Supporting Information

Per- and polyfluoroalkyl substances in North American School Uniforms

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Calibration description for PIGE analysis

Figure S2 reveals that as material thickness increases, the slope of the standard curve decreased, and the limit of detection increased. This thickness-dependent response was used to develop a standardized approach for determining accurate concentrations of fluorine in textiles where the thickness of each textile standard (from 180-620 μm) was plotted against its measured slope (**Figure S2**). A linear fit was applied to generate an equation relating measured thickness to a predicted slope. For thicknesses below the minimum and above the maximum thickness used to generate this fit equation (areas where the slope is constant), a single value slope for the material with the closest thickness was used (**Table S3**).

Substance Flow Analysis (SFA)

Stocks and flows of specific chemicals can be tracked, ultimately providing a better understanding of where to prioritize intervention.[1] We constructed a SFA tracking PFAS originating from intentional use in school uniforms. The proposed model is based on the framework developed by Minet et. al. (submitted)[2] which was used to track PFAS deriving from use in food packaging. We modified that framework by considering uniforms with intentionally added PFAS (concentration >0.15% or 1500 ppm see below) and combining together uniforms no PFAS (e.g., not marketed to be stain resistant and ND in Table S1) with low PFAS concentrations (< 0.15% , see below). Levels of PFAS <0.15%, a minimum level recommended to confer water and grease repellency, presumably come from PFAS used as a processing agent or lubricant in the textile production process.[3]

Insufficient information was available to allow us to quantitatively estimate flows except for the use of PFAS in school uniforms purchased in a given year. However, the entire SFA provides insights into intermediate and final sinks of PFAS used in school uniforms.

The flow of total PFAS in children's school uniforms purchased in a given year (F_1) was calculated as:

$$F_1 = M_{school\ uniform} * \ (C_{functional} * \%_{functional} + C_{no\ PFAS} \ * \%_{no\ PFAS}) \qquad (1)$$

where $M_{school\ uniform}$ is the mass of children's school uniforms purchased in a given year; $C_{functional}$ is the concentration of functional PFAS in school uniforms, C_{noPFAS} is the concentration of PFAS in untreated school uniforms, $\%_{functional}$ is the percent of school uniforms with functional PFAS, and $\%_{noPFAS}$ is the percent of school uniforms with PFAS levels below those conferring functionality. Two versions of F1 were calculated: one for polymeric PFAS and one for non-polymeric PFAS. We assumed that these estimates pertained to a single year between 2019 and 2021.

1) Mass of School Uniforms Purchased. The mass of children's school uniforms purchased in a given year, $M_{school\ uniform}$, was defined in equation 2 below, where $\%_{children}$ is the percent of school-aged children that wear uniforms; *Population* represents number of school-aged children (5-19 years, which includes elementary, middle and high school); *Number of Items* is the average number of new school uniforms an individual will purchase, per year; *Weight of garment* represents the average weight of a school uniform.

$$M_{school\ uniform} = (\%_{children})(Population)(Number\ of\ items)(Weight\ of\ garment) \quad (2)$$

A Coresight Research survey reported that in 2018, 26.1% of American school-aged children wore uniforms to school.[4] This value was used for as both the US and Canadian mid-range estimate for $\%_{children}$, with assumed low and high estimates of 16 and 36%, respectively. We then assumed the number of new school uniform items that an individual would purchase, per year. Assuming that a child would need to purchase at least 1 bottom (pants, skirt, etc.) and 1 top (polo, dress shirt, etc.), the low estimate was set at 2 garments per student per year, where the same set of garments would be worn year-round. We estimated that most students would purchase between 2-3 sets of garments and some may purchase a set for each day of the week, which puts the mid-range estimate at 6 garments and the high-estimate at 10 garments, per year.

Populations of school-aged children between 5-19 years of age for US and Canada were taken from 2020 data from the United Nations Department of Economic and Social Affairs[5] and Statistics Canada,[6] respectively.

Given that the weight of garments for children's school uniforms can be highly variable, depending on the size, material, and type of garment, we calculated an average weight using data from our sample analysis. Twenty-nine unique U.S. and Canadian children's school uniforms were weighed prior to sample manipulation. This included a diverse range of types of school uniforms, including polo shirts, pants and skirts. Additionally, a variety of garment sizes were included, ranging from children's products to pre-teen apparel. The mean garment weight from these data was taken as the middle estimate (166 g), bound by the first quartile weight for low estimate (125 g) and third quartile weight for high estimate (202 g).

2) **$C_{functional}$,** Polymeric. Typical textile finishing agents use copolymers with side-chain fluoropolymers, such as methyl acrylate or perfluoroalkyl acrylate, as active ingredients.[7] These polymers are described as fluoroalkyl chains attached to a polymer back bone.[8] The fluorinated chains are positioned perpendicular to the surface of the fabric and exist in a tight formation, acting as a barrier between oil/water

and the fabric layer.[8] Polymers used in textiles include C4 and C6 short-chain fluorinated polymers, which are used for oil, stain, and water repellency, as well as fluoropolymers such as polytetrafluoroethylene (PFTE), which is commonly used in “breathable” membranes.[9]

We based our estimates on literature recommendations for polymeric fluorochemical deposition on fabric to acquire optimal functionality of stain and water repellency. According to a 3M report on fluorochemical textile repellents, fluorochemical repellency performance is reported to “plateau between 0.3%-0.45% solids fluorine on fabric”, corresponding to roughly 1000-1500 ppm of fluorine on fabric.[10] Other sources suggest fluorochemical deposited on the fabric ranges from 0.15%-0.30% “on the weight of the fabric”,[11] or more generally summarized as <1% “on weight fabric”. [12] We proposed 0.1% as a low range estimate, 0.30% as a mid-range estimate, and 0.45% as a high range estimate for functional polymeric PFAS in textile use, where percent indicates weight of PFAS formulation relative to weight of garment.

We note that the literature mentions (e.g., Choudhury et al. 2017[12]) and our results showed that school uniforms made from cotton had higher levels of PFAS than those made from cotton-synthetic blends. The range of $C_{functional}$ chosen for the Substance Flow Analysis brackets the use of PFAS in both cotton and cotton-synthetic blends.

3) **$C_{functional}$,** Non-Polymeric. Non-polymeric PFAS are used in the production of fluoropolymers,[3] but can also form as a result of polymeric PFAS breakdown.[13] The concentration of functional non-polymeric PFAS in school uniforms was estimated using values from the total oxidizable precursor (TOP) assay of 5 school uniforms reported in this study. TOP assay values were converted to percent PFAS using the mass of the material (gram) as for $C_{functional}$ polymeric. The first quartile measurement for Σ_{49} PFAS was used as a low estimate (3.52E-03%), followed by the median value used as the mid-range estimate (1.05E-02%), and third quartile measurement used as the high estimate (1.25E-02%) (Table S15). Due to large variety of PFAS species (>4700) [3] and the limited number of commercially available standards (49 species considered in this study), the suggested values for non-polymeric PFAS in school uniforms are likely underestimates. Due to a lack of data, we did not apportion $C_{functional}$ according to fabric-type on account of our finding of higher PFAS in cotton versus cotton blend fabrics.

4) Percent Functional & Percent No PFAS. The percent of school uniforms with functional PFAS was estimated using equation 3:

$$\%_{functional} = \%_{SR\ marketed} * \%_{SR\ actual} \quad (3)$$

where $\%_{functional}$ represents the percent of school uniforms with PFAS added for stain resistance; $\%_{SR\ marketed}$ is the percent of school uniforms marketed as stain resistant; $\%_{SR\ actual}$ is the percent of school uniforms marketed as stain resistant suspected of PFAS treatment, based on PIGE data. In other words, we did not assume that all school uniforms marketed as stain resistant contained PFAS.

$\%_{SR\ marketed}$ was estimated using data collected from 5 major retailer websites (both US and Canadian) that were sampled in this study. Under the "uniforms" category of each website, the terms "stain" or "stain-resistant" were used to highlight specific uniforms. We then compared the number of stain-resistant items to the total number of uniforms available on each website. Table S19 lists each major retailer website surveyed and the percent of uniforms available for sale that were marketed as "stain resistant", $\%_{SR\ marketed}$. The low estimate of 2% was the minimum value reported by retailer #2, the middle estimate of 8% was the median value reported by retailer #5, and the high estimate of 19% was the maximum value reported by retailer #1.

Although items may be marketed as stain resistant, they may be treated with non-fluorinated substances to acquire water, grease and/or dirt repellency. [14, 15] For this reason, we considered the percentage of school uniforms marketed as "stain resistant" that were indicative of PFAS use, based on PIGE data. Of the 30 unique uniforms sampled across US and Canada (excluding field and lab duplicates), 26 were marketed as "stain resistant". For samples tested on front and back and/or different layers, only the highest total F value of each sample was considered in the calculation. Of the 26 samples, 19 samples had fluorine levels of 1000 ppm or higher, which we assumed was indicative of intentional PFAS use. This equates to ~73% that was used as the middle estimate for $\%_{SR\ actual}$. The middle value was bounded by assumed values of 65% and 85% as low and high estimates, respectively.

The low, mid, and high estimates for $\%_{functional}$ were 1, 6, and 16%, respectively. For each estimate, the percent of school uniforms with no PFAS was calculated accordingly.

Canadian values were taken as one-tenth of the US values based according to country populations and because no significant differences were found between PFAS concentrations in school uniforms purchased in the US and Canada.

Table S1 Sample information with PIGE results.

Sample ID	Subsample ID	Total fluorine, µg F/m^2	Product Category	Material composition	Country of manufacture	
Purchased country: US						Functionality
UOT-IP-US-1	1A	ND	Bib	60% Cotton, 40% polyester	China	Water resistant
	1B	ND	Bib	100% Thermoplastic polyurethane	China	Water resistant
UOT-IP-US-2	2A	16000	Bib	100% Polyester	China	Stain-resistant, water-resistant
	2B	12500	Bib	100% Polyester	China	Stain-resistant, water-resistant
UOT-IP-US-3	3	ND	Bib	100% polyester twill	China	Water resistant
UOT-IP-US-4	4A	30700	Mittens	No label	China	Waterproof
	4B	ND	Mittens	No label	China	Waterproof
	4C	ND	Mittens	100% cotton	China	Waterproof
UOT-IP-US-5	5A	25800	Mittens	100% polyester	China	Waterproof
	5B	42500	Mittens	100% polyester	China	Waterproof
	5C	ND	Mittens	100% polyester	China	Waterproof
UOT-IP-US-6	6A	ND	Rainsuit	100% polyester for shell and lining, 100% acrylic for coating	Bangladesh	Water resistant
	6B	ND	Rainsuit	100% polyester for shell and lining, 100% acrylic for coating	Bangladesh	Water resistant
	6C	ND	Rainsuit	100% polyester for shell and lining, 100% acrylic for coating	Bangladesh	Water resistant
UOT-IP-US-7	7A	ND	Sweatshirt	TPU	USA	Stain proof
	7B	ND	Sweatshirt	100% cotton	USA	Stain proof
	7C	ND	Sweatshirt	100% cotton	USA	Stain proof
UOT-IP-US-8	8A	26000	Shoes	100% polyester	China	Windproof, water-resistant
	8B	ND	Shoes	unknown	China	Windproof, water-resistant
	8C	25300	Shoes	unknown	China	Windproof, water-resistant
	8D	ND	Shoes	unknown	China	Windproof, water-resistant
UOT-IP-US-9	9	ND	Shoes	100% cotton	China	Waterproof
UOT-IP-US-10	10	16000	Stroller Cover	Nylon (210D)	China	Waterproof
UOT-IP-US-11	11A	ND	Swim Diaper	Nylon, elastane, polyester, spandex	Vietnam	Water resistant lining
	11B	ND	Swim Diaper	Nylon, elastane, polyester, spandex	Vietnam	Water resistant lining

