

Forever Chemicals - The Latest in an Ever Changing Landscape

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Forever Chemicals – The Latest in an Ever Changing Landscape



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Roadmap

- **Plaintiffs' Attorneys' Recent PFAS Advertising**
- **PFAS Cutting Edge Updates**
 - MDL No. 2873
 - New complaints filed
 - Recent court rulings
 - New federal proposed legislation
 - PFAS crystal ball predictions



MDL No. 2873

- **February 2, 2024 – 3M Final Fairness Hearing**
 - Imperfect
 - Five year anniversary
 - Largest water settlement in history
 - Over 2 years to reach settlement
 - Bankruptcy and punitives
 - Opt outs
- **Personal Injury Bellwether (25 Cases)**
 - 5 kidney; 8 testicular; 8 thyroid; 4 ulcerative colitis

New PFAS Complaints

- **Connecticut** (Sup. Ct. Judicial Dist. of Hartford)
- **North Carolina** (Sup. Ct. New Hanover County)
- **New Hampshire Class Certification** (Kevin Brown, et al. vs. St. Gobain)
- **Madison County, Illinois** (Edward Allsman vs. Shell USA, et al.)
- **Hawaii** (1st Circuit)

Recent Court Rulings

- **Sixth Circuit Court of Appeals – Kevin D. Hardwick (Ohio)**
 - Firefighter for more than 40 years
 - No symptoms or disease
 - PFAS in blood
 - \$ 11.8 M
 - Too broad; traceability issues
 - “Seldom is so ambitious a case filed on so slight a basis”
 - Thousands but just 10 listed

Recent Court Rulings

- **U.S. Judicial Panel to MDL (AFFF Products Liability Litigation): Hoffnagle, et al. – U.S. Dist. Ct. for the Dist. of Connecticut**
 - Class Action against Connecticut Water Co.
 - Monetary damages, medical monitoring, filter out
 - AFFF defendants only in MDL

Recent Court Rulings

- **Wolverine World Wide, Inc. vs. The Travelers, et al. (U.S. Dist. Ct. W.D. MI)**
 - Six claims handlers
 - Travelers claims handling practices
 - Coverage dispute
 - “May have relevant personal knowledge” of practices & industry standards
 - “Recalcitrant” in producing claim handling materials

New Federal Proposed Legislation

- **“PFAS Action Act” – U.S. Congress**
 - Establish national drinking water standard
 - Accelerate designation of PFOA & PFOS as hazardous
 - Limit industrial discharge
 - \$200M to water utilities & wastewater treatment



VIRA

PFAS Predictions For 2024

1. CERCLA/Hazardous Substances & Drinking Water Standards
2. County & State Litigation
3. 3M & DuPont Settlements
4. AFFF/MDL Bellwether Claims
5. Consumer Class Actions

Science in the Courtroom

Good Science

Science that adheres to the **scientific method**, a rigorous, systematic, and transparent method of inquiry involving the formation of a hypothesis, gathering evidence to test if it is supported

Good science never says never

Junk Science

Any theory or method presented as scientific fact **without sufficient research or evidence** to support it.

Junk science **rejects** the requirements of good science and **undermines** public trust in “real” science.

Daubert

An expert's causation opinions must be the product of the employment of a reliable scientific methodology.

The *ipse dixit* of the expert (“he himself said it”) is to be rejected.

Daubert commands trial courts to exercise their gatekeeper responsibility to only allow jury consideration of expert opinions that are grounded good science.

FRE 702

FRE 702 Amendment

- (c) It is the proponent who has the burden to establish admissibility of the expert by a preponderance of the evidence (“more likely than not”).
- (d) The expert’s opinion must reflect a reliable application of the principles and methods to the facts of the case.

Toxic Tort Cases – Plaintiffs’ Causation Burdens

Plaintiffs’ burden is to prove both general causation and specific causation.

General causation: Has a substance been proven to cause an illness in the general population?

*Does diesel exhaust cause esophageal cancer?
Does PFAS cause kidney cancer?*

Specific causation: Has an individual’s exposure to a substance caused that individual’s illness?

*Did plaintiff’s exposure to diesel exhaust cause his esophageal cancer?
Did plaintiff’s exposure to PFAS cause her kidney cancer?*

General causation must be established for specific causation to be investigated.

