

PFAS in drinking water in Norway; generally, very low levels. Elevated concentrations were detected near known PFAS sources

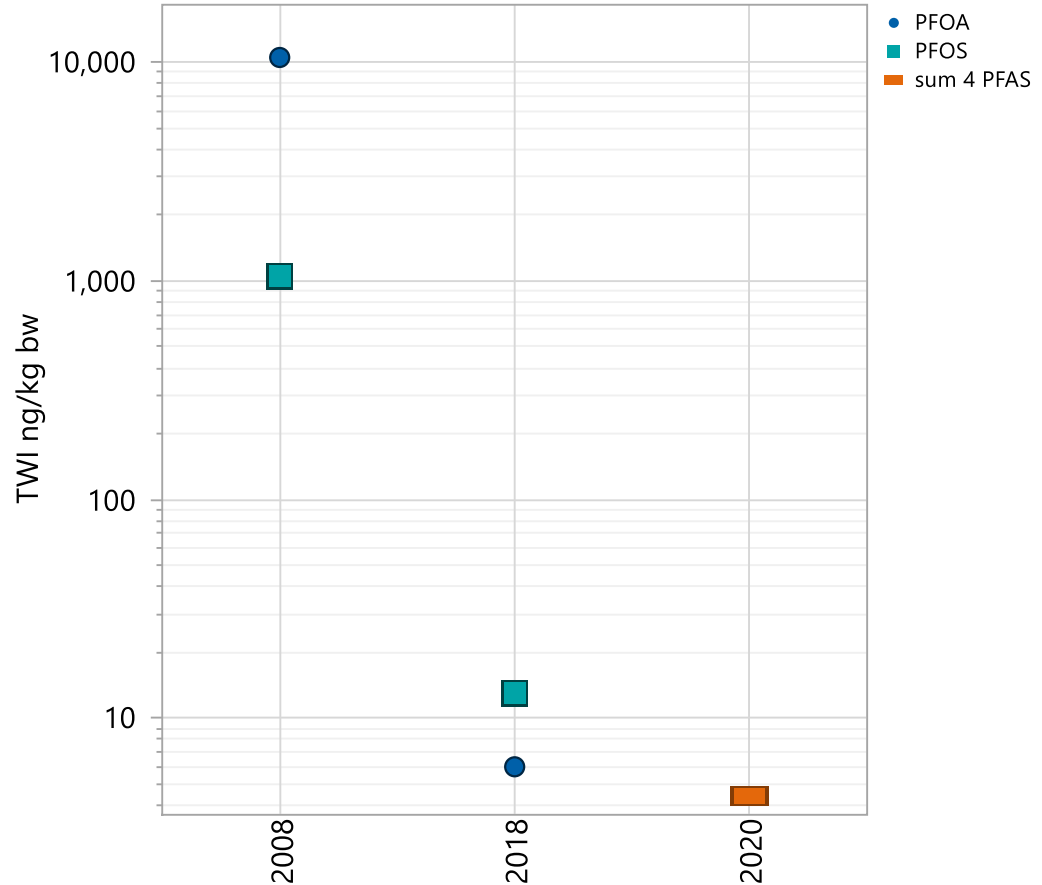
Merete Grung¹, Kine Bæk¹, Thomas Rundberget¹, Dag Hjermann¹

¹ NIVA – Norwegian Institute for Water Research, Økernveien 94, 0579 Oslo, Norway

EFSA Risk assessment

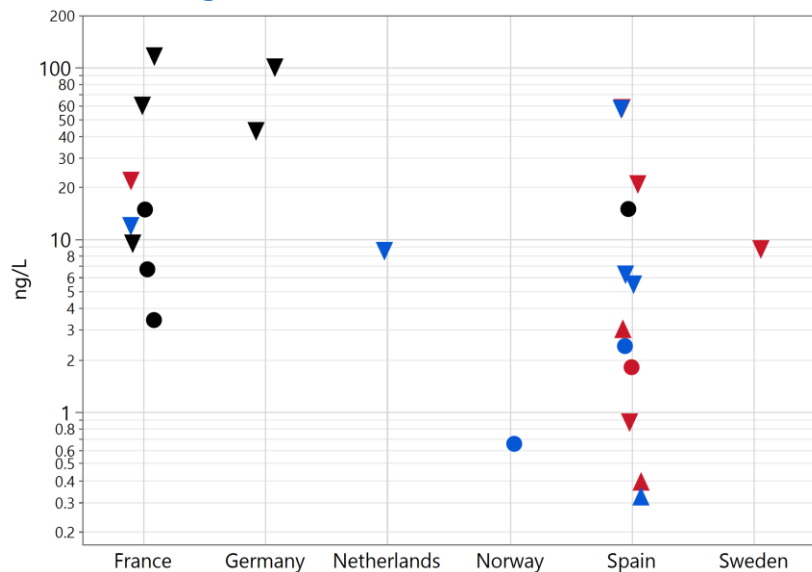
2020:
TWI sum (PFOS+PFHxS+PFOA+PFNA)
4.4 ng/kg body wt.

timeline TWI (ng/kg body weight)

