Exposure to PFAS in firefighters and its associations with biomarkers of thyroid function (CELSPAC-FIREexpo Study)

Petr Gregor, Soňa Skřídlová, Jana Navrátilová, Aleš Pindur, Maribel Casas, Klára Komprdová, Jan Kuta, Katarína Řiháčková, Petr Šenk, Nina Pálešová, Nuria Güil, Martine Vrijheid, Pavel Čupr

newly recruited firefighters (n=58) & professional firefighters (n=52)

all 18–35 years blood serum urinary

questionnaires

Exposure: PFAS (blood)

Thyroid health: TSH, T3, FT3 T4, FT4

Lifestyle: Age BMI Smoking Occupation

Generalized Linear Regression (GLM)

Quantile G-Computation (QGcomp) for mixtures of chemicals

False discovery rate correction (FDR)

PFUnDA and PFDA significantly positively associated with FT3 and T3

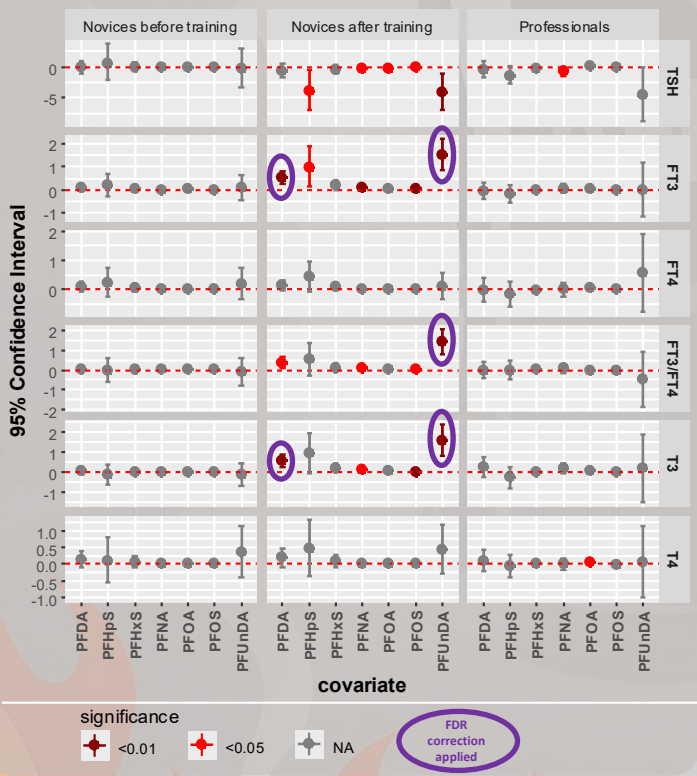
STATISTICAL ANALYSES & RESULTS

Generalized Linear Model (GLM) with **Gamma distribution** and **log link function** used to model PFAS exposure and thyroid hormone levels.

Gamma distribution: Suitable for continuous, positive, skewed data (typical of hormone concentrations)

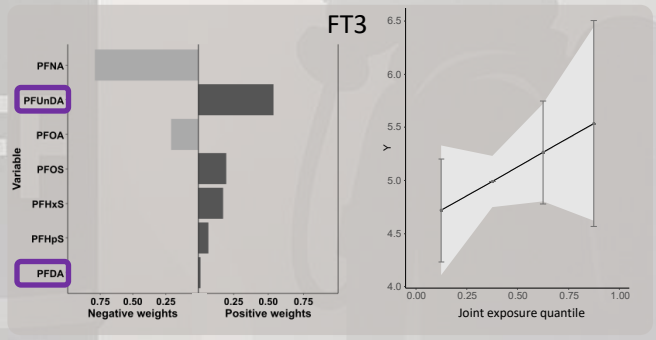
Log link function: Ensures positive predicted values and stabilizes variance, essential for skewed data like thyroid hormones.

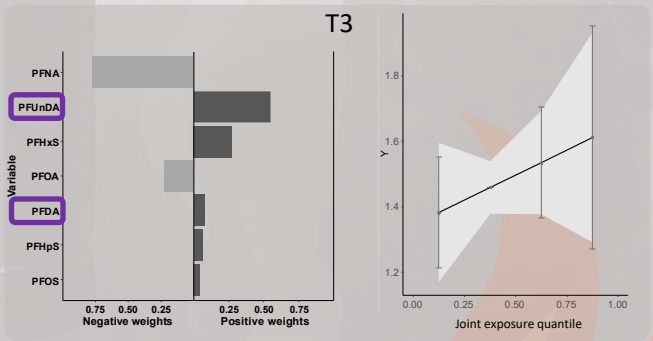
GLM framework accounts for heteroscedasticity (variance changes) and provides accurate associations

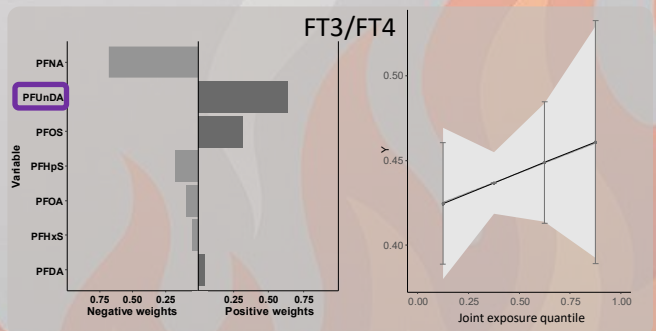


Quantile G-Computation (QG)

- applied to study complex relationships in chemical exposure data, including the effects of mixtures of chemicals
- non-linear relationships and interaction effects
- identifies specific thresholds and subgroups where associations are most pronounced
- enhances understanding of exposure-response relationships, providing deeper insights into PFAS-induced thyroid disruption







Hyperthyroidism ⇒ Inflammatory processes (Inflammation disrupts normal tissue.) ⇒ Dysregulated cell signaling (Abnormal cellular activity) ⇓ Proliferation of cells (Excessive cell division.) ⇐ Genomic instability (DNA damage mutations.) ⇐ Potencial carcinomas (Malignant transformation leading to cancer.)

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