University, EA 3533, Laboratory of the Metabolic Adaptations to Exercise under Physiological and Pathological Conditions (AME2P), Clermont-Ferrand, France

² UGECAM Nutrition Obesity Ambulatory Hospital, Clermont-Ferrand, France

³ Healthy Active Living and Obesity Research Group, Children's Hospital of Eastern Ontario Research Institute, Ottawa, Ontario, Canada

⁴ Department of Pediatrics, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada

⁵ Clermont-Ferrand University hospital, Biostatistics unit (DRCI), Clermont-Ferrand, France

⁶ Post Graduate Program of Nutrition. Paulista Medicine School, Universidade Federal de São Paulo (UNIFESP), Rua Botucatu, 862-Vila Clementino, São Paulo, SP 04020-050, Brazil

⁷ CRNH-Auvergne, Clermont-Ferrand, France

⁸ Department of Sport Medicine and Functional Explorations, Clermont-Ferrand University Hospital, G. Montpied Hospital, Clermont-Ferrand, France

⁹ INRA, UMR 1019, Clermont-Ferrand, France

¹⁰ University Clermont 1, UFR Medicine, Clermont-Ferrand, France

¹¹ Department of Human Nutrition, Clermont-Ferrand University Hospital, G. Montpied Hospital, Clermont-Ferrand, France

Corresponding author:

MIGUET Maud

AME2P 24 Avenue des Landais

63170 Aubière

maud.miguet@gmail.com

Consumption of dairy products, macro- and micro-nutrients and clinical characteristics of French elderly people enrolled in the Three-City-Bordeaux cohort

Background: Most food groups characterized by healthy eating habits, such as the Mediterranean diet, are now well known. Although recommendations place a premium on dairy products (DP) in the diet of elderly, differences remain in the calculation of dietary scores of healthy diets.

Objective: The objective of this study was to identify DP consumers and to describe their macro- and micro-nutrients intake, socio-demographic and clinical characteristics.

Methods: The study sample was constituted of Bordeaux participants enrolled in the 3-City cohort, aged 65y and older at baseline, who answered dietary surveys, including a food frequency questionnaire and a 24h dietary recall. Regular consumers (RC) were identified as those consuming DP at least once a day and were compared to non-regular consumers (NC). Clinical characteristics were measured (hypertension, BMI, hypercholesterolemia, diabetes, global cognitive performances) or self-reported (smoking, angina, cardiac rhythm disorders, cardiac failure, arteritis, myocardial infarction, osteoporosis, dyspnea, asthma, depressive symptomatology and Parkinson disease).

Results: The study sample was constituted of 1596 participants, aged 74.2y on average, 62% were women. Among them, 94% were considered as RC. Compared with NC, RC presented similar age on average and the same educational level, but were more often married. Regarding macro- and micro-nutrients intake, RC reported significant higher consumption of calcium (877mg vs 691mg), and phosphorus (1119mg vs 1013mg) than NC. Regarding clinical characteristics, RC suffered significantly less often from cardiac failure (6% vs 11%) and dyspnea (13% vs 20%) than NC. There was no significant difference on other co-morbidities.

Conclusion: This cross-sectional study pointed out that a regular consumption of DP was a significant provider of calcium and phosphorus and was associated with a lower prevalence of some adverse clinical events among the elderly, suggesting that DP could be considered as a relevant food group. A study by profile will clarify the share of DP's benefits in overall diet.

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PELLAY *Hermine*¹HELMER Catherine¹BOYER Constance²MARMONIER Corinne²SAMIERI Cécilia¹FEART Catherine¹

¹ Univ. Bordeaux, Inserm, Bordeaux Population Health Research Center, UMR 1219, F-33000 Bordeaux, France

² CNIEL, Technical and Scientific Department, Health and Nutrition Research Unit, F-75009 Paris, France

Corresponding author:

Hermine PELLAY

INSERM U1219, BPH - Team LEHA

146 rue Léo Saignat

33076 BORDEAUX Cedex

hermine.pellay@u-bordeaux.fr

Vegetable and fruit delivered to beneficiaries in Alimento para Todos (Mexican Food bank)

Alimento para Todos (APT) is a Mexican Food Bank in Mexico City. APT attends about 34 990 beneficiaries per week: the beneficiaries are selected between people in food insecurity and with a very low income (food poverty). Each week the population in family groups pick up 80 to 100% of vegetable and fruit daily recommendations and 50% of energy daily recommendations for the beneficiaries.

Objective: analyse the difference of total delivery between 2 different periods of the year (May vs December).

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PEREZ-LIZAU *Ana Bertha*¹JIMENEZ Mariana²

¹ Universidad Iberoamerica

² Alimento para Todos

Corresponding author:

PEREZ-LIZAU Ana Bertha

Prolong Reforma 880 CDMX

01219 Mexico

anabertha.perez@ibero.mx

Methodology: The institution records in an electronic system (APTSis) the deliveries to families, the data were obtained from the system and analysed the months of May and December 2017 to compare the quantities of vegetable and fruit delivered and the amount of vitamins A and C provided in this food groups.

