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Diet-obesity relationships in children:

Approaches to handle implausible dietary recalls

C. Börnhorst, I. Huybrechts, G. Eiben, D. Molnár, L. Moreno, V. Pala, M. Eha, Y. Kourides, A. Siani, I. Pigeot
- on behalf of the IDEFICS consortium -

BiPS

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Sixth Framework Programme

Introduction

Measurement errors in dietary data

- attenuated/biased estimates of associations between dietary exposure and health outcomes
- may be more pronounced in case of proxy-reported data (children)

Different procedures to screen out implausible dietary recalls… but to date there is no formal way how to deal with differential measurement errors, e.g. caused by misreporting

How should we handle recalls identified as implausible?

Aim

Overall aim:

Comparison and evaluation of different procedures to handle implausible 24-hour dietary recalls (24-HDR)

Exploratory approach:

Exemplary analysis of the association between reported dietary intakes and overweight/obesity

Source: http://www.future-of-food.de/wp-content/uploads/2012/03/Ernaehrung_Gesund_Ungesund-300x204.jpg

Study data

IDEFICS:

- Multi-centre setting-based study
- Includes 2-9 year old children from 8 European countries (N≈16200)
- Aims to prevent and investigate causes of diet and lifestyle related diseases

Current analysis includes 5962 children with complete covariate information and one 24-HDR:

- Computer-assisted 24-HDR “SACINA“ (Self-Administered Children and Infants Nutrition Assessment)
- Based on proxy-reports
- Pictures with increasing portion sizes
- Additional assessment of school meals

24-HDR: 24-hour dietary recall

Identification of implausible 24-HDR

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Classification of 24-HDR in three reporting groups using adapted Goldberg cut-offs:

Low-Energy-Report (LER)
Plausible-Energy-Report (PER)
High-Energy-Report (HER)

- Literature-based replacement of reference values used in the original calculation by age- and sex-specific values
- Based on 95%-confidence limits of the expected ratio of EI over basal metabolic rate (BMR)

Age (years)	Sex	Low-Energy-Report (lower 95% CL)	Plausible-Energy-Report	High-Energy-Report (upper 95% CL)
2-<6	Boys	EI/BMR < 0.74	0.74 ≤ EI/BMR < 2.85	2.85 ≤ EI/BMR
2-<6	Girls	EI/BMR < 0.78	0.78 ≤ EI/BMR < 2.69	2.69 ≤ EI/BMR
6-<10	Boys	EI/BMR < 0.92	0.92 ≤ EI/BMR < 2.61	2.61 ≤ EI/BMR
6-<10	Girls	EI/BMR < 0.93	0.93 ≤ EI/BMR < 2.43	2.43 ≤ EI/BMR

EI/BMR: ratio of energy intake over basal metabolic rate

EI: energy intake
BMR: basal metabolic rate
CL: confidence limit

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Standard model

Outcome: Overweight/obese vs. thin/normal weight* (dummy)

Exposure variables:

1. Total energy intake (EI)
2. Fruit/vegetable intake (% of total EI)
3. Soft drink** intake (% of total EI)

Logistic multilevel model adjusted for age and sex, country included as random effect (standard model).

*Cut-offs according to IOTF criteria
**Sweetened and unsweetened carbonated/soft/isotonic drinks including non alcoholic wine, non alcoholic beer

Approaches to handle implausible 24-HDR

I. Exclusion of implausible 24-HDR

II. Dummy-adjustment for the reporting group

III. Stratification by reporting group

IV. Propensity score adjustment

- Conditional probability (propensity score) of being classified as LER given selected covariables

***Propensity score = estimated* P(LER|*covariates*)**

- Covariables: socio-economic indicators (income, household size), characteristics of study subjects and proxies, parental concerns/perceptions regarding their child's weight status, day of the week, etc.

