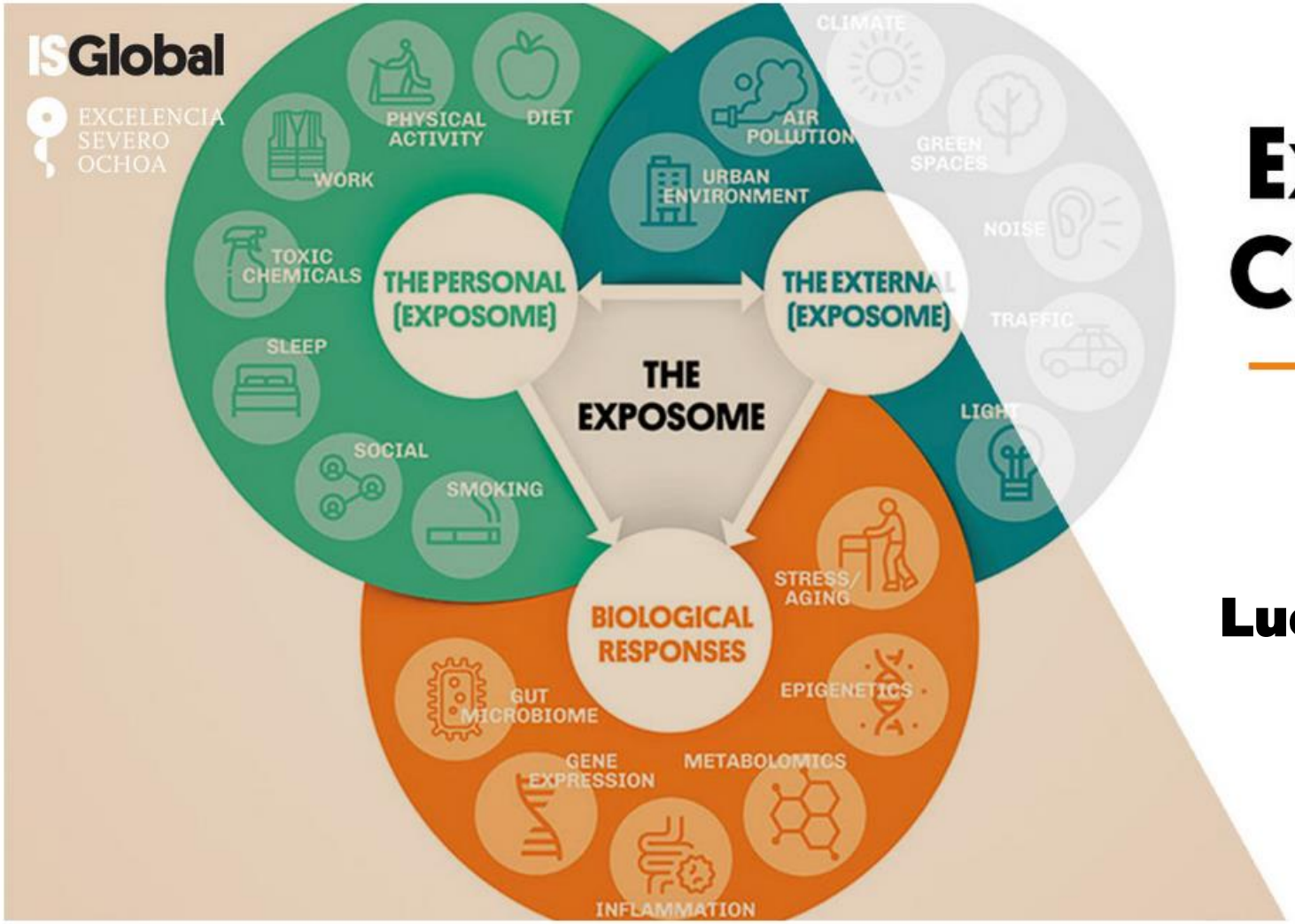

#ISGlobalExposome

Exposome Data Challenge Event

28-30 April 2021

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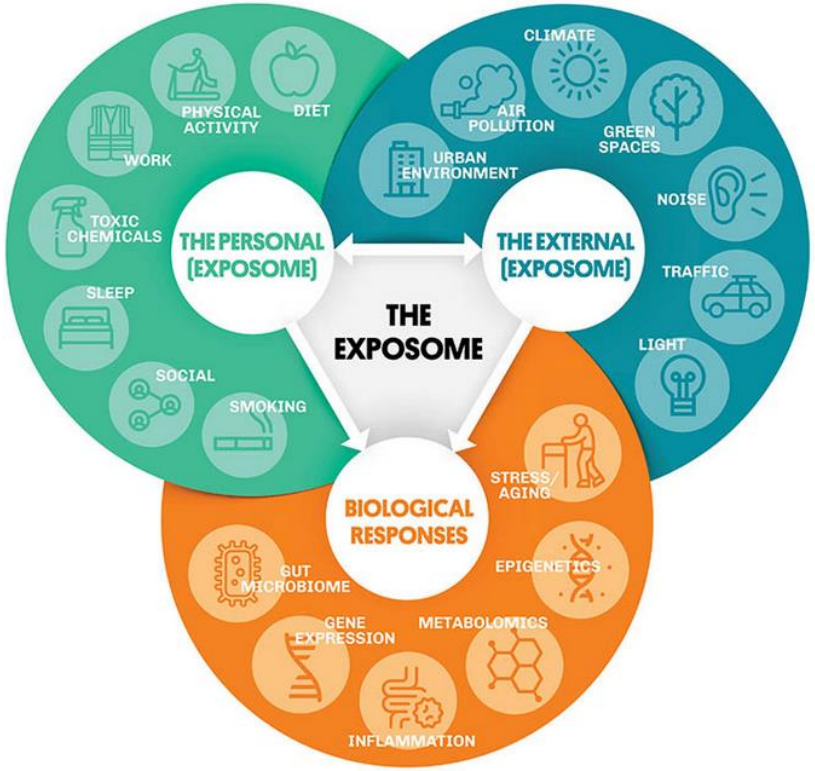
Université Grenoble Alpes

Searching for the risk factors for childhood overweight – A novel approach to identify the most relevant child BMI-associated exposures

Objective

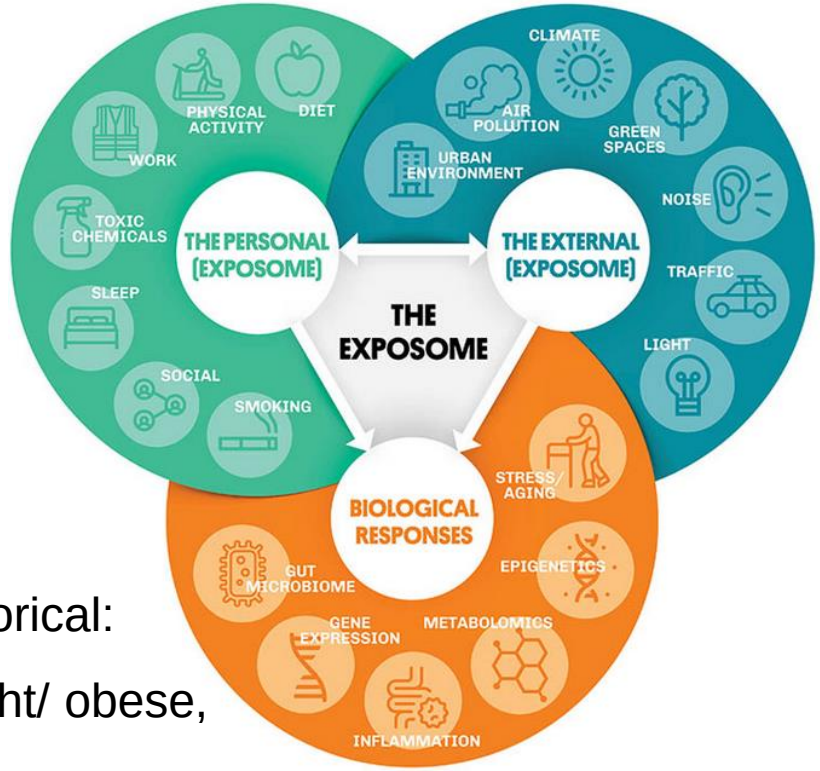
To assess associations between child postnatal exposome and risk of overweight and obesity



Objective

To assess associations between child postnatal exposome and risk of overweight and obesity

- Lifestyle
- Chemical exposome



- Child BMI (categorical: normal/ overweight/ obese, N = 1288)

Postnatal Exposures

Lifestyle exposures

(24 exposures, 21 categorical and 3 continuous)

