

Do Product Labels Predict the Presence of PFAS in Consumer Items Used by Children and Adolescents?

NORTHEAST CONFERENCE
THE SCIENCE OF PFAS:
Public Health & The Environment

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Objectives

- Measure PFAS in consumer products commonly used by children and adolescents
- Compare concentrations of specific PFAS compounds and PFAS precursors (TOP assay) among various product types
- Evaluate whether marketing language and information on product labels can be used to identify PFAS-free products



8 product types with long exposure duration

Product category

Rugs

Upholstery

Bed / crib sheets

Mattress / crib mattress protectors

Pillow protectors

Clothing, including school uniforms

Menstrual underwear

Miscellaneous infant products



5 categories based on marketing language and product labels



- Stain- or water-resistant with trademark (e.g., Scotchgard)



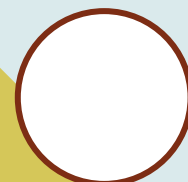
- Stain- or water-resistant
- No trademark treatment indicated



- Stain- or water-resistant
- Non-toxic or “green” language or certification (e.g., Oeko-Tex)

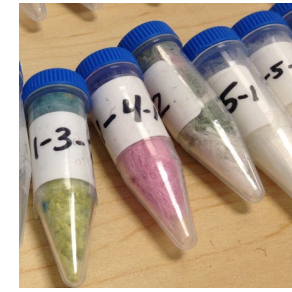


- Not stain- or water-resistant
- Non-toxic or “green” language or certification



- Not stain- or water-resistant
- No non-toxic or “green” language

3 Types of analytical measurements



93
items

Total fluorine

- ▶ Combust sample, measure total fluorine released
- ▶ Used to screen products for PFAS

61
items

Targeted PFAS





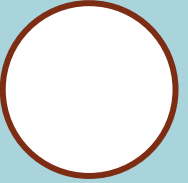
- ▶ Methanol extraction with LC/MS/MS
- ▶ Measure 36 specific PFAS, extended US EPA 537.1