Results: In May 2017, the amount of vegetable delivered daily per person was 190g and of fruit 280g; in December 2017, the daily amount was 120g and 210g respectively of vegetable and fruit; in May the most important food were tomato red and green, papaya, eggplant, mango, prunes, grapes, pineapple; in December the food were oranges, mandarina, tejocote, and mostly the same vegetables. Both vitamins A and C covered the nutritional recommendations in both period of time: Vitamin C 182.5mg vs 165.72; Vitamin A 765µg vs 802µg.

Conclusion: APT mission to deliver enough vegetable and fruit is covered for the population and allows a better diet to population, with a very low recuperation fee (5% of the market price).

Visual approach for estimating the compliance of plate model in school meals – baseline study for EU school fruit, vegetables and milk scheme in Finland

Objectives: All Finnish school children under the compulsory education are offered a lunch free of charge at the school canteen every school day. The plate model of school meal includes the main course, fresh vegetables, bread, bread spread and milk/sour milk according to the school meal nutrition recommendations. In this study, we investigated whether the pupils aged 12 to 14 years (sixth and eighth graders) chose fresh vegetables and milk to their school meal. The baseline for milk and vegetable consumption was measured and the follow up study to assess the impact of school scheme will be conducted after five years.

Methodology: The data of this study - photographs of school meals in comprehensive schools - are derived as a part of the field study conducted at five schools across Finland, for 593 adolescents. Photographs were analyzed according to the criteria of the National Nutrition Recommendations and the Food Portion Picture booklet. Meal was considered being in accordance with the nutrition recommendations when it contained the main course, fresh vegetables, rye bread, margarine and milk or sour milk and when the portion size was following that of described in the recommendations.

Results: Portions that were in perfect accordance with the nutrition recommendation were rare: only 2.5% of the portions of sixth graders and 5% of the portions of eighth graders. Fresh vegetables were included only in 40% of the portions of sixth graders and in 50% of the portions of eighth graders. Only 30% of sixth graders and 40% of eighth graders chose milk to their school meal. The main course, in the other hand, was chosen by almost all of those who attended school lunch.

Conclusion: In EU school scheme the consumption of milk and fresh vegetables are promoted since these foods are important contributors to the healthy meal. Despite the detailed National Nutrition Recommendations the sixth and eighth graders in the studied schools did not follow the recommendations accurately. More intense nutrition promoting in schools is needed to encourage pupils to consume fresh vegetables and milk regularly.

P 26

RAULIO Susanna¹
TAPANAINEN Heli¹
KUUSIPALO Heli¹
VIRTANEN Suvi M^{1, 2}

¹ National Institute for Health and Welfare (THL)

² University of Tampere and Tampere University Hospital

Corresponding author:
RAULIO Susanna
National Institute for Health and Welfare (THL), P.O. Box 30
00270 Helsinki Finland
susanna.raulio@thl.fi

Fatty acid composition of visceral adipose tissue in colorectal cancer and obesity: influence of dietary habits

Objectives: Colorectal cancer (CRC) is one of the major causes of cancer-related mortality in both men and women worldwide. Obesity and lifestyles, specifically dietary habits and physical activity, are primary determinants of cancer risk. Fatty acid (FA) profile of white adipose tissue (AT) depends on both dietary intake and innate metabolic differences. Modified FA profiles have been found associated with an inflamed microenvironment in visceral AT in obese subjects and patients affected by CRC. This study aimed to determine the influence of the diet on FA profile of visceral AT and to compare FA composition of lean healthy subjects (Nw) with those of obese (Ob) individuals and normal weight (NwCRC) and obese (ObCRC) CRC patients.

Methodology: AT biopsies were collected from 71 lean and obese subjects aged 25-70 years, undergoing abdominal surgery or laparoscopy for benign or CRC conditions (histologically proved primary colon adenocarcinoma, stage Duke's A,B/stage I-II) and were analyzed for fatty acid composition by gas-liquid chromatography. Matched validated food frequency questionnaires were filled in during individual interviews, and analyzed by Winfood software. Estimated desaturase activities were calculated as precursor to product FA ratios in AT.

Results: Data showed inadequate dietary habits in Ob and CRC subjects. NwCRC subjects showed an increased intake of saturated-FA (SFA) ($p=0,0151$), specifically palmitic ($p=0,0042$) and stearic acid ($p=0,0091$), and a parallel reduction of monounsaturated-FA (MUFA) consumption ($p=0,002$), in particular oleic acid, with respect to Nw. Estimated AT SCD-1 activity, a key enzyme converting saturated-FA to monounsaturated-FA, was increased in all the groups in comparison with Nw ($p=0.029$).

Conclusions: Unhealthy eating habits, characterizing obese and CRC subjects, may influence the FA composition of visceral AT contributing to the alteration of tissue functions. The quality of the diet, other than the quantity of energy consumed, might have a main role in the inflammatory microenvironment found in CRC visceral AT.

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SCAZZOCCHIO Beatrice

VARI' Rosaria
DEL CORNO' Manuela
CONTI Lucia
D'ARCHIVIO Massimo
SILENZI Annalisa
GESSANI Sandra
MASELLA Roberta

Center for Gender-Specific Medicine,
Istituto Superiore di Sanità, Viale Regina
Elena, 299, 00161 Rome, Italy

Corresponding author:
SCAZZOCCHIO Beatrice
Center for Gender-Specific Medicine
Istituto Superiore di Sanità
Viale Regina Elena, 299
00161 Rome, Italy
beatrice.scazzocchio@iss.it

Eating habits in early pregnancy: a study with pregnant women from "Healthy Bellies Program"

Background: The importance of healthy lifestyles during pregnancy is currently an indisputable fact in improving the health of both the pregnant and the newborn. For a healthy pregnancy, it is recommended that the pregnant woman adopt several essential health care, including balanced nutrition, physical activity, abstention from smoking, alcohol and drugs, and appropriate obstetric surveillance.