- Diet (20)
- Diet quality indicator (KIDMED)
- Physical activity (1 + 1)
- Sleep (1)

https://www.parentmap.com/article/keep-kids-active-sports

Chemical exposures

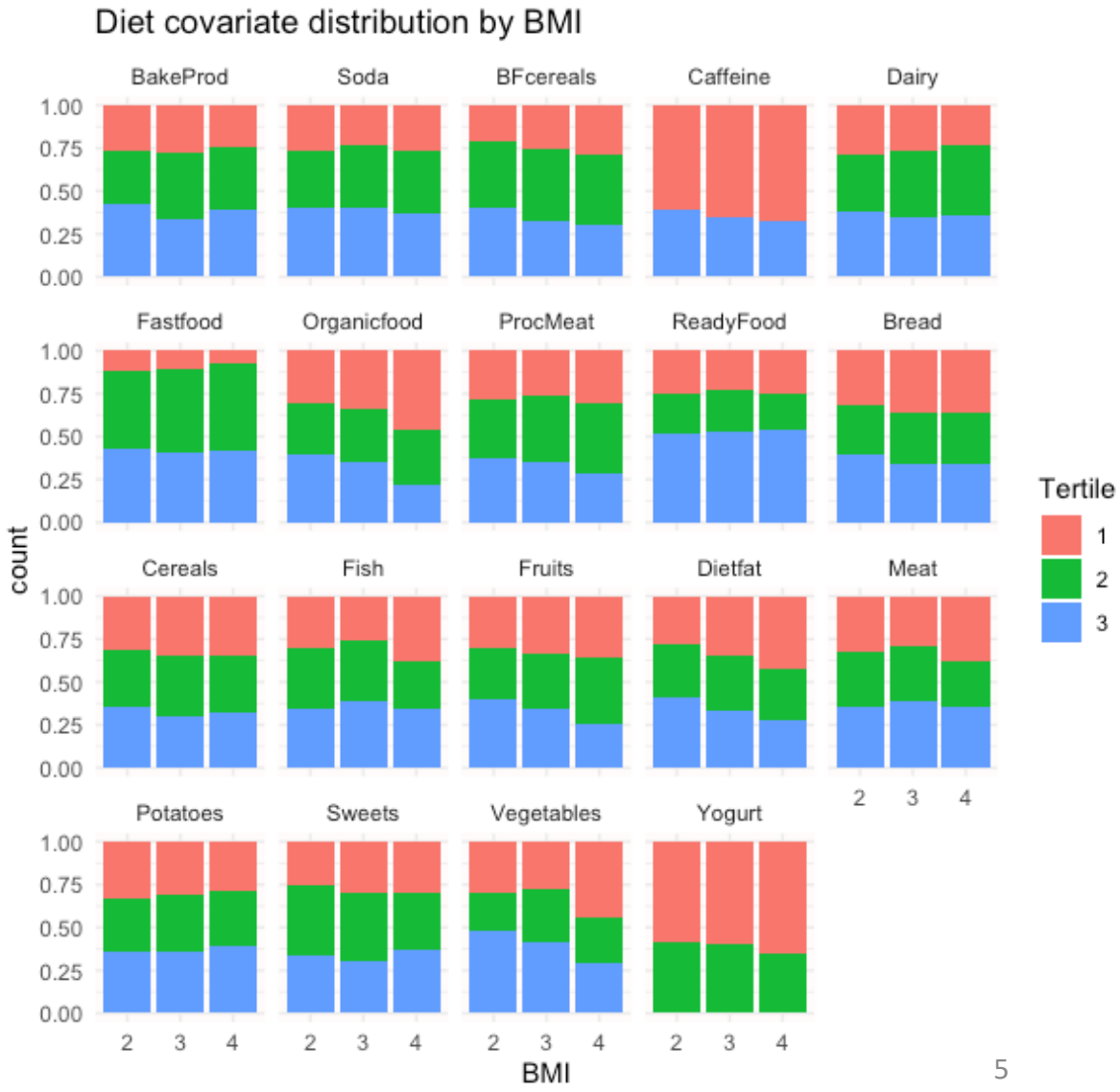
(40 exposures from 7 families plus cotinine)

- Metals (10)
- Organochlorine compounds (OCs, 4)
- Organophosphorus (OP) pesticides (5)
- Polybrominated diphenyl ethers (PBDEs, 2)
- Perfluoroalkyl substances (PFASs, 5)
- Phenols (7)
- Phthalates (7)
- Cotinine

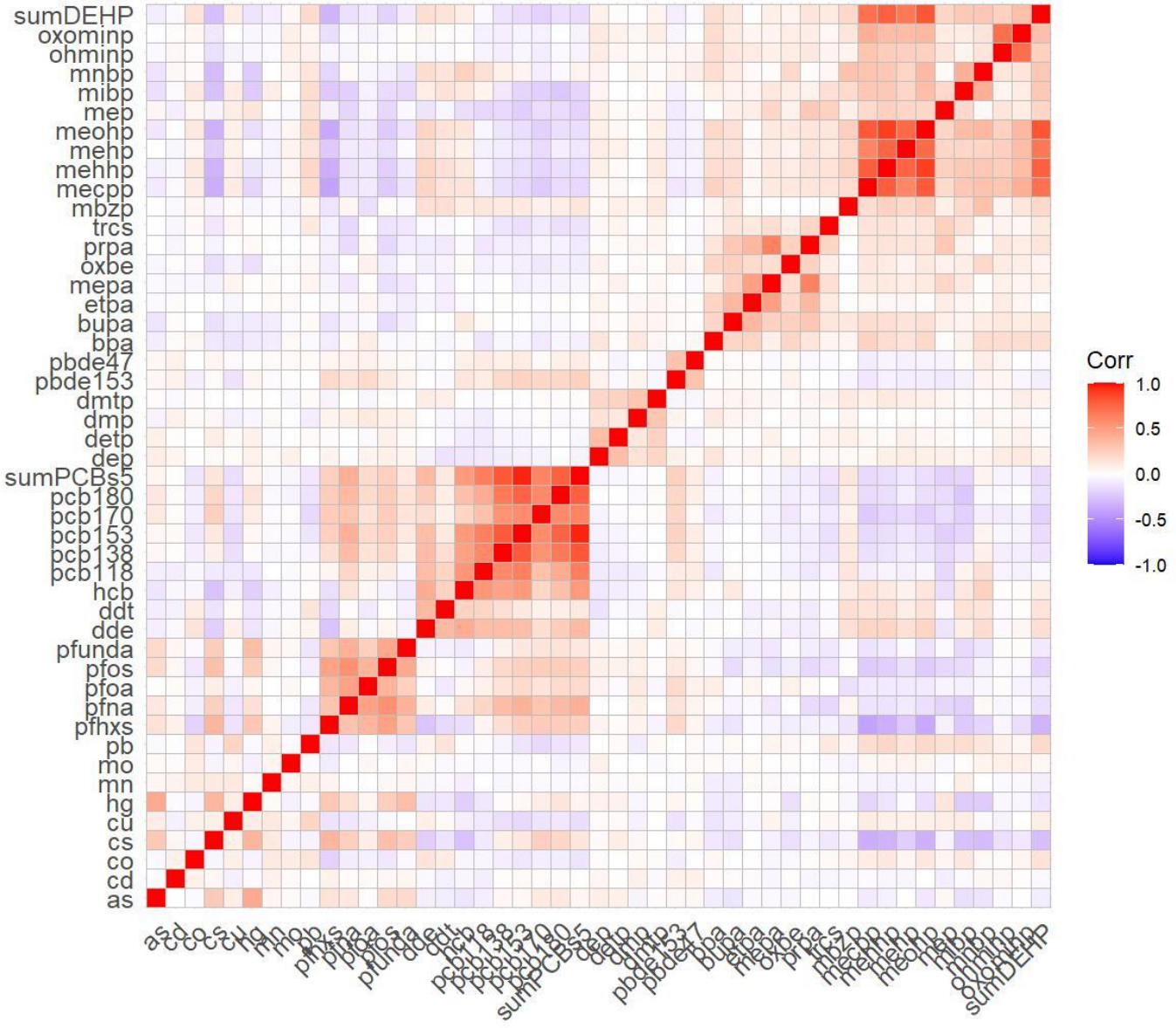
Challenges: exposure data

Lifestyle exposures

- Categorical and continuous covariates
- Diet covariates summarized into tertiles
- Several diet covariates are ambiguous aggregates (e.g., potatoes/ French fries case)