No general causation = no specific causation

Plaintiff's Experts Methodology

Plaintiff's experts often try to change or moderate the requirements of good science

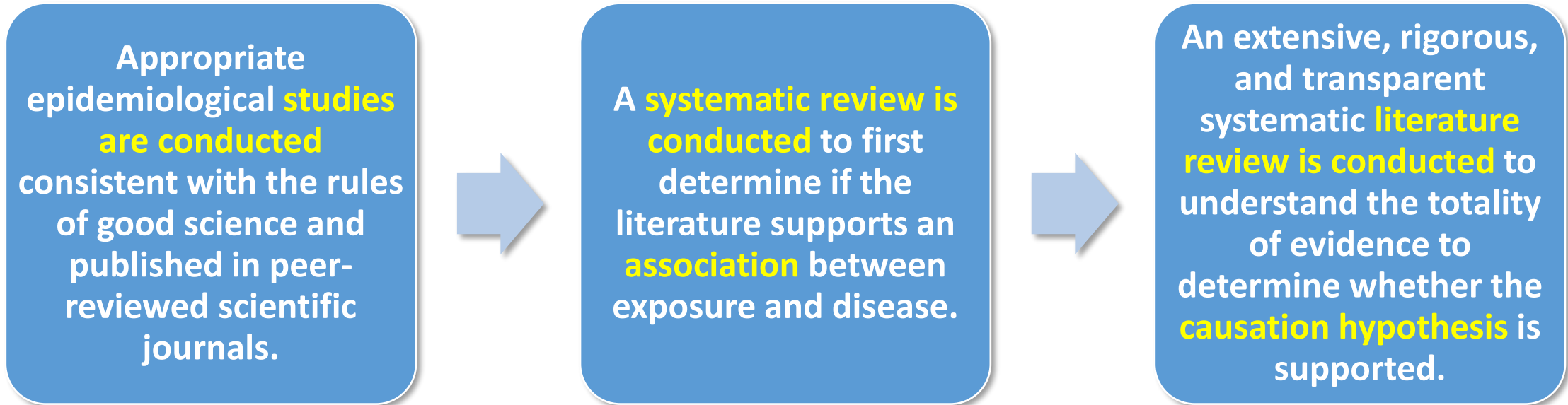
There is no safe level of exposure to a carcinogen

Even "background" exposures can cause cancer.

Statistical significance is not essential for a study to support a causation hypothesis.

Only a couple of positive studies are necessary to establish causation.

How is general causation established?



A reliable and widely used set of guidelines consistent with the Bradford Hill guidelines is employed in this review.

Bias, confounding and ***chance*** must be excluded as likely explanations for the results of each individual study.

Comparative Litigation – Roundup/NHL toxic tort cases

30,000+ lawsuits pending.

18 trials: 9 defense verdicts; 9 plaintiffs' verdicts.

\$6.75 billion awarded in those 9 plaintiffs' verdicts.

Average verdict: **\$750,000,000.**

\$11 billion in settlements paid through 2023.

Government positions on glyphosate



- **IARC:** Glyphosate is a **Group 2A “probable” human carcinogen** that causes NHL.



- **US EPA:** No convincing evidence that glyphosate causes cancer in humans



- **European Union:** Has authorized continued glyphosate use for 10 years



- **OSHA:** No PEL for glyphosate

- Ubiquitous exposure: 80% of people have detectable levels of glyphosate in their urine
- Manufacturer is a giant multinational company, a target defendant
- Epidemiology is still developing
- Exposure levels are very low as residential use is limited and occasional

Toxic tort PFAS litigation – possible similarities with glyphosate litigation

Ubiquitous exposure – nearly all Americans have detectable levels of PFAS in their blood, typically PFOA and PFOS.

In November 2023 IARC determined that:

PFOA is a Group 1 carcinogen with limited evidence for kidney and testicular cancer.

PFOS is a Group 2B “possible” carcinogen.

Monograph to be published in 2024.

Many manufacturers of PFAS-containing products are giant multinational corporations, target defendants.

Multi-billion-dollar settlements have been negotiated and then extensively covered in the media.

