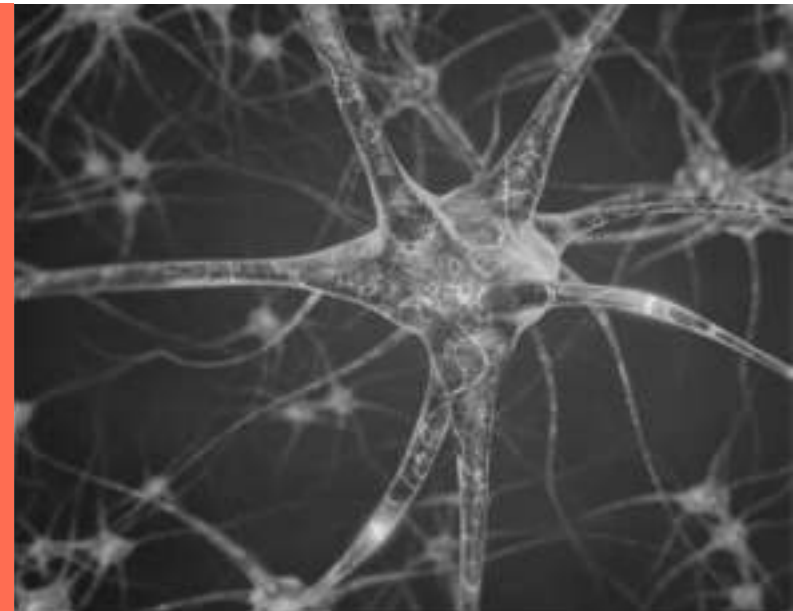


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# Why do I have Parkinson's?

May 19, 2023

[info@endingPD.org](mailto:info@endingPD.org)



# Outline

Parkinson's is rising

Parkinson's is largely man-made

Parkinson's is preventable

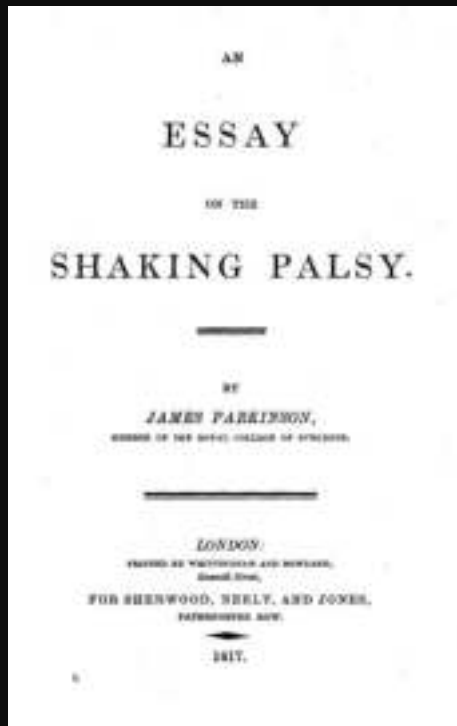
# Outline

Parkinson's is rising

Parkinson's is largely man-made

Parkinson's is preventable

Parkinson's disease was once rare ...