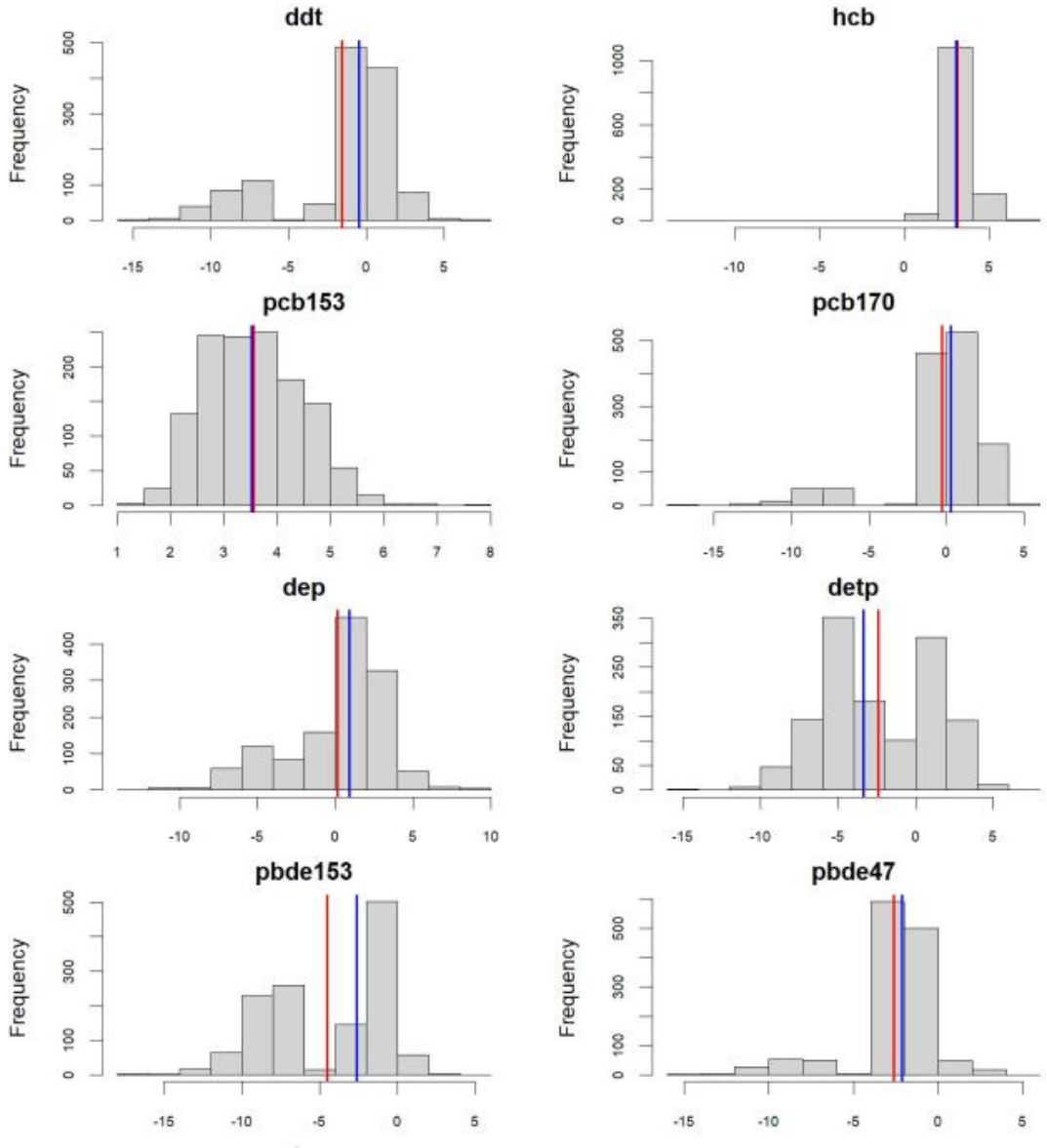
Challenges: exposure data



Chemical exposures

- Correlation between compounds

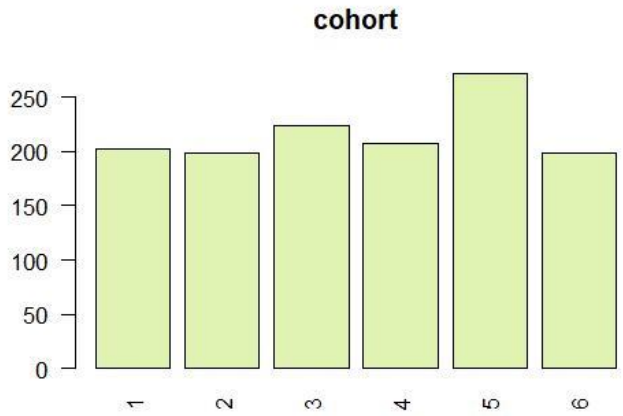
Challenges: exposure data

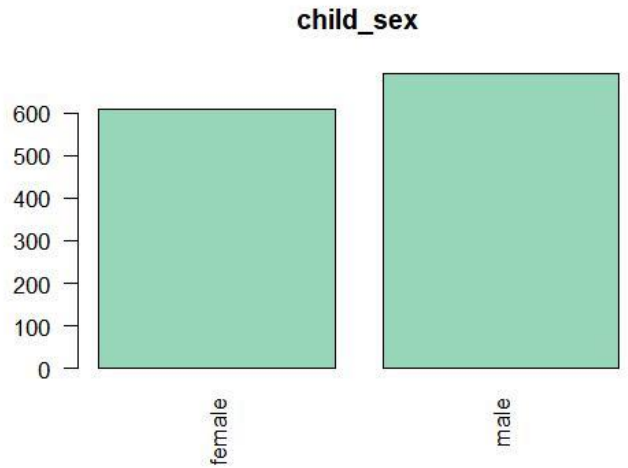


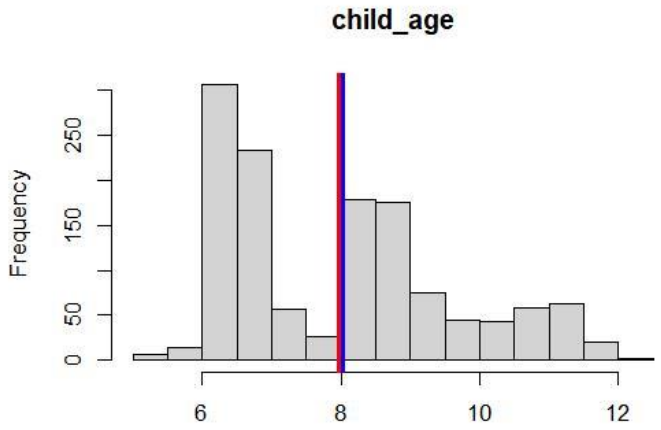
Chemical exposures

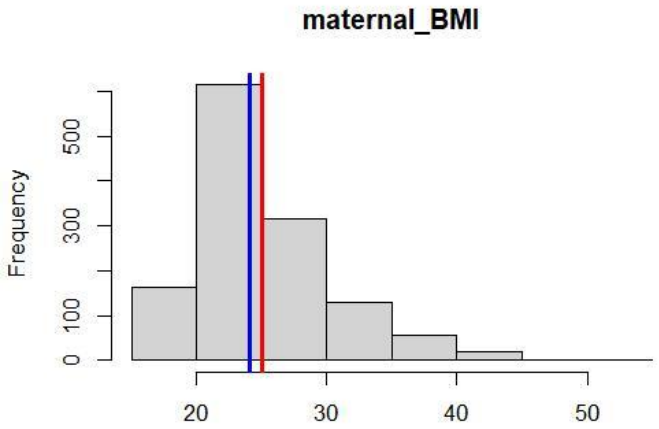
- Correlation between compounds
- Compound distribution