30
items

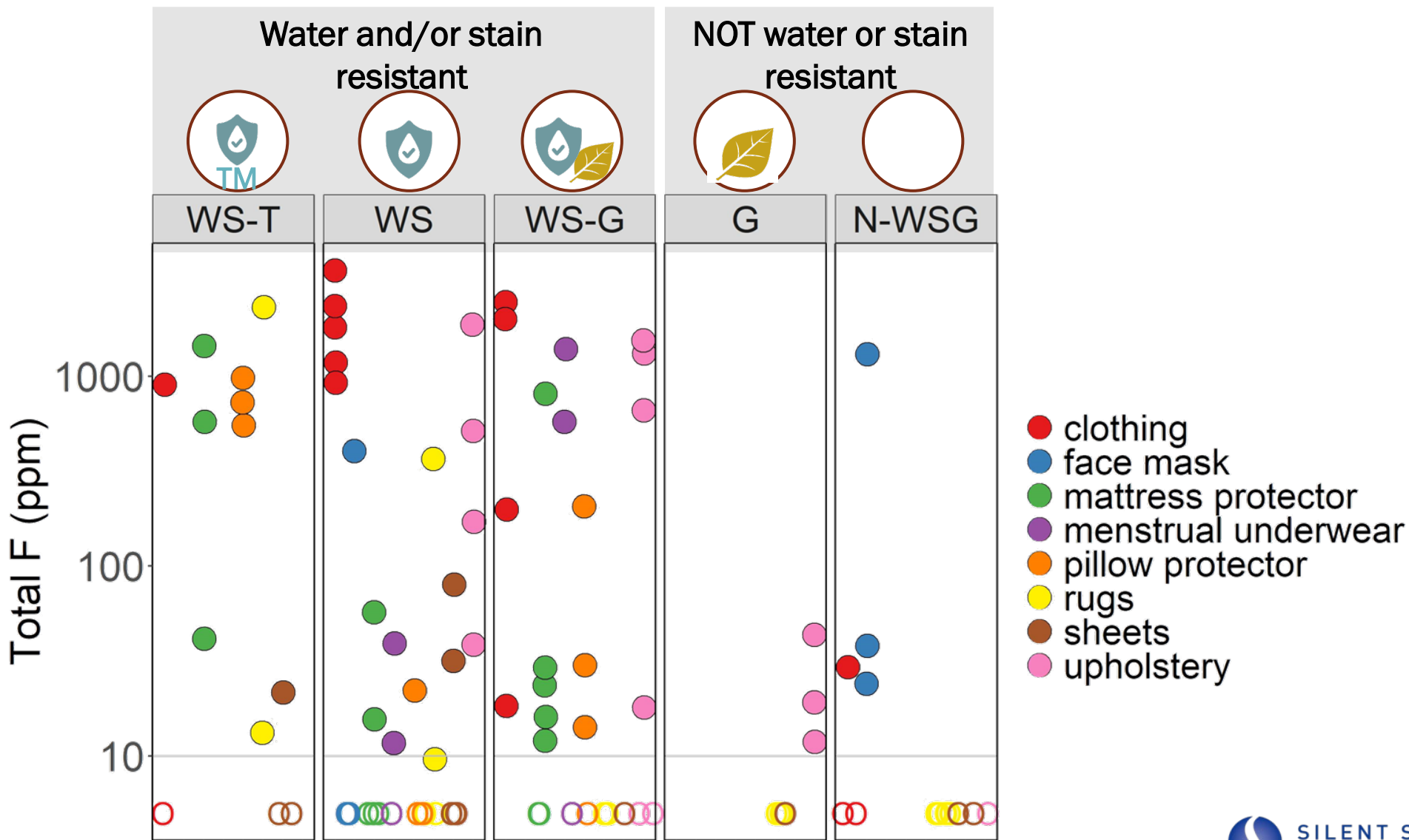
Total Oxidizable Precursor analysis

- ▶ LC/MS/MS after oxidation of methanol extracts
- ▶ Measure additional PFAS present as precursors

Samples screened for total F

					
Rugs	2	4	2	3	5
Upholstery	0	4	6	3	1
Sheets	3	5	1	1	2
Mattress protectors	3	5	7		
Pillow protectors	3	3	4		
Clothing	2	5	4		3
Menstrual underwear		3	3		

Total fluorine was detected more often in water- and stain-resistant items, regardless of “green” assurances



Detected

PFCAs

PFBA (C4)
PFPeA (C5)
PFHxA (C6)
PFHpA (C7)
PFOA (C8)
PFNA (C9)
PFDA (C10)
PFDoA (C12)
PFTA (C14)

PFSAs

PFBS (C4)
PFOS (C8)

Others

NMeFOSE*
NEtFOSE*

Not detected

PFCAs

PFUnA (C11)
PFTrDA (C13)
PFHxDA (C16)

PFSAs

PFPeS (C5)
PFHxS (C6)
PFHpS (C7)
PFNS (C9)
PFDS (C10)
PFDoDS (C12)