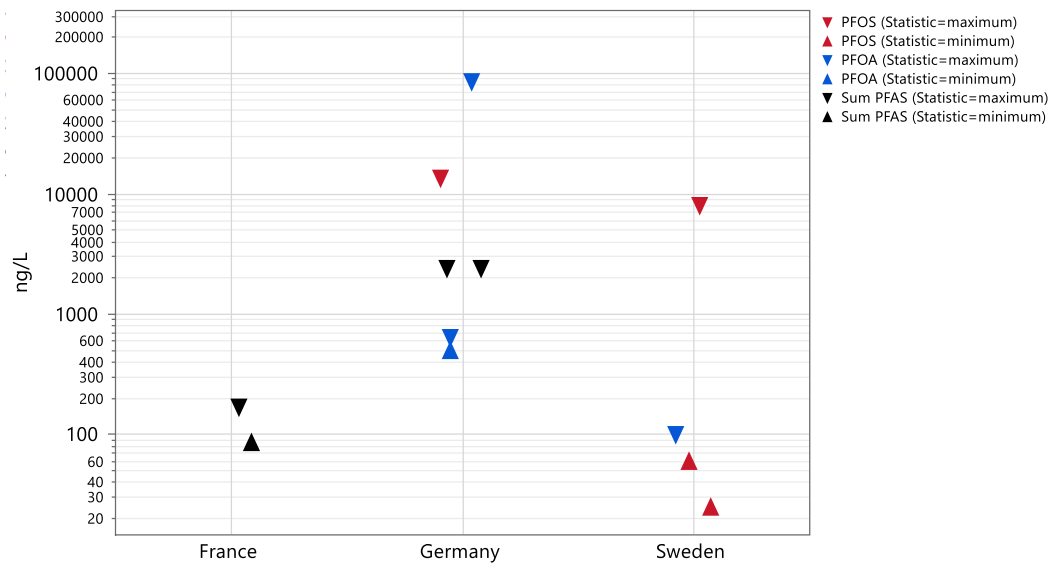


PFAS in drinking water in Europe

Drinking water



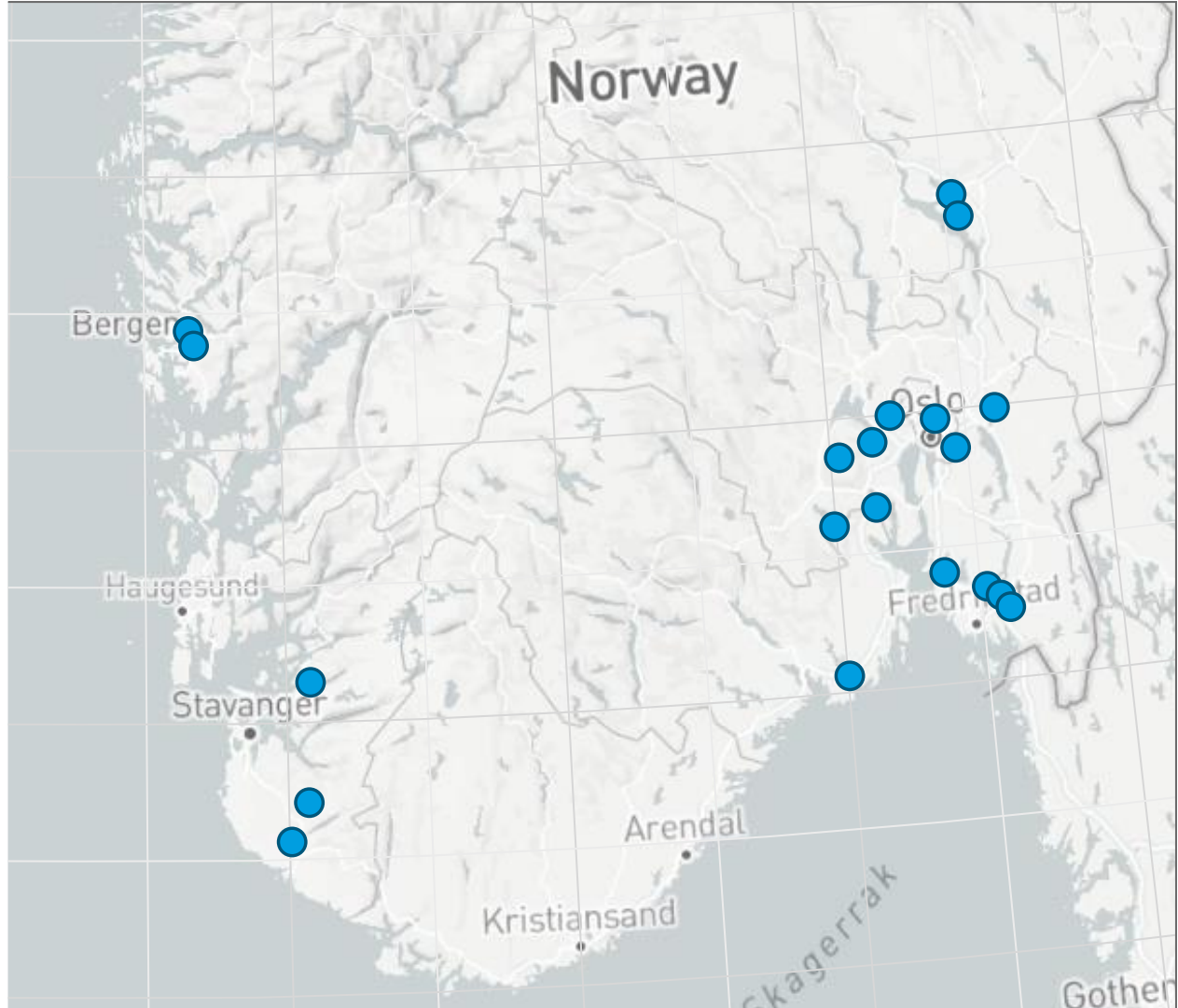
water/drinking water near known pollution



Domingo et al. 2019. doi:[10.1016/j.envres.2019.108648](https://doi.org/10.1016/j.envres.2019.108648).

Water sources

20 sources
ca. 2.2 mill.
consumers (41%)