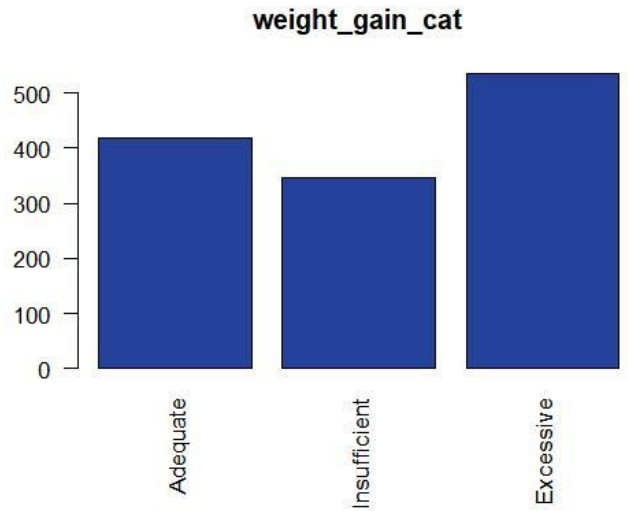
Challenges: confounding factors

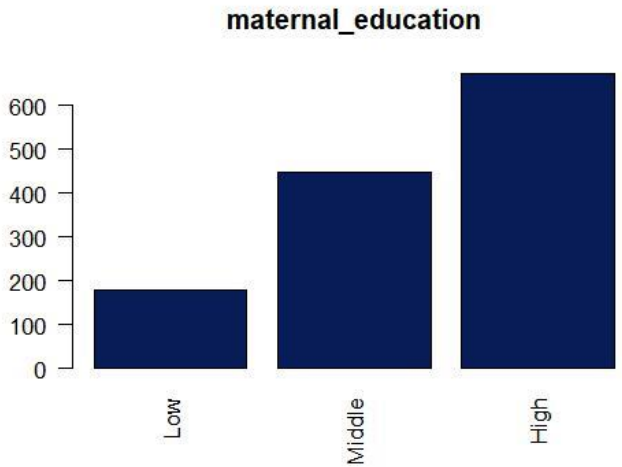






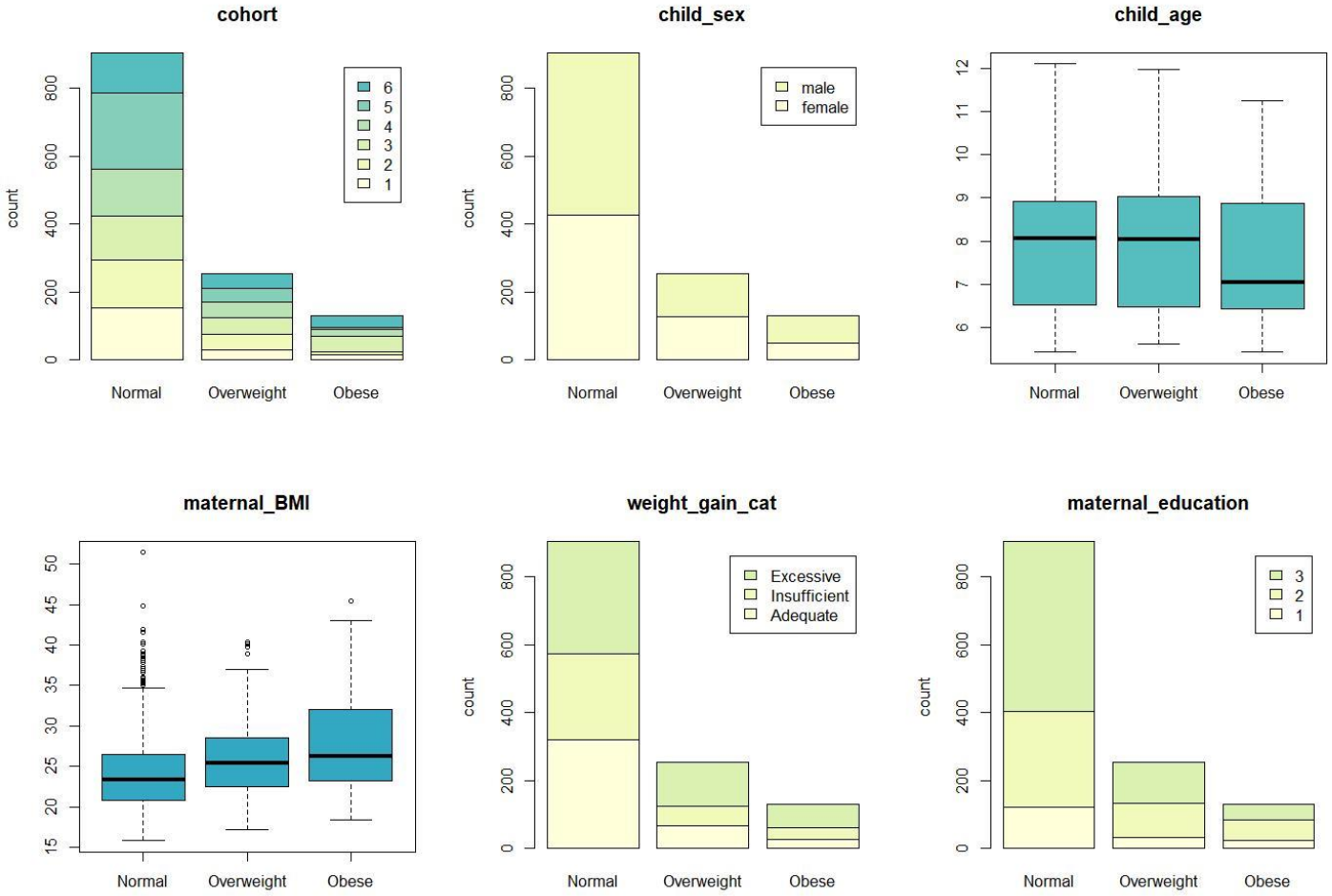




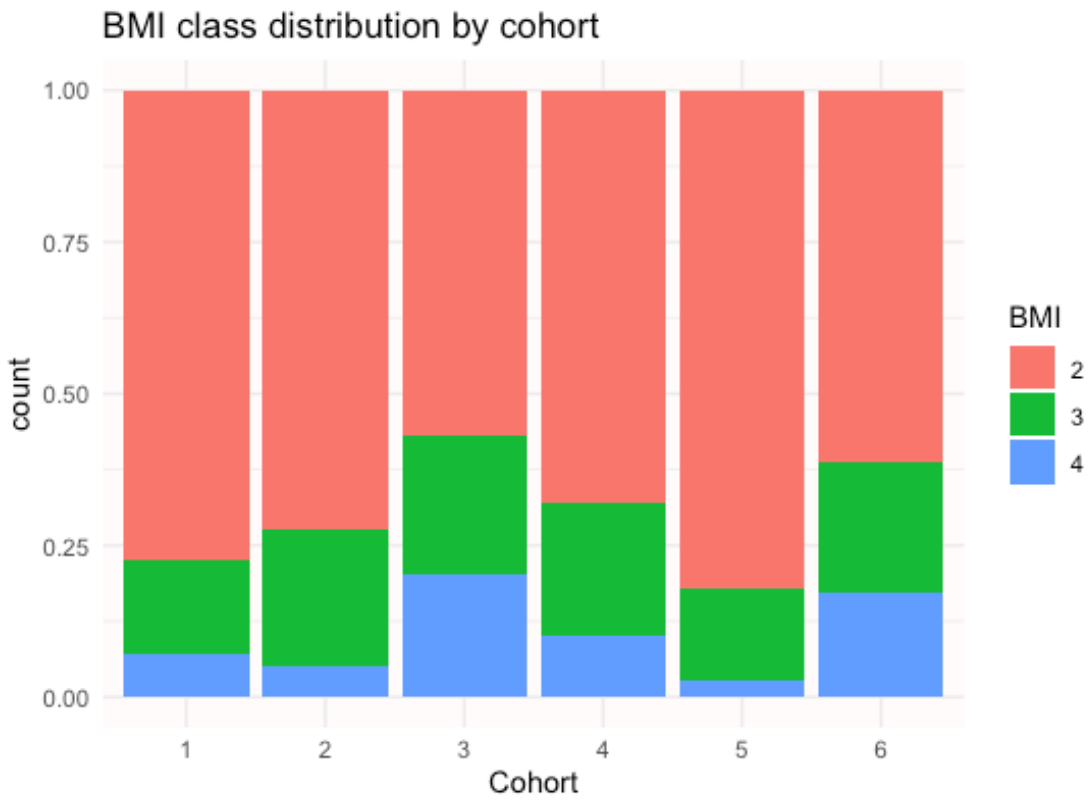


Outcome: child BMI class

- Many confounding factors



- Unbalanced BMI classes

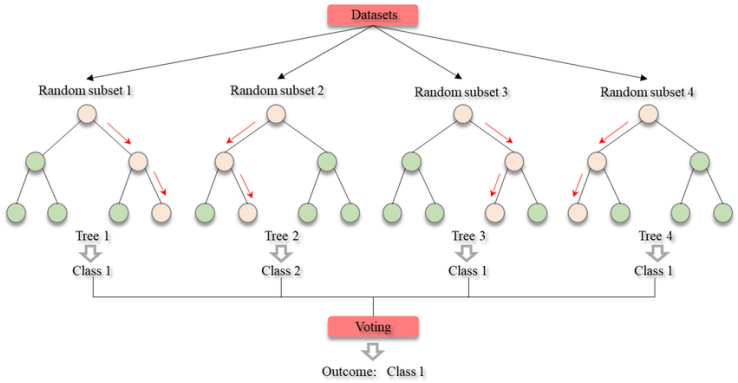


Method overview

A multi-step approach to define an individual profile for each exposure family

Searching for best predictors of child BMI

Multivariate Ordinal Random Forests



- Apply to mixed data
- Adjustment on confounding factors
- Ranking of predictors (variable importance)
- Can handle unbalanced classes

Interpretation and curation of findings

Univariate Ordinal Logistic Regression

(estimate associated risk and effect direction)