UOT-IP-US-12	12A	13600	Swim Diaper	100% Polyester	China	Waterproof
	12B	ND	Swim Diaper	100% Polyester	China	Waterproof
UOT-IP-US-13	13A	53600	Snow suit	100% polyester, coating: polyacrylates	Indonesia	NA
	13B	ND	Snow suit	35% Cotton, 65% Polyester	Indonesia	NA
UOT-IP-US-14	14A	ND	Snow suit	100% polyester	China	Durable water-repellent, windproof
	14B	ND	Snow suit	100% polyester	China	Durable water-repellent, windproof
UOT-IP-US-15	15	319000	School Uniform	50% cotton, 50% polyester	EI Salvador	Stain-resistant treatment
UOT-IP-US-16	16	222000	School Uniform	60% Cotton, 40% Polyester	China	Easy-to-care, stain release and wrinkle-resistant
UOT-IP-US-17	17	ND	School Uniform	60% Cotton, 40% Polyester	Vietnam	Easy-to-care, stain release and wrinkle-resistant
UOT-IP-US-18	18	ND	School Uniform	100% polyester	Egypt	Stain, fade, shrink and pill resistant
UOT-IP-US-19	19	ND	School Uniform	67% cotton/30% polyester/3% Lycra	Dominican Republic	Stain and wrinkle-resistant
UOT-IP-US-20	20	2100000	School Uniform	97% cotton, 3% spandex	Vietnam	Stain resistant
UOT-IP-US-21	21	954000	School Uniform	98% cotton, 2% spandex	Indonesia	Stain resistant
UOT-IP-US-22	22	1040000	School Uniform	98% cotton, 2% spandex	Bangladesh	Stain resistant
UOT-IP-US-23	23	696000	School Uniform	98% cotton, 2% spandex	Bangladesh	Stain resistant
UOT-IP-US-24	24	984000	School Uniform	98% cotton, 2% spandex	Bangladesh	Stain resistant
UOT-IP-US-25	25	2040000	School Uniform	100% Cotton	Indonesia	Stain Release
UOT-IP-US-26	26	ND	School Uniform	60% Cotton, 40% Polyester	Honduras	Easy-care stain release, wrinkle resistant
UOT-IP-US-27	27	103000	School Uniform	35% Cotton, 65% Polyester	Nicaragua	Easy-care stain release, wrinkle resistant
UOT-IP-US-28	28	492000	School Uniform	100% Cotton	Bangladesh	Stain-resistant
UOT-IP-US-29	29	1010000	School Uniform	100% Cotton	Bangladesh	Stain-resistant

UOT-IP-US-30	30	402000	School Uniform	97% cotton, 3% spandex	Bangladesh	Stain resistant, wrinkle resistant
UOT-IP-US-31	31	1440000	School Uniform	97% cotton, 3% spandex	Indonesia	Stain resistant, wrinkle resistant
UOT-IP-US-32	32	ND	School Uniform	100% cotton	Tanzania	NA
UOT-IP-US-33	33	5020000	School Uniform	100% cotton	Indonesia	Stain release
UOT-IP-US-34	34	ND	School Uniform	60% Cotton, 40% recycled Polyester	Indonesia	NA
UOT-IP-US-35 (Lab duplicate for UOT-IP-US-34)	35	ND	School Uniform	60% Cotton, 40% recycled Polyester	Indonesia	NA
Purchased country: Canada						Functionality
UOT-IP-1	1A	21300	Bib	100% polyester with TPU coating for waterproofing	China	Waterproof, stain resistant
	1B	17000	Bib	100% polyester with TPU coating for waterproofing	China	Waterproof, stain resistant
UOT-IP-2	2A	ND	Bib	Shell: 80% Cotton, 20% polyester. Lining: Polyurethane	China	Waterproof
	2B	ND	Bib	Shell: 80% Cotton, 20% polyester. Lining: Polyurethane	China	Waterproof
UOT-IP-3	3A	19500	Bib	100% Nylon with polyurethane coating	Canada	Waterproof
	3B	15800	Bib	100% Nylon with polyurethane coating	Canada	Waterproof
UOT-IP-4	4A	441000	School Uniform	97% Cotton, 3% Spandex	Vietnam	Stain resistant
	4B	439000	School Uniform	97% Cotton, 3% Spandex	Vietnam	Stain resistant
UOT-IP-5	5A	393000	School Uniform	98% Cotton, 2% Spandex	Indonesia	Stain resistant
	5B	609000	School Uniform	98% Cotton, 2% Spandex	Indonesia	Stain resistant
UOT-IP-6	6A	212000	School Uniform	95% Polyester, 5% elastane	China	Waterproof, repel oil, stain resistant
	6B	181000	School Uniform	95% Polyester, 5% elastane	China	Waterproof, repel oil, stain resistant
UOT-IP-7	7A	ND	Miscellaneous	Outer: 100% laminated polyester. Lining: 70% rayon from bamboo, 30% cotton	Canada	Waterproof
	7B	ND	Miscellaneous	Outer: 100% laminated polyester. Lining: 70% rayon from bamboo, 30% cotton	Canada	Waterproof

UOT-IP-8	8A	ND	Miscellaneous	Top: 80% cotton, 20% polyester. Fill and lining: 100% polyester	Pakistan	Waterproof
	8B	ND	Miscellaneous	Top: 80% cotton, 20% polyester. Fill and lining: 100% polyester	Pakistan	Waterproof
UOT-IP-9	9A	ND	Miscellaneous	Front: 100% polyester. Back: 100% polyurethane. Filling: 100% polyester	China	Waterproof
	9B	ND	Miscellaneous	Front: 100% polyester. Back: 100% polyurethane. Filling: 100% polyester	China	Waterproof
UOT-IP-10 (Lab duplicate for UOT-IP-9)	10A	ND	Miscellaneous	Front: 100% polyester. Back: 100% polyurethane. Filling: 100% polyester	China	Waterproof
	10B	ND	Miscellaneous	Front: 100% polyester. Back: 100% polyurethane. Filling: 100% polyester	China	Waterproof
UOT-IP-11	11A	30100	Shoes	No label	No label	Waterproof
	11B	ND	Shoes	No label	No label	Waterproof
UOT-IP-12	12A	ND	Shoes	Polyester, ethylene vinyl acetate	Cambodia	Waterproof
	12B	55600	Shoes	Polyester, ethylene vinyl acetate	Cambodia	Waterproof
	12C	ND	Shoes	Polyester, ethylene vinyl acetate	Cambodia	Waterproof
	12D	ND	Shoes	Polyester, ethylene vinyl acetate	Cambodia	Waterproof
UOT-IP-13	13A	5190	Shoes	No label	China	NA
	13B	ND	Shoes	No label	China	NA
UOT-IP-14	14A	53800	Mittens	Outer: 100% nylon. Lining: 100% polyester	China	Waterproof
UOT-IP-15	15A	11800	Mittens	Outer: 100% nylon. Insulation: 100% polyester. Inner lining: 100% polyester	Canada	Waterproof
	15B	24900	Mittens	Outer: 100% nylon. Insulation: 100% polyester. Inner lining: 100% polyester	Canada	Waterproof
UOT-IP-16	16A	18300	Mittens	Shell: 100% polyester with polyurethane membrane. Palm: 100% nylon. Fill & lining: 100% polyester	Cambodia	Water repellant
	16B	132000	Mittens	Shell: 100% polyester with polyurethane membrane. Palm: 100% nylon. Fill & lining: 100% polyester	Cambodia	Water repellant
	16C	145000	Mittens	Shell: 100% polyester with polyurethane membrane. Palm: 100% nylon. Fill & lining: 100% polyester	Cambodia	Water repellant
UOT-IP-17	17A	67200	Swimwear	100% polyester	China	Waterproof (outer layer)
	17B	ND	Swimwear	100% polyester	China	Waterproof (outer layer)
UOT-IP-18	18A	ND	Swimwear	No label	No label	Waterproof (outer layer)
	18B	ND	Swimwear	No label	No label	Waterproof (outer layer)

UOT-IP-19	19A	20300	Swimwear	Shell: 100% polyester. Back: Polyurethane. Inner layer: 88% biconstituent fiber (80% polyester, 20% nylon), 12% polyester. Lining: 100% cotton	China	NA
	19B	ND	Swimwear	Shell: 100% polyester. Back: Polyurethane. Inner layer: 88% biconstituent fiber (80% polyester, 20% nylon), 12% polyester. Lining: 100% cotton	China	NA
UOT-IP-20 (Lab duplicate for UOT-IP-19)	20A	45700	Swimwear	Shell: 100% polyester. Back: Polyurethane. Inner layer: 88% biconstituent fiber (80% polyester, 20% nylon), 12% polyester. Lining: 100% cotton	China	NA
	20B	ND	Swimwear	Shell: 100% polyester. Back: Polyurethane. Inner layer: 88% biconstituent fiber (80% polyester, 20% nylon), 12% polyester. Lining: 100% cotton	China	NA
UOT-2-IP-1	1A	26100	Bib	Shell: 100% polyester with polyurethane coating. Lining: 100% polyester. Pocket: 100% silicone	China	Waterproof
	1B	ND	Bib	Shell: 100% polyester with polyurethane coating. Lining: 100% polyester. Pocket: 100% silicone	China	Waterproof
UOT-2-IP-2	2A	ND	Bib	Front: 75% cotton, 25% polyester. Back: 100% polyethylene vinyl acetate	China	Water resistant
	2B	ND	Bib	Front: 75% cotton, 25% polyester. Back: 100% polyethylene vinyl acetate	China	Water resistant
UOT-2-IP-3	3A	13600	Hat	Shell: 100% nylon. Lining: 100% polyester	Canada	Water-repellent (outer layer)
	3B	ND	Hat	Shell: 100% nylon. Lining: 100% polyester	Canada	Water-repellent (outer layer)
	3C	ND	Hat	Shell: 100% nylon. Lining: 100% polyester	Canada	Water-repellent (outer layer)
UOT-2-IP-4	4A	24400	Hat	100% polyester	China	Waterproof
	4B	ND	Hat	100% polyester	China	Waterproof
UOT-2-IP-5	5A	12000	Hat	100% nylon with polyurethane coating	China	Waterproof
UOT-2-IP-6	6A	ND	Mittens	Shell, lining & padding: 100% polyester	China	Water-repellent
	6B	ND	Mittens	Shell, lining & padding: 100% polyester	China	Water-repellent
	6C	ND	Mittens	Shell, lining & padding: 100% polyester	China	Water-repellent
UOT-2-IP-7 (Field duplicate for UOT-IP-16)	7A	10200	Mittens	Shell: 100% polyester with polyurethane membrane. Palm: 100% nylon. Fill & lining: 100% polyester	Cambodia	Water repellant
	7B	21400	Mittens	Shell: 100% polyester with polyurethane membrane. Palm: 100% nylon. Fill & lining: 100% polyester	Cambodia	Water repellant
	7C	136000	Mittens	Shell: 100% polyester with polyurethane membrane. Palm: 100% nylon. Fill & lining: 100% polyester	Cambodia	Water repellant

UOT-2-IP-8	8A	10800	Mittens	Shell, lining & padding: 100% polyester	China	Waterproof
	8B	32500	Mittens	Shell, lining & padding: 100% polyester	China	Waterproof
	8C	24800	Mittens	Shell, lining & padding: 100% polyester	China	Waterproof
UOT-2-IP-9	9A	114000	Rainsuit	Shell: 100% polyester. Lining: 100% nylon. Fleece: 100% polyester	Vietnam	NA
	9B	ND	Rainsuit	Shell: 100% polyester. Lining: 100% nylon. Fleece: 100% polyester	Vietnam	NA
UOT-2-IP-10	10A	4780	Rainsuit	100% nylon	China	Waterproof
	10B	7450	Rainsuit	100% nylon	China	Waterproof
	10C	6830	Rainsuit	100% nylon	China	Waterproof
	10D	4000	Rainsuit	100% nylon	China	Waterproof
UOT-2-IP-11 (Lab duplicate for UOT-2-IP-10)	11A	4460	Rainsuit	100% nylon	China	Waterproof
	11B	8400	Rainsuit	100% nylon	China	Waterproof
	11C	7510	Rainsuit	100% nylon	China	Waterproof
	11D	4350	Rainsuit	100% nylon	China	Waterproof
UOT-2-IP-12	12A	462000	School Uniform	98% cotton, 2% spandex	Bangladesh	Waterproof, stain resistant
	12B	555000	School Uniform	98% cotton, 2% spandex	Bangladesh	Waterproof, stain resistant
UOT-2-IP-13	13A	563000	School Uniform	Shell: 98% cotton, 2% spandex. Lining: 100% cotton	Bangladesh	Waterproof, stain resistant
	13B	7450	School Uniform	Shell: 98% cotton, 2% spandex. Lining: 100% cotton	Bangladesh	Waterproof, stain resistant
	13C	5380	School Uniform	Shell: 98% cotton, 2% spandex. Lining: 100% cotton	Bangladesh	Waterproof, stain resistant
UOT-2-IP-14	14A	ND	School Uniform	97% cotton, 3% spandex/elastane	Vietnam	NA
	14B	ND	School Uniform	97% cotton, 3% spandex/elastane	Vietnam	NA
UOT-2-IP-15	15A	ND	School Uniform	100% cotton	India	NA
	15B	ND	School Uniform	100% cotton	India	NA
UOT-2-IP-16	16A	ND	School Uniform	97% cotton, 3% spandex	Bangladesh	NA
	16B	ND	School Uniform	97% cotton, 3% spandex	Bangladesh	NA
UOT-2-IP-17	17A	ND	School Uniform	100% cotton	India	Stain resistant