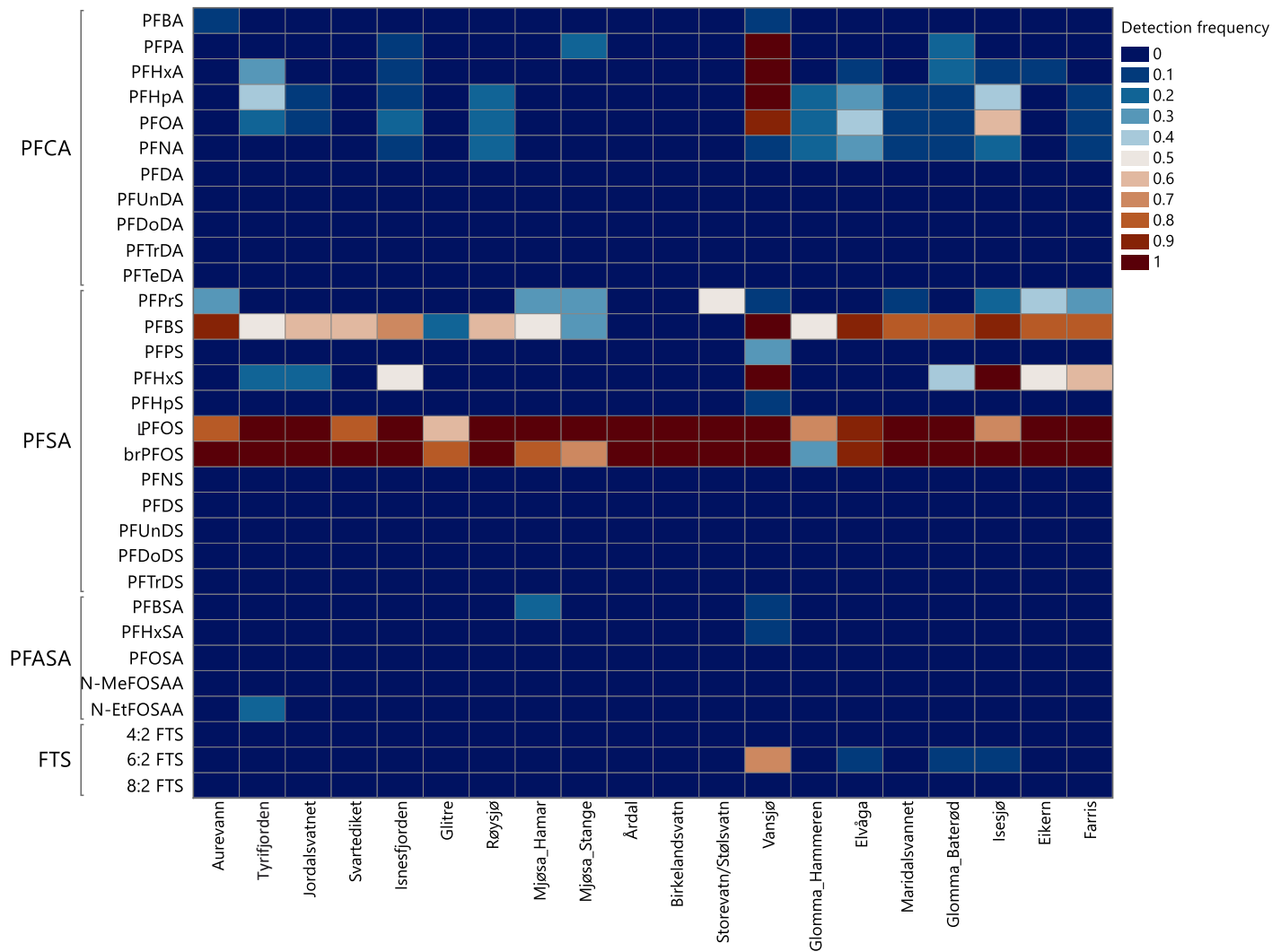


Group	PFAS	LOQ (ng/L)	Included in EU DWD	EFSA TWI
PFCA	PFBA	0.1	X	
	PFPA	0.1	X	
	PFHxA	0.2	X	
	PFHpA	0.2	X	
	PFOA	0.2	X	X
	PFNA	0.2	X	X
	PFDA	0.1	X	
	PFUnDA	0.2	X	
	PFDODA	0.2	X	
	PFTTrDA	0.2	X	
	PFTeDA	0.2		
PFSA	PFPrS	0.05		
	PFBS	0.05	X	
	PFPS	0.05	X	
	PFHxS	0.05	X	X
	PFHpS	0.04	X	
	LPFOS	0.05	X	X
	brPFOS	0.05	X	X
	PFNS	0.04	X	
	PFDS	0.1	X	
	PFUnDS	0.1	X	
	PFDODS	0.1	X	
PFTTrDS	0.1	X		
PFASA	PFBSA	0.05		
	PFHxSA	0.05		
	PFOSA	0.1		
	N-MeFOSAA	0.04		
	N-EtFOSAA	0.04		
FTS	4:2 FTS	0.05		
	6:2 FTS	0.05		
	8:2 FTS	0.05		

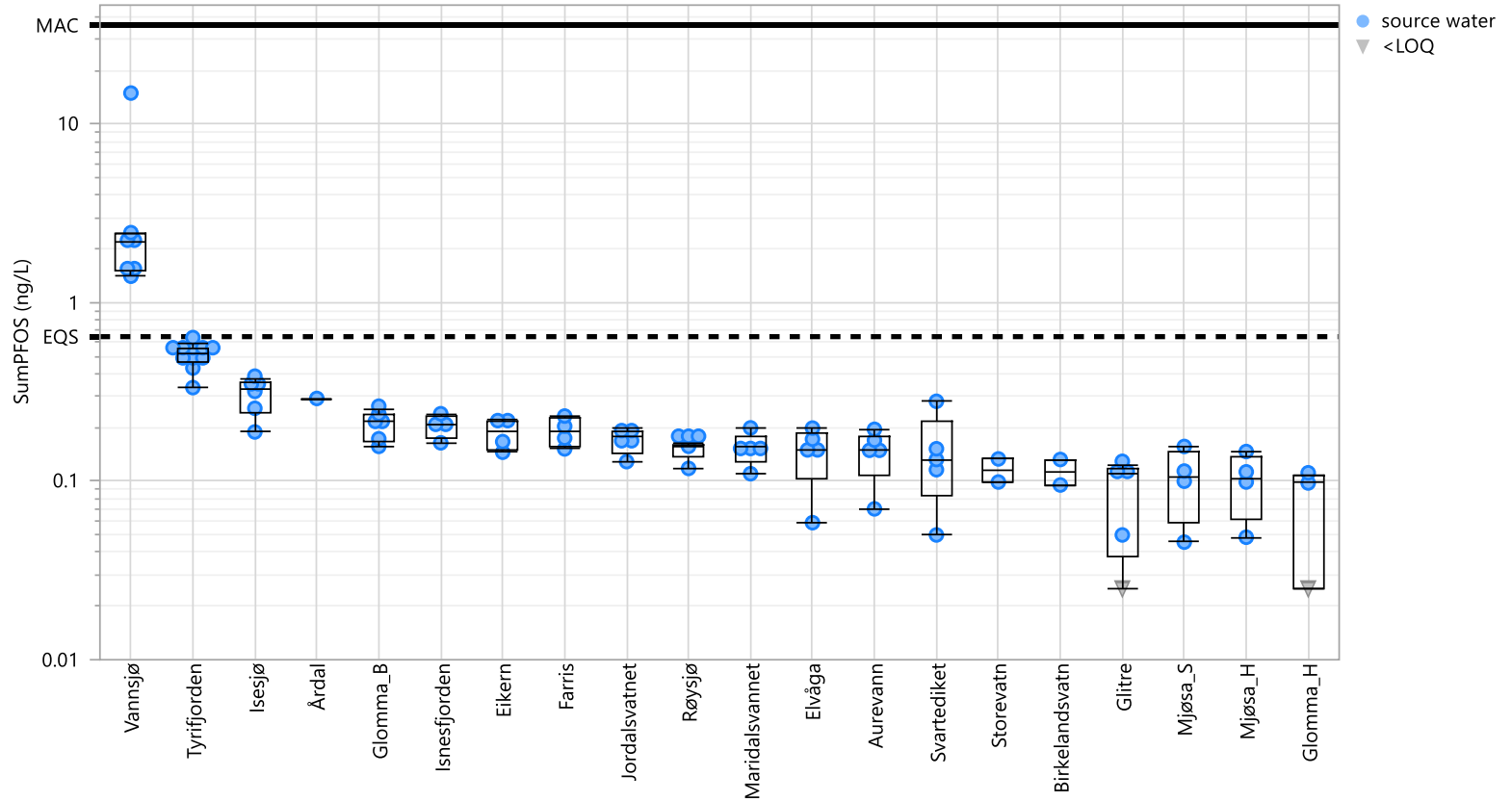
Water supplier	Water Source	Source water	Drinking water
ABV IKS	Aurevann	5	3
	Tyrifjorden	11	2
Bergen kommune	Jordalsvatnet	5	5
	Svartediket	5	5
FREVAR KF	Isnesfjorden	4	6
Glitrevannverket IKS	Glitre	5	0
	Røysjø	5	0
Hias IKS	Mjøsa_Hamar	5	3
	Mjøsa_Stange	3	1
IVAR IKS	Årdal	1	1
	Birkelandsvatn	2	0
	Langevatn	2	2
MOVAR IKS	Vansjø	7	7 (15*)
NRVA IKS	Glomma_Hammeren	3	3
Oslo VAV	Elvåga	5	6
	Maridalsvannet	5	7
Sarpsborg kommune	Glomma_Baterød	6	6
	Isesjø	6	6
Vestfold Vann IKS	Eikern	4	4
	Farris	4	4
Sum		93	71 (79)