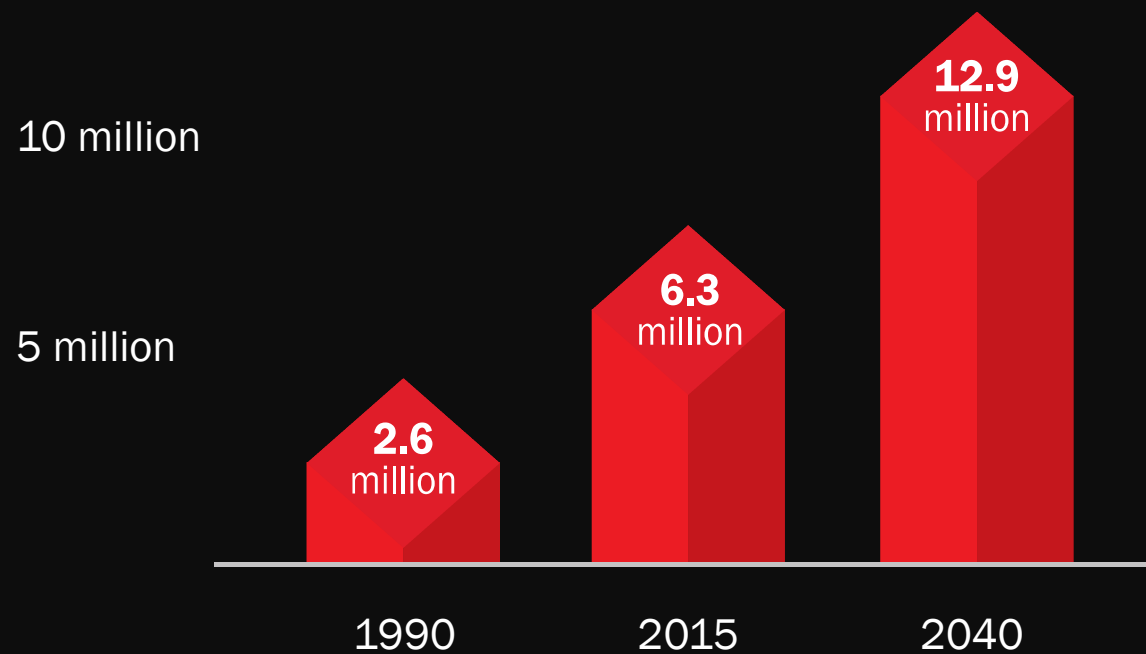


First page of *An Essay on the Shaking Palsy*, 1817



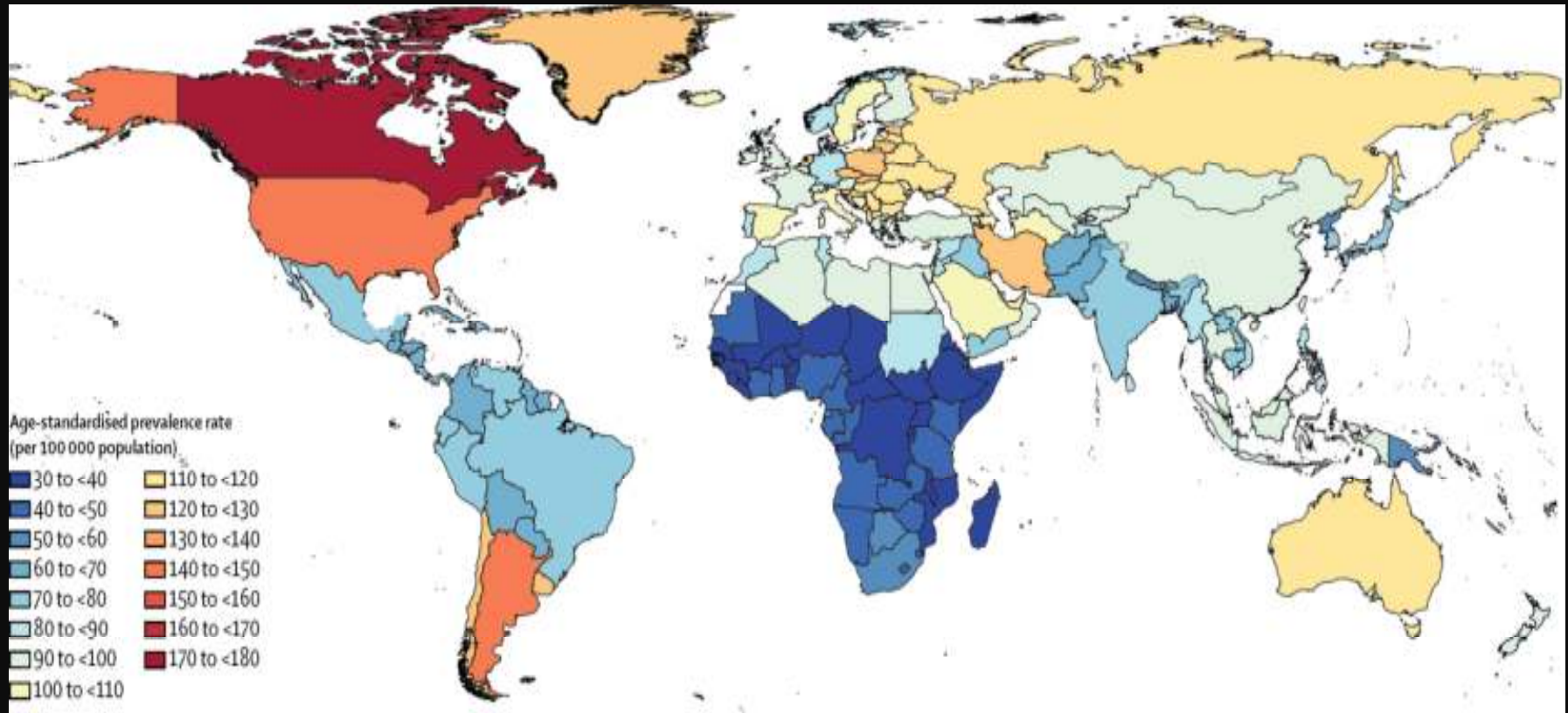
Illustration of London Fog, 1847

...but is now the fastest growing brain disease ...



Source: Dorsey ER, Bloem BR. The Parkinson Pandemic—A Call to Action. *JAMA Neurol.* 2018;75(1):9-10. doi:10.1001/jamaneuro.2017.3299

...in the world



Source: GBD 2016 Parkinson's Disease Collaborators. *Lancet Neurology* 2018;17:939-53

