



NATIONAL INSTITUTE FOR HEALTH AND WELFARE

# **Fish consumption and PFAS – risk or over-estimated threat**

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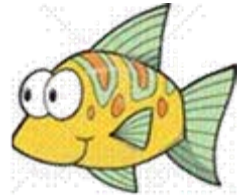
- Accredited laboratory T077, EN ISO/IEC 17025
- PCDD/Fs, PCBs, PBDEs, PFCs and organometals from several environmental and human matrices
- national reference laboratory for PCDD/Fs and PCBs in food and feed
- analytical services
- approx 20 employees



# Why to study a fish

## Health-promoting properties

- fish is a great source of protein and healthy n-3 fatty acids and vitamin D



## Health problem concerns

- fish contains environmental pollutants, such as dioxins, PCBs, organotinayhdisteitä, mercury and PFCs, which may cause severe health problems



# Fish and PFAS

**Fish is shown to be an important dietary source of PFAS for consumers**

- **high levels of PFAS – from 60 to 1100 ng/g - are found in fishes from certain areas (Giesy & Kannan 2001 Environ Sci Technol; Wilhelm et al. 2008 J Toxicol Environ Health A)**
- **positive correlations between PFAS body burdens and fish consumption in Polish and German sub-population (Falandysz et al. 2006 Environ Sci Technol; Hölzer et al. 2008 Environ Health Perspect)**



# Finnish study population

- **n=301 (139 men, 162 women)**
- **128-item food frequency questionnaire**
- **Study population (professional fishermen and their relatives) with high fish consumption 70 g/day (general Finnish population 45 g/day)**
- **PFAS in serum were analyzed with LC-MS/MS (poster Koponen et al.)**



# Finnish study population



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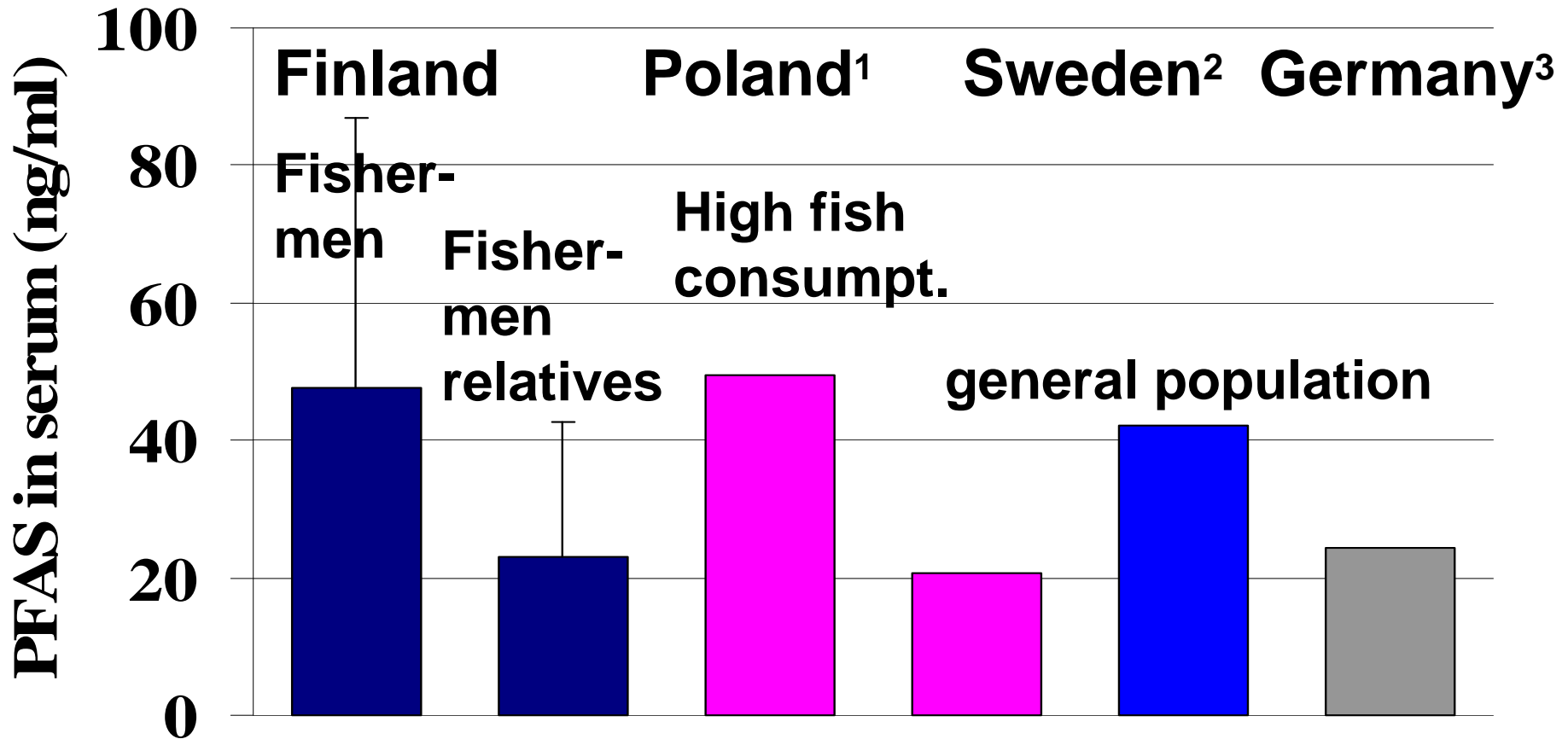
PERFOOD WORKSHOP, June 15-17, 2011, Amsterdam, The Netherlands