Detection frequencies

source water and drinking water

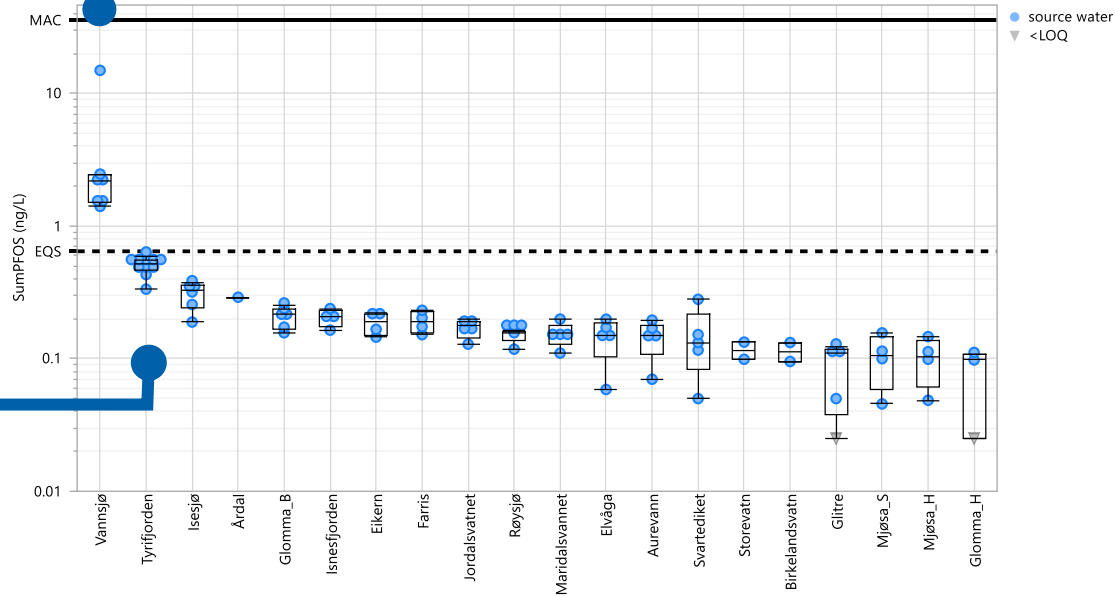
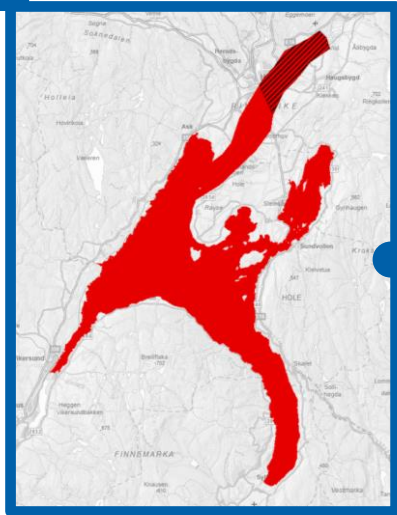
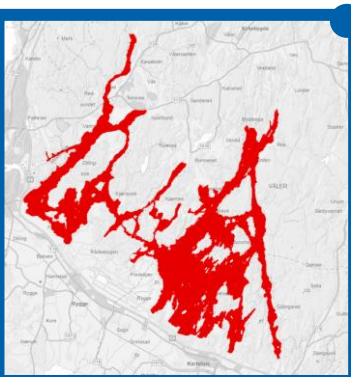


PFOS in source water (Water Framework Directive EQS/MAC)



Warning against eating seafood (PFOS)

(<https://miljoatlas.miljodirektoratet.no>)