	17B	ND	School Uniform	100% cotton	India	Stain resistant
UOT-2-IP-18	18A	ND	School Uniform	65% polyester, 35% viscose	Bangladesh	Stain and weatherproof
	18B	ND	School Uniform	65% polyester, 35% viscose	Bangladesh	Stain and weatherproof
UOT-2-IP-19 (Field duplicate for UOT-IP-5)	19A	514000	School Uniform	98% cotton, 2% spandex/elastane	Indonesia	Stain resistant
	19B	463000	School Uniform	98% cotton, 2% spandex/elastane	Indonesia	Stain resistant
UOT-2-IP-20	20A	97200	Snowsuit	Shell, filler & lining: 100% polyester. Coating: polyacrylates. Fur: 67% acrylic, 18% modacrylic, 15% polyester	Vietnam	Water resistant
	20B	ND	Snowsuit	Shell, filler & lining: 100% polyester. Coating: polyacrylates. Fur: 67% acrylic, 18% modacrylic, 15% polyester	Vietnam	Water resistant
UOT-2-IP-21 (Lab duplicate for UOT-2-IP-20)	21A	99500	Snowsuit	Shell, filler & lining: 100% polyester. Coating: polyacrylates. Fur: 67% acrylic, 18% modacrylic, 15% polyester	Vietnam	Water resistant
	21B	ND	Snowsuit	Shell, filler & lining: 100% polyester. Coating: polyacrylates. Fur: 67% acrylic, 18% modacrylic, 15% polyester	Vietnam	Water resistant
UOT-2-IP-22	22A	119000	Snowsuit	Shell & lining: 100% recycled polyester. Fill: 60% recycled polyester, 40% polyester	China	Durable water repellent
	22B	67500	Snowsuit	Shell & lining: 100% recycled polyester. Fill: 60% recycled polyester, 40% polyester	China	Durable water repellent
UOT-2-IP-23	23A	16200	Stroller Cover	No label	China	Waterproof
	23B	14100	Stroller Cover	No label	China	Waterproof
UOT-2-IP-24	24A	15100	Stroller Cover	No label	No label	Waterproof
	24B	14800	Stroller Cover	No label	No label	Waterproof

Table S2. Details of Fabrics and paper selected for total Fluorine analysis by PIGE.

Material Type	Material Composition	Thickness (μm)	Area (cm^2)	Volume (μL)	Slope of μg F/mL curve	Slope of μg F/cm^2 curve	Precision (RSD)	Accuracy (% Difference)
Whatman 1 Filter Paper	100% Cellulose	180	14.2	300	14.9	1555	19%	30%
Cotton Broadcloth	100% Cotton	370	4	80	5.7	634	10%	2%
Cotton Polyester Broadcloth	60% Cotton, 40% Polyester	450	4	80	4.4	492	-	-
Matte Milliskin Tricot	80% Nylon, 20% Spandex	620	4	190	2.7	95	6%	4%
Scuba Double Knit	100% Polyester	950	4	250	3.5	123	6%	2%

Table S3. Values and equations used to determine a predicted slope (in units of μg F/cm^2) based on the thickness of the material being measured.

Thickness (μm)	**Slope value or equation (μg F/cm^2)**
0-370	1555
370-620	y = -3.3 + 2027
620+	109

Table S4. List of PFAS analytes including abbreviation, CAS number and full name. SS and IS represent surrogate and internal standard, respectively.

Abbr.	CAS #	Compound name
PFPrA	422-64-0	Perfluoropropanotic acid
PFBA	375-22-4	Perfluorobutanoic acid
PFPeA	2706-90-3	Perfluoropentanoic acid
PFHxA	307-24-4	Perfluoro-n-hexanoic acid
PFHpA	375-85-9	Perfluoro-n-heptanoic acid
PFOA	335-67-1	Perfluoro-n-octanoic acid
PFNA	375-95-1	Perfluoro-n-nonanoic acid
PFDA	335-76-2	Perfluoro-n-decanoic acid
PFUnDA	2058-94-8	Perfluoro-n-undecanoic acid
PFDoDA	307-55-1	Perfluoro-n-dodecanoic acid
PFTrDA	72629-94-8	Perfluoro-n-tridecanoic acid
PFTeDA	376-06-7	Perfluoro-n-tetradecanoic acid
PFHxDA	67905-19-5	Perfluoro-n-hexadecanoic acid
PFPrS	423-41-6	Perfluoro-1-propanesulfonic acid
PFBS	375-73-5	Perfluoro-1-butanesulfonic acid
PFPeS	2706-91-4	Perfluoro-1-pentanesulfonic acid
PFHxS	355-46-4	Perfluoro-1-hexanesulfonic acid
PFHpS	375-92-8	Perfluoro-1-heptanesulfonic acid
PFOS	1763-23-1	Perfluoro-1-octanesulfonic acid
PFNS	68259-12-1	Perfluoro-1-nonanesulfonic acid
PFDS	335-77-3	Perfluoro-1-decanesulfonic acid
PFECHS	646-83-3	Perfluoro-4-ethylcyclohexanesulfonic acid
Cl-PFOS	777011-38-8	8-Chloroperfluoro-1-octanesulfonic acid
FBSA	30334-69-1	Perfluoro-1-butanesulfonamide
FHxSA	41997-13-1	Perfluoro-1-hexanesulfonamide
FOSA	754-91-6	Perfluoro-1-octanesulfonamide
MeFOSA	31506-32-8	N-methylperfluoro-1-octanesulfonamide
EtFOSA	4151-50-2	N-ethylperfluoro-1-octanesulfonamide
4:2 FTSA	757124-72-4	1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2)
6:2 FTSA	27619-97-2	1H,1H,2H,2H-perfluorooctane sulfonic acid (6:2)
8:2 FTSA	39108-34-4	1H,1H,2H,2H-perfluorodecane sulfonic acid (8:2)
M3PFBA (SS)		Perfluoro-n-[2,3,4-$^{13}C_3$]butanoic acid
MPFHxA (SS)		Perfluoro-n-[1,2-$^{13}C_2$]hexanoic acid
MPFOA (SS)		Perfluoro-n-[1,2,3,4-$^{13}C_4$]octanoic acid
MPFUnDA (SS)		Perfluoro-n-[1,2-$^{13}C_2$]undecanoic acid
M2PFTeDA (SS)		Perfluoro-n-[1,2-$^{13}C_2$]tetradecanoic acid
M3PFBS (SS)		Perfluoro-1-[2,3,4-$^{13}C_3$]butanesulfonic acid
MPFHxS (SS)		Perfluoro-1-hexane[$^{18}O_2$]sulfonic acid
MPFOS (SS)		Perfluoro-1-[1,2,3,4-$^{13}C_4$]octanesulfonic acid
dMeFOSA (SS)		N-methyl-d_3-perfluoro-1-octanesulfonamide

M2-8:2 FTCA (SS)		2-Perfluorooctyl-[1,2-$^{13}C_2$]-ethanoic acid (8:2)
M2-8:2 FTSA (SS)		1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-decane sulfonic acid (8:2)
MPFBA (IS)		Perfluoro-n-[1,2,3,4-$^{13}C_4$]butanoic acid
M8PFOA (IS)		Perfluoro-n-[$^{13}C_8$]octanoic acid
M7PFUnDA (IS)		Perfluoro-n-[1,2,3,4,5,6,7-$^{13}C_7$]undecanoic acid
M3PFHxS (IS)		Perfluoro-1-[1,2,3-$^{13}C_3$]hexanesulfonic acid
M8PFOS (IS)		Perfluoro-[$^{13}C_8$]octanesulfonic acid
6:2 PAP	57678-01-0	1H,1H,2H,2H-perfluorooctylphosphate
8:2 PAP	57678-03-2	1H,1H,2H,2H-perfluorodecylphosphate
6:2 diPAP	57677-95-9	Bis(1H,1H,2H,2H-perfluorooctyl)phosphate
6:2/8:2 diPAP	943913-15-3	(1H,1H,2H,2H-perfluorooctyl-1H,1H,2H,2H-perfluorodecyl)phosphate
8:2 diPAP	678-41-1	Bis(1H,1H,2H,2H-perfluorodecyl)phosphate
M2-8:2 PAP (SS)		1H,1H,2H,2H-[1,2-13C2]perfluorodecylphosphate
M4-6:2 diPAP (IS)		Bis(1H,1H,2H,2H-[1,2-13C2]perfluorooctyl)phosphate
4:2 FTOH	2043-47-2	2-Perfluorobutyl ethanol (4:2)
6:2 FTOH	647-42-7	2-Perfluorohexyl ethanol (6:2)
8:2 FTOH	678-39-7	2-Perfluorooctyl ethanol (8:2)
10:2 FTOH	865-86-1	2-Perfluorodecyl ethanol (10:2)
6:2 FTAC	17527-29-6	1H,1H,2H,2H-perfluorooctyl acrylate
8:2 FTAC	27905-45-9	1H,1H,2H,2H-Perfluorodecyl acrylate
10:2 FTAC	17741-60-5	1H,1H,2H,2H-Perfluorododecyl acrylate
6:2 FTMAC	2144-53-8	1H,1H,2H,2H-perfluorooctyl methacrylate
8:2 FTMAC	1996-88-9	1H,1H,2H,2H-heptadecafluorodecyl methacrylate
MeFOSE	24448-09-7	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
EtFOSE	1691-99-2	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol
M4-4:2 FTOH (SS)		2-Perfluorobutyl-[1,1,2,2-$^{2}H_4$]-ethanol (4:2)
M2-8:2 FTOH (SS)		2-Perfluorooctyl-[1,2-$^{13}C_2$]-ethanol (8:2)
dMeFOSE (SS)		2-(N-methyl-d_3-perfluoro-1-octanesulfonamido)ethan-d_4-ol
M4-8:2 FTOH (IS)		2-Perfluorooctyl-[1,1-$^{2}H_2$]-[1,2-$^{13}C_2$]-ethanol (8:2)

Table S5. Instrumental parameters of LC-MS/MS for PAPs analysis.

Column	Acquity BEH C18 1.7 µm (2.1 id x 50 mm)	
Column temp	40 ^{O}C	
Mobile phase	A = 2 mM ammonium acetate + 5 mM N-Methylpiperidine in water; B = 2 mM ammonium acetate + 5 mM N-Methylpiperidine in methanol	
Flow rate	0.4 mL/min	
Injection volume	5 µL	
Mode	Negative ESI using the Agilent jet spray ionization source	
Nebulizer	25 psi	
Gas flow	5 L/min	
Gas temp	300 °C	
Capillary voltage	2800 V	
Sheath gas temp	330 °C	
Sheath gas flow	11 L/min	
Ramp gradient		
Time (min)	%A	%B
0.0	90	10
0.5	90	10
1.0	70	30
7.5	0	100
8.0	90	10
Post-run (2 min)	90	10

Table S6. Instrumental parameters of LC-MS/MS for ionic PFAS analysis.