Objective: The objective of this study is to describe eating habits in early pregnancy, namely caloric intake and intake of vegetables and fruit.

P 28

SILVA Ana^{1,2}
PEREIRA Beatriz^{1,2}
SOUZA Sérgio^{2,3}
PEIXOTO Inês^{1,2}
ROSÁRIO Rafaela^{2,4}

¹ School of Education, University of Minho, Portugal

² Research Centre in Child Studies, Portugal

³ Federal University of Maranhão, Brazil

⁴ School of Nursing, University of Minho, Portugal

Methods: This study is part of a larger, quasi-experimental, called «Healthy Bellies». A descriptive analysis of 313 pregnant women, apparently healthy, with ages between 18 and 44 years (mean = 31.37, SD = 4.13) was performed. Food intake data were obtained through the food frequency questionnaire.

Results: The mean (SD) of ingested calories was 1331.22 (549.29) Kcal. The total consumption of vegetables was 485.15 (337.21) g / day and fruit consumption was 386.36 (274.23) g / day. The highest energy consumption, as well as fruit and vegetable intake, was associated with participants with higher literacy, higher socioeconomic status and higher total physical activity level.

Conclusion: The health profile in early pregnancy contributes to the design of effective interventions.

Corresponding author:
SILVA, Ana
Largo do Paço 4704
553 Braga - Portugal
anasilva0883@gmail.com

Consumption of vegetables and fruits, as well as their juices, nectars and drinks by Polish schoolchildren

Objectives: Vegetables and fruits are important elements of children's menu. These groups of products are included in the Polish food pyramid as the base of the daily diet. WHO recommends the intake of a minimum of 400g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity as well as prevention of several micronutrient deficiencies. The aim of the study was to assess the children's diets with special regard to consumption of fruit, vegetable and their products.

Methodology: The study was carried out between 2006 and 2011 among 981 girls and boys aged 9-13 years from North and South-East Poland, with the use of one-day dietary recall method. The consumption of vegetables, fruits, juices, nectars and fruit drinks was calculated.

Results: The mean consumption of vegetables was 155 grams per day in children. The consumption of fruits was smaller (128 grams per day). The group of girls were characterized by a higher consumption of vegetables and fruits than the group of boys, in particular of fruits (137 grams per day in girls and 119 grams per day in boys). The total mean consumption of juices among children was 102 milliliters per day and the mean consumption of nectars and fruit drinks was 60 milliliters per day.

Conclusion: The results from the study show that daily consumption of vegetables and fruits among Polish schoolchildren was below the WHO recommendations. The mean consumption of above products (283 g per day) covered nearly 71% of minimum recommended amount. It is necessary to promote the consumption of vegetables and fruits, especially among children, in order to achieve the recommended levels.

P 29

STOS Katarzyna

JAROSZ Miroslaw
OLTARZEWSKI Maciej
GLOWALA Aneta
ZIOLKOWSKA Izabela

Institute of Food and Nutrition,
Warsaw, Poland

Corresponding author:
STOS Katarzyna
Institute of Food and Nutrition,
61/63 Powsinska St.
02-903 Warsaw, Poland
kstos@izz.waw.pl

National nutrition education projects in Finnish schools – from curriculum and recommendations to children’s participation and health promoting food choices

In recent years two national food educational activities have been launched in Finland: Maistuva koulu (in English: Tasty School) project and Ruokatutka (in English: Food Radar) campaign. Both are founded on the National core curriculum and National Nutritional Council’s recommendations for dining in schools and early childhood education. The Finnish school dining system, established in 1948, provides many possibilities to integrate food and nutrition education to the school day.

Maistuva koulu project (2018-2020) is a national R&D project, financed by the Ministry of Social Affairs and Health. The project aims to establish a permanent culture of conscious food education in the Finnish primary schools. A model for planning, implementation and evaluation of food education at schools is developed. The model utilizes school dining as well as activities in and out of classroom as a platform for education. The co-operation of different stakeholders is especially emphasized. The project also establishes a national network of mentors for food education. The model is developed in pilot schools during the school year 2018-2019 and feasibility and effects of the model will be tested in research schools during the school year 2019-2020.

Ruokatutka campaign (2018-) is part of the School fruit, vegetable and milk scheme of the European Union, funded by the European Union’s common agricultural policy. The program aims to educate pupils about the benefits of healthy eating and to help them reconnect to agriculture. The campaign includes different internet-based materials, e.g. games, activities, Youtube-videos and tests. First materials, including a nutrition knowledge oriented game, were launched in August 2018. In the videos a young girl called Dabi explores food related topics with food professionals and celebrities. First tests included a test for milk product consumption and a test for fruit and vegetable consumption. The campaign inspires children and young people to ask food-related questions, to research topics together and to get creative. In that way they will grow up to citizens with a curious attitude to food and eating, with respect to food and food producers and with capability of constructive thinking in food matters.