24-HDR: 24-hour dietary recall
LER: Low-Energy-Report

Results: Descriptive analysis

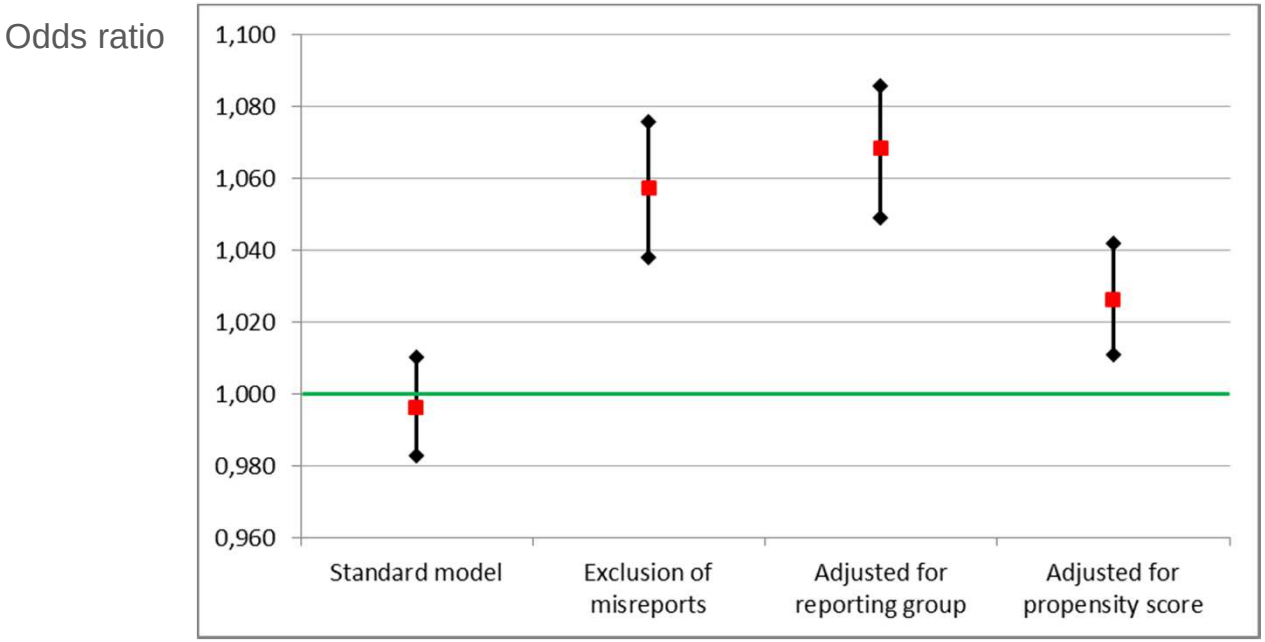
	All	Low-Energy-Report	Plausible-Energy-Report	High-Energy-Report
	N	% (N)	% (N)	% (N)
All	5962	6.7 (402)	89.2 (5319)	4.0 (241)
Sex of the child				
Male	3029	6.2 (187)	90.7 (2747)	3.1 (95)
Female	2933	7.3 (215)	87.7 (2572)	5.0 (146)
Age groups				
2-<6 years	2625	4.6 (120)	91.0 (2388)	4.5 (117)
6-<10 years	3337	8.5 (282)	87.8 (2931)	3.7 (124)
Weight status*				
Thin/normal weight	4721	5.3 (249)	90.3 (4263)	4.4 (209)
Overweight/obese	1241	12.3 (153)	85.1 (1056)	2.6 (32)

Dietary exposures	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Energy intake (kcal/day)	1578 (530)	764 (244)	1585 (432)	2770 (438)
%EI from fruits/vegetables	8.5 (8.2)	11.1 (13.0)	8.4 (7.7)	6.7 (6.0)
%EI from soft drinks	2.7 (5.7)	2.7 (6.7)	2.7 (5.7)	2.2 (4.0)