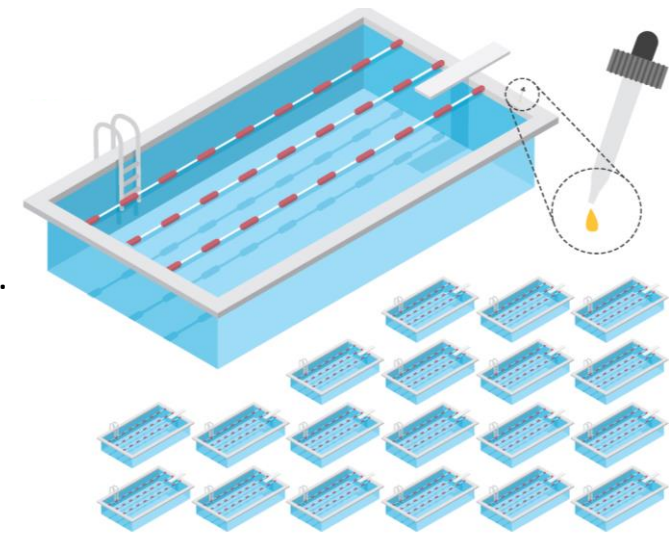
Exposure levels are low. No OSHA PEL for PFAS.

EPA: Interim updated Health Advisory for:

- PFOA = 0.004 parts per trillion (ppt) with a minimum reporting level of 4 ppt.
- PFOS = 0.02 ppt with a minimum reporting level of 4 ppt.

1 part per trillion = one drop of water in 20 Olympic pools (10 million gallons) or one second of time in approximately 31,700 years.

Source: ChemEurope



Differences and Challenges

Unlike glyphosate litigation:

- Illnesses related to PFAS are **numerous** and **not limited to cancer**
 - High cholesterol, cardiovascular disease and other potential “lifestyle” diseases
- The focus is **not on a single chemical** or compound.
 - Thousands of different types of PFAS
- Exposure is **not limited** to a single, **short-lived activity** (herbicide application).

Differences and Challenges

Of the estimated **12,000 different PFAS**, only **two** have been studied with any level of rigor – PFOA and PFOS, two PFAS that are not manufactured any longer.

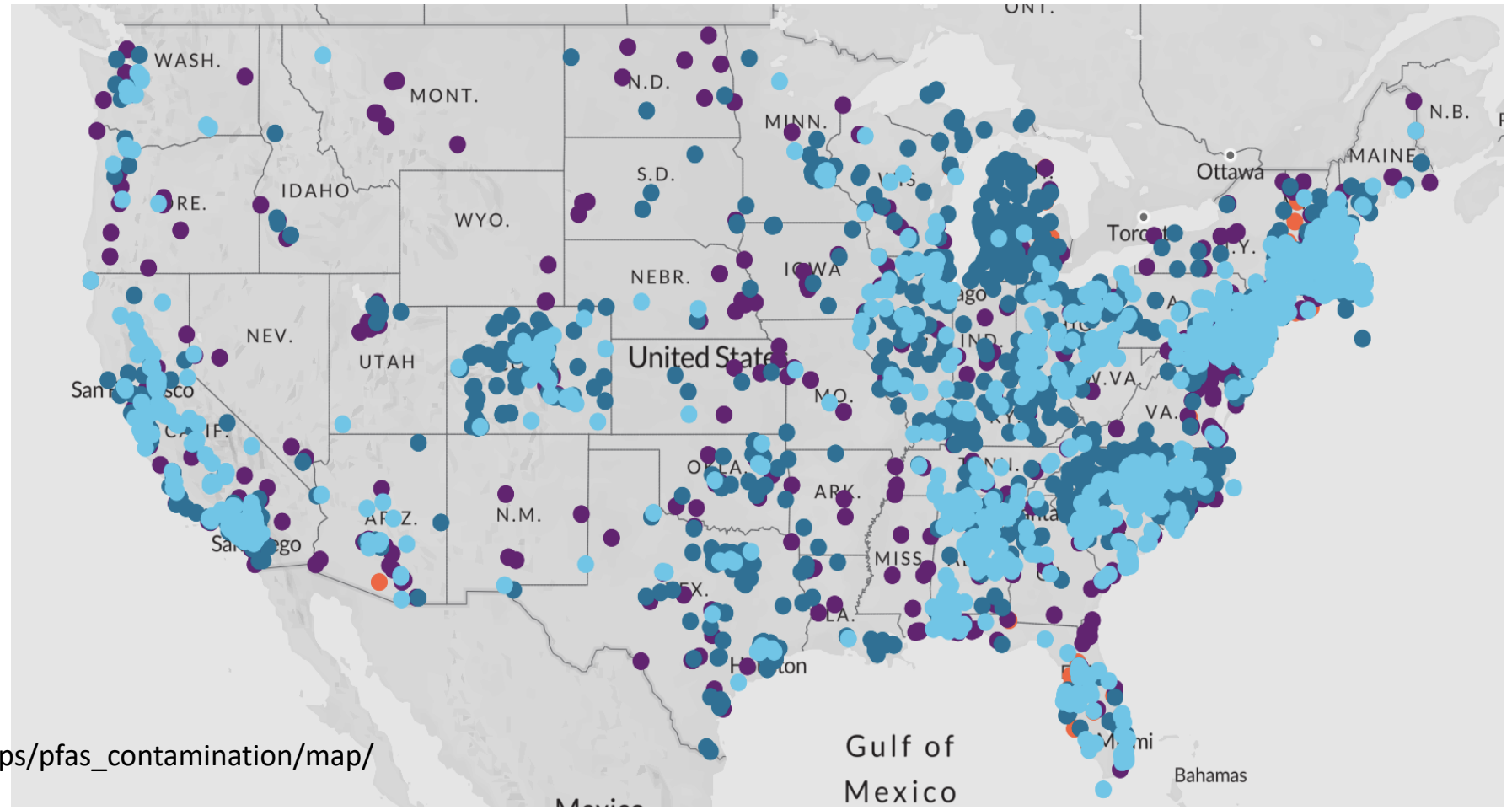
Potential plaintiffs' PFAS litigation themes can likely track those employed in other toxic tort litigation that create the **potential for runaway verdicts**.

