

Variation of bias in protein and potassium intake collected with 24-h recalls across European populations using multilevel analysis

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European Food COnsumption VALidation (EFCOVAL)

- Further development and validation of a European food consumption method to be used for estimation of the intake of foods, nutrients and potentially hazardous chemicals within the European adult population
- Validation study in five European centers: Belgium, the Czech Republic, France, the Netherlands, and Norway
- 600 subjects (~120 per center)

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EFCOVAL validation study

OBSERVED

2 x 24-h recalls (EPIC-Soft)
for assessing dietary intakes of
protein and potassium

REFERENCE

2 x 24-h urine collections
for estimating nitrogen (protein) and
potassium



Bias in protein and potassium intake

- Underestimation of protein intake varied from 2% (Norway) to 13% (France)
- Results on potassium intake varied from 17% underestimation (France) to 6% overestimation (the Czech Republic)



Differences in the performance of the 24-h recall may exist across European countries

We now investigated

- whether mean bias of a 24-h recall estimate of protein and potassium intake, as compared to biomarkers, varied across European centers
- whether this bias was influenced by characteristics of individuals or centers
 - EFCOVAL data was combined with data from EPIC calibration study → combined data included 1841 subjects from 14 European centers (9 countries)



Methods (1)

- One application of the 24-h recall (EPIC-Soft) vs one 24-h urine collection (protein and potassium)
- Country-specific food composition tables were used to estimate nutrient intakes

Differences between studies:

- Nutrient calculations were harmonized as much as possible (e.g. conversion factor N → protein)
- Design aspects of the 24-h recall were included as co-variables (e.g. mode of administration)
- Laboratory calibration study (EPIC, Cambridge – EFCOVAL, Wageningen): 45 EPIC urine samples were reanalyzed in Wageningen → no significant differences between N and K measurements of the two labs → original biomarker data used in analyses



Methods (2)

Multilevel linear regression analysis including:

- individual-level variables: age, educational level, BMI, mode of administration, day of the week, year of recruitment
- center-level variables: study (EFCOVAL or EPIC), human development index for the country, food pattern index

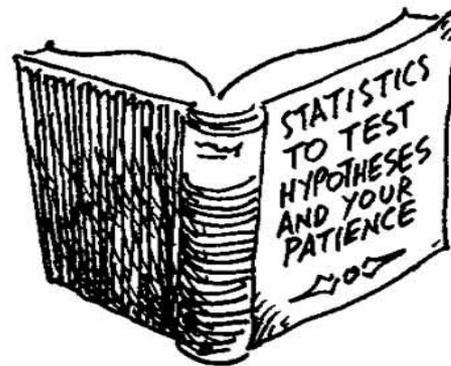
Three models:

- i. Random intercept to model between center variation of bias in protein and potassium intake
- ii. i + individual-level explanatory variables
- iii. ii + center-level explanatory variables



Methods (3)

- Analyses for men and women separately
- Bias was defined as ratio between nutrient intake and its excretion
- Ratios were In-transformed to improve normality
- Fit of the models was tested by the likelihood ratio test
- Total variance of bias was split in between-center variance (center random effect) and within-center between-individual variance (individual random effect)



Protein: variation in bias across centers

- In men, bias in assessment of protein intake did not vary between centres
- In women, 3% of total variance was due to differences between centers (model i)
 - Ratio intake/excretion overall was 0.95; 3 centers showed deviating results
- Between-center variance in bias was not significant anymore after inclusion of individual-level variables, 'day of the week', 'mode of administration' and especially BMI (model ii)
- Fit of model iii, including center-level explanatory variables, was not significantly better than model ii



Potassium: variation in bias across centers

- In men, 5% of total variance was due to differences between centers (model i)
- After inclusion of the individual-level variable BMI, 6% of total variance was due to differences between centers (model ii)
 - Ratio intake/excretion overall was 0.99; 4 centers showed deviating results
- Fit of model iii, including center-level explanatory variables, was not significantly better than model ii
- In women, bias in assessment of potassium intake did not vary between centres



Discussion

- Complete harmonization of protein conversion factor was not possible
- Lab calibration study had a small sample size
- Generalization of results to other nutrients may not be possible because of differential misreporting
- Importance of considering BMI when performing 24-h recalls in Europe



Conclusion

- The results suggest that bias in the assessment of protein in men and women and of potassium in women, collected with 24-h recalls, does not vary across centers and to a certain extent varies for potassium in men
- Explanatory variables at the individual level (BMI and study design aspects), rather than center-level characteristics, predicted and explained the between-center variation of bias in protein and potassium intake



Bias in protein and potassium intake collected with 24-h recalls (EPIC-Soft) is rather comparable across European populations

Crispim S. P., Geelen A., de Vries J. H., Freisling H., Souverein O., Hulshof P. J., Ocke M. C., Boshuizen H., Andersen L. F., Ruprich J., de Keyzer W., Huybrechts I., Lafay L., McTaggart A., Ricceri F., Tumino R. , Krogh V., Bueno-de-Mesquita H. B., Kaaks R., Boutron-Ruault M., Naska A., Crowe F. L., Boeing H., van't Veer P., Slimani N.

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