Column	Acquity BEH C18 1.7 µm (2.1 id x 50 mm)
Column temp	40 ^{O}C

Mobile phase	A = 2 mM ammonium acetate in water; B = 2 mM ammonium acetate in methanol
Flow rate	0.4 mL/min
Injection volume	5 µL
Mode	Negative ESI using the Agilent jet spray ionization source
Nebulizer	25 psi
Gas flow	5 L/min
Gas temp	300 °C
Capillary voltage	2800 V
Sheath gas temp	330 °C
Sheath gas flow	11 L/min

Ramp gradient		
Time (min)	%A	%B
0.0	90	10
0.5	90	10
1.0	60	40
17.5	0	100
18.0	90	10
Post-run (3 min)	90	10

Table S7. Instrumental parameters for GC-MS analysis.

Mode	Positive chemical ionization
Inlet temperature	200 °C
AUX temperature	200 °C
Injection mode	Pulsed splitless
Injection volume	2 µL
Carrier gas (He) flow rate	1 mL/min
Column	CP-Wax 57 CB, 25 m, 0.25 mm, 0.20 µm (Agilent J&W)

Oven program	
Time (min)	Temperature (°C)
0.0	60
3.0	60
13.0	85
20.0	190
28.0	190

Table S8. Surrogate standards (SS) and internal standards (IS) used to calculate PFAS concentrations. Surrogates were used as general indicators of overall analytical quality (i.e., recoveries) during the entire analytical process, and internal standards were used for quantitation for both SS and targeted compounds.

Native PFASs	SS for QA/QC	IS for quantitation	SS for QA/QC	IS for quantitation
PFPrA	M3PFBA	MPFBA	M3PFBA	MPFBA
PFBA	M3PFBA	MPFBA	MPFHxA	M8PFOA
PFPeA	M3PFBA	MPFBA	MPFOA	M8PFOA
PFHxA	MPFHxA	M8PFOA	MPFUnDA	M7PFUnDA
PFHpA	MPFHxA	M8PFOA	M2PFTeDA	M7PFUnDA
PFOA	MPFOA	M8PFOA	M3PFBS	M3PFHxS
PFNA	MPFOA	M8PFOA	MPFHxS	M3PFHxS
PFDA	MPFUnDA	M7PFUnDA	MPFOS	M8PFOS
PFUnDA	MPFUnDA	M7PFUnDA	M2-8:2 FTSA	M8PFOS
PFDoDA	M2PFTeDA	M7PFUnDA	dMeFOSA	M8PFOS
PFTrDA	M2PFTeDA	M7PFUnDA	M4-4:2 FTOH	M4-8:2 FTOH
PFTeDA	M2PFTeDA	M7PFUnDA	M2-8:2 FTOH	M4-8:2 FTOH
PFHxDA	M2PFTeDA	M7PFUnDA	dMeFOSE	M4-8:2 FTOH
PFPrS	M3PFBS	M3PFHxS	M2-8:2 PAP	M4-6:2 diPAP
PFBS	M3PFBS	M3PFHxS		
PFPeS	MPFHxS	M3PFHxS		
PFHxS	MPFHxS	M3PFHxS		

PFHpS	MPFOS	M3PFHxS
PFOS	MPFOS	M8PFOS
PFNS	MPFOS	M8PFOS
PFDS	MPFOS	M8PFOS
PFECHS	MPFOS	M8PFOS
Cl-PFOS	MPFOS	M8PFOS
FBSA	M3PFBS	M3PFHxS
FHxSA	MPFHxS	M3PFHxS
FOSA	MPFOS	M8PFOS
MeFOSA	dMeFOSA	M8PFOS
EtFOSA	dMeFOSA	M8PFOS
4:2 FTSA	M2-8:2 FTSA	M3PFHxS
6:2 FTSA	M2-8:2 FTSA	M3PFHxS
8:2 FTSA	M2-8:2 FTSA	M8PFOS
6:2 PAP	M2-8:2 PAP	M4-6:2 diPAP
8:2 PAP	M2-8:2 PAP	M4-6:2 diPAP
6:2 diPAP	M2-8:2 PAP	M4-6:2 diPAP
6:2/8:2 diPAP	M2-8:2 PAP	M4-6:2 diPAP
8:2 diPAP	M2-8:2 PAP	M4-6:2 diPAP
4:2 FTOH	M4-4:2 FTOH	M4-8:2 FTOH
6:2 FTOH	M2-8:2 FTOH	M4-8:2 FTOH
8:2 FTOH	M2-8:2 FTOH	M4-8:2 FTOH
10:2 FTOH	M2-8:2 FTOH	M4-8:2 FTOH
6:2 FTAC	M4-4:2 FTOH	M4-8:2 FTOH
8:2 FTAC	M2-8:2 FTOH	M4-8:2 FTOH
10:2 FTAC	M2-8:2 FTOH	M4-8:2 FTOH
6:2 FTMAC	M2-8:2 FTOH	M4-8:2 FTOH
8:2 FTMAC	M2-8:2 FTOH	M4-8:2 FTOH
MeFOSE	dMeFOSE	M4-8:2 FTOH
EtFOSE	dMeFOSE	M4-8:2 FTOH

Table S9. Ionic PFAS compounds analyzed by LC-MS/MS under ESI (-) mode.

Abbr.	Compound Name	CAS #	Formula	Retention time (min)	Mol. Wt.	Precursor ion [M-H/D]-	Fragmentor (volts)	Product ions (m/z)	Collision energy (volts)
PFPrA	Perfluoropropanotic acid	422-64-0	$C_3HF_5O_2$	0.738	163.99	162.9	64	**119**	5
PFBA	Perfluorobutanoic acid	375-22-4	$C_4HF_7O_2$	2.243	214.04	213.0	64	**169**	5
								/	/
PFPeA	Perfluoropentanoic acid	2706-90-3	$C_5HF_9O_2$	3.518	264.05	263.0	64	**218.9**	5
								140.8	5
PFHxA	Perfluoro-n-hexanoic acid	307-24-4	$C_6HF_{11}O_2$	5.008	314.05	313.0	73	**268.9**	5
								119	21
PFHpA	Perfluoro-n-heptanoic acid	375-85-9	$C_7HF_{13}O_2$	6.646	364.06	363.0	78	**319**	5
								169	17
PFOA	Perfluoro-n-octanoic acid	335-67-1	$C_8HF_{15}O_2$	8.186	414.07	413.1	83	**369**	5
								169	17
PFNA	Perfluoro-n-nonanoic acid	375-95-1	$C_9HF_{17}O_2$	9.542	464.08	463.1	83	**419**	5
								218.9	17
PFDA	Perfluoro-n-decanoic acid	335-76-2	$C_{10}HF_{19}O_2$	10.712	514.08	513.0	93	**468.9**	5
								269	17
PFUnDA	Perfluoro-n-undecanoic acid	2058-94-8	$C_{11}HF_{21}O_2$	11.725	564.09	563.0	102	**518.9**	5
								268.9	17
PFDoDA	Perfluoro-n-dodecanoic acid	307-55-1	$C_{12}HF_{23}O_2$	12.601	614.10	613.0	102	**569**	9
								269	21

PFTrDA	Perfluoro-n-tridecanoic acid	72629-94-8	$C_{13}HF_{25}O_2$	13.347	664.11	663.1	107	**619**	9
								169	29
PFTeDA	Perfluoro-n-tetradecanoic acid	376-06-7	$C_{14}HF_{27}O_2$	13.998	714.11	713.1	112	**668.9**	13
								169	29
PFHxDA	Perfluoro-n-hexadecanoic acid	67905-19-5	$C_{16}HF_{31}O_2$	15.041	814.13	813.1	121	**768.9**	13
								168.9	37
PFPrS	Perfluoro-1-propanesulfonic acid	423-41-6	$C_3HF_7SO_3$	2.748	250.09	249.1	140	**80**	37
								98.9	33
PFBS	Perfluoro-1-butanesulfonic acid	375-73-5	$C_4HF_9SO_3$	3.876	300.10	299.0	149	**80**	37
								98.9	37
PFPeS	Perfluoro-1-pentanesulfonic acid	2706-91-4	$C_5HF_{11}SO_3$	5.336	350.11	349.0	175	**80**	45
								98.9	37
PFHxS	Perfluoro-1-hexanesulfonic acid	355-46-4	$C_6HF_{13}SO_3$	6.885	400.11	399.0	179	**80**	45
								98.9	41
PFHpS	Perfluoro-1-heptanesulfonic acid	375-92-8	$C_7HF_{15}SO_3$	8.357	450.12	449.0	183	**80**	49
								98.9	45
PFOS	Perfluoro-1-octanesulfonic acid	1763-23-1	$C_8HF_{17}SO_3$	9.647	500.13	499.0	208	**80**	101
								98.9	49
PFNS	Perfluoro-1-nonanesulfonic acid	68259-12-1	$C_9HF_{19}SO_3$	10.776	549.93	549.0	218	**80**	105
								98.9	49
PFDS	Perfluoro-1-decanesulfonic acid	335-77-3	$C_{10}HF_{21}SO_3$	11.764	600.14	598.9	232	**80**	137

								98.9	53
PFECHS	Perfluoro-4-ethylcyclohexanesulfonic acid	646-83-3	$C_8HF_{15}SO_3$	8.096	462.13	461.0	150	**380.9**	29
								98.9	29
Cl-PFOS	8-Chloroperfluoro-1-octanesulfonic acid	777011-38-8	$C_8HF_{16}ClSO_3$	9.897	516.58	515.0	203	**80**	105
								98.9	49
FBSA	Perfluoro-1-butanesulfonamide	30334-69-1	$C_4H_2F_9NO_2S$	5.272	299.12	298.0	98	**78**	25
								48.1	93
FHxSA	Perfluoro-1-hexanesulfonamide	41997-13-1	$C_6H_2F_{13}NO_2S$	8.778	399.13	397.9	117	**78**	29
								48.1	100
FOSA	Perfluoro-1-octanesulfonamide	754-91-6	$C_8H_2F_{17}NO_2S$	11.159	499.14	498.0	169	**78**	37
								48.1	150
MeFOSA	N-methylperfluoro-1-octanesulfonamide	31506-32-8	$C_9H_4F_{17}NO_2S$	12.808	513.17	512.0	160	**169**	29
								218.9	25
EtFOSA	N-ethylperfluoro-1-octanesulfonamide	4151-50-2	$C_{10}H_6F_{17}NO_2S$	13.375	527.20	526.0	165	**169**	29
								219	29
4:2 FTSA	1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2)	757124-72-4	$C_6H_5F_9O_3S$	4.870	328.15	327.1	136	**306.9**	21
								81	33
6:2 FTSA	1H,1H,2H,2H-perfluorooctane sulfonic acid (6:2)	27619-97-2	$C_8H_5F_{13}O_3S$	8.091	428.17	427.0	164	**406.9**	25
								81	41
8:2 FTSA	1H,1H,2H,2H-perfluorodecane sulfonic acid (8:2)	39108-34-4	$C_{10}H_5F_{17}O_3S$	10.676	528.18	527.0	179	**506.9**	29
								81	41