We are litigating the toxicity of PFAS before the necessary epidemiology has even been conducted

Declarations

- Principal Investigator, “Perfluoroalkyl substances and risk of kidney cancer in US men and women,” funded by NIH/NIEHS, 2023-2027
- Scientific Advisory Board member, Per- and Polyfluoroalkyl Substances (PFAS) Review Panel, Environmental Protection Agency’s National Primary Drinking Water Rulemaking for PFAS, 2021-2022
- Any opinions stated are my own and do not represent those of Vanderbilt University Medical Center

PFAS contamination hotspots in the US; Nov 28, 2023

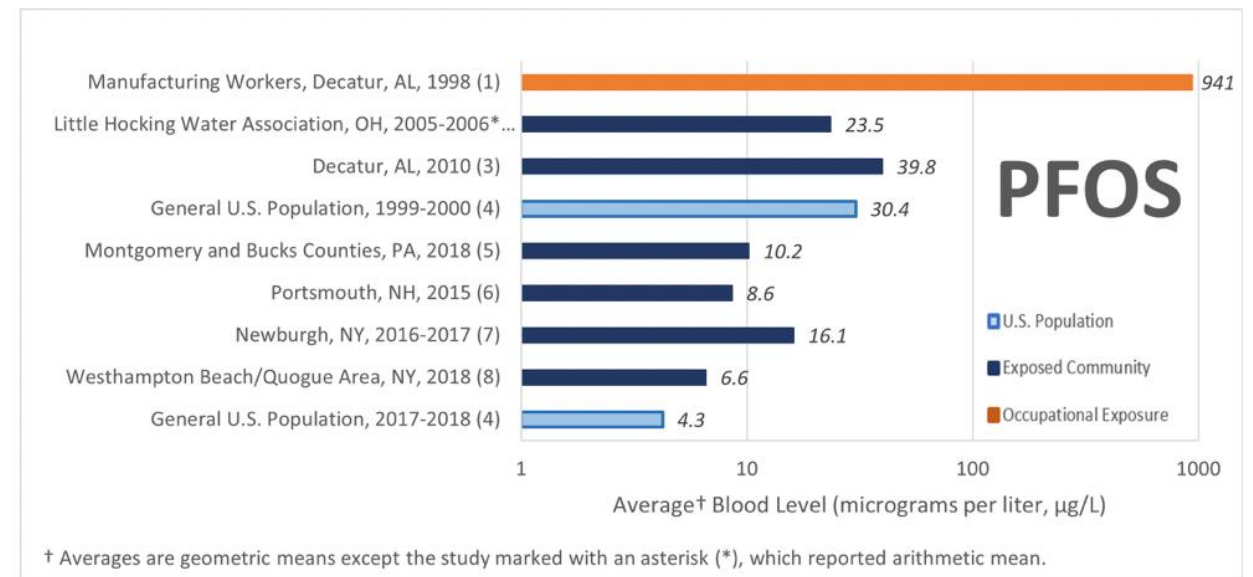
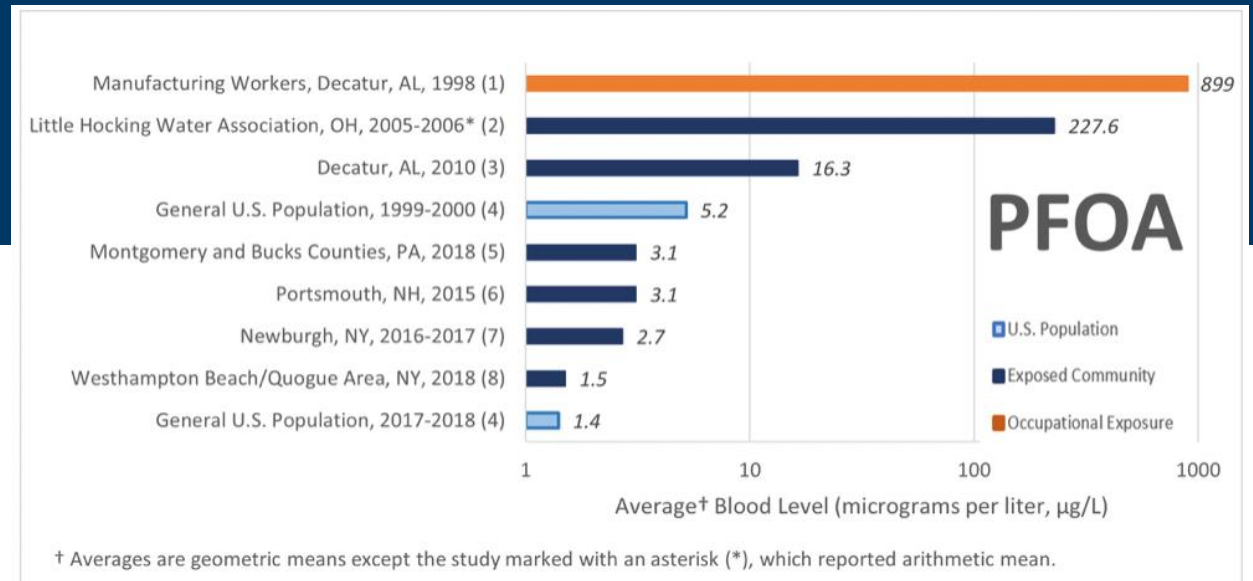