# Outline

Parkinson's is rising

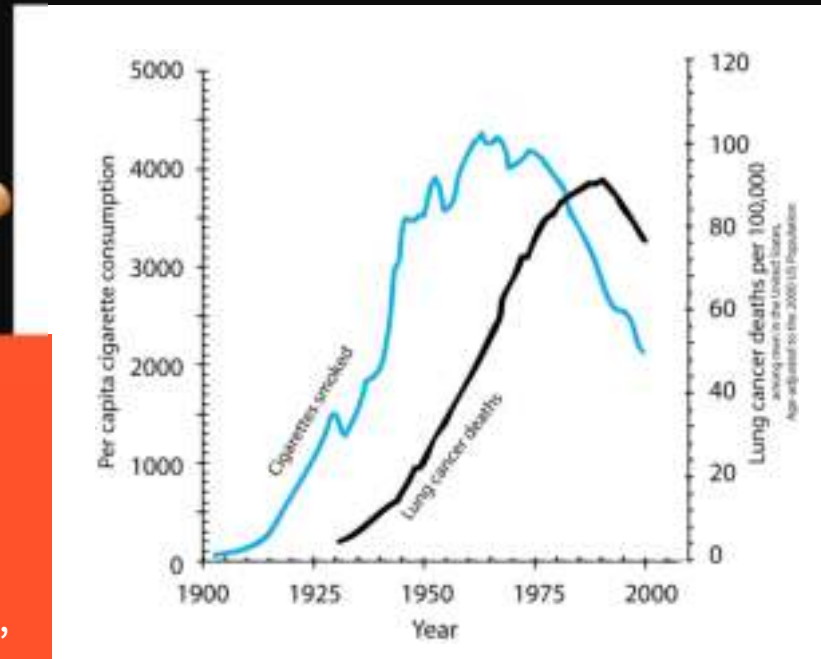
Parkinson's is largely man-made

Parkinson's is preventable

# Some common diseases are clearly man-made



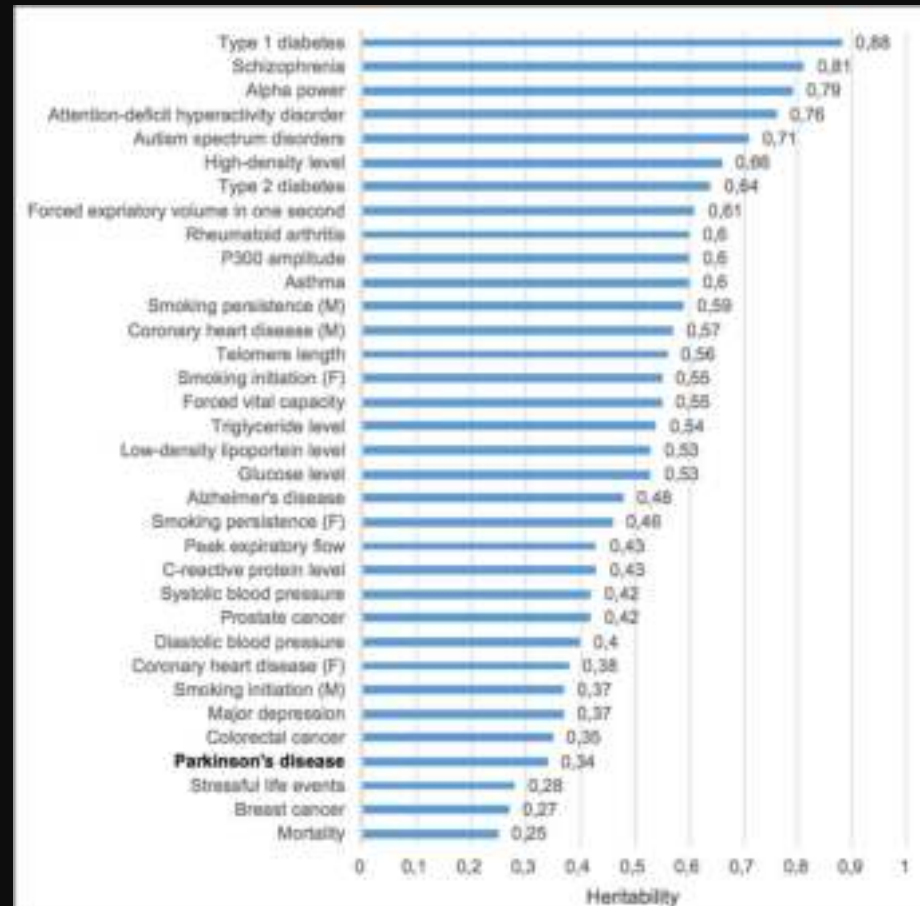
Before the advent of cigarettes, “doctors took special notice when confronted with a case, thinking it a **once-in-a-lifetime oddity**”



Sources: Chart showing correlation between increased cigarette consumption and incidence of lung cancer, with a lag time. [https://en.wikipedia.org/wiki/File:Smoking\\_lung\\_cancer.png#/media/File:Smoking\\_lung\\_cancer.png](https://en.wikipedia.org/wiki/File:Smoking_lung_cancer.png#/media/File:Smoking_lung_cancer.png); Proctor RN. The history of the discovery of the cigarette–lung cancer link: evidentiary traditions, corporate denial, global toll *Tobacco Control* 2012;21:87-91.



# The heritability of Parkinson's is low



Sources: van Dongen J et al. Nature Review Genetics 2012;13:640-53; organized by Drs. J.S. Bogers and Bastiaan Bloem

# Three environmental toxicants are likely fueling Parkinson's rise

## Air pollution



### Comment

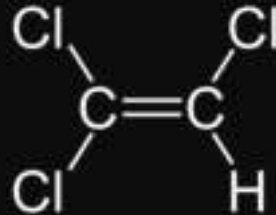
- Increasing evidence links air pollution to PD and Alzheimer's
- Sixth leading preventable cause of death globally
- U.S. pollution has improved, but 40% breathe in unhealthy air
- 95% of world population have exposure above WHO guidelines

## Certain pesticides



- Paraquat is associated with a 150% increased risk of PD
- U.S. use, including in California, has doubled in recent years
- EPA says, "One sip can kill," but has not banned the weedkiller
- Global use of pesticides has ~doubled in the past 20 years