M3PFBA (surrogate standard, SS)	Perfluoro-n-[2,3,4-$^{13}C_3$]butanoic acid	$CHF_7O_2 + {}^{13}C_3$	2.242	217.04	216.0	64	**172**	5
MPFHxA (SS)	Perfluoro-n-[1,2-$^{13}C_2$]hexanoic acid	$C_4HF_{11}O_2 + {}^{13}C_2$	4.999	316.05	315.1	78	**270**	5
MPFOA (SS)	Perfluoro-n-[1,2,3,4-$^{13}C_4$]octanoic acid	$C_4HF_{15}O_2 + {}^{13}C_4$	8.185	418.07	417.1	83	**372**	5
MPFUnDA (SS)	Perfluoro-n-[1,2-$^{13}C_2$]undecanoic acid	$C_9HF_{21}O_2 + {}^{13}C_2$	11.725	566.09	565.1	97	**520**	9
M2PFTeDA (SS)	Perfluoro-n-[1,2-$^{13}C_2$]tetradecanoic acid	$C_{12}HF_{27}O_2 + {}^{13}C_2$	13.997	716.11	715.1	116	**669.9**	13
M3PFBS (SS)	Perfluoro-1-[2,3,4-$^{13}C_3$]butanesulfonic acid	$CHF_9SO_3 + {}^{13}C_3$	3.874	303.10	302.0	149	**80**	45
MPFHxS (SS)	Perfluoro-1-hexane[$^{18}O_2$]sulfonic acid	$C_6HF_{13}SO + {}^{18}O_2$	6.882	404.11	403.0	169	**84**	49
MPFOS (SS)	Perfluoro-1-[1,2,3,4-$^{13}C_4$]octanesulfonic acid	$C_4HF_{17}SO_3 + {}^{13}C_4$	9.646	504.13	503.0	198	**80**	93
dMeFOSA (SS)	N-methyl-d$_3$-perfluoro-1-octanesulfonamide	$C_9HF_{17}NO_2S + D_3$	12.799	516.17	515.0	160	**169**	29
M2-8:2 FTCA (SS)	2-Perfluorooctyl-[1,2-$^{13}C_2$]-ethanoic acid(8:2)	$C_8H_3F_{17}O_2 + {}^{13}C_2$	9.926	480.10	479.0	215	**394**	11
M2-8:2 FTSA (SS)	1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-decane sulfonic acid (8:2)	$C_8H_5F_{17}O_3S + {}^{13}C_2$	10.675	530.18	529.0	195	**509**	33
MPFBA (internal standard, IS)	Perfluoro-n-[1,2,3,4-$^{13}C_4$]butanoic acid	$HF_7O_2 + {}^{13}C_4$	2.240	218.04	217.0	64	172	5
M8PFOA (IS)	Perfluoro-n-[$^{13}C_8$]octanoic acid	$HF_{15}O_2 + {}^{13}C_8$	8.184	422.07	421.1	83	376	5
M7PFUnDA (IS)	Perfluoro-n-[1,2,3,4,5,6,7-$^{13}C_7$]undecanoic acid	$C_4HF_{21}O_2 + {}^{13}C_7$	11.724	571.09	570.0	97	525	9
M3PFHxS (IS)	Perfluoro-1-[1,2,3-$^{13}C_3$]hexanesulfonic acid	$C_3HF_{13}SO_3 + {}^{13}C_3$	6.883	403.11	402.0	184	80	45
M8PFOS (IS)	Perfluoro-[$^{13}C_8$]octanesulfonic acid	$HF_{17}SO_3 + {}^{13}C_8$	9.637	508.13	507.0	203	79.9	97

Table S10. PAPs compounds analyzed by LC-MS/MS under ESI (-) mode.

Abbr.	Compound Name	CAS #	Formula	Retention time (min)	Mol. Wt.	Precursor ion [M-H/D]-	Fragmentor (volts)	Product ions (m/z)	Collision energy (volts)
6:2 PAP	1H,1H,2H,2H-perfluorooctylphosphate	57678-01-0	$C_8H_6F_{13}O_4P$	3.513	443.98	443	108	**97** 79	17 100
8:2 PAP	1H,1H,2H,2H-perfluorodecylphosphate	57678-03-2	$C_{10}H_6F_{17}O_4P$	4.306	543.97	543	108	**97** 79	21 93
6:2 diPAP	Bis(1H,1H,2H,2H-perfluorooctyl)phosphate	57677-95-9	$C_{16}H_9F_{26}O_4P$	5.289	789.98	789	132	**442.9** 97	17 37
6:2/8:2 diPAP	(1H,1H,2H,2H-perfluorooctyl-1H,1H,2H,2H-perfluorodecyl)phosphate	943913-15-3	$C_{18}H_9F_{30}O_4P$	5.478	889.98	889	156	**443** 96.9	21 33
8:2 diPAP	Bis(1H,1H,2H,2H-perfluorodecyl)phosphate	678-41-1	$C_{20}H_9F_{34}O_4P$	5.622	989.97	989	151	**542.9**	25
M2-8:2 PAP (SS)	1H,1H,2H,2H-[1,2-13C2]perfluorodecylphosphate		C8H6F17O4P[13C]2	4.305	545.98	545	113	**97**	17
M4-6:2 diPAP (IS) 6:2 PAP	Bis(1H,1H,2H,2H-[1,2-13C2]perfluorooctyl)phosphate		C12H9F26O4P [13C]4	5.288	794.00	793	137	445	21

Table S11. PFASs analyzed by GC-MS under positive chemical ionization (PCI) mode.

Abbr.	Compound Name	CAS #	Formula	Mol. Wt.	Retention time (min)	Quantifier	Qualifier
4:2 FTOH	2-Perfluorobutyl ethanol (4:2)	2043-47-2	$C_6H_5F_9O$	264.09	5.840	265	227
6:2 FTOH	2-Perfluorohexyl ethanol (6:2)	647-42-7	$C_8H_5F_{13}O$	364.10	7.569	365	327
8:2 FTOH	2-Perfluorooctyl ethanol (8:2)	678-39-7	$C_{10}H_5F_{17}O$	464.12	9.993	465	427
10:2 FTOH	2-Perfluorodecyl ethanol (10:2)	865-86-1	$C_{12}H_5F_{21}O$	564.13	12.460	565	527
6:2 FTAcr	1H,1H,2H,2H-perfluorooctyl acrylate	17527-29-6	$C_{11}H_7F_{13}O_2$	418.15	6.450	419	399
8:2 FTAcr	1H,1H,2H,2H-Perfluorodecyl acrylate	27905-45-9	$C_{13}H_7F_{17}O_2$	518.17	9.100	519	499
10:2FTAcr	1H,1H,2H,2H-Perfluorododecyl acrylate	17741-60-5	$C_{15}H_7F_{21}O_2$	618.18	11.916	619	599
6:2 FTMAcr	1H,1H,2H,2H-perfluorooctyl methacrylate	2144-53-8	$C_{12}H_9F_{13}O_2$	432.18	7.672	433	413
8:2 FTMAcr	1H,1H,2H,2H-heptadecafluorodecyl methacrylate	1996-88-9	$C_{14}H_9F_{17}O_2$	532.19	10.413	533	513
MeFOSE	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	24448-09-7	$C_{11}H_8F_{17}NO_3S$	557.22	19.068	558	540
EtFOSE	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	1691-99-2	$C_{12}H_{10}F_{17}NO_3$	571.25	19.194	572	554
M4-4:2 FTOH (SS)	2-Perfluorobutyl-[1,1,2,2-$^2H_4$]-ethanol(4:2)		$C_6HF_9O + D_4$	268.09	5.776	269	230
M2-8:2 FTOH (SS)	2-Perfluorooctyl-[1,2-$^{13}C_2$]-ethanol(8:2)		$C_8H_5F_{17}O + {}^{13}C_2$	466.12	9.985	467	429
dMeFOSE (SS)	2-(N-methyl-d_3-perfluoro-1-octanesulfonamido)ethan-d_4-ol		$C_{11}H_1F_{17}NO_3S + D_7$	564.22	19.028	565	547
M4-8:2 FTOH (IS)	2-Perfluorooctyl-[1,1-$^2H_2$]-[1,2-$^{13}C_2$]-ethanol(8:2)		$C_8H_3F_{17}O + {}^{13}C_2D_2$	468.12	9.946	469	431

Table S12. Field, and procedural blanks for target analysis and for TOP and hydrolysis assay (ng, average ± standard error), matrix spike recoveries (MS%, mean ± standard error) and method detection limits (MDLs, after blank correction, ng/g) of individual PFAS analytes from the MS analyses. ORG, FBK, PBK, TOP and HYD represent original extraction, field blank, procedural blank, the TOP assay blank, and hydrolysis blank samples, respectively.

	Blanks (ng)				MS recovery(%)		**MDL (ng/g)**			
	FBK (n=5)	PBK (n = 11)	TOP (n = 2)	HYD (n = 2)	ORG (n=9)	TOP (n=3)	FBK	PBK	TOP	HYD
PFPrA	0.15±0.02	0.23±0.02	1.01±0.34		104±14.3	67.4±1.17	1.16	1.78	14.4	
PFBA	0.32±0.03	0.33±0.04	0.77±0.32		93.8±3.09	86.4±0.39	2.09	3.49	13.7	
PFPeA					98.7±7.11	144±4.29	0.09	0.09	0.09	
PFHxA					69.4±3.53	80.6±0.92	0.11	0.14	0.07	
PFHpA					72.3±5.23	75.0±1.18	0.05	0.05	0.05	
PFOA	0.01±0.00	0.01±0.00			88.9±4.01	77.1±3.11	0.11	0.24	0.04	
PFNA					81.5±5.20	68.1±1.80	0.07	0.06	0.07	
PFDA			0.10±0.03		102±3.25		0.05	0.11	1.16	
PFUnDA					94.7±3.96		0.16	0.04	0.06	
PFDoDA			0.15±0.01		91.2±6.12		0.08	0.08	0.31	
PFTrDA					108±8.83		0.05	0.05	0.06	
PFTeDA					94.0±4.04		0.07	0.07	0.07	
PFHxDA	0.02 ± 0.00	0.02 ± 0.00			111±9.23		0.24	0.21	0.10	
PFPrS					80.1±2.81	117±1.53	0.07	0.07	0.07	
PFBS					80.5±2.41	123±1.94	0.02	0.02	0.01	
PFPeS					82.2±1.91	116±3.48	0.01	0.01	0.01	
PFHxS					88.5±1.47	99.4±2.81	0.01	0.11	0.02	
PFHpS					94.8±1.93	92.7±2.67	0.05	0.05	0.05	
PFOS					92.5±3.21	94.8±3.57	0.02	0.05	0.05	
PFNS					93.8±2.22	81.8±4.30	0.02	0.02	0.02	
PFDS					90.5±3.18		0.08	0.08	0.08	
PFECHS					85.9±2.61		0.03	0.03	0.03	
Cl-PFOS					91.6±2.47		0.05	0.05	0.05	
4:2 FTSA					87.4±3.26		0.03	0.03	0.03	
6:2 FTSA	0.01±0.01	0.02±0.01	0.98±0.16		156±12.3		0.32	0.95	6.84	
8:2 FTSA					119±4.73		0.02	0.03	0.03	
FBSA					74.8±1.40		0.02	0.02	0.05	
FHxSA					91.2±2.83		0.02	0.02	0.02	

FOSA					108±3.20	0.08	0.03	0.03	
MeFOSA					89.4±3.08	0.03	0.03	0.03	
EtFOSA					96.7±3.40	0.01	0.04	0.04	
4:2 FTOH					63.5±3.46	3.70	3.70	3.70	3.70
6:2 FTOH	0.59±0.15	0.26±0.12			67.7±5.02	9.19	7.03	2.20	2.20
8:2 FTOH	1.21±0.09	1.11±0.08	0.65±0.11	0.23±0.23	86.4±1.95	5.72	7.99	4.79	7.45
10:2 FTOH	0.02±0.03			0.08±0.23	91.2±7.91	1.99	2.18	2.20	2.65
MeFOSE		0.03±0.02		0.03±0.03	72.6±6.53	2.26	2.23	2.30	1.78
EtFOSE				0.02±0.02	70.6±7.31	2.18	2.20	2.20	1.81
6:2 FTAc				0.05±0.05	63.7±4.02	0.24	0.32	0.32	1.48
8:2 FTAc				0.03±0.03	86.4±12.8	0.39	0.39	0.39	0.90
10:2 FTAc	0.01±0.00			0.02±0.02	101±11.0	0.33	0.36	0.41	0.78
6:2 FTMAc				0.06±0.06	70.6±4.34	0.31	0.03	0.31	1.82
8:2 FTMAc		0.03±0.03		0.01±0.01	83.4±5.00	0.34	0.03	0.34	0.34
6:2 PAP		0.02±0.01	0.15±0.01		58.3±10.3	0.39	0.27	0.35	
8:2 PAP	0.02±0.04	0.04±0.02	0.11±0.07		97.0±3.84	1.04	2.12	2.92	
6:2 diPAP			0.01±0.00		91.8±2.75	0.14	0.08	0.02	
6:2/8:2 diPAP	0.01±0.01		0.01±0.00		144±8.70	0.33	0.05	0.16	
8:2 diPAP			0.01±0.00		99.2±7.76	0.16	0.05	0.11	

Table S13. Surrogate recoveries (%, average ± standard error) for original extraction (ORI) and TOP assay (TOP) procedure.