https://www.ewg.org/interactive-maps/pfas_contamination/map/

PFOA and PFOS blood levels

US general population, 1999-2000 to 2017-2018:

- PFOS levels declined by 85%
- PFOA levels declined by 70%

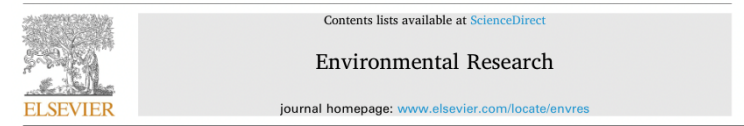


Centers for Disease Control and Prevention. [National Report on Human Exposure to Environmental Chemicals, Biomonitoring Data Tables for Environmental Chemicals.](https://www.atsdr.cdc.gov/pfas/health-effects/us-population.html)

<https://www.atsdr.cdc.gov/pfas/health-effects/us-population.html>

Human exposure

- Contaminated **drinking water** is a major pathway of human exposure
- **Consumer products** including inhalation of dust and direct and indirect contact
- **Dietary intake** is a major source of exposure
fish, meat, fruit, eggs



Locally caught freshwater fish across the United States are likely a significant source of exposure to PFOS and other perfluorinated compounds

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^b Environmental Working Group, 1250 I Street NW, Suite 1000, Washington, DC, 20005, USA

“PFAS have been detected in nearly all sampling of geographic locations and environmental matrices worldwide, including sites that had no nearby manufacture or use of PFAS”

Barbo et al. Environ Res 2023

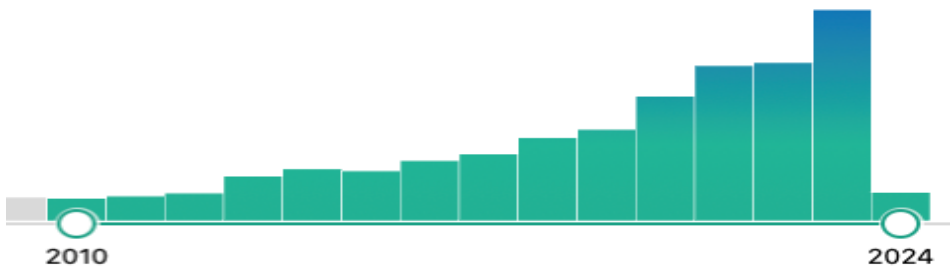
Epidemiology

- Directly evaluate whether a particular exposure may be associated with the risk of disease in human populations
- Existence of an association in an epidemiologic study does NOT mean that there is a causal relationship