# PFAS in Finnish study population

- **PFAS concentration in serum ranged**
  - from 3.7 to 280 ng/ml men
  - from 3.2 to 100 ng/ml women
- **The main compounds were**
  - perfluorooctanesulfonate (PFOS) 70%
  - perfluorooctanoate (PFOA) 14%
  - perfluorohexanesulfonate (PFHxS) 7%
  - perfluorononanoate (PFNA) 7%



# PFAS in European population



1 Falandysz et al. 2006 Environ Sci Technol

2 Kärrmann et al. 2004 Organohalogen Compd, 2006 Chemosphere

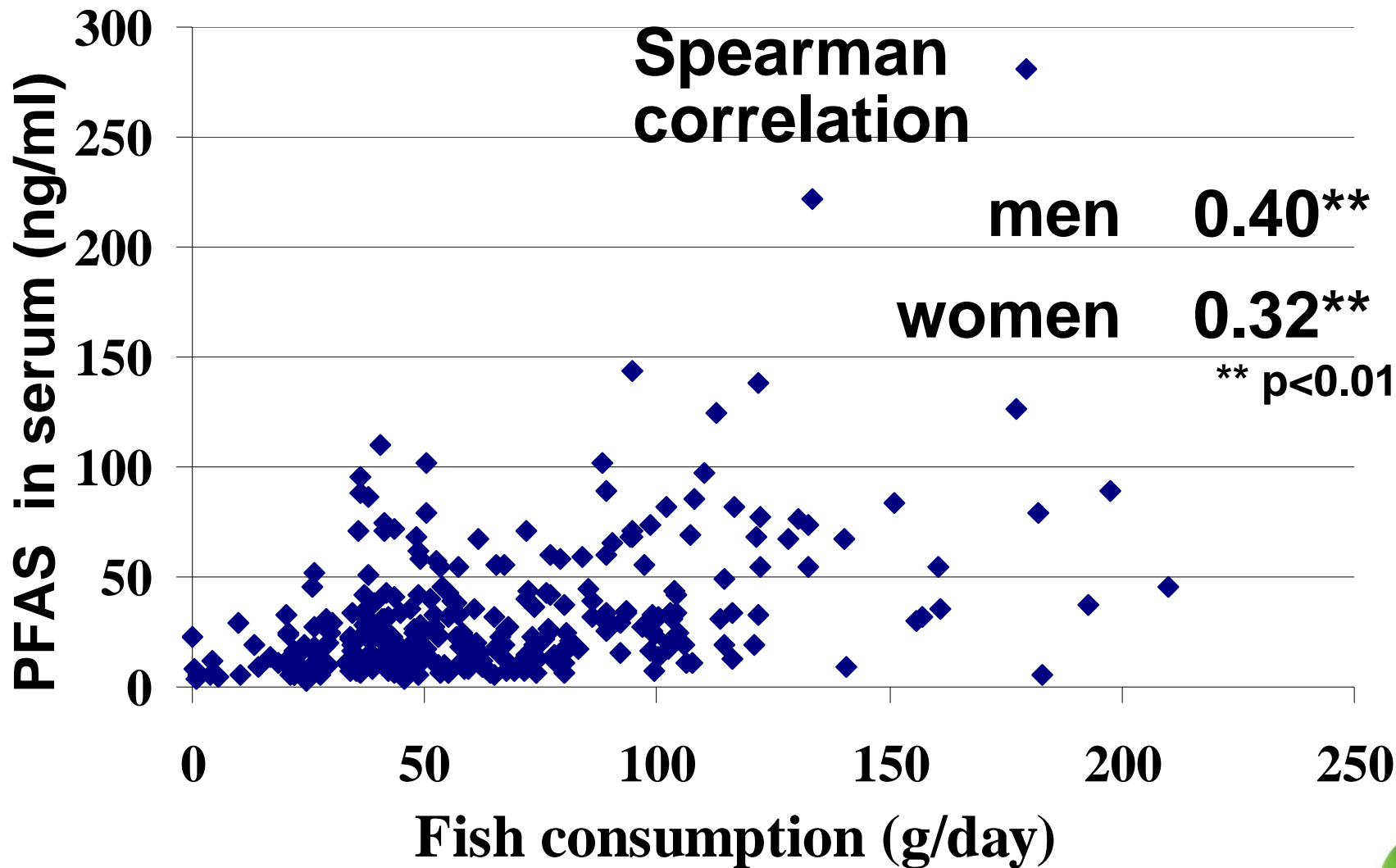
3 Midasch et al. 2006 Int J Hyg Environ. Health; Fromme et al. Int. Arch Occup Environ Health 2007