Co-operators in the Maistuva koulu project: Ruukku – Centre for Food Culture and University of Eastern Finland

Co-operators in the Ruokatutka Campaign: Communication agency CoComms Oy Ltd, University of Eastern Finland, Ruukku – Centre for Food Culture, Ammattikeittiöosaajat Amko Ry (Professional kitchen experts’ association)

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TALVIA Sanna¹

JALKANEN Henna¹

TILLES-TIRKKONEN Tanja¹

KÄHKÖNEN Kaisa¹

KARHUNEN Leila¹

¹ Team of food and nutrition education research, Institute of Public Health and Clinical Nutrition, University of Eastern Finland

Corresponding author:

TALVIA Sanna

P.O. Box 1627

FI-70211 Kuopio, Finland

sanna.talvia@uef.fi

Knowledge and nutritional behaviours of Polish parents related to fruit and vegetable consumption.

Objectives: Parents create child's environment from an early age and influence on behaviors, habits and attitudes. Therefore eating habits of parents play an important role in shaping the preferences of food intake, including fruit and vegetable (F&V), by children.

Methodology: Data was obtained from 1165 parents on the basis of anonymous questionnaire in May/June 2015. The study was the part of evaluation of School Fruit and Vegetable Scheme conducted in Poland in 2012-2016. Parents were asked i.a. about their knowledge and nutritional behaviours related to F&V consumption.

Results: Almost all parents (99,2%) claimed that daily consumption of F&V by children is important but only 20,6% of them knew that children should eat at least 5 portions F&V a day. The main source of nutritional knowledge of parents were media: TV, radio – 65,4%, internet – 68,1%. Professionals or school were source of information for 35,2% and 20,4% of parents respectively. Almost 80% of parents offered access to various kind of fruits and 68% offered access to various kind of vegetable to children at home. Ready to eat F&V between meals were given children by 52,5% and only 21% of parents respectively. Merely 30% of parents gave fruit and 11% - vegetable to their children to school every day/most days. In parents' opinion barriers in F&V consumption were high price (F: 9,5%, V: 4,6%), problems with storage (F: 6,8%, V: 5,3%), long time of preparing to eat (F: 1,2%, V: 4,3%) or taste (F: 5,6%, V: 8,8%).

Conclusions: Parents' knowledge related to the F&V consumption by children is incomplete and there is still need to popularize information through reliable sources. It is also necessary to promote strongly vegetable consumption and searching and promoting practical ideas which will help parents to increase vegetable consumption in their children.

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TARASZEWSKA Anna¹

WOLNICKA Katarzyna¹
JACZEWSKA-SCHUETZ Joanna¹
JAROSZ Mirosław¹
NIEWIAROWSKA Monika²

¹ Institute of Food and Nutrition, Poland

² National Support Centre for Agriculture, Poland

Corresponding author:
TARASZEWSKA Anna
Institute of Food and Nutrition
61/63 Powsinska Str.
Warsaw, Poland
ataraszewska@izz.waw.pl

Impact of a youth-led social marketing intervention run by adolescents to encourage healthy lifestyles among younger school peers (EYTO-Kids project): a parallel-cluster randomized controlled pilot study

Background: Encouraging healthy lifestyles in children is a challenge.

Objective: This project aimed to improve lifestyles of younger peers by engaging adolescent creators (ACs) to design and implement peer-led and social marketing (SM) health promoting activities.

Methods: A 10-month parallel-cluster randomized controlled school-based pilot study was performed in disadvantaged neighborhoods in Reus (Spain) spanning two academic years (2015-2016/ 2016-2017). Eight primary schools (n=375 children) and 4 high schools (n=94 ACs) were randomly placed in the intervention group (IG), and 8 primary schools (n=327 children) and 3 high schools

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TARRO Lucía^{1,2}

LLAURADÓ Elisabet¹
ACEVES-MARTINS Magaly¹
MORIÑA David³
PAPELL-GARCIA Ignasi²
AROLA Lluís^{2,4}
GIRALT Montse^{1,5}
SOLÀ Rosa^{1,2,6}

¹ Universitat Rovira i Virgili, Facultat de Medicina i Ciències de la Salut, Functional Nutrition, Oxidation, and Cardiovascular Diseases Group (NFOC-Salut), Health Education and Promotion, C/ Sant Llorenç, 21, Reus (43201), Spain

² Eurecat, Centre Tecnològic de Catalunya, Unitat de Nutrició i Salut, Avinguda Universitat 1. Reus (43204), Spain

(n=98 adolescents) served as the control group (CG). In the intervention group, 94 ACs (12-14y) designed and implemented 4-SM activities for their younger peers (9-11y). The CG received no intervention. Primary (physical activity and fruit consumption) and secondary outcomes (screen time, consumption of vegetables, sugary drinks and fast-food) were assessed with validated questionnaires at baseline (T0) and at the end-of-the-study period (T1). Generalized linear models were used to analyze differences from the baseline to the end of the study of the IG and CG.

Results: At T1, in the principal outcomes, there were no significant changes in fruit consumption and physical activity within and between the intervention and control groups.

However, in the secondary outcomes, the number of children consuming sweets weekly decreased in the IG from T0 to T1 (20.4% to 12.9%; $p=0.006$), whereas no change happened in the CG (10.2% to 10.3%; $p=0.782$), resulting in a significant difference between both groups at the end of the study ($p=0.004$).