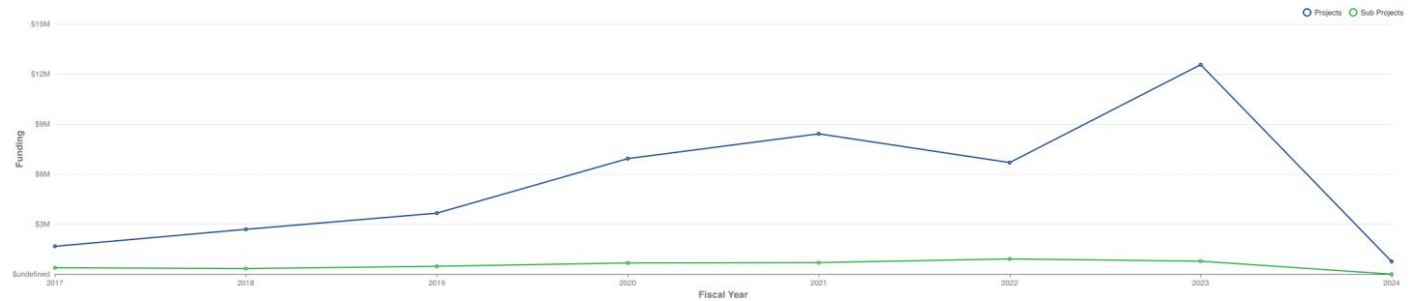
Because of the absence of randomization, it is crucial that other potential explanations for any observed exposure-disease association - including bias, confounding, and chance - be confidently excluded in individual studies before a reported association can be assessed for cause and effect

Exponential increase in PFAS epidemiology research

PubMed Search: “(PFAS OR PFOA OR PFOS)” AND “epidemiology” AND “human” yielded **831 publications** just in the past 10 years

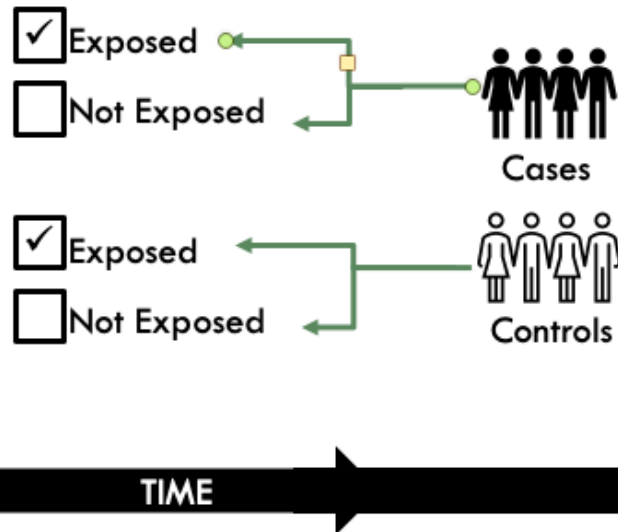


NIH RePORTER Search: “PFAS” AND “epidemiology” showed **112 projects** funded by NIH institutes (primarily NIEHS) since 2017
Total NIH funding >\$45 million