PF ethers

HFPO-DA
ADONA

FTSs

4:2 FTS
6:2 FTS
8:2 FTS
10:2 FTS






Others

NMeFOSA*
NEtFOSA*
NMeFOSAA
NEtFOSAA
PFODA
FOSA
9CI-PF30NS
11CI-PF30UdS

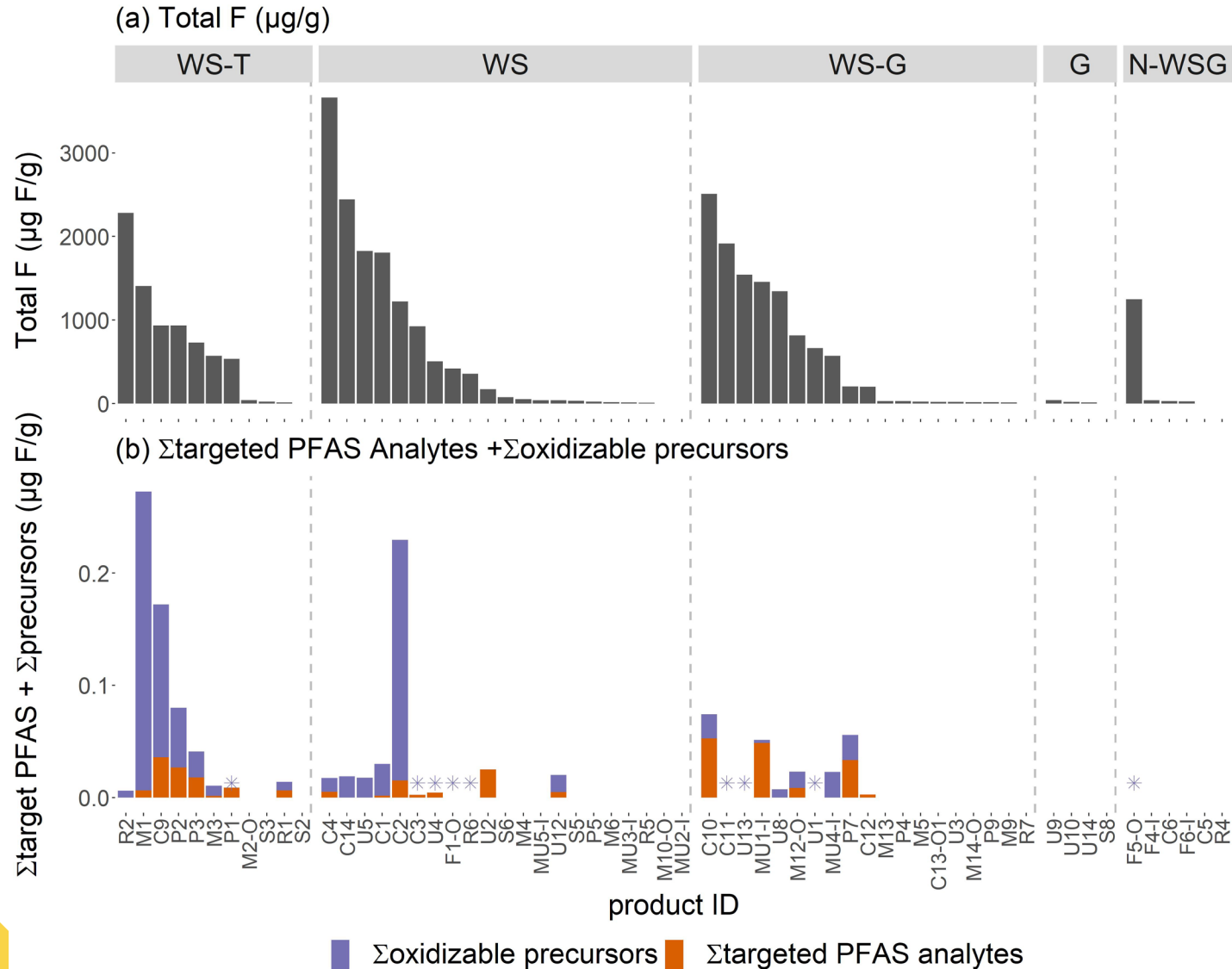
Both legacy and newer alternative PFAS were detected. PFOA was among the most frequently detected.

	#	PFHxA	PFBA	PFOA	PFBS
OVERALL	55	24%	15%	13%	9%
Rugs	6	17%	17%	17%	17%
Upholstery	9	22%	0%	22%	0%
Sheets	5	0%	0%	0%	0%
Mattress protectors	11	27%	9%	9%	9%
Pillow protectors	7	29%	29%	29%	29%
Clothing	11	45%	36%	0%	9%
Menstrual underwear	5	0%	0%	0%	0%
Misc. infant	1	0%	0%	100%	0%

PFAS were only detected in stain-resistant and waterproof products

	#	PFHxA	PFBA	PFOA	PFBS
	13	38%	38%	23%	38%
	19	26%	11%	11%	0%
	16	19%	6%	12%	0%
	4	0%	0%	0%	0%
	3	0%	0%	0%	0%

Most F unaccounted for and precursors were generally more abundant



Strengths and limitations

STRENGTHS

- ▶ Unique study design allowed us to evaluate usefulness of information on product labels to avoid PFAS
- ▶ Broad array of products
- ▶ Testing for precursors provided data on a wide range of PFAS

LIMITATIONS

- ▶ Total F may include inorganic F
- ▶ No volatiles PFAS tested
- ▶ Limited number of samples per product category
- ▶ One-time sampling may miss changes in formulations over time

Conclusions



▶ PFAS are common in products frequently found in children's homes. Some of the highest levels were found in clothing.

▶ Products with stain/water resistant labeling were more likely to have total fluorine above 100 ppm, regardless of "green" labels.

▶ Much of extractable PFAS were PFCA precursors, but vast majority of total F not accounted for.

▶ PFOA was among most frequently detected analytes. Long-chain PFAS were mainly in products from China.

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