The number of girls consuming fast food decreased non-significantly in the IG (20.7% to 18.5%; $p=0.701$) and a non-significant increase occurred in the CG (9.5% to 13.2%; $p=0.356$), being a significant difference between groups in favor of IG ($p=0.015$) and following the same tendency in the sugary drinks IG (38% to 33.8%; $p=0.327$) and CG (28.6% to 38.0%; $p=0.053$) being a significant difference between groups in favor of IG ($p=0.044$). The number of boys who reported screen time ≤ 2 h/weekday non-significant increase in the IG from T0 to T1 (68.4% to 71.6%; $p=0.585$) and non-significant decrease in the CG (87.3% to 82.3%; $p=0.265$), being a significant difference between groups in favor of IG ($p=0.003$).

Conclusion: The EYTO-Kids intervention, using 4-SM and peer-led activities, was not effective in improving the primary outcomes but was effective in reducing consumption of sugary drinks, fast-food and sweets among girls and reducing screen time in boys, compared to the CG.

³ Unit of Infections and Cancer - Information and Interventions (UNIC-I&I), Catalan Institute of Oncology (ICO)-IDIBELL, L'Hospitalet de Llobregat, Barcelona, Spain

⁴ Universitat Rovira i Virgili, Departament de Bioquímica i Biotecnologia, Nutrigenomics Research Group, C/ Marcel·lí Domingo, 1, Tarragona (43007), Spain

⁵ Universitat Rovira i Virgili, Facultat de Medicina i Ciències de la Salut, Unit of Pharmacology, C/ Sant Llorenç, 21, Reus (43204), Spain

⁶ Hospital Universitari Sant Joan de Reus, Reus, Spain

Corresponding author:

TARRO Lucia
Facultat de Medicina i Ciències de la Salut
NFOC group, Eurecat-Reus
Centre Tecnològic de Catalunya
C/ Sant Llorenç 21
43201-Reus, Spain
lucia.tarro@urv.cat

Impact of community gardens in promoting sustainable lifestyles in urban settings: design and protocol of the JArDinS study

Background/Objective: Despite the growing body of evidence on the health benefits associated with community gardening, qualitative and cross-sectional designs still dominate the scientific literature and longitudinal studies based on quantitative data are needed. Here we describe the protocol of the JArDinS study, a quasi-experimental research focusing on community gardens as a way to induce more sustainable lifestyles.

Methods/Design: This study will be based on a natural experiment (access to a community garden). Gardeners (n=80) who recently had access to a community garden will be recruited in Montpellier, France. Volunteers living in the same neighborhoods but with no access to a community garden will be recruited in a control group (n=80). Participant will be issued with three tools: a Food Supply Dairy to collect data on household's food supply patterns over 1-month, a triaxial accelerometer (Actigraph) to measure physical activity and an online questionnaire. The sustainability of lifestyles will be examined by considering conjointly the three dimensions of sustainability:

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THARREY Marion¹
PERIGNON Marlène¹
MEJEAN Caroline¹
DARMON Nicole¹

¹ MOISA, INRA, CIHEAM-IAMM, CIRAD, Montpellier SupAgro, Univ Montpellier, Montpellier, France

Corresponding author:

THARREY Marion
INRA, UMR 1110 MOISA
Campus Inra-SupAgro de la Gaillarde,
2 place Pierre Viala - Bât. 26
34060 Montpellier Cedex 2, France
marion.tharrey@supagro.fr

1) Social/health – measured by nutritional quality of food supply, physical activity, mental well-being and social connection.

2) Environment – measured by environmental impact of household's food supply and related food trips, concern for food waste and connection with nature.

2) Economy - measured by household food expenditure and the share of each food group and subgroup.

Results: Change of outcomes after 1 year will be compared between the natural experiment and control group, to evaluate the effect of access to a community garden on the sustainability of lifestyles.

Conclusion: This study will provide valuable information about the role of community gardens in urban strategies to favor sustainable lifestyle, based on a robust quasi-experimental design allowing causality evaluation.

Connected cooking devices to influence nutritional homeostasis: a feasibility randomized controlled trial at home

Rationale: Unhealthy lifestyles are major contributing factors to chronic conditions that impose a huge financial burden on EU healthcare systems. Cook2Health pilot study (C2H) aims to assess the feasibility of using connected cooking devices to improve dietary habits and health-status.

Methods: Monocentric randomized controlled trial (ClinicalTrials.gov NCT03171571): healthy volunteers, representative of the French population, were randomly allocated (1:1) to connected cooking devices with a recipes application: Intervention Group (IG) or Control Group (CG) using Zelen design. Feasibility/acceptability, assessed by completeness of collected data, was the primary outcome. Secondary outcomes included changes over a 1-year period between groups in Alternative Healthy Eating Index-2010 (AHEI-2010) score, anthropometric measurements, body composition, blood pressure, quality of life SF36, actimetry, blood and urine nutritional biomarkers and microbiota.

Results: 20 subjects (16 women), non-smokers, main person who prepares meals at home, with a mean age of 39.3(SD \pm 3.2) years and a Body Mass Index of 27.3(\pm 1.3)kg/m² were randomized in IG (n=11) or CG (n=9). Completeness of assessment at Month 0, 6 and 12 (home and hospital visits) was deemed successful.