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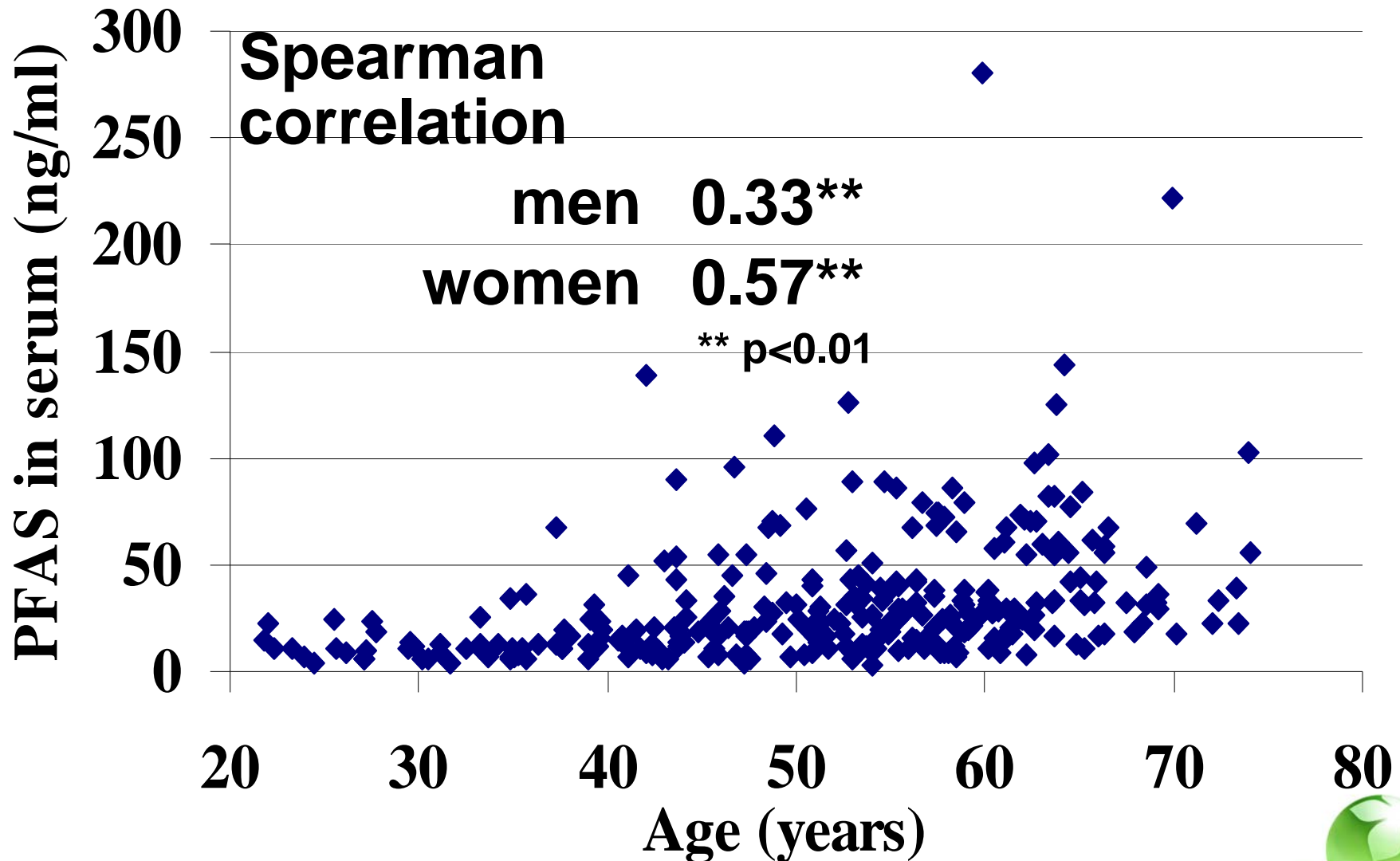