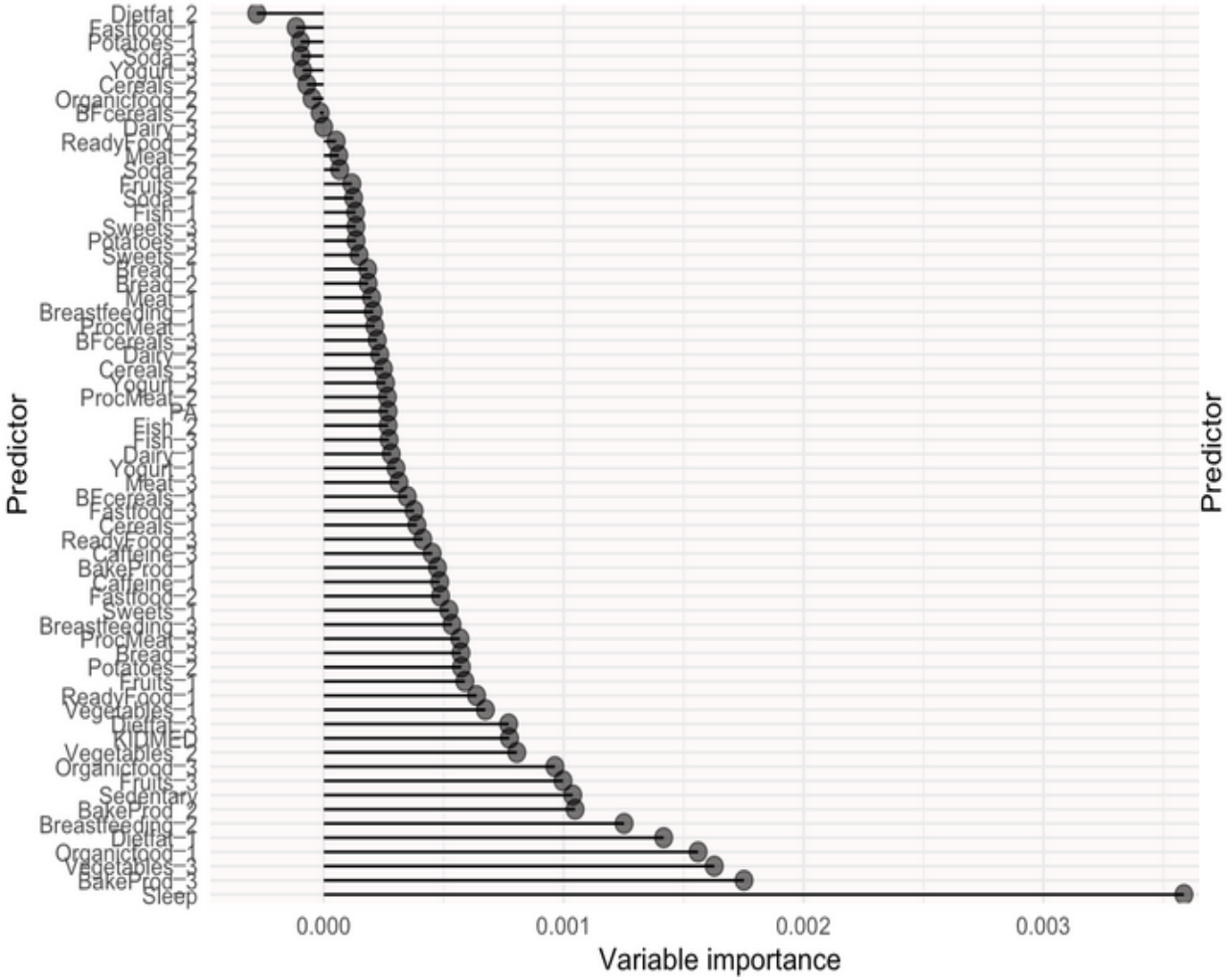
Multiple Correspondence Analysis (MCA)

(graphical exploration of mixing between exposures)