At 1-year follow-up: there was no significant difference between IG vs CG for AHEI-2010 (gain of a quintile), weight change mean(SD) 2.1 kg (\pm 6.5 kg) vs -0.4 kg (\pm 3.6 kg), waist circumference change: -5.9 cm (\pm 7.7) vs 0.2 (\pm 4.0), % fat mass -1.8(\pm 6.7) vs -1.4 (\pm 5.9), systolic blood pressure 123.0 (\pm 15.0) vs 111.9 (\pm 6) and diastolic blood pressure 74.3 (\pm 11.6) vs 71.7 (\pm 6.1).

However, median sleep duration increased in IG +0.9h/d[0.3-1.2] vs -0.0[-0.4-0.3] for CG (P=0.04). Microbiota analysis showed promising differences with an increase in Firmicutes (P = 0.02) for IG.

Conclusions: Our preliminary results demonstrated the feasibility and acceptability of a home comprehensive multiscale assessment to measure the impact of connected cooking devices on dietary habits and health-status. This will be validated with 160 subjects in the on-going randomized multicenter controlled trial (NCT03169088).

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VAILLANT Marie-France^{1,2}

TERRISSE Hugo³

ARTEMOVA Svetlana³

ROLLAND Carole³

JOYEUX-FAURE Marie^{2,4,5}

BOREL Jean-Christophe^{2,4,5}

OBERLI Marion⁶

DANCER Paul⁶

SICARD Mariette⁶

CASAS-AGUSTENCH Patricia⁷

ANDRES-LACUEVA Cristina⁷

LLOYD Amanda J.⁸

DRAPER John⁸

PISON Christophe^{1,2}

MOINARD Christophe¹

¹Laboratory of Fundamental and Applied Bioenergetics, INSERM 1055, Université Grenoble Alpes, France

²CHU Grenoble Alpes, France

³TIMC-IMAG, UMR CNRS5525, France, Université Grenoble Alpes, France

⁴INSERM 1042, Grenoble, France, Université Grenoble Alpes, France

⁵IC@dom, Meylan, France

⁶Groupe SEB, Ecully, France

⁷Biomarkers and Nutrimetabolomic Laboratory, Department of Nutrition, Food Sciences and Gastronomy, XaRTA, INSA, Faculty of Pharmacy and Food Sciences, University of Barcelona, CIBERFES ICSIII, Barcelona, Spain

⁸Metabolomics Centre, IBERS, Aberystwyth University, United Kingdom

Corresponding author:

Marie-France VAILLANT

LBFA - U1055

Université Grenoble Alpes - CS40700

38058 Grenoble cedex 9

mfvaillant@chu-grenoble.fr

MaestraNatura: an innovative nutrition education method for children

Objectives: The prevalence of paediatric overweight/obesity is a well-recognized public health problem worldwide. Educational programs have been carried out in the last few years in Italy. However, evidence for their real effectiveness in enabling children to transfer the theoretical knowledge in the daily life is quite equivocal. MaestraNatura (MN) is an innovative educational program tested from 2012 to 2017 in six Italian regions involving 103 schools, 900 teachers, about 20,000 students (6-13 y) and their parents.

This study was aimed at assessing the effectiveness of MN nutrition education program in filling the gaps in children's knowledge on nutritional issues, also highlighting possible gender differences in dietary habits and basic knowledge on nutritional issues.

Methodology: The didactical contents were distributed by a web platform to 1000 students of primary school (V class) and secondary-first level school (second class). Dietary habits and knowledge about the origin and function of different food were assessed by ad-hoc questionnaires. At the beginning and at the end of the scholastic year, the students were required to organize a weekly meal planner that were scored by nutritionists. This allowed us to assess possible improvements in their performances.

Results: Data collected from the questionnaires evidenced gender differences in behaviours/eating habits. In addition, females had better basic nutrition knowledge than males (T0 $F_{1,532} = 9.20$ $p = 0.0025$); interestingly, this difference disappeared at the end of the didactic path (T1 $F_{1,471} = 2.96$ $p = 0.0861$). Moreover, significant differences between the beginning (T0) and the end (T1) of the scholastic year ($F_{1,498} = 23.95$ $p = 0.0000$) were found in terms of student knowledge.

Conclusions: The MN educational program has shown its effectiveness in transferring information contained in the food pyramid to the real context of a daily menu. This activity favoured a greater awareness on the importance of having appropriate dietary habits.

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VARI' Rosaria¹
SCAZZOCCHIO Beatrice¹
 SILENZI Annalisa¹
 DEL PAPA Sara²
 D'AMORE Antonio¹
 GIOVANNINI Claudio¹
 GIMIGLIANO Annamaria²
 MASELLA Roberta¹

¹ Center for Gender-Specific Medicine, Istituto Superiore di Sanità, Viale Regina Elena, 299, 00161 Rome, Italy

² AMG Edutainment s.r.l., Rome, Italy

Corresponding author:

VARI' Rosaria
 Center for Gender-Specific Medicine
 Istituto Superiore di Sanità
 Viale Regina Elena, 299
 00161 Rome, Italy
 rosaria.vari@iss.it

Milk polar lipids reduce cardiometabolic risk factors in post-menopausal women: a randomized double-blind controlled trial

Background: Disturbances of fasting and postprandial lipid profiles are major cardiovascular (CV) risk factors. Nutrition plays a key role in their modulation, notably in postmenopausal women at CV risk. Interest has grown on the potential benefits of milk polar lipids (MPL). However, effects of MPL supplementation in humans have been inconsistent, often due to trials being performed in healthy subjects by increasing lipid intake. We hypothesized that isolipidic enrichment of the diet with MPL via a realistic dairy product could improve lipid markers of CV risk.