	ORI	TOP
M3PFBA	92.5±1.7	51.4±6.6
M3PFBS	85.9±0.7	82.1±12.1
MPFHxA	74.5±1.5	83.5±2.8
MPFHxS	92.5±0.8	92.3±2.6
MPFOA	95.8±1.2	62.1±5.6
MPFOS	90.5±0.9	94.8±9.1
MPFUdA	97.8±1.7	
M2PFTeDA	104±2.5	
M2-8:2 FTSA	137±7.2	89.8±9.7
dMeFOSA	98.7±3.2	
M4-4:2 FTOH	57.8±1.3	
M2-8:2 FTOH	75.1±1.4	52.0±10.1
dMeFOSE	76.1±2.5	115±15.6
M2-8-2_PAP	112±10.5	41.8±7.1

Table S14. Relative Standard Deviation (RSD, %) of individual PFAS in field and lab duplicates

	Field Duplicates		**Lab duplicates**		
	UOT-IP-5a/2-IP-19a	UOT-IP-16c/2-IP-7c	UOT-IP-19a/20a	UOT-2-IP-20a/21a	UOT-IP-US-34/35
PFCAs					
PFPrA	6.95	12.2	16.1	4.1	
PFBA	5.50	26.3		4.0	
PFPeA				16.8	12.8
PFHxA	10.4	17.9	19.4		
PFHpA	21.8		43.3	41.2	
PFOA		38.4			
PFSAs					
PFHxS					
PFOS	25.9				
Cl-PFOS					
PAPs					
6-2_diPAP					
Neutral PFAS					
6:2 FTOH	7.90	17.9	11.6	5.7	
8:2 FTOH	3.63			15.0	
10:2 FTOH				13.9	
6:2 FTAcr					
8:2 FTAcr				21.8	
6:2 FTMAcr	19.8	1.3	12.7	19.1	
ΣPFAS	12.2	11.4	12.2	10.9	12.8

Table S15: School uniforms marketed as “stain resistant” as reported by major school uniform retailer websites.

Retailer number	**Website country (CAN or US)**	**Number of uniforms marketed as “stain resistant”**	**Total number of uniform items**	**Percent of uniforms marketed as “stain resistant”**	**Date of data collection**
1	US	65	338	19.23	Aug-2021
2	CAN	1	59	1.69	Aug-2021
3	CAN	52	365	14.25	Aug-2021
4	US	2	95	2.11	Oct-2021
5	US	5	62	8.06	Oct-2021

Table S16. Detection Frequencies (df, %), min, max, median and mean concentration (ng/g) of PFAS in five selected school uniforms analyzed before and after oxidization by the total oxidizable precursor (TOP) assay and before and after hydrolysis.

ng/g		**Total targeted PFAS**	**PFPrA**	**PFBA**	**PFPeA**	**PFHxA**	**PFHpA**	**PFNA**	**PFBS**	**PFPeS**	**PFHxS**	**6:2 FTS**	**6:2 FTOH**	**6:2 FTAc**	**6:2 FTMAc**
Before TOP	df	100		20.0		100	80.0		20.0			20.0	80.0	60.0	60.0
	min	40.6		ND		0.539	ND		ND			ND	ND	ND	ND
	max	72000		22.6		4.20	0.32		6.47			1.03	72000	36.6	371
	median	16200		3.19		1.59	0.15		0.01			0.50	16200	2.58	4.15
	mean	21600		6.99		1.85	0.17		1.30			0.61	21500	13.5	108
After TOP	df	100	100	100	100	100	100	100	100	60.0	60.0	60.0	100		
	min	3520	176	579	878	7.99	0.743	2.35	0.357	ND	ND	ND	143		
	max	308000	35300	154000	167000	40900	2120	5.24	19400	6.97	11.9	80.4	550		
	median	105000	6900	21200	16800	6140	446	4.32	2.45	0.947	0.566	52.7	225		
	mean	126000	12200	48600	49300	10900	853	4.02	3890	1.79	3.77	40.4	282		

ng/g		**4:2 FTOH**	**6:2 FTOH**	**8:2 FTOH**	**10:2 FTOH**	**6:2 FTAC**	**8:2 FTAC**	**10:2 FTAC**	**6:2 FTMAC**	**8:2 FTMAC**	**MeFOSE**	**EtFOSE**
Before hydrolysis	df	20.0	80.0	20.0	20.0	60.0	20.0	20.0	60.0		20.0	
	min	ND	ND	ND	ND	ND	ND	ND	ND		ND	
	Max	5.25	72000	29.0	16.1	36.6	7.70	8.50	371		5.78	
	Median	1.81	16200	9.49	1.08	2.58	0.19	0.38	4.15		1.12	
	Mean	2.46	21500	13.2	4.05	13.5	1.69	2.00	108		2.03	
After Hydrolysis	Df	40.0	80.0	20.0	80.0	20.0	40.0	80.0	20.0	40.0	100.0	60.0
	Min	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.0	ND
	Max	777	3160000	132	53.7	7.87	50.7	24.2	35.7	21.5	641	29.8
	Median	6.17	1220000	19.6	28.0	3.89	2.41	10.6	4.80	0.93	62.2	10.8
	Mean	183	1450000	42.2	28.7	4.68	18.2	12.5	11.0	7.83	178	12.1

Table S17 Concentration (ng/g) of individual PFAS in five selected school uniforms analyzed before and after oxidization by the total oxidizable precursor (TOP) assay and before and after hydrolysis. Original, TOP and HYD represent original extraction, TOP assay, and hydrolysis.

Concentration, ng/g	US-16			US-24			US-25			US-27			US-29		
	Original	TOP	HYD	Original	TOP	HYD	Original	TOP	HYD	Original	TOP	HYD	Original	TOP	HYD
PFCAs															
PFPrA		6900			176			35300			15600			2970	
PFBA	22.6	154000			579			62400			21200			4740	
PFPeA		878			1630			167000			60900			16800	
PFHxA	4.21	7.99		1.32	885		1.62	40900		0.542	6520		1.59	6140	
PFHpA	0.151	0.743		0.070	42.5		0.258	2120			446		0.324	1650	
PFOA	0.330												0.287	4.97	
PFNA		2.35			5.11			4.32			3.08			5.24	
PFDA	0.381			0.160											
PFUdA	0.084						0.0591								
PFDoA	0.127												0.106		
PFTrDA	0.186												0.274		
PFTeDA		1.69			1.51			1.63			1.25			1.61	
PFSAs															
PFPrS		1.67													
PFBS	6.47	19400			0.774			2.88			2.45			0.357	
PFPeS								6.97			1.01			0.947	
PFHxS					0.566			11.9						6.34	
PFHpS								0.318							
PFDS				0.386											
FTSs															
4:2 FTS	0.028										0.431				
6:2 FTS		68.8		1.06	52.7			80.4							
8:2 FTS										0.038					
PAPs															

6-2_PAP		5.72					0.478	17.0							
6-2_diPAP					0.278			0.178					1.12		
Neutral PFAS															
FBSA	0.284	91.7													
4:2 FTOH						122			777				5.25		
6:2 FTOH		225		445	143	1270000	72000	550	1580000	16200	220	609000	18800	272	172000
8:2 FTOH			62.6										29.03		
10:2 FTOH			25.6			26.8					25.9	28.0	16.1		28.0
6:2 FTAcr			7.87				28.2			36.6			2.58		
8:2 FTAcr						50.7			33.4				7.70		
10:2 FTAcr			10.6						24.2			15.1	8.50		10.4
6:2 FTMAcr				371			4.15			1.47			161		35.7
8:2 FTMAcr						21.5			14.9						
MeFOSE	5.78		641			22.0			59.6			105			62.2
EtFOSE			12.9									29.8			10.8

Table S18. Comparison of PFAS concentrations in earlier studies and this study

Year of PFAS analysis, sampling location	**Year of products purchased**	**Type of products**	**Ionic PFAS, μg/m²**	**FTOHs and FT(M)ACs, μg/m²**	**Total targeted PFAS, μg/m²**	**Ref.**
2006, Scandinavia	2006*	Outdoor clothing (16)	2.33 to 453 (median:18.0)	Total FTOHs: ND-10700 (median: 94.4) predominate: 8:2 FTOH, followed by 10:2 FTOH		[16]
2009, US	2007-2008	Children's uniform (4)	PFCAs: 90.3-672.ng/g (median: 134 ng/g)	N/A	PFCAs: 90.3-672.ng/g (median: 134 ng/g)	[17]
2014, US	2007-2011	Children's uniform (13)	PFCAs + PFSAs: ND-976 ng/g (median: 116 ng/g)	N/A	PFCAs + PFSAs: ND-976 ng/g (median: 116 ng/g)	[18]
2015, Denmark	2015*	Children products (15) prescreening with total fluorine	PFCAs: 0.10-45.30	6:2 FTOH: 0.02-83.05 8:2 FTOH: 6.52-264.99 10:2 FTOH: 1.83-54.54 ΣFT(M)AC: 0.06-6.46		[14]
2016 Thailand	2016*	Body contact Textile (17)	PFOA:0.02-0.61 (mean: 0.18) PFOS:0.31-14.14 (mean: 2.74)	N/A		[19]
2017, US	2015	Children clothing (2)	ND	6:2 FTOH: ND-7.0 8:2 FTOH: 72-130 10:2FTOH: 37-42		[20]
2017, US	2015	Outdoor clothing (5)	0.66-55.92	6:2 FTOH: ND-14000 8:2 FTOH: 22-990 10:2 FTOH: ND -490		[20]
2020, Sweden	2020*	Outdoor clothing (13)	ND-82.9	6:2 FTOH: ND-120 6:2 FTMAC: 4.1-180		[21]

2020, US	2016-2020	Infant clothing (59) and functional textiles (101)	ND- 63.7 (ND -285 ng/g) (mean: 3.18 (14.2 ng/g))	N/A		[22]
2020, US	2020	Infant clothing (86)	Median: 3.42 ng/g	6:2 FTOH (Median: 27.1 ng/g)		[23]
2021, US & Canada	2020 & 2021	Children's products (57)	0.004-8.18 (0.021– 48.8 ng/g) (mean: 0.67 (2.99 ng/g))	6:2 FTOH: ND – 38100(ND – 153000 ng/g) (median: 55.31 (355 ng/g)) 6:2 FTMAc: ND – 343.2 (ND – 1020.0 ng/g) (median: 28.2 (219 ng/g))	0.250-153000 ng/g (median:117 ng/g) 0.0272-38100, median: 24.0)	This study
2021, US & Canada	2020 & 2021	School uniform (25)	0.10-34.6 ng/g (median: 2.30 ng/g) 0.014-7.98 (median:0.544)	6:2 FTOH ND-153000 ng/g (median:445 ng/g) ND-38100 (median: 78.0) 6:2 FTMAc: ND-1020 ng/g (median: 132 ng/g) ND-340 (median: 48.2)	0.283-153000 ng/g (median:728 ng/g) 0.041-38100, (median: 178)	This study

Table S19. Input data for Substance Flow Analysis of PFAS found in school uniforms purchased with description, and estimates of low, middle, and high values, and source of information.

Parameter	Description	Parameter Values Used			Source
		Low	Middle	High	
$C_{functional}$ polymeric	Concentration of functional polymeric PFAS in school uniforms	0.15%	0.30%	0.45%	Audenaert et al.[10], Sayed & Dabhi,[11] Choudhury[12]
$C_{no\ PFAS}$ polymeric	Concentration of polymeric PFAS in untreated school uniforms	0%	0%	0%	N/A
$C_{functional}$ non-polymeric	Concentration of functional non-polymeric PFAS in school uniforms	3.52E-03%	1.05E-02%	1.25E-02%	TOP Assay, Table 15
$C_{no\ PFAS}$ non-polymeric	Concentration of non-polymeric PFAS in untreated school uniforms	0%	0%	0%	N/A
$\%_{functional}$	Percent of school uniforms with functional PFAS	1%	6%	16%	Calculated
$\%_{no\ PFAS}$	Percent of school uniforms with no PFAS	99%	94%	84%	Calculated

Table S20. Values used to estimate the mass of school uniforms purchased in a given year between 2019 and 2021.