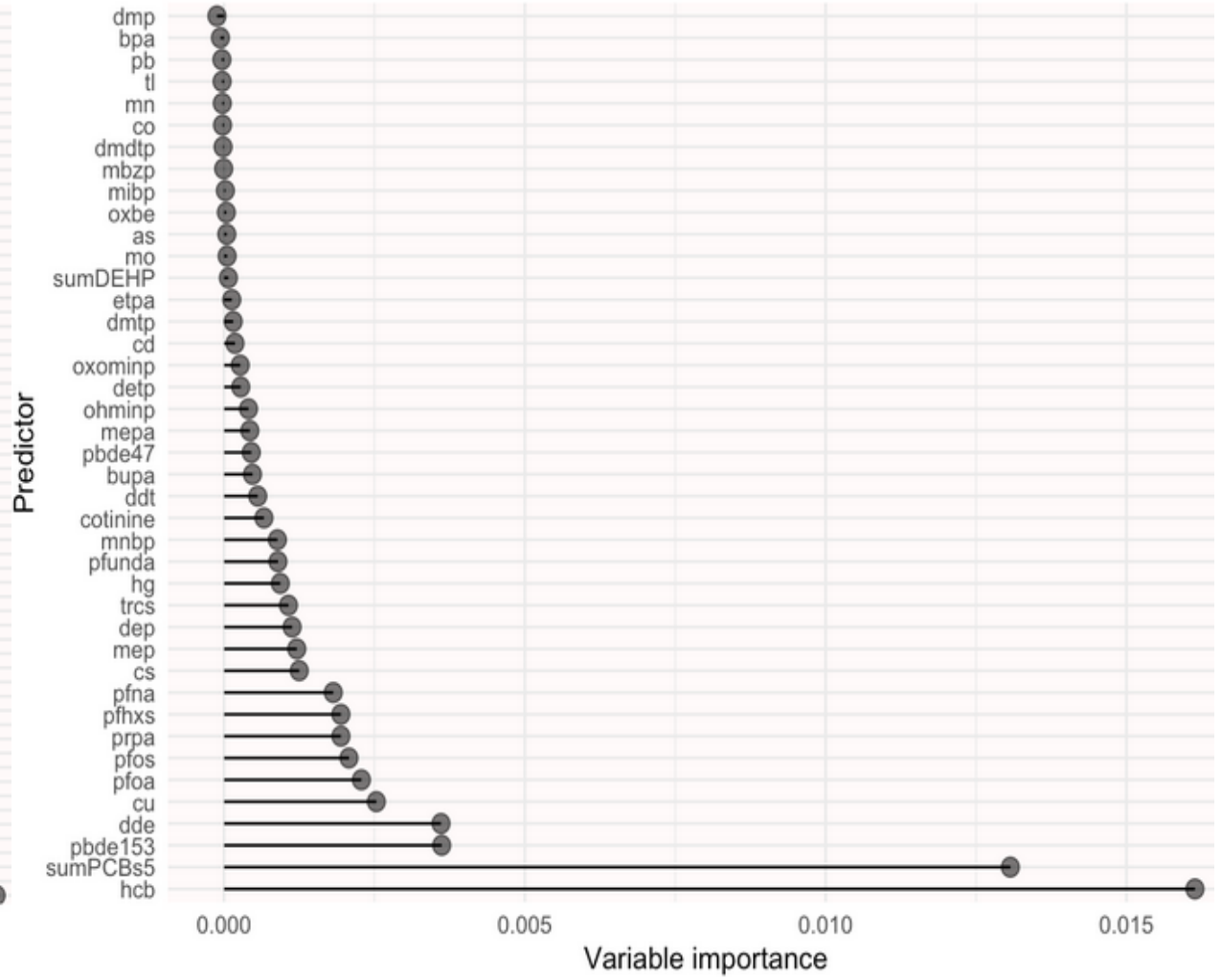
Detect spurious/indirect associations

Results – Ordinal Random Forests

Lifestyle exposures

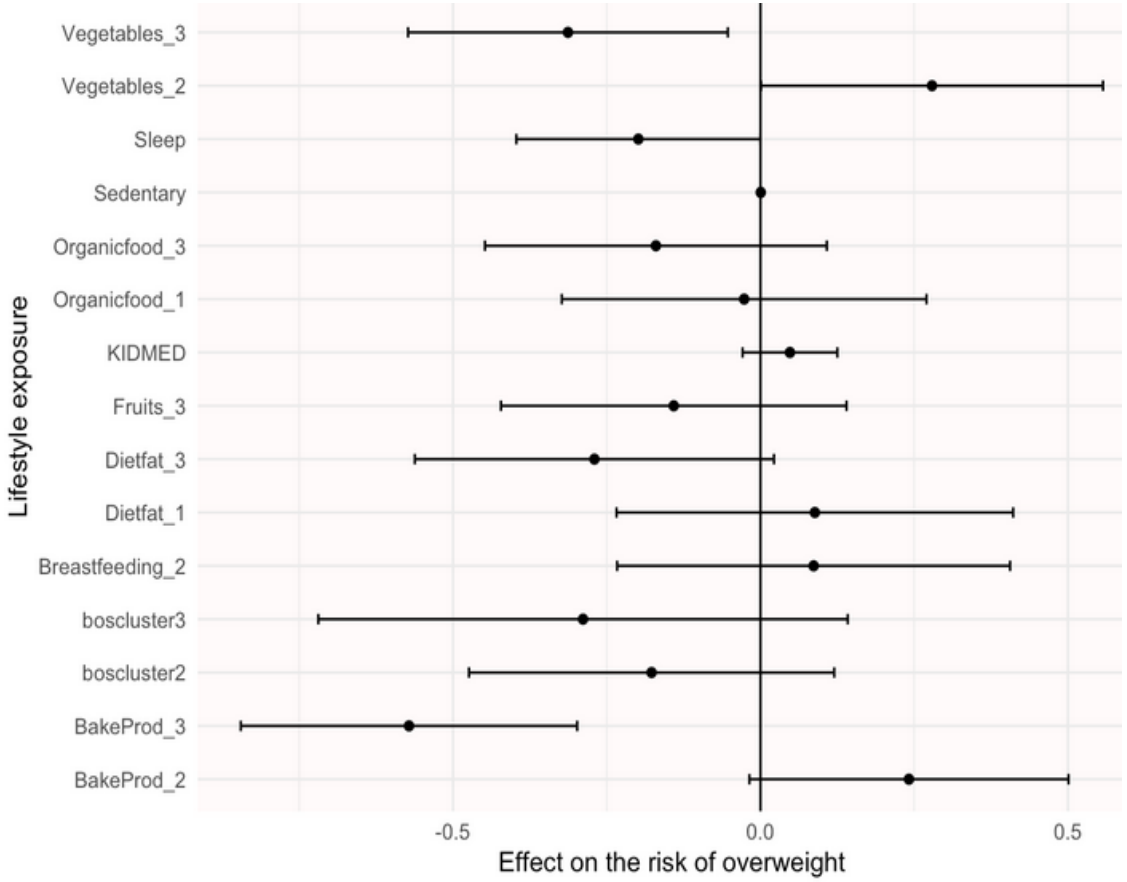


Chemical exposures

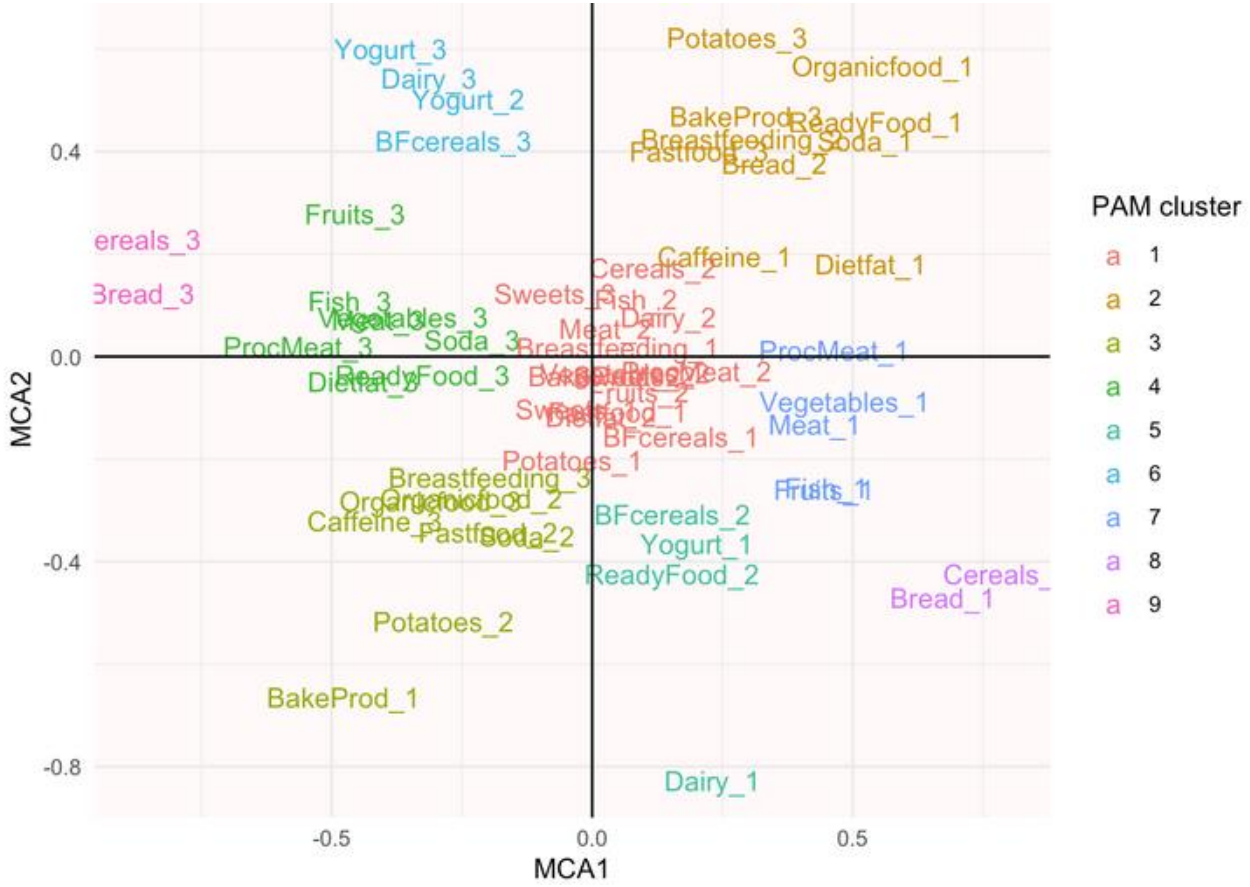


Lifestyle - Results interpretation

Univariate ordinal logistic regression

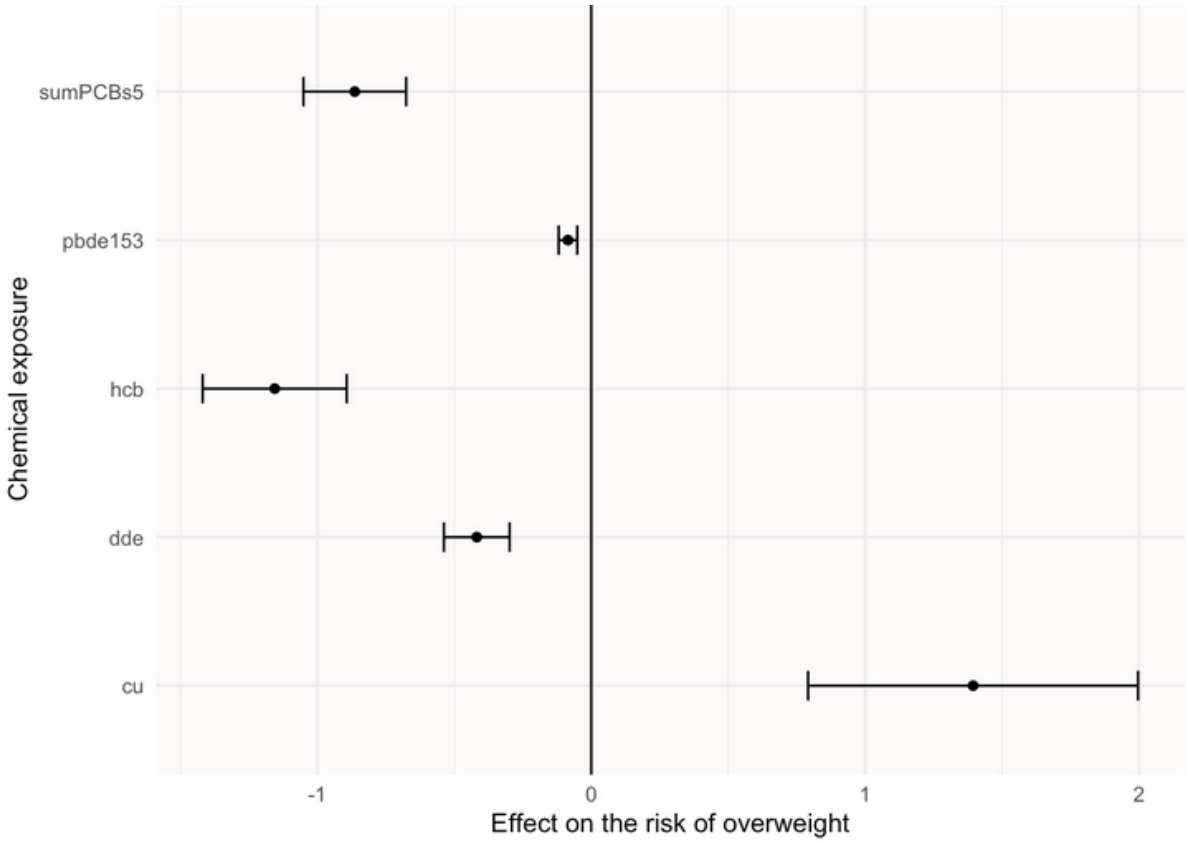


MCA



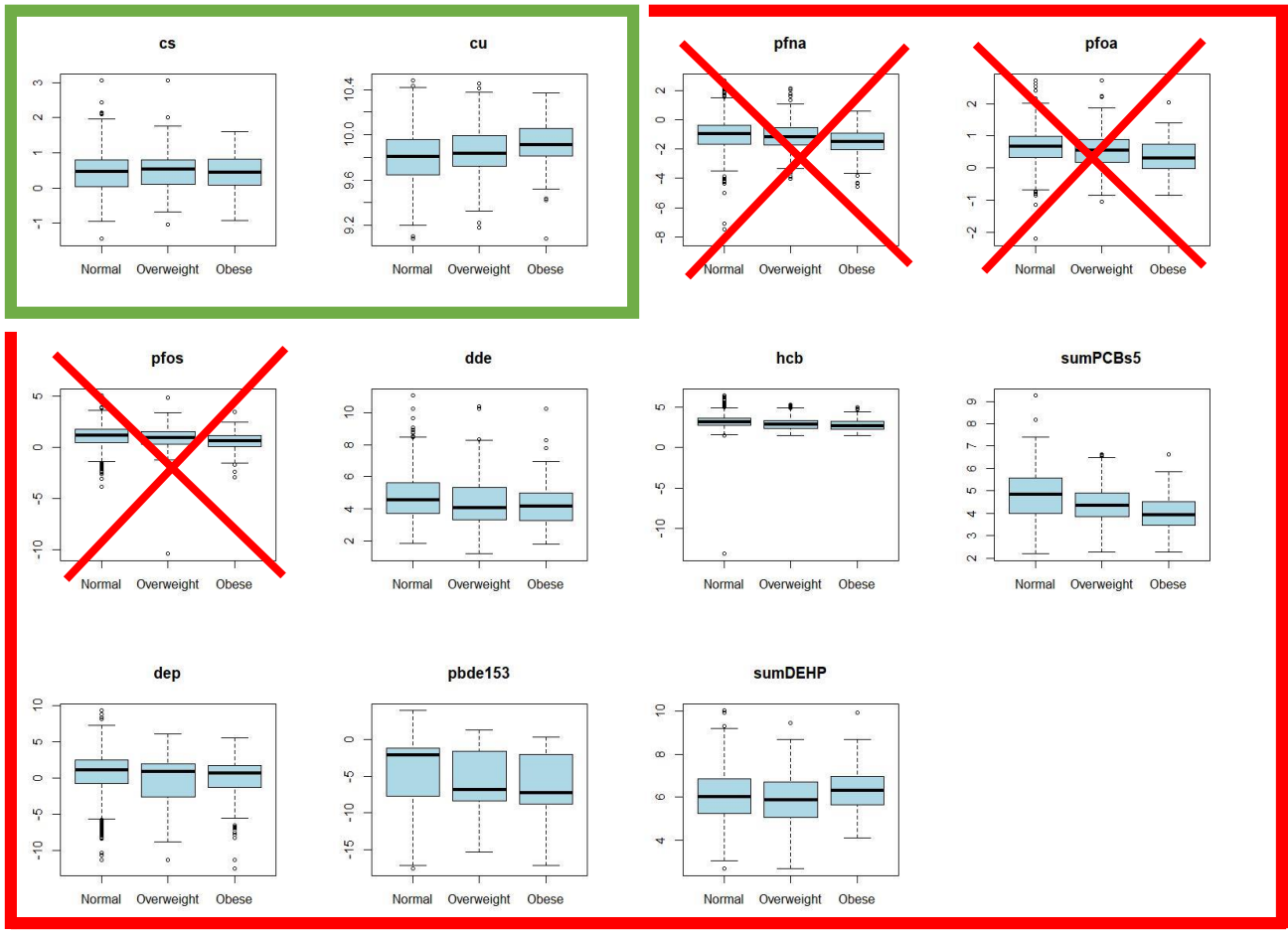
Chemicals - Results interpretation?

Univariate ordinal logistic regression



Exposures selected basing on the predictive importance

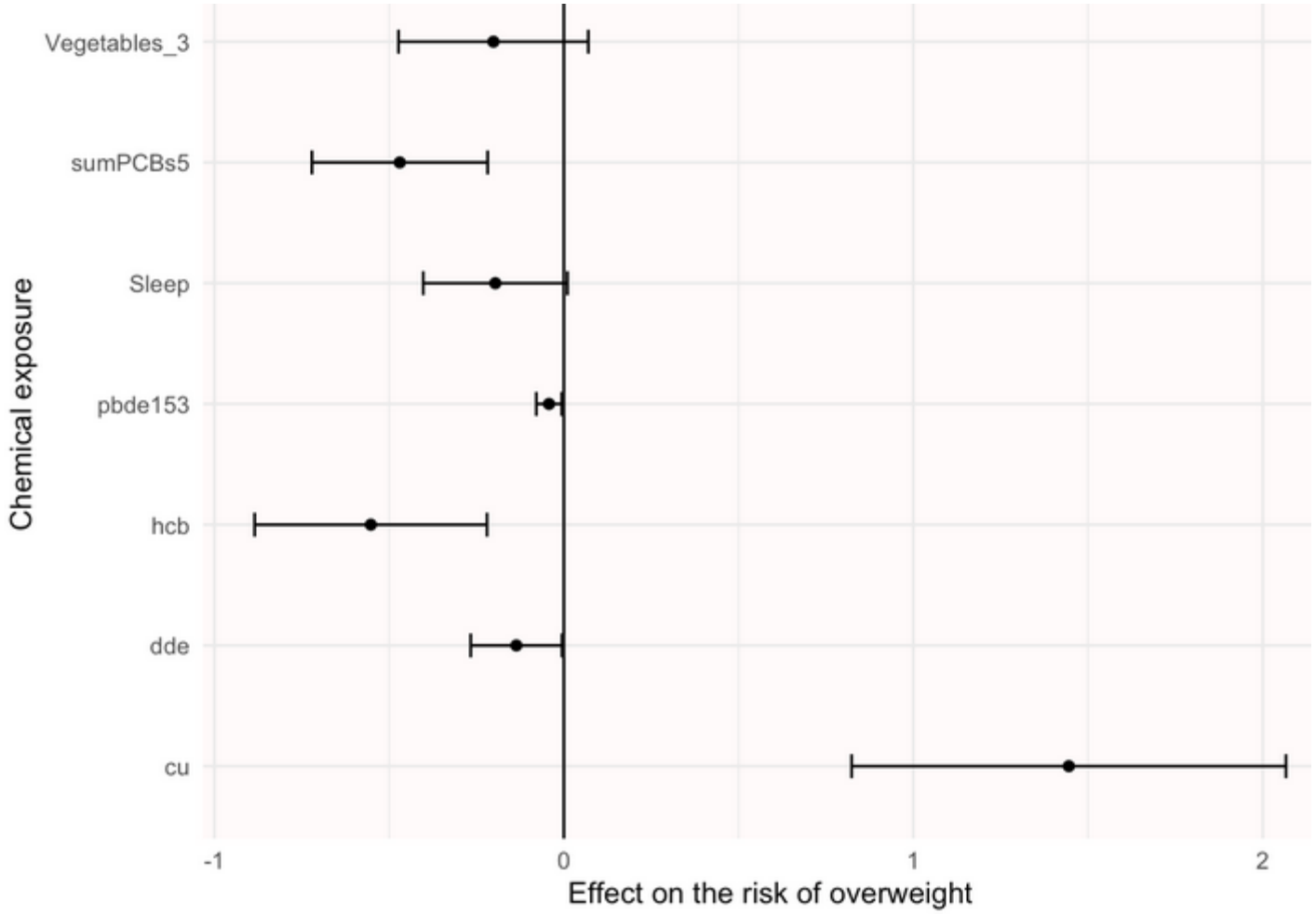