Methods: We notably targeted a 5g/day dose using an originally designed butterserum microfiltration process (Gassi et al., Int. Dairy J. 2016). We performed a double-blind randomized controlled trial in 58 postmenopausal overweight women with HDL-cholesterol < 1.6 mM.

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VORS Cécile^{1,2}
 JOUMARD-CUBIZOLLES Laurie³
 LECOMTE Manon¹
 COMBE Emmanuel¹
 OUCHCHANE Lemlih^{4,5}
 DRAI Jocelyne^{1,2,6,7}
 RAYNAL Ketsia⁸
 JOFFRE Florent⁹
 LE BARZ Mélanie¹
 GABORIT Patrice⁸
 GESAN-GUIZIOU Geneviève¹⁰
 COTTE Eddy⁶
 LAVILLE Martine^{1,2,6}
 BERNALIER-DONADILLE Annick¹¹
 LAMBERT-PORCHERON Stéphanie^{2,6}
 MALPUECH-BRUGERE Corinne³
MICHALSKI Marie-Caroline^{1,2}

They were subjected to (i) a 4-week dietary intervention with daily consumption of a cream-cheese containing 12g of milkfat randomly including either 0g (control, n=19), 3g (n=19) or 5g (n=20) of MPL, and to (ii) 8h-postprandial explorations after a test meal, before and after intervention (i.e. 2 visits). Lipid markers were measured in plasma and in the chylomicron fraction; stools were collected for RT-qPCR analysis of major bacterial species of the gut microbiota. The effect of MPL dose was tested through a linear mixed model (SAS®).

Results: The 5g MPL dose decreased fasting and postprandial total cholesterol and plasma triglycerides, and decreased fasting total/HDL-cholesterol and ApoB/ApoA1 ratios (effects different from control, $p < 0.05$). The 5g MPL dose decreased both chylomicron-cholesterol and -triglycerides ($p < 0.01$), suggesting impact on lipid metabolism can be due to lower intestinal lipid absorption and/or increased clearance. We found no major effect of MPL on tested bacterial families in the gut microbiota.

Conclusions: Altogether, our data suggest that a dietary strategy based on milk lipid quality, including MPL, can contribute to improve the cardiometabolic health of postmenopausal women.

¹ CarMeN Laboratory, INSERM, INRA, INSA Lyon, Université Claude Bernard Lyon 1, Oullins, France

² CRNH Rhône-Alpes, Pierre-Bénite, France

³ Université Clermont Auvergne, INRA, Unité de Nutrition Humaine, CRNH Auvergne, Clermont-Ferrand, France

⁴ Université Clermont Auvergne, CNRS, SIGMA Clermont, Institut Pascal, Clermont-Ferrand, France

⁵ CHU Clermont-Ferrand, Unité de Biostatistique, Clermont-Ferrand, France

⁶ Hospices Civils de Lyon, France

⁷ Laboratoire de Biochimie, Centre Hospitalier Lyon Sud, France

⁸ ACTALIA, Surgères, France

⁹ ITERG, Canéjan, France

¹⁰ STLO, INRA, Rennes, France

¹¹ Université Clermont Auvergne, INRA, UMR 454, MEDIS, Clermont-Ferrand, France

Corresponding author:
Marie-Caroline MICHALSKI
INRA UMR1397 - INSERM U1060 -
Laboratoire CarMeN - Bâtiment IMBL,
INSA-Lyon, 15 avenue Jean Capelle,
69621 VILLEURBANNE cedex, France
arie-caroline.michalski@inra.fr

Fruit and vegetable intake of adolescents living in a Swedish multicultural area

Dietary related diseases have increased alongside with an increase in body weight in young people during the last decades, and so have also socioeconomic inequalities within youth health. Fruits and vegetables are of great importance for health and contribute with important vitamins, dietary fibre and antioxidants. Thus, people over 10 years of age in Sweden are recommended to eat at least 500 grams of fruits and vegetables per day.

Objective: The aim was to compare reported fruit and vegetable intake of adolescents living in a Swedish multicultural area characterized with low socioeconomic status (SES), to the intake of adolescents in a national sample.

Methodology: Dietary intake was assessed with food frequency questionnaires among adolescents in 7th grade, mean age 13 years old, (n=118) living in a Swedish multicultural area characterized with low SES, as well as among a national sample of adolescents (n=2292) in the same age. Dietary information was collected in 2014.

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WANSELIUS Julia¹

BERG Christina¹

LARSSON Christel¹

¹ University of Gothenburg Department of Food and Nutrition, and Sport Science Visiting address: Läroverksgatan 5 Box 300, 405 30 Göteborg, Sweden

Corresponding author:
WANSELIUS Julia
University of Gothenburg Box 300
405 30 Gothenburg
Visiting Address: Läroverksgatan 5
julia.wanselius@gu.se

Results: Adolescents living in the multicultural area had higher frequencies of fruit intake than the national sample ($p < 0.001$). Differences were also seen in number of adolescents who had a daily consumption of fruits ($p < 0.001$), where the multicultural sample had a higher proportion of daily consumers (44 %) than the national sample (25 %). No difference was seen between the groups in frequency of vegetable intake, and neither in daily consumptions of vegetables, where 41 % in the multicultural sample and 38 % in the national sample had a daily consumption respectively.