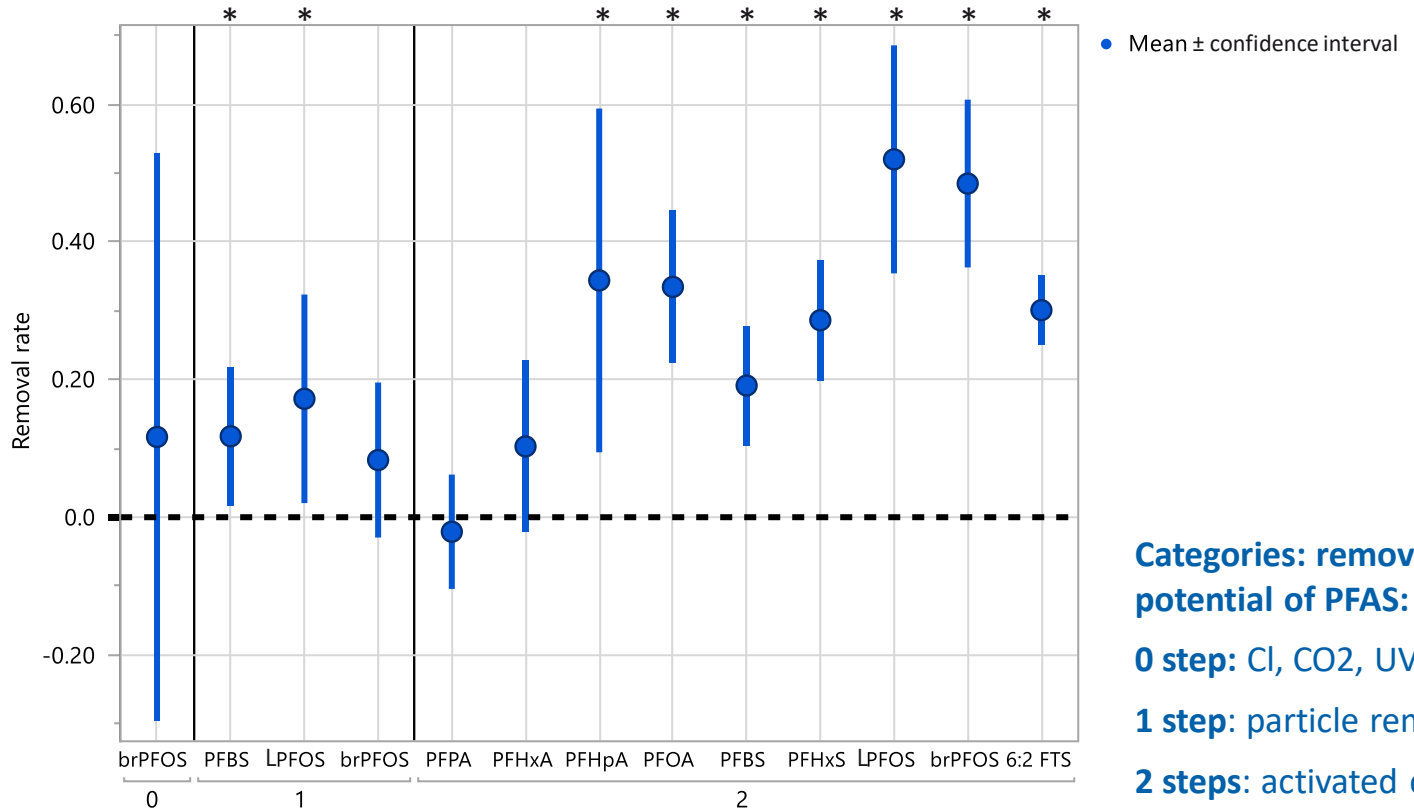


Removal rate dependent on treatment

Source water/
drinking water
sampled same day

PFAS $\geq 2 \times$ LOQ
in source water

110/232 pairs
where criteria
were fulfilled



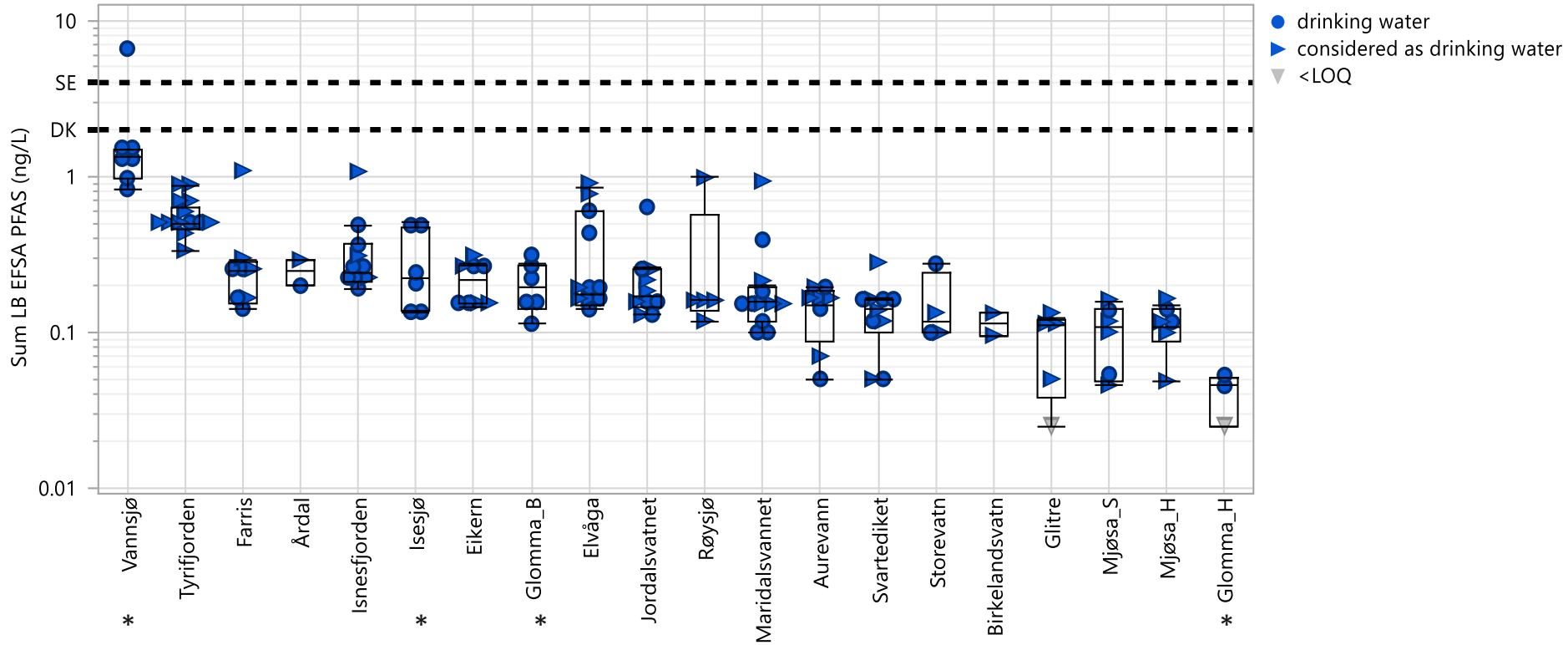
Categories: removal potential of PFAS:

0 step: Cl, CO₂, UV

1 step: particle removal

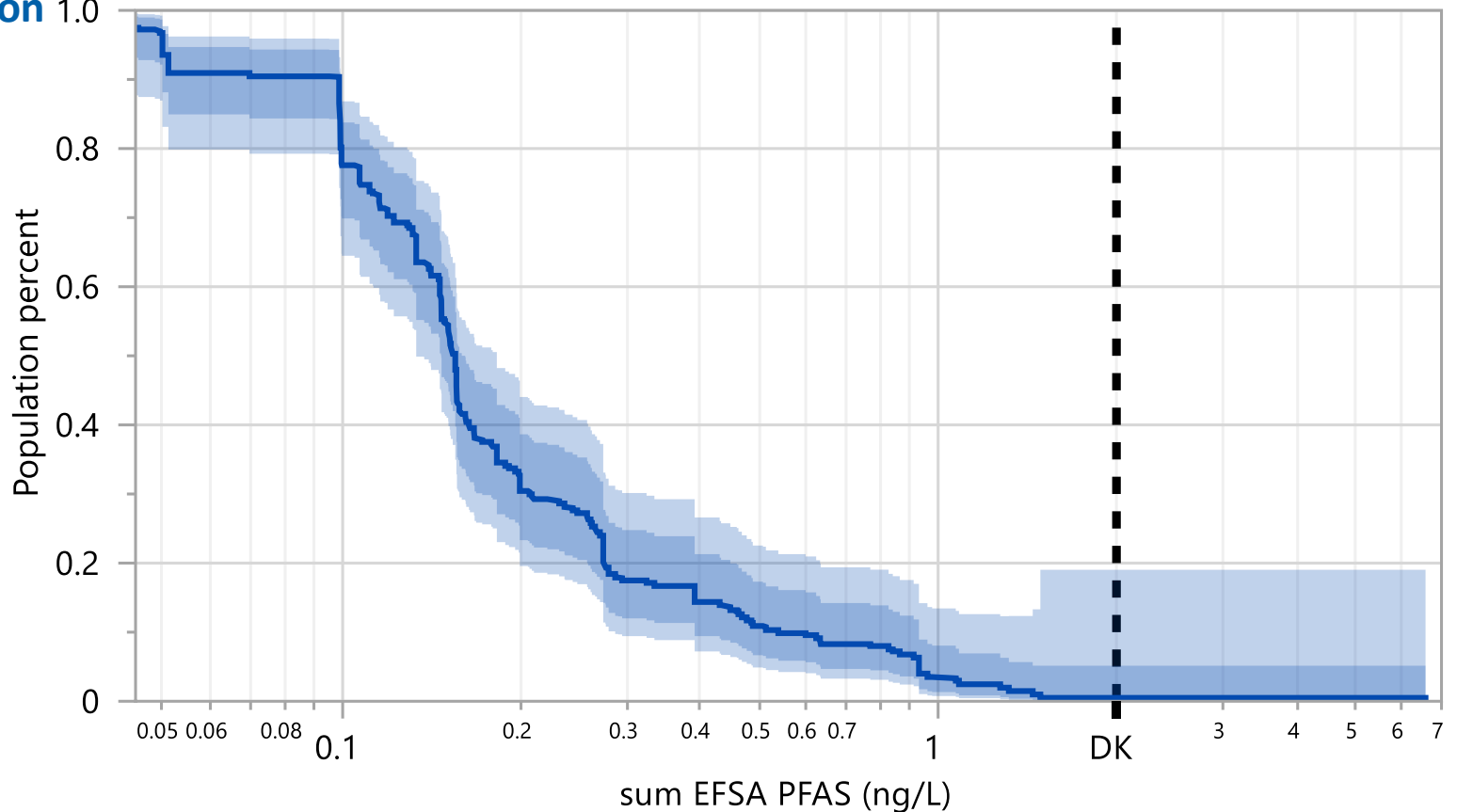
2 steps: activated carbon + particle removal

Sum LB EFSA PFAS PFOS, PFHxS, PFOA, PFNA



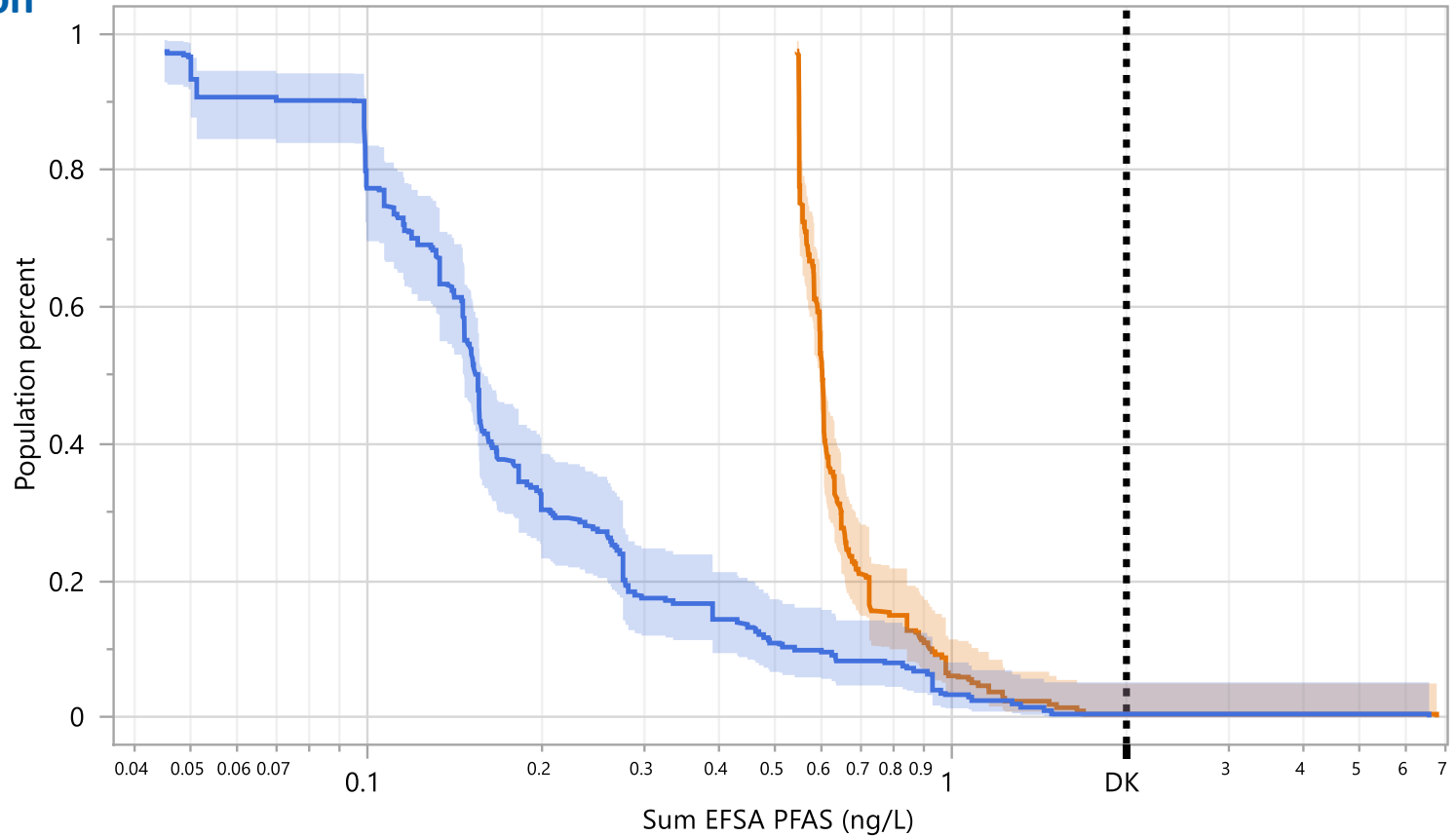
Inhabitant exposure sum EFSA PFAS (LB)