Multivariate ordinal logistic regression



Exposures selected basing on p-value (< 0.05)

Results – combined effect of lifestyle and chemicals

Multivariate ordinal logistic regression

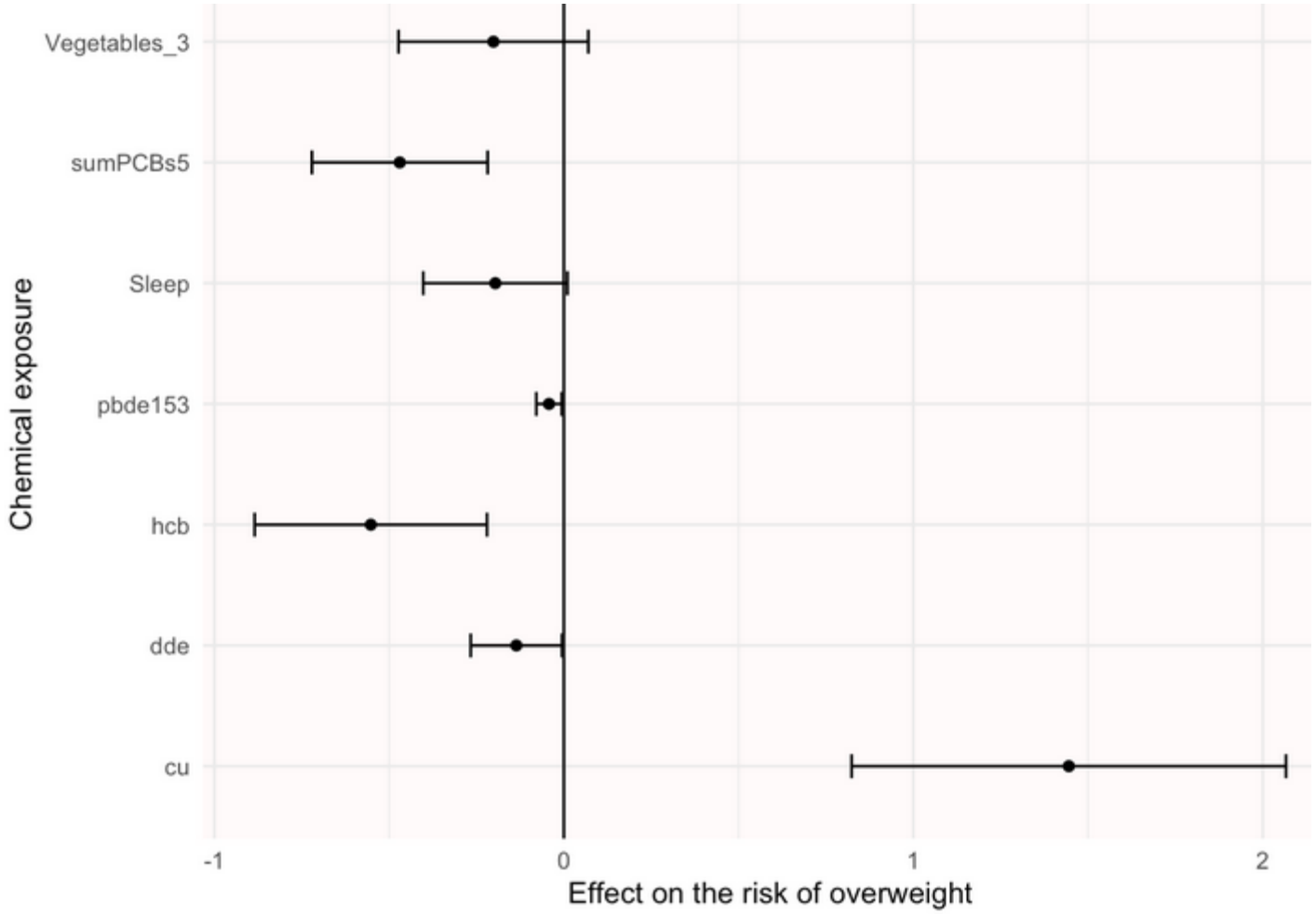


Lifestyle

- Sleep and Vegetables were associated with lower risk of overweight
- Complexity of diet (eg: mixtures, compensatory behaviours)
- Binning into tertiles possibly results in a lost of information and spurious associations
- Ambiguous aggregates (eg: potatoes/ French fries case); possible interactions with SES

