Study	Population	Design	Exclusions	PFOS levels in participants		Outcome(s)	Effect Size
				Average	Spread		
Melzer et al. ²⁴	Sub sample aged over 20 years from 3 consecutive NHANES cohorts (n=3,974)	Cross sectional	8 who did not complete questions on thyroid disease	Weighted mean serum ng/ml (95% CI) Males: 30.36 (28.2-32.5)	Range ng/ml And quartiles (Q) Range 0.3-435.0 Q1: 0.3-18.0 Q2 :18.2-25.5 Q3:25.6-36.7	Self-reported history of ever having diagnosed thyroid disease or having current disease treated with medication	Adjusted OR (95% CI) for current thyroid disease treated with medication by quartile of PFOS: Males: Q1: 1 Q2: 0.43 (0.17-1.08) Q3: 0.95 (0.34-2.70) Q4: (1.89 (0.72-4.93)
				Females: 24.78 (22.6-26.9)	Q4 :36.8-435.0 Range 0.14-406.0 Q1: 0.14-12.4 Q2 :12.5-19.4 Q3:19.5-29.8 Q4:29.9-406.0		Q4 vs. Q1 & Q2 : 2.68 (1.03-6.98) Female: Q1: 1 Q2: 1.05 (0.55-2) Q3: 0.81 (0.44-1.51) Q4 ⁻ 1.31 (0.72-2.36) Q4 vs. Q1 & Q2:1.27 (0.82-1.97)
Steenland et al. ²⁹	C8 Health Project, adults from Ohio and West Virginia (n= 69,030)	Cross- sectional	14,439 reasons not given	Mean serum 23.4 ng/ml (sd 16.1)	IQR: 13.6-29.3 ng/ml Quintile 1 st : 0-12.1 2 nd : 12.2-17.4 3 rd : 17.5-23.2 4 th : 23.2-31.8 5 th ≥31.90	Uric acid	Adjusted OR (95% CI) for hyperuricaemia by quintile of PFOS exposure: 1^{st} : 1 2^{nd} : 1.02 (0.95-1.10) 3^{rd} : 1.11 (1.04-1.20) 4^{th} : 1.19 (1.11-1.27) 5^{th} : 1.26 (1.17-1.35) Predicted increase in uric acid from lowest to the highest decile of 0.22 mg/dl
Steenland et al. ²⁰	C8 Health Project, adults from Ohio and West Virginia (n=69,030)	Cross- sectional	22,536 under 18 or taking cholesterol lowering medication	Mean serum 22.4 ng/ml (sd 14.8)	Range: 0.25 - 759.2 ng/ml Quartiles: Q1: 0 - 13.2 Q2: 13.3 - 19.5 Q3: 19.6 - 28.0 Q4: ≥28.1	Total cholesterol; HDL; LDL; triglycerides	Adjusted OR (95% CI) for hypercholesterolemia by quartile of serum PFOS: Q1: 1 Q2: 1.14 (1.05-1.23) Q3: 1.28 (1.19-1.39) Q4: 1.51 (1.40-1.64) Predicted increase in cholesterol from lowest to highest decile was 11-12 mg/dl
Nelson et al. ²¹	Sub sample aged over 12 years from NHANES cohort (n=1,950)	"exploratory " cross- sectional	pregnant (n=77), breastfeeding (n=17), insulin (n=37), dialysis (n=1) and for cholesterol analysis: cholesterol lowering	Median serum 19.9 µg/L	Not presented	Cholesterol; body size (BMI and waist circumference); insulin resistance	Predicted increase in total cholesterol from lowest to highest quartile was 13.4 mg/dl (95% Cl 3.8%- 23.0%)

Table 1. Summary of epidemiological studies investigating the health effects of PFOS in the general population