Conclusion: Adolescents living in a Swedish multicultural area characterized with low SES had higher intakes of fruit than adolescents in general. However, intakes of fruits and vegetables need improvement among all groups of Swedish adolescents since not even half of the studied populations had a daily consumption.

The School Fruit Scheme as an effective strategy leading to positive changes in some eating behaviours of children

Objectives: The School Fruit and Vegetable Scheme (SFVS), one of the priority activities of the European Commission, aims at the development among children of a habit of eating fruit and vegetables (F&V). The aim of the survey was to identify both the strengths of the scheme and areas requiring further support.

Methods: The study was conducted in randomly selected 85 primary schools among 1255 students of grades I-IV, which participated in the program (intervention group) and control group. At IVth class both groups didn't participate in SFVS. F&V consumption of pupils was evaluated on the basis of 3-day food record method; others behaviours by questionnaires.

Results: Over the three years of the implementation of the SFVS (class I-III), fruit consumption significantly increased (by about 30 g a day, i.e. by 18%), ($p < 0.0001$). Consumption of fruit after the third year of the program was significantly higher by 13.5% netto in the intervention group compared to the control group ($p = 0.0001$). Vegetable consumption remained at a similar level in both groups (no significant differences). Other positive effects of the SFVS included statistically significant changes: increase in children's knowledge on the health aspects of fruit and vegetables and the levels of their consumption, the less frequent occurrence of barriers to fruit and vegetable consumption in relation to the control group, greater willingness to eat fruit and vegetables, higher preferences for fruit in general and peppers as a vegetable, lower preferences for sweet drinks/sweets. The enhanced variety of vegetables provided in the third school year could have contributed to significant increasing the percentage of children who mentioned vegetables as products which they liked.

Conclusion: In order to further strengthen the achieved positive effects, the SFVS should be supported by activities of the school covering the whole environment e.g. balanced school lunches, healthy products at school shops, intensified educational activities which should also involve parents. Teachers need tools for education. Consideration should be given to the enhancing the frequency of F&V availability, more than 2-3/w.

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WOLNICKA Katarzyna¹

TARASZEWSKA Anna¹

JACZEWSKA-SCHUETZ Joanna

JAROSZ Mirosław¹

NIEWIAROWSKA Monika²

¹ Institute of Food and Nutrition, Poland

² National Support Centre for Agriculture, Poland

Corresponding author:

WOLNICKA Katarzyna
Institute of Food and Nutrition
61/63 Powsinska Str.
Warsaw, Poland
kwolnick@izz.waw.pl

Nudging young adults to choose more vegetables in mass eating context: Findings from field studies

Objectives: Although health advantages of eating sufficient amounts of vegetables are recognized among young adults, their consumption of vegetables remains low. Although conventional health education approaches have increased awareness of the issue among public, their effectiveness in changing choice and intake of vegetables has been limited. Nudge (Thaler and Sunstein, 2008) offers a promising framework by introducing subtle changes to the immediate food choice environment so that choosing vegetables becomes easier and more natural for consumers at the moment of decision. With the University of Guelph Hospitality Services' support, we are conducting a series of field studies in student cafeterias by introducing nudges designed to increase the choice of vegetables. In this paper, we are reporting three nudge-based strategies recently implemented.

Methodology: Three interventions for nudging were selected after brainstorming with students and hospitality managers. They were implemented in different sections of a centrally located cafeteria on campus. First, a short prompt for adding kale or spinach for only \$1 was placed next to the server receiving orders for smoothie for 9 weeks. The number of customers who added kale or spinach was compared between the implementation weeks and the earlier baseline weeks (Weeks 1-3). A similar prompt was used in the custom-made sandwich section. Lastly, large plates instead of the usual medium-sized plates were placed in prime locations for taking salad bar items, and the display was alternated day by day. Weight of salad bar items sold daily was compared between large versus small plate days. Data came from the University of Guelph Food Services, and the number of students using all the cafeterias on campus daily is about 10,000.

Results: ANOVA analyses showed that sales of the target items were significantly higher on days the nudge was in place versus removed.

Significantly more sandwiches with spinach were sold on days the nudge poster was placed than the baseline ($M=10.91$ vs. 1.23 ; $F(1,58)=8.79$, $p<.01$). Similarly, significantly more smoothies with kale or spinach were sold on days the nudge poster was placed than the baseline ($M=16.5$ vs. 6.9 ; $F(1,58)=21.66$, $p<.01$). However, the weight of salad bar items did not significantly vary depending on the size of plates placed in the salad bar section.

Conclusion: Our findings indicate that simple nudge-based interventions placed at the point of food choice can increase the choice of vegetables among young adults whose eating patterns are less healthy than older people in most advanced countries.

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YI Sunghwan¹
BRAUER Paula¹

¹ University of Guelph

Corresponding author:
YI Sunghwan
Dept. of Marketing and Consumer
Studies
University of Guelph, Canada
syi@uoguelph.ca