Country	Description	Values Used			Units	Source
		Low	Middle	High		
US	$\%_{children}$	16	26	36	Percent	Coresight Research[4]
	Population	62,377,000			Persons	United Nations[5]
	Number of items	2	6	10	Number of items purchased/person/year	Assumed
	Weight of garment	125	166	202	Grams	This study
	$\mathbf{M_{school\ uniform}}$	249	1,610	4,521	Tonnes	Calculated
Canada	$\%_{children}$	16	26	36	Percent	Assume same as US
	Population	6,217,568			Persons	Government of Canada[6]
	Number of items	2	6	10	Number of items purchased/person/year	Assumed
	Weight of garment	125	166	202	Grams	This study
	$\mathbf{M_{school\ uniform}}$	249	1,610	4,521	Tonnes	Calculated

Table S21: Additional PFAS Flows illustrated in Figure S3

Flow Designation	Description
F_1	Flow of PFAS in children's school uniform sales.
F_2	Flow of PFAS in discarded school uniforms
F_3	Flow of PFAS in littered infants' textiles
F_4	Flow of PFAS in recycled children's school uniforms
$F_{4.1}$	Flow of PFAS from recycled children's school uniforms that are recycled back into uniforms
$F_{4.2}$	Flow of PFAS from recycled children's school uniforms that are recycled into other materials
$F_{4.3}$	Flow of PFAS from used children's school uniforms that are resold locally at secondhand shops
$F_{4.4}$	Flow of PFAS from used children's school uniforms that are exported
$F_{4.5}$	Flow of PFAS from recycled children's school uniforms intended for recycling but ultimately landfilled
$F_{4.6}$	Flow of PFAS from children's school uniforms which is released to the environment during the recycling process
F_5	Flow of PFAS from incinerated children's school uniforms
F_6	Flow of PFAS in landfilled children's school uniforms
$F_{6\ Michigan}$	Flow of PFAS in landfilled children's school uniforms sent to Michigan from Canada
F_{SU}	Flow of PFAS produced which are used in children's school uniforms
$F_{SU\ storage}$	Flow of PFAS from children's school uniforms stored for long periods
$F_{Production}$	Flow of PFAS released during the production of children's school uniforms
$F_{shedding}$	Flow of PFAS from children's school uniform fiber shedding directly into environment
F_{Intake}	Flow of PFAS from children's school uniforms ingested or absorbed into the skin
F_{drying}	Flow of PFAS released to the environment during machine drying
$F_{Human\ Storage}$	Flow of PFAS bioaccumulated due to children's school uniforms
$F_{Human\ WWTP}$	Flow of PFAS from children's school uniforms eliminated in feces and urine by humans and sent to WWTP
F_{Bio}	Flow of PFAS from WWTP biosolids
F_{WWTP}	Flow of PFAS in WWTP effluent from children's school uniforms
$F_{influent}$	Flow of PFAS from washing to WWTP
$F_{Bio\ to\ env}$	Flow of PFAS from biosolids into the environment
F_{litter}	Flow of PFAS contained in littered children's school uniforms
$F_{Incineration}$	Flow of PFAS released to environment via incineration of children's school uniforms
$F_{Destruction}$	Flow of PFAS permanently destroyed via incineration
$F_{Leachate}$	Flow of PFAS from landfill leachate sent to WWTP

Table S22. Description of relevance of each flow to understanding the movement of PFAS added to school uniforms through the environment.

Flow Designation	Motivation/Description
F_1	PFAS may be added to textiles intentionally for stain, water, dirt, and/or grease resistance or unintentionally through contamination.[3, 24,]
F_2	We assumed that a portion of PFAS remain in textiles after use and will enter the end of life pathway.
F_3	We assumed that PFAS in littered school uniforms is likely a negligible flow.
F_4	We assumed that PFAS can remain in textiles sent for recycling.
$F_{4.1}$	20% of recyclable textiles are reprocessed into fiber and used in the manufacturing of new products.[25, 26]
$F_{4.2}$	30% of recyclable textiles are reprocessed into industrial polishing/wiping cloths.[25, 26]
$F_{4.3}$	20% of recyclable textiles are resold at local (i.e. within the same country) second-hand stores.[25, 26]
$F_{4.4}$	25% of recyclable textiles are exported and sold abroad.[25, 26]
$F_{4.5}$	5% of recyclable textiles are intended for recycling but are ultimately sent to landfill.[25, 26]
$F_{4.6}$	Textiles are either pulled into fibers or shredded during the recycling process.[2731] Air emissions during the shredding process can lead to airborne PFAS release.[2828]
F_5	In Canada, approximately 3% of waste requiring final disposal is incinerated.[29] In the U.S., the EPA reported that the total municipal solid waste combusted with energy recovery by material for clothing and footwear was 2,004,878 tonnes in 2018.[30] We assumed that a portion of PFAS-treated textiles are sent to incineration.
F_6	The Canadian government estimates that 9,475,471 tonnes of waste was landfilled in Ontario in 2016, and that textiles account of 1.4% of overall Canadian residual municipal solid waste disposal.[31] In 2018, the U.S. estimate of the total municipal solid waste landfill by material for clothing and footwear was 82,28,166 tonnes, and that textiles in general accounted for 7.7% of all municipal solid waste landfilled.[32] Michigan estimates that textiles and leather constituted 4.7% (3.8-5.5%) of municipal solid waste.
$F_{6\ Michigan}$	A portion of waste generated in Canada is sent to Michigan for landfilling.[33] We assumed that a portion of PFAS-treated textiles are sent to Michigan landfills.
F_{SU}	A portion of PFAS production is used in the textile industry. In fact, the US EPA reported that textiles and apparel accounted for 50% of fluorotelomer and associated side-chain fluoropolymer use in 2006.[28, 34]
$F_{SU\ storage}$	We assumed that a portion of school uniforms are kept in storage prior to use, whether in warehouses, department stores, etc.
$F_{Production}$	PFAS may be released to the environment during PFAS production, whether to air, water, and/or land.[13, 35]
$F_{shedding}$	Microfiber shedding can occur during wearing and washing processes[36, 37]. PFAS thus may enter the environment through fiber shedding processes.
F_{Intake}	Direct contact of clothing with skin is a route of chemical exposure through dermal absorption, and has been identified as a critical human exposure pathway for PFAS.[23, 3840,41]
F_{drying}	Microfibers shed during the electric drying process can be released directly to the environment through dryer vents.[39, 40] PFAS thus may enter the environment through fiber shedding during clothing drying.
$F_{Human\ Storage}$	Numerous species of PFAS have been identified as bioaccumulative in humans and other organisms.[41]

$F_{Human\ WWTP}$	PFAS contained in the human body can be excreted via urine,[42, 43] which may be a minor flow to wastewater treatment plants, given that fluorochemicals have previously been identified in wastewater influent.[44, 45]
F_{Bio}	Biosolids produced during the wastewater treatment process may contain residual PFAS.[46]
F_{WWTP}	Wastewater treatment plants are well-known sources of PFAS emissions directly to the environment, as they are inefficiently removed during treatment processes.[35, 37]
$F_{influent}$	Microfibers released during machine washing can enter wastewater influent[36, 37] and thus present a flow for PFAS originating in school uniforms.
$F_{Bio\ to\ env}$	Biosolids applied to agricultural lands as fertilizer may present an exposure of PFAS to the environment.[46]
F_{litter}	We assume that PFAS originating from littered school uniforms is likely a negligible flow, and therefore exposure to the environment is also likely minimal.
$F_{Incineration}$	Incomplete destruction of PFAS during incineration processes can result in emission of smaller PFAS and other volatile compounds, leading to environmental contamination.[47, 48]
$F_{Destruction}$	Incineration at high enough temperatures is used to “thermally mineralize” fluorinated polymers in textiles.[28] However, the effectiveness of employing incineration (high temperature chemical breakdown) as a final destruction pathway for PFAS is not well understood.[48, 49]
$F_{Leachate}$	Landfill leachate is a known source of PFAS, as they are routinely detected with short-chain PFAS being the most abundant.[28]

Table S23. Estimate Daily Intake of PFAS via dermal absorption based on the total targeted PFAS concentration measured in these products.

Sample ID	EDI derm, ng/kg bw/ day
UOT-IP-4b	2.32
UOT-IP-5a	5.56
UOT-IP-6b	0.61
UOT-2-IP-12a	2.80
UOT-2-IP-13a	2.91
UOT-IP-US-15	0.23
UOT-IP-US-16	0.05
UOT-IP-US-17	0.0005
UOT-IP-US-18	0.0002
UOT-IP-US-19	0.0009
UOT-IP-US-20	0.74
UOT-IP-US-21	2.57
UOT-IP-US-22	1.54
UOT-IP-US-23	1.85
UOT-IP-US-24	1.20
UOT-IP-US-25	95.3
UOT-IP-US-26	0.0004
UOT-IP-US-27	23.4
UOT-IP-US-28	1.03
UOT-IP-US-29	26.9
UOT-IP-US-30	0.39
UOT-IP-US-31	0.42
UOT-IP-US-32	0.14
UOT-IP-US-33	222
UOT-IP-US-34	0.003
Median	1.03

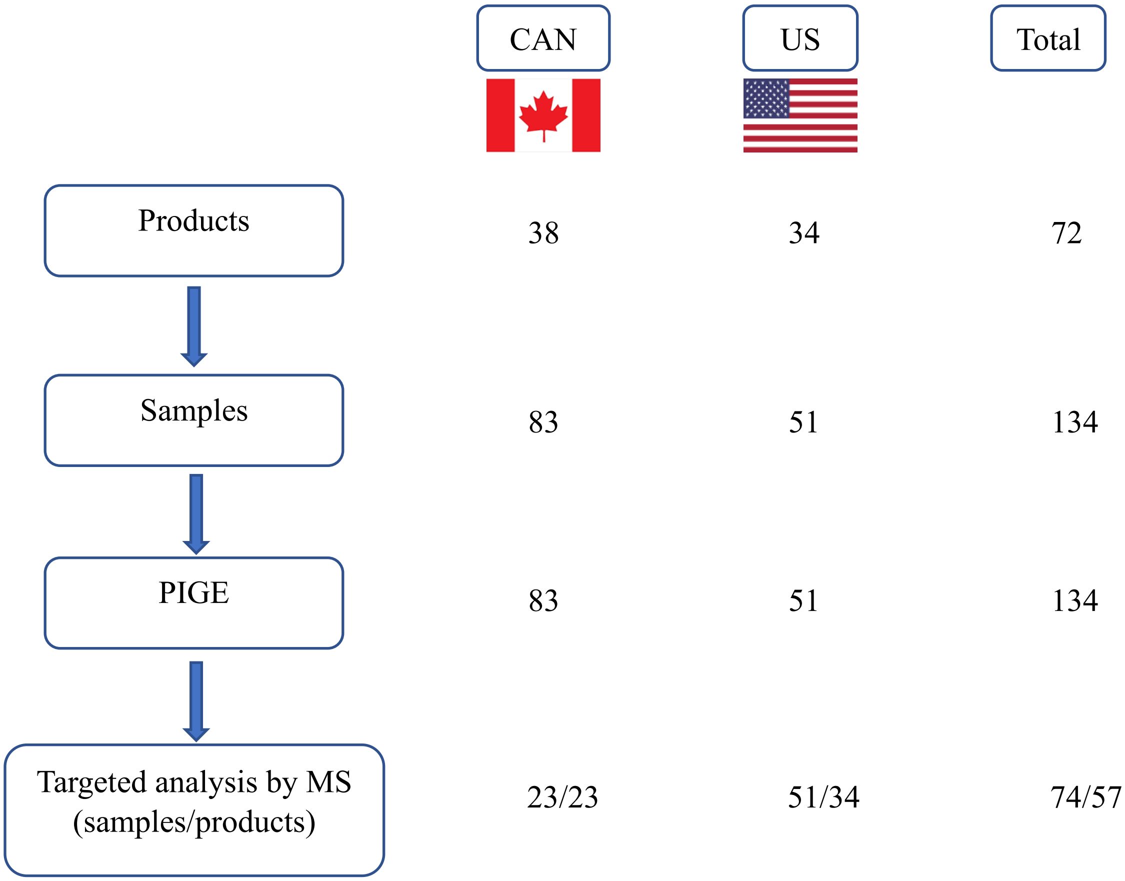

Figure S1. Summary of sampling scheme identifying the number of products purchased, the number of samples generated from the products and the total number of samples analyzed with each technique.