Epidemiologic study designs

CASE-CONTROL STUDY



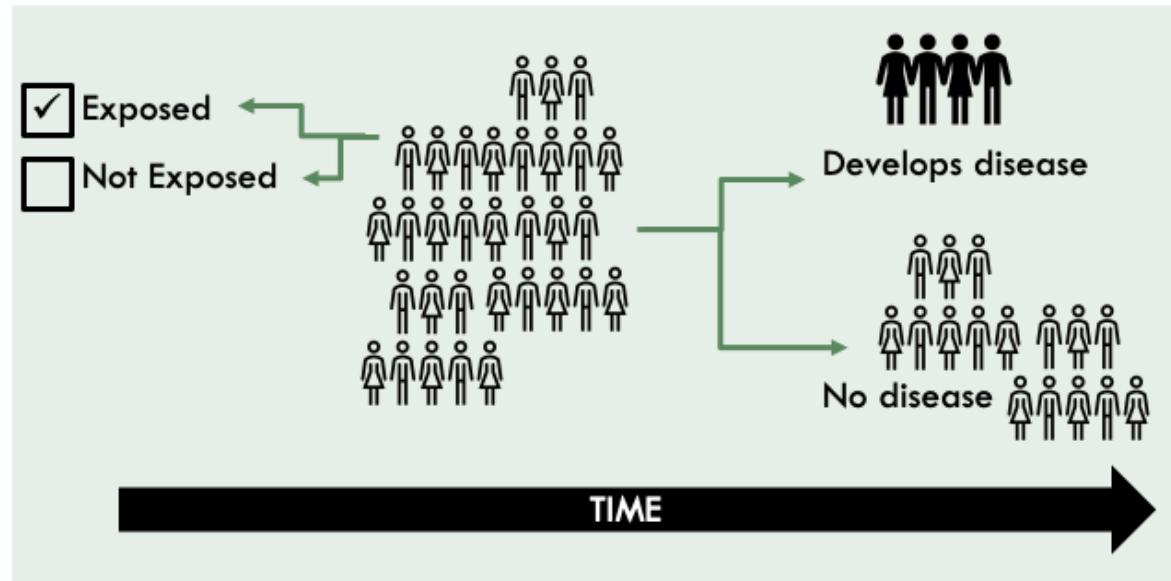
Comparisons between cases and controls

Same levels of exposure: no association

More exposure: increased risk

Less exposure: decreased risk

COHORT STUDY



Comparisons between exposed and not exposed

Same proportion of disease: no association

More disease: increased risk

Less disease: decreased risk

Multitude of health outcomes in epidemiologic studies of PFOA and PFOS exposure

- Cancer
- Cholesterol levels/Cardiovascular disease
- Liver function
- Kidney function
- Thyroid disease
- Immunological outcomes, including arthritis, infectious disease, and vaccine response
- Neurodevelopment in children
- Reproductive outcomes, including low birth weight and pregnancy-induced hypertension/preeclampsia
- ...

EPA Guidelines for Carcinogen Risk Assessment (2005)

- “Epidemiologic data are extremely valuable in risk assessment because they provide direct evidence on whether a substance is likely to produce cancer in humans...When human data of high quality and adequate statistical power are available, they are generally preferable over animal data and should be given greater weight in hazard characterization and dose-response assessment, although both can be used”
- “In epidemiology, an inference of causality is strengthened when a pattern of elevated risks is observed across several independent studies. **The reproducibility of findings constitutes one of the strongest arguments for causality**”

International Agency for Research on Cancer (IARC), November 2023

- PFOA classified as “Carcinogenic to humans” (Group 1) based on:
 - “sufficient” evidence for cancer in experimental animals
 - “strong” mechanistic evidence
 - “limited” evidence for cancer in humans for renal cell carcinoma and testicular cancer
 - “inadequate” evidence for all other cancers (sporadic positive findings)
- PFOS classified as “Possibly carcinogenic to humans” (Group 2B) based on:
 - “limited” evidence for cancer in experimental animals
 - “strong” mechanistic evidence
 - “inadequate” evidence for cancer in humans (sporadic and inconsistent findings)

Kidney cancer (renal cell carcinoma, RCC)

- With the exception of a study of DuPont workers in WV, numerous studies of PFOA production workers or exposed community residents did not observe statistically significant associations with kidney cancer
- Shearer et al. 2021: General population nested case-control study of 324 RCC cases and 324 controls in the PLCO cohort
Measured PFOA, PFOS and 6 other PFAS chemicals in stored, prediagnostic blood collected 1993-2001



JNCI | Natl Cancer Inst (2021) 113(5): djan143

doi: 10.1093/jnci/djaa143
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Article

Serum Concentrations of Per- and Polyfluoroalkyl Substances and Risk of Renal Cell Carcinoma

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Kidney cancer (Shearer et al. 2021)

PFAS	Controls, No.	Cases, No.	$\mu\text{g/L}^{\text{a}}$	OR (95% CI) ^b	$P_{\text{trend}}^{\text{c}}$	OR (95% CI) ^d	$P_{\text{trend}}^{\text{c}}$
PFOA	81	47	<4.0	1.00 (Reference)	.007	1.00 (Reference)	.13
	79	83	$\geq 4.0\text{-}5.5$	1.47 (0.77 to 2.80)		1.41 (0.69 to 2.90)	
	83	69	$>5.5\text{-}7.3$	1.24 (0.64 to 2.41)		1.12 (0.52 to 2.42)	
	81	125	$>7.3\text{-}27.2$	2.63 (1.33 to 5.20)		2.19 (0.86 to 5.61)	
			Continuous ^e	1.71 (1.23 to 2.37)		1.68 (1.07 to 2.63)	

- Significant trend of increasing risk of RCC with increasing quartile of PFOA
 - BUT no longer statistically significant after adjustment for other PFAS
- No association with PFOS or other measured PFAS