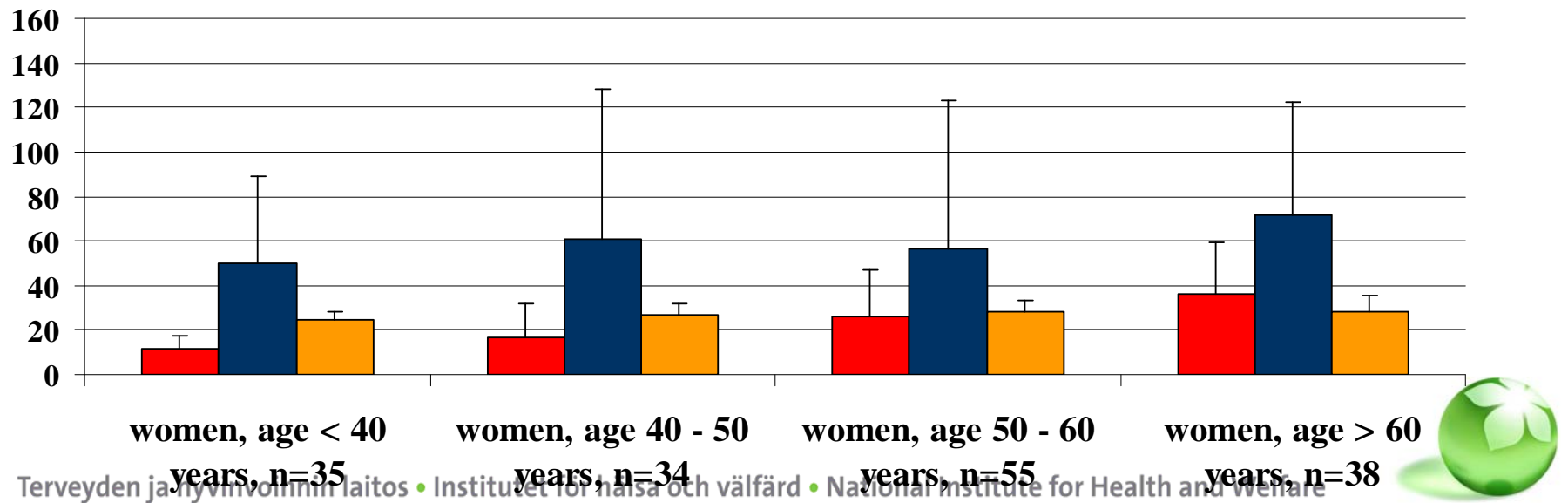
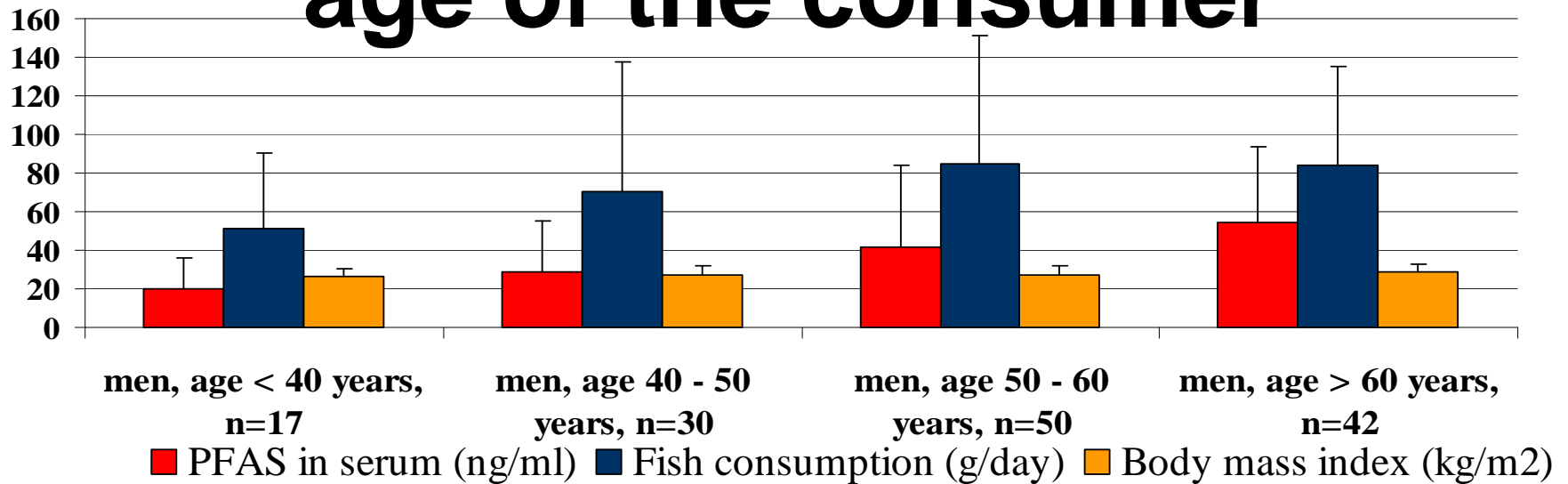
# PFAS vs. fish consumption