Dallaire et al. ²⁵	Stratified random sample of Inuit adults from Nunavik Canada (a=1056)	Cross sectional	medication (n=196), or no data for this variable (n=43), under 20 (n=625) 167 no plasma samples, pregnancy (n= 23), non-Inuit (n=20), medication for thyroid disease (n= 19) and extreme layele of TSH (n=5)	Geometric mean Plasma 18280 ng/L	Range: 480-470000 ng/L	Cholesterol (unspecified); triglycerides; TSH; free T4; total T3; TBG	Adjusted regression coefficients for thyroid hormones for each 1 unit increase in log PFOS: TSH: -0.102 ($p\leq0.05$) tT3: -0.017 ($p\leq0.05$) TBG: -0.034 (<0.01) fT4: 0.014 ($p\leq0.05$)
Joensen et al. ¹⁹	Sample of male Danish military recruits (n=546)	Cross sectional	443 with testosterone levels in the middle range	Mean 24.5 ng/ml	Range: 14.2-42.1 ng/ml	Testosterone; oestradiol; sex- hormone binding globulin; LH; FSH; inhibin B; free androgen index; Semen volume and weight; sperm concentration, count and morphology	Adjusted univariate regression coefficients for a 1ng/ml change in PFOS : Ln sperm count: 0.014 (-0.045 - 0.010) Morphology -0.085 (-0.2 - 0.026) Ln sperm motility -0.006 (-0.019 - 0.007) Testosterone: -0.087 (-0.32 - 0.15) Ln LH: 0.00 (-0.014 - 0.012) Ln FSH: 0.004 (-0.13 - 0.22) Ln SHBG: 0.002 (-0.007 - 0.012)
Fei <i>e</i> t al. ¹⁷	Sample of mothers and infants from the DNBC (n=1,260)	Cohort	160 unable to report a time to pregnancy	Median maternal serum at 4-14 wks gestation 33.7 ng/ml	IQR: 26.6-43.5 ng/ml Quartile: Q1: 6.4 – 26.0 Q2: 26.1 – 33.3 Q3: 33.4 – 43.2 Q4: ≥43.3	Self-reported time to pregnancy and use of fertility treatment	Adjusted OR (95% CI) of infertility by quartile of PFOS: Q1: 1 Q2: 1.70 (1.01-2.86) Q3: 2.34 (1.40-3.89) Q4: 1.77 (1.06-2.95)
Lin et al. ²³	Sub sample aged over 12 years from the NHANES cohort (n=3,685)	Cross- sectional	1,897 with no fasting sample; 345 with missing covariate data	Log PFOS in adults 3.19 ng/ml (SEM ±0.04)	Not presented	blood glucose; insulin; insulin resistance; β cell function); metabolic syndrome	Adjusted multiple linear regression coefficients (SEM) per 1 unit increase in log PFOS in adults: Glucose: -0.03 ± 0.07 Log insulin 0.14 ± 0.05 (p<0.01) Log HOMA-IR 0.14 ± 0.05 (p<0.01) Log β cell function 0.15 ± 0.05 (p<0.01)
Eriksen et al. ¹⁶	Sample aged 50-65 yrs from population of Denmark (n=57,053)	Nested case control within prospective cohort (1,240 cases and 772 controls)	Nil	Median plasma (ng/ml) Males: Cases 35.1 Controls 35.0 Females: Cases 32.1 Controls 29.3	5 th -95 th percentiles (ng/ml) 17.4 - 60.9 16.8 - 62.4 14.0 - 58.1 14.2 - 55.6	Diagnoses of bladder, liver, pancreas or prostate cancer obtained from Danish Cancer Registry and Pathology Data Bank	No differences in adjusted IRR's for each specific type of cancer in relation to PFOS plasma concentration