Kidney cancer (Rhee et al. 2023)

PFAS (µg/L)	N control	N case	OR (95 % CI) ^a	OR (95 % CI) ^b
PFOA^c				
≤3.27	106	107	1	1
>3.27–4.47	102	99	1.09 (0.73,1.64)	1.26 (0.80,1.97)
>4.47–6.22	113	122	1.05 (0.70,1.56)	1.26 (0.78,2.05)
>6.22	107	100	0.88 (0.58,1.35)	1.04 (0.60,1.81)
P-trend			0.46	0.75
Continuous ^d	428	428	0.87 (0.73,1.05)	0.89 (0.67,1.18)
PFOS^c				
<16.65	107	118	1	1
16.65–<25.05	107	105	0.90 (0.60,1.35)	1.05 (0.66,1.66)
25.05–<36.40	106	100	0.89 (0.57,1.37)	0.99 (0.58,1.68)
≥36.40	108	105	0.83 (0.53,1.30)	0.93 (0.51,1.72)
P-trend			0.44	0.72
Continuous ^d	428	428	0.92 (0.79,1.07)	0.95 (0.74,1.23)

- Nested case-control study in Multiethnic Cohort Study, prediagnostic samples collected 2001-2006
- No association between PFOA or PFOS exposure and RCC risk
- Suggestive association between PFNA and RCC risk among Black individuals

New study of PFAS and kidney cancer in 5 large diverse prospective cohorts (NIH/NIEHS)

This 5-year project will examine whether:

1. Environmental exposure to PFAS (in particular, PFOA, PFOS and PFHxS) increases the risk of RCC
2. Risk of RCC associated with environmental PFAS exposure varies by mixture patterns, and varies by PFAS chemical structure, branched vs linear isomers, and short vs. long chain length
3. Established baseline risk factors of RCC (hypertension, obesity, diabetes and smoking) moderate the relationship between PFAS exposure and risk of RCC










VANDERBILT UNIVERSITY
MEDICAL CENTER



Cholesterol/Cardiovascular Disease

- Epidemiologic studies of worker/highly exposed populations and general population have yielded **inconsistent results** and **few significant findings** for:
 - associations with total cholesterol, LDL-C, HDL-C, and triglycerides
 - clinical CVD outcomes including atherosclerotic heart disease and myocardial infarction
- Cross-sectional studies (including NHANES) cannot be assessed for causality
- Cardiovascular disease is common in the general population and there are many known confounders including demographic, environmental/lifestyle, and genetic factors

Regulatory/expert panel determinations

Health Effect	ATSDR Review of Associations (PFAS Associated with Health Effects)*
NASEM and ATSDR Health Effects	
 Increases in cholesterol levels	Evidence of an association (PFOA, PFOS, PFNA, PFDA)
 Small decreases in birth weight (<0.7-ounce decrease per 1 ng/mL blood PFOA/PFOS increase)	Evidence of an association (PFOA, PFOS)
 Lower antibody response to vaccines	Evidence of an association (PFOA, PFOS, PFHxS, PFDA)
 Kidney and testicular cancer	Evidence of an association (PFOA)
 Pregnancy-induced hypertension or preeclampsia	Evidence of an association (PFOA, PFOS)
 Changes in liver enzymes	Evidence of an association (PFOA, PFOS, PFHxS)
Additional Health Effects Considered	
 Thyroid disease and dysfunction	No consistent evidence of an association
 Breast cancer	No consistent evidence of an association
 Ulcerative colitis	No consistent evidence of an association

- Determinations for numerous health outcomes have been made in the absence of consistent epidemiologic evidence of association
- Preponderance of null associations reported as well as some positive and inverse associations
 - even in highly exposed occupational groups or communities
- Biologic plausibility does not represent empirical epidemiologic evidence of an association in humans
- “Causal relationships have not been established for these health effects”

CDC/Agency for Toxic Substances and Disease Registry, 1/18/24

Important considerations/*Daubert* hearings

- Assessment of the weight of the evidence requires a systematic, transparent and reproducible review of the literature
 - this is a **reliable and rigorous** methodology; cherry picking a few studies that support a particular inference is not
- **Bias** (systematic error), **confounding** (mixing of an extraneous variable), and **chance** (statistical significance) must first be confidently **excluded** in every epidemiologic study
 - Findings that are not statistically significant cannot rule out chance
- **Association ≠ causation**, and causation cannot be established in the absence of association
- **Consistency of evidence is key** – repeated observation of an association across studies

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