# PFAS vs. age of the consumer

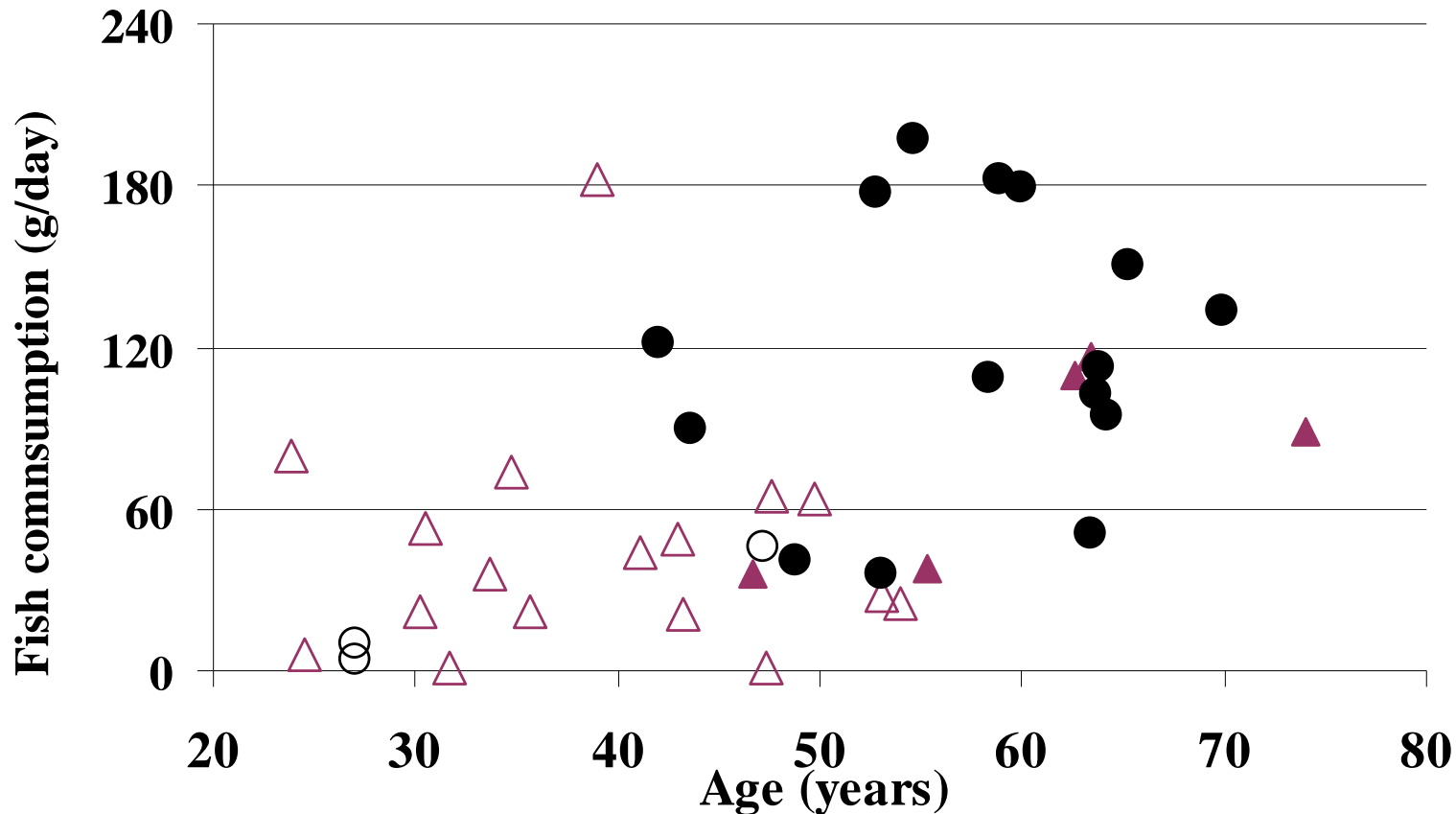


# PFAS vs. fish consumption and age of the consumer



# PFAS vs. fish consumption and age of the consumer

- △ Women low PFAS
- Men, low PFAS
- ▲ Women, high PFAS
- Men, high PFAS



# PFAS TDI vs. serum level

- **Tolerable daily intake (TDI) for PFOS was set at 150 ng/kg b.w. (European Food Safety Authority, 2008)**
- **Serum concentration for PFAS is estimated to be 1700 ng/ml with daily intake of 150 ng/kg b.w. based on the parameters**
  - **body weight 80 kg**
  - **body serum volume 2500 ml**
  - **PFOS half-life 5.6 years (Olsen et al. 2007 Environ Health Perspect)**
  - **absorption of the PFOS cumulative intake 5.5% (Seacat et al. 2003 Toxicology)**



# PFAS TDI vs. serum level

- **Based on the previous parameters the estimated average daily intake for Finnish high fish consumption population is 4 ng/kg b.w. resulting in the serum concentration of 46 ng/ml**
  - **Finnish fishermen PFAS serum concentration was 47 ng/ml (range 9 – 280 ng/ml)**



# Conclusions

- **Positive correlations between PFAS serum concentration and fish consumption in Finnish sub-population was observed, but**
- **The high fish consumption is NOT a risk in Finland regarding the PFAS intake**



# ACKNOWLEDGEMENTS

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**norden**

***NORDFLUOR*** - Nordforsk Network for  
Research on Fluorinated Compounds





*Thank you for  
your attention*