*according to IOTF criteria
SD: standard deviation
EI: energy intake

Results: Multilevel model Energy intake

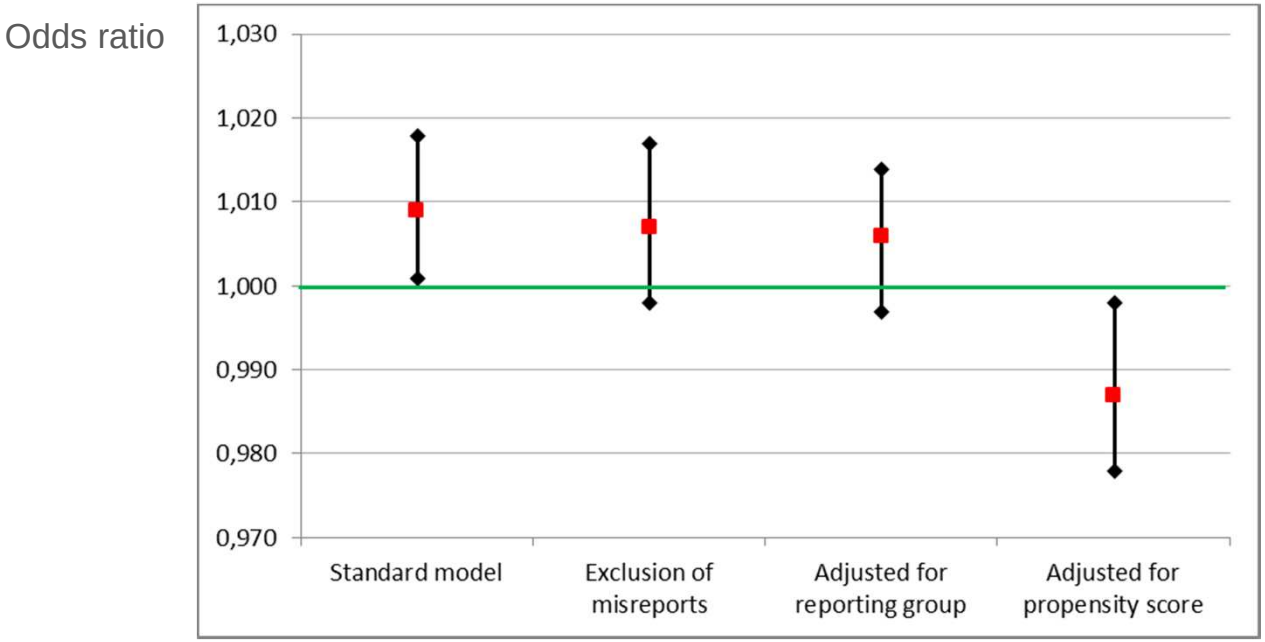
Odds ratios and 95% confidence intervals for the association between overweight/obesity and total energy intake (1 unit ~ 100kcal/day)



Effects are assessed as one unit offsets from the mean

Results: Multilevel model Fruits/vegetables

Odds ratios and 95% confidence intervals for the association between overweight/obesity and %EI from fruits/vegetables (1 unit ~ 1%)

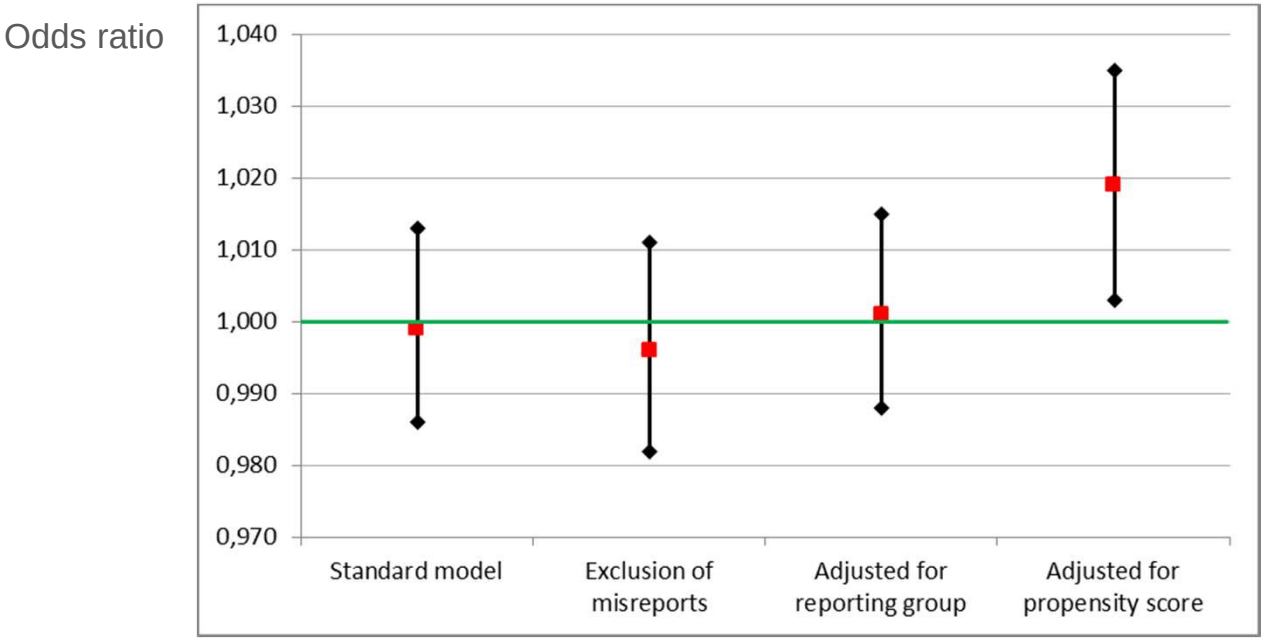


EI: energy intake

Effects are assessed as one unit offsets from the mean

Results: Multilevel model
Soft drinks

Odds ratios and 95% confidence intervals for the association between overweight/obesity and %EI from soft drinks (1 unit ~ 1%)