2.2 million

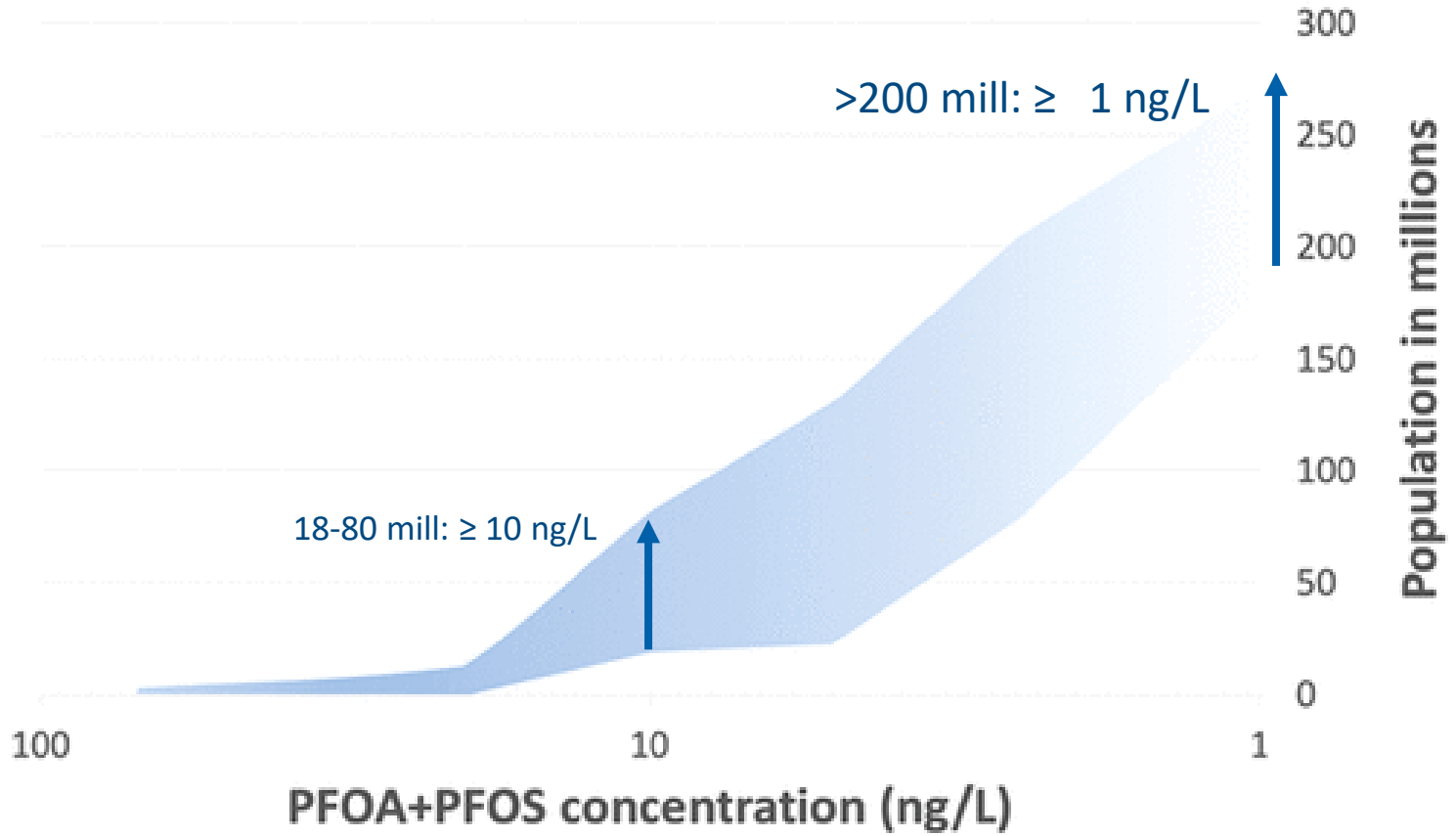


Inhabitant exposure sum EFSA PFAS (LB+UB) (LB+UB)

2.2 million



Estimated population-wide exposure to PFOA and PFOS from drinking water in the United States



Take home messages:

<https://www.niva.no/en/news/niva-at-setac-2022>

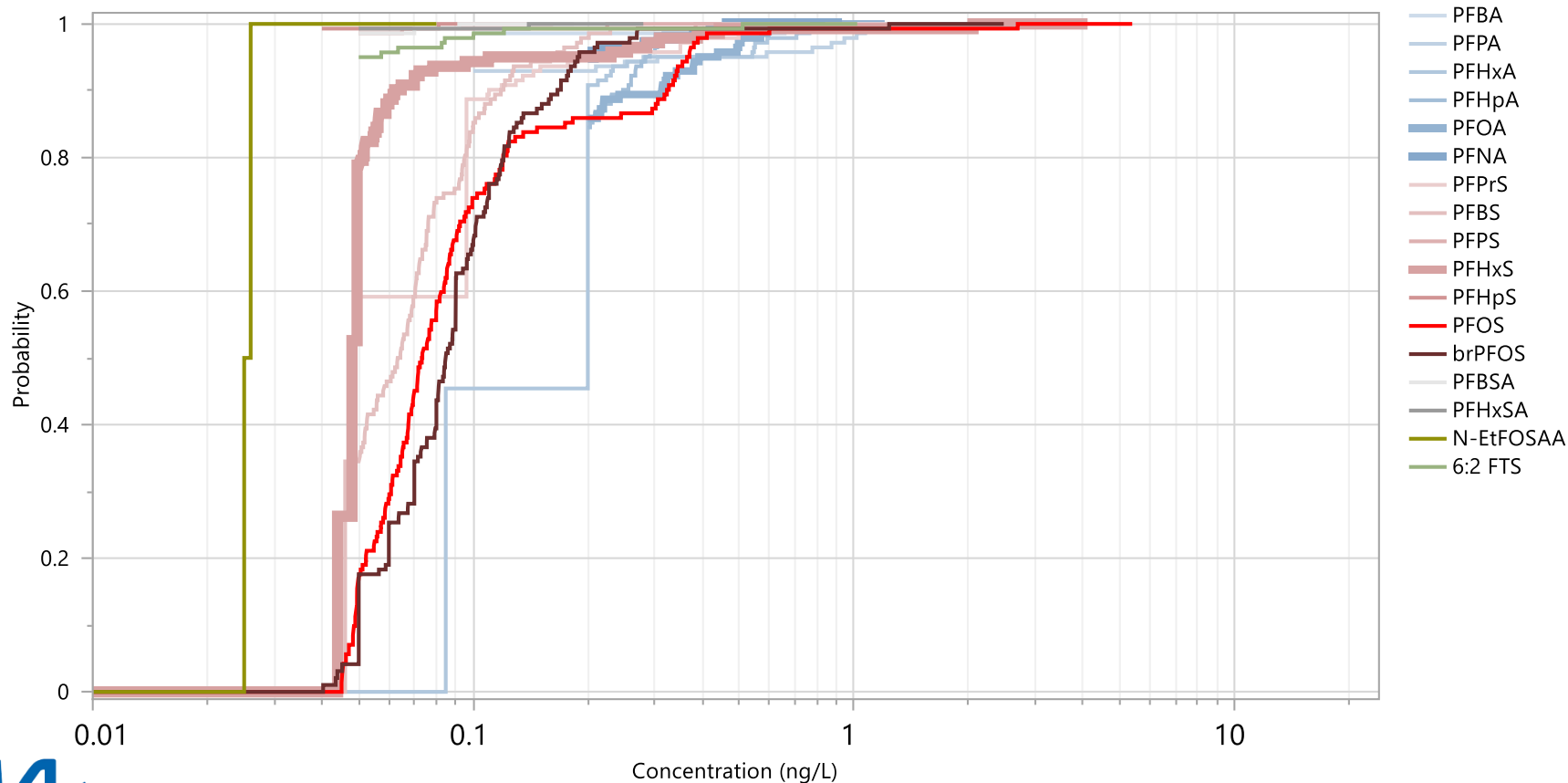
First broad analysis of
PFAS in drinking water
in Norway

Detection frequencies
of LPFOS and brPFOS
high (95%)

Removal rates PFOS
60% by use of
advanced treatment

Concentrations of
PFAS very low except
near known sources

Kaplan Meyer plot (all PFAS quantified)

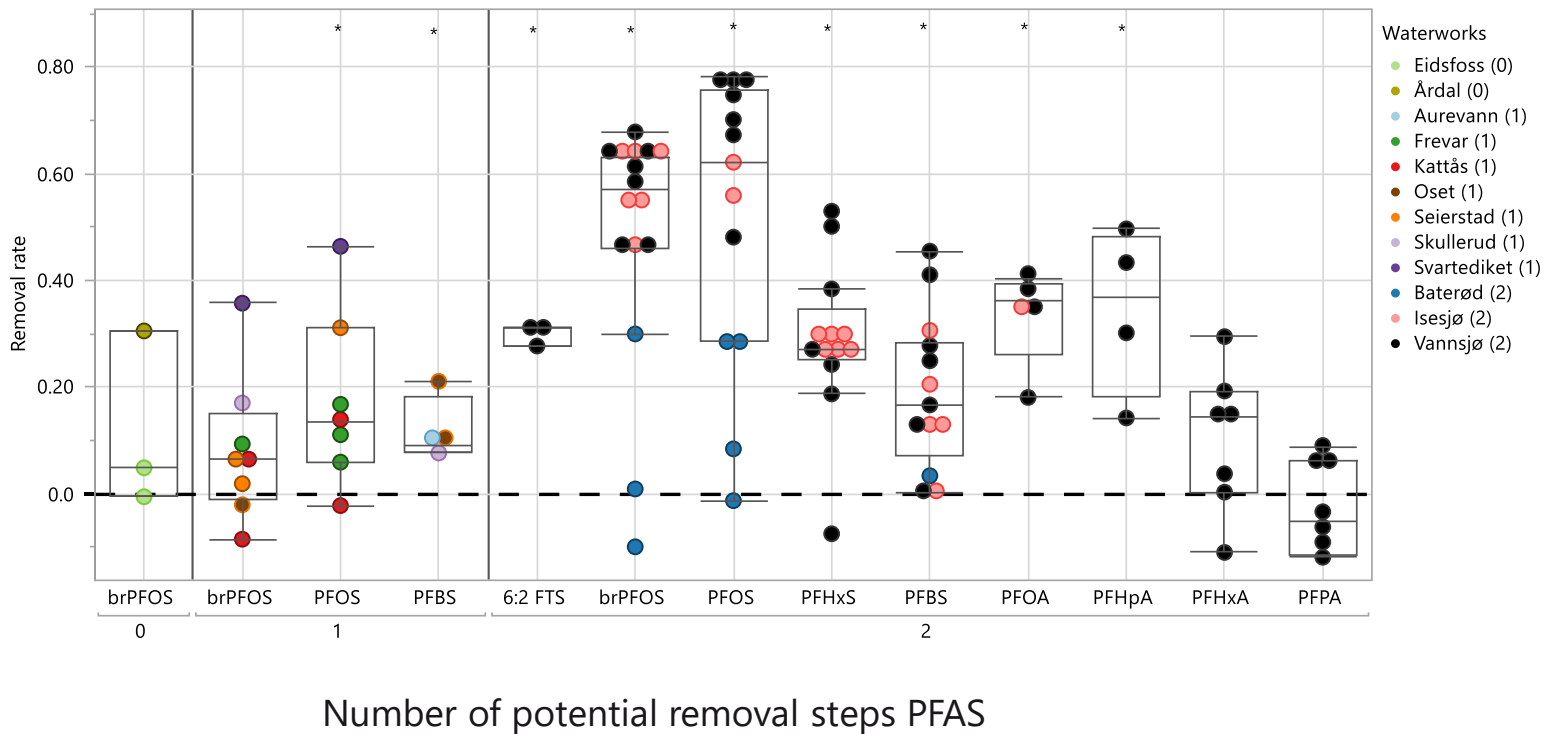


Removal rates

Source water/
drinking water
sampled same day

PFAS $\geq 2 \times$ LOQ
in source water

110/232 pairs
where criteria
were fulfilled



PFOS levels in biota (ng/g ww)