Pirali et al. ²⁶	Selected people diagnosed with thyroid disease (n = 31 in serum analysis; n = 35 in thyroid analysis)	Case control	Not provided (Not clear how the samples were recruited and participation rates)	Thyroid tissue PFOS median 5.3 ng/g Serum PFOS median 11.4 ng/ml	Thyroid tissue (range 2.1-44.7 ng/g) Serum (range 0.5- 92.9 ng/ml)	PFOS appeared not to concentrate in the thyroid	Not applicable
Bloom et al. ²⁷	N = 31 (Pilot study looked at 31 out of 38 people from New York State Angler cohort study)	Cross sectional	This population were chosen as sportfish consumption is a potential source of perfluorinated chemical exposure	Geometric mean 19.6 ng/ml	95% confidence interval 16.3 – 23.5	No evidence of association between serum PFOS and TSH or fTH.	Study pilot in nature and lacked statistical power
Fei et al. ¹⁸	Sample of pregnant women from the DNBC (n=1,400)	Cohort	53 who provided inconsistant response	Mean 37.1 ng/ml (overweight / obese 25.0 – 30 kg/m ² or over); Mean 34.5 ng/ml (normal weight 18.5 – 24.9 kg/m ²)	Not provided	Duration of breastfeeding	Adjusted OD ratios for weaning before 6 months of age 1.20 (95% CI: 1.06-1.37) per 10 ng/ml increase in PFOS concentrations
Frisbee et al. ²²	Sample from C8 Health Project (n= 12 476) (aged 1.0- 11.9 years and 12.0-17.9 years)	Cross- sectional	Not specified	Mean (SD) serum concentrations 22.7 (12.6) ng/mL; 1.0 – 11.9 yr mean (SD) 23.6 ng/mL (13.1) 12 – 17.9 yr mean (SD) 21.9 (12.2).	Not provided	Serum lipids (total, high-density lipoprotein [HDL-C], and low-density lipoprotein [LDL-C] cholesterol and fasting triglycerides)	Adjusted OR (95% CI) for Total-C by quintiles of serum PFOS: First: 1 Second: 1.3 (1.1-1.4) Third: 1.3 (1.2-1.5) Fourth: 1.3 (1.2-1.6) Fifth: 1.6 (1.4-1.9) Adjusted OR (95% CI) for HDL-C by quintiles of serum PFOS: First: 1 Second: 0.9 (0.8-1.1) Third: 0.8 (0.7-0.9) Fifth: 0.7 (0.6-0.9) Adjusted OR (95% CI) for LDL-C by quintiles of serum PFOS: First: 1 Second: 1.2 (1.0-1.5) Third: 1.2 (1.0-1.5) Fourth: 1.3 (1.1-1.6) Fifth: 1.6 (1.3-1.9)

							Adjusted OR (95% CI) for Fasting Triglycerides by quintiles of serum PFOS: First: 1 Second: 1.3 (0.9-1.8) Third: 1.0 (0.7-1.4) Fourth: 1.1 (0.7-1.6) Fifth: 1.2 (0.8-1.5) Using general linear model analysis of covariance, an 8.5-mg/dL and a 5.8-mg/dL increase in the adjusted mean levels of total cholesterol and LDL-C, respectively, between the first and fifth quintiles of PFOS
Chan et al. ²⁸	Pregnant women from Edmonton, Canada, in 2005-2006, who underwent a "triple screen" blood test at 15-20 weeks gestation as part of ante- natal care (n= 974)	Case- control	Those not associated with hypothyroxinemia in pregnancy	Geometric mean serum 7.39 ng/ml (sd 2.08)	Not provided	Thyroid hormones, fT4 and TSH	No association between exposure to PFOS and maternal hypothyroxinemia Adjusted OR for maternal hypothyroxinemia for PFOS 0.88 (95% CI 0.63 – 1.24).
Hoffman et al. ³⁰	Sub sample aged 12-15 years from the NHANES cohort (n= 571 age 12–15 years)	Cross- sectional	Not specified but children without reported ADHD	Median serum: 22.6 μg/L	(range: 2.1-87.2 µg/L)	Attention deficit/hyperactivity disorder (ADHD) by a doctor or health care professional	Adjusted OR (95% CI) for reported ADHD with a 1-µg/L increase in serum PFOS was 1.03 (1.01– 1.05)

Legend:

Sd - standard deviation; IQR – inter-quartile range; SHGB – sex hormone binding globulin; LH – luetenising hormone; FSH – follicle stimulating hormone; TSH – thyroid stimulating hormone; fT4 – free thyroxine; tT3 – total triiodothyronine; TBG – thyroid binding globulin; DNBC – Danish National Birth Cohort; NHANES – National Health and Nutritional Examination Survey; SES – socio-economic status; CRP – c-reactive protein; HOMA – Homeostatic model assessment.

Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts This journal is C The Royal Society of Chemistry 2013