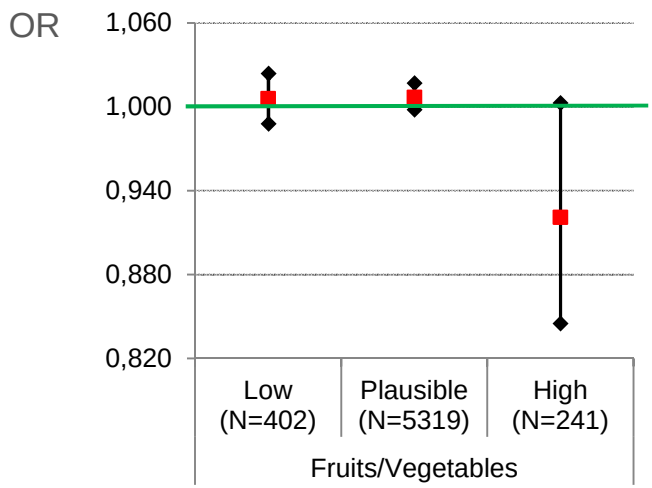


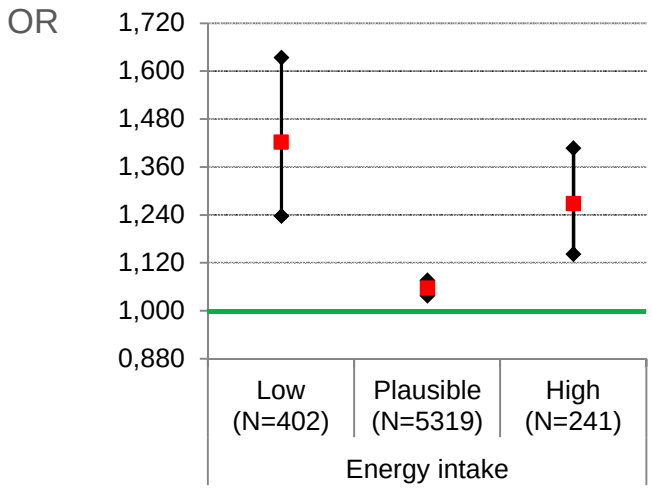
EI: energy intake

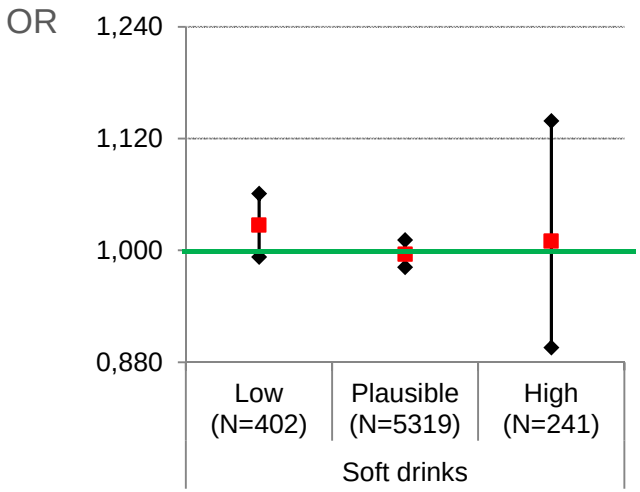
Effects are assessed as one unit offsets from the mean

Results: Multi-level-model Stratification

Odds ratios for the association between overweight/obesity and the dietary exposures stratified by reporting group







OR: odds ratio

Effects are assessed as one unit offsets from the mean

Summary

- Results strongly differed depending on the selected model:
  - **Data exclusions strenghtened diet-obesity relations but may introduce selection bias**
  - **Stratified analysis revealed differences between reporting groups but reduces power**
  - **Adjustment for the reporting group strengthened associations**
  - **Propensity score strengthened or even reversed associations but only exploratory approach**

True effects are unknown

→ Validation data needed!

Limitations

- Use of the cut-off technique
  - **Limited sensitivity**
  - **Underreporting cannot be distinguished from undereating**
- Only one 24-HDR per child
- Cross-sectional study

24-HDR: 24-hour dietary recall

Conclusions

- Non-consideration of misreporting in the statistical model revealed insignificant or even reversed diet-obesity associations
- Misreporting should be addressed in the model building process
- Propensity score approach should be further addressed in future studies

Thank you for your attention!

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