Results – combined effect of lifestyle and chemicals

Multivariate ordinal logistic regression

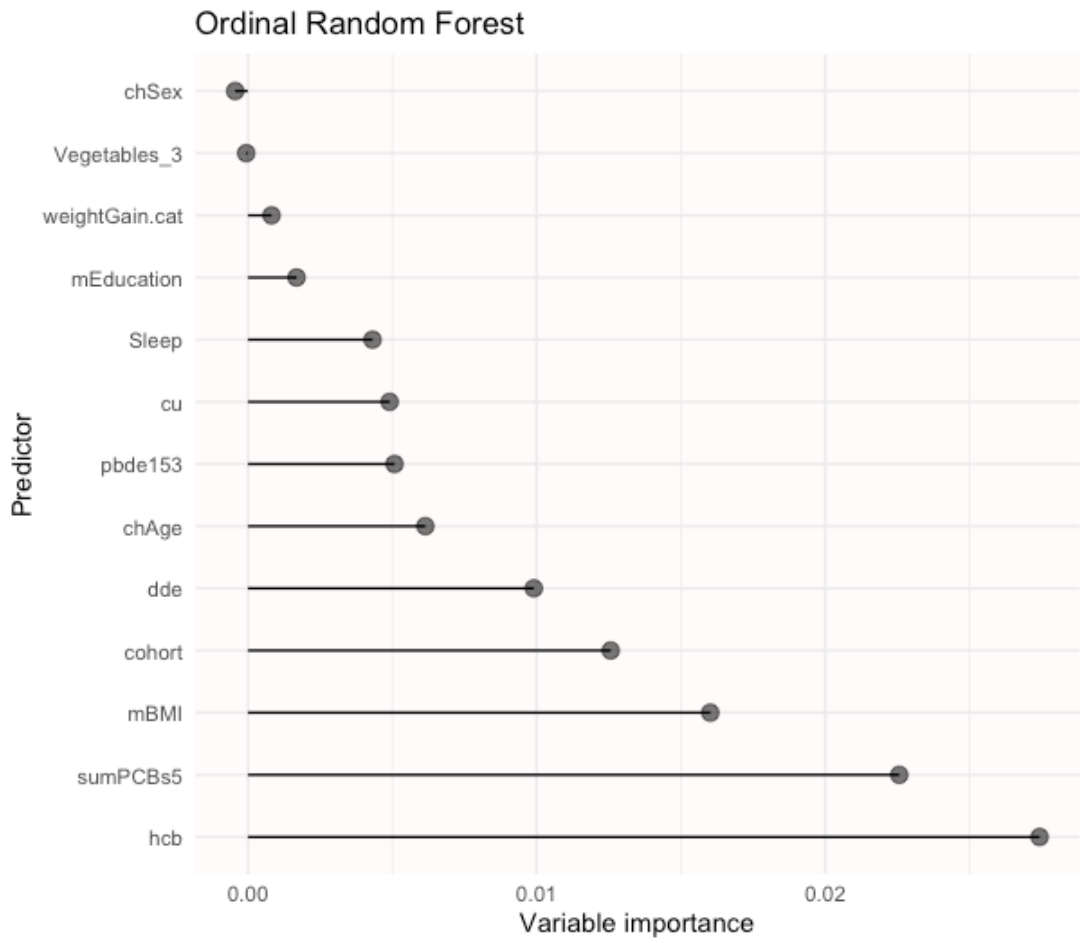


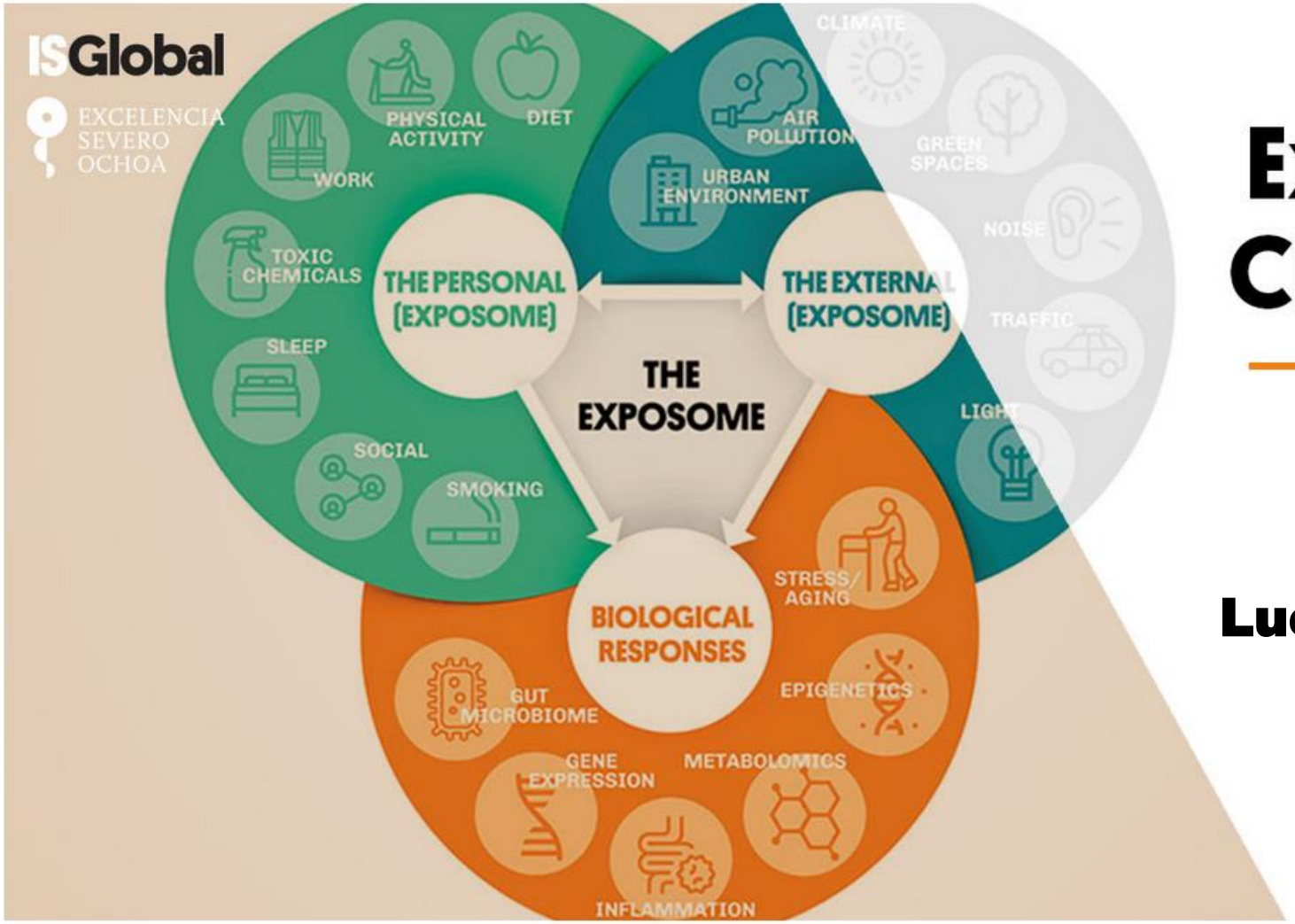
Chemical compounds

- Essential metal Cu was associated with higher risk of increased BMI
- Lipophilic compounds: organochlorine compounds (PCBs, DDE and HCB) and polybrominated diphenyl ether (PBDE-153) were associated with lower risk of increased BMI

Discussion

- Socio-economic factors are known to be major determinants of overweight and obesity
- We identified a number of lifestyle and chemical exposures associated with child BMI
- The predictive value of exposures was not equal and chemical exposures tended to be better predictors than lifestyle
- Some chemical exposures had more predictive power than confounders
- Several surprising associations with lifestyle exposures could be understood and curated
- But this warns on the meaning of associations found with chemicals
- Chemicals might be indirect predictors, partly surrogates for hidden socio-economic factors (e.g., HCB in rural and industrial areas)





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THANK YOU FOR YOUR ATTENTION