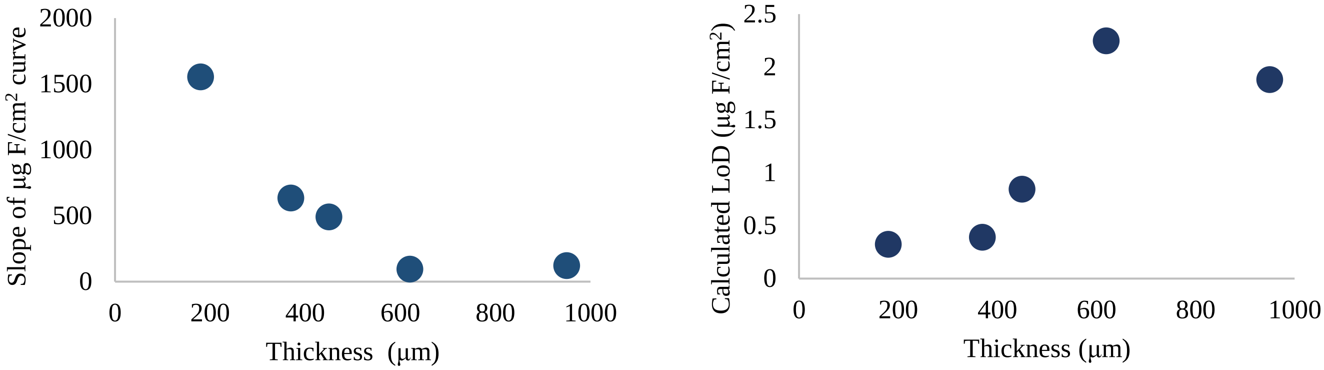

Figure S2 Relationship between material thickness and the slope of a calibration curve generated using that material (left) and the relationship between material thickness and the LoD determined from a calibration curve generated using that material (right).

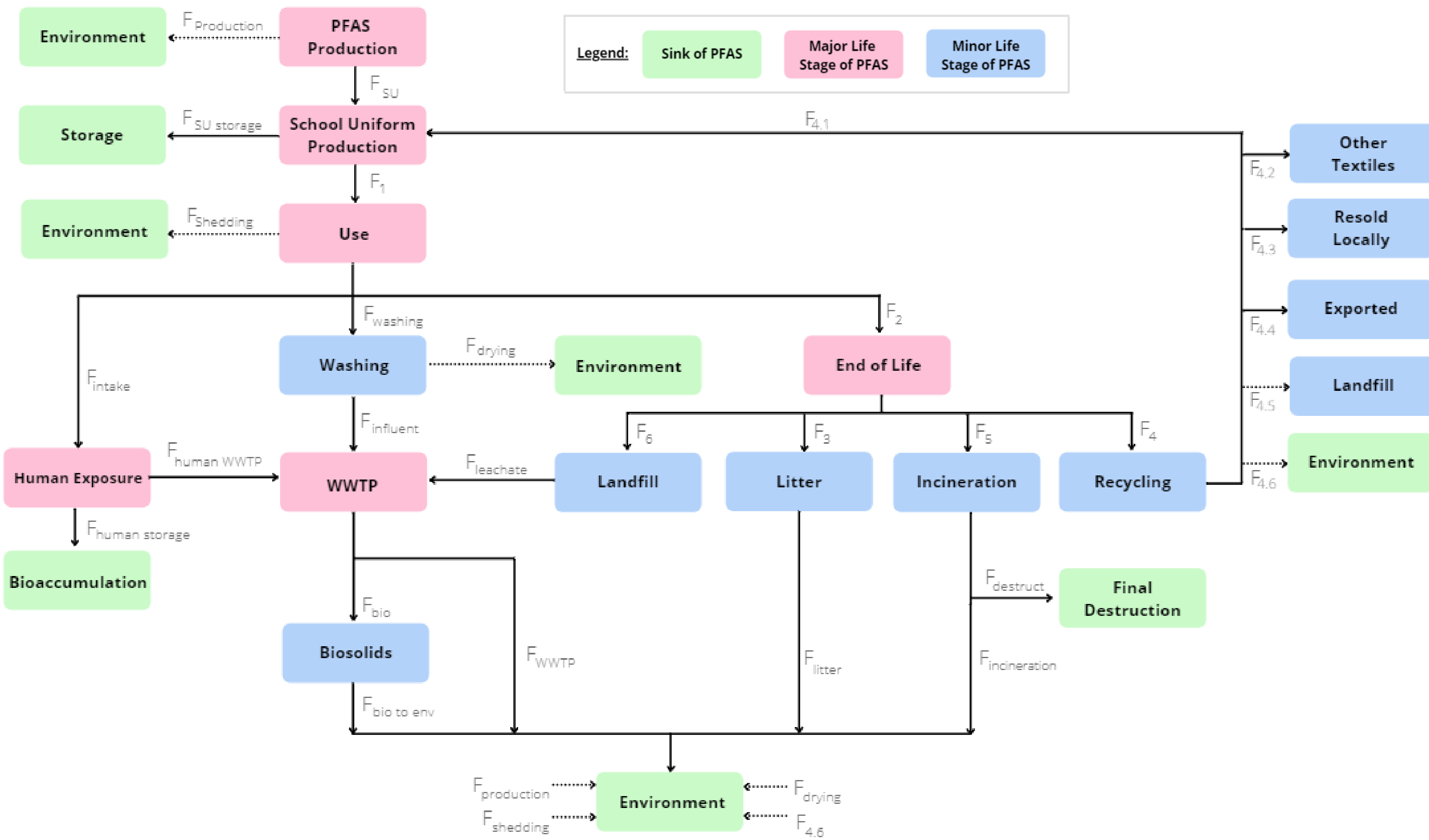

Figure S3. Substance flow analysis flow chart.

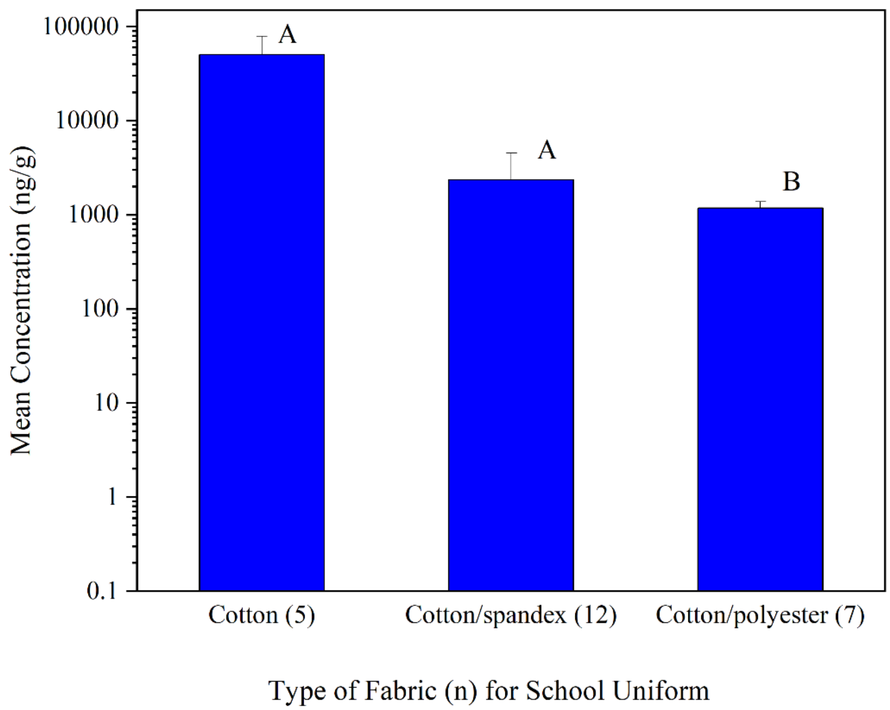

Figure S4. Mean (with standard errors) total targeted PFAS concentrations (ng/g) in different fabric types for school uniforms. Numbers in the bracket represent the number of samples. The letters represent the results of Kruskal-Wallis ANOVA; the concentrations are ranked from high to low in alphabetic order; the bars sharing the same letters are not significantly different at $p<0.05$.

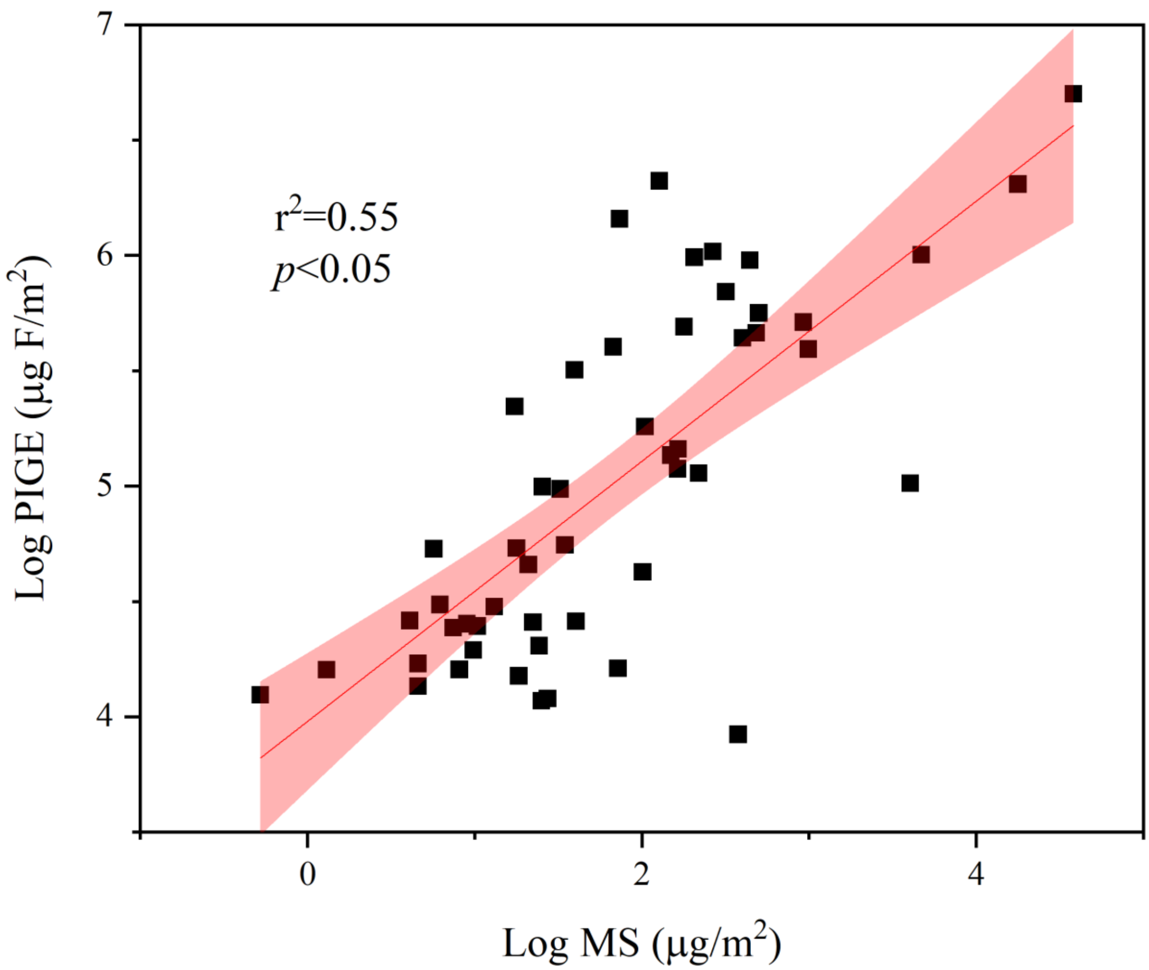

Figure S5. Correlation between total fluorine (µg F/m^2) by PIGE and total targeted PFAS (µg/m^2) by MS

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