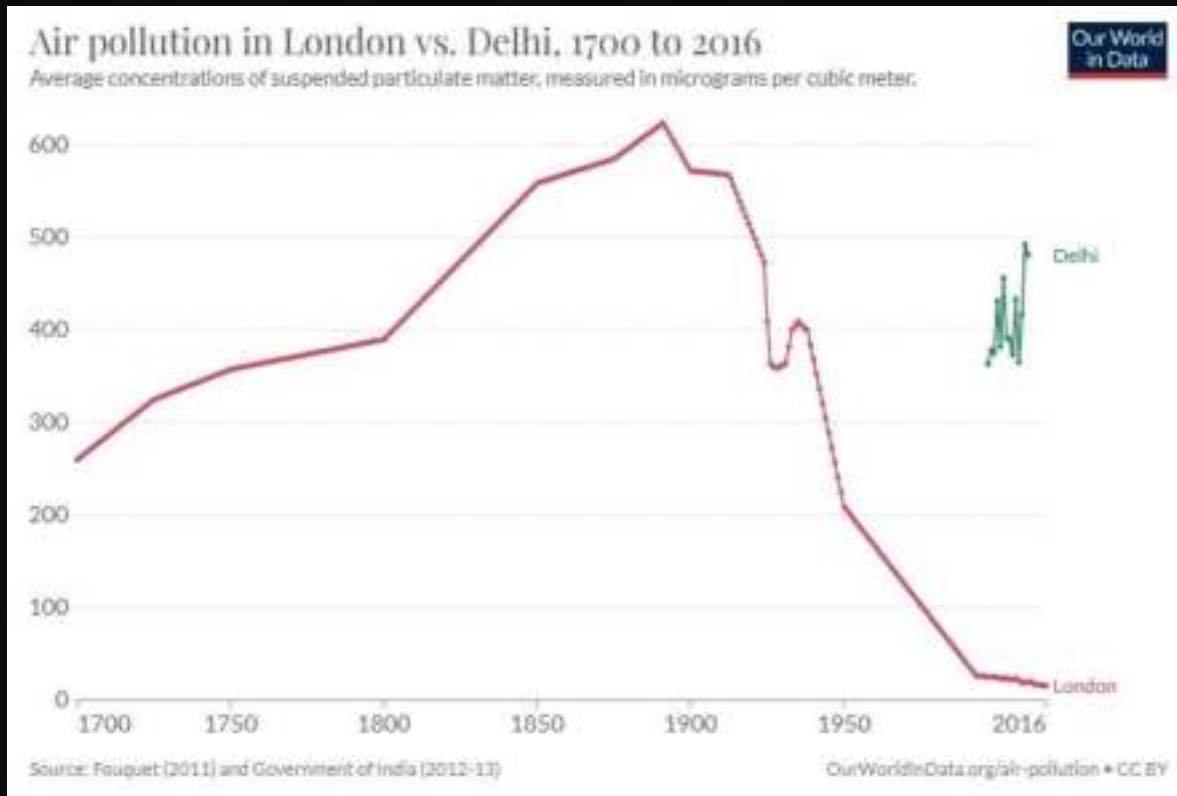
## Trichloroethylene (TCE)



- TCE is associated with a 500% increased risk of PD
- U.S. still permits use of the carcinogen
- Thousands of sites, including in Silicon Valley, are contaminated
- Global use is increasing ~3% per year

Sources: Environ Health Perspect 2011;119:866-72; U.S. Geological Survey available at: [https://water.usgs.gov/nawqa/pnsp/usage/maps/show\\_map.php?year=2018&map=PARAQUAT&hilo=H](https://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2018&map=PARAQUAT&hilo=H); EPA available at: <https://www.epa.gov/pesticide-worker-safety/paraquat-dichloride-one-sip-can-kill>; Our World in Data available at: <https://ourworldindata.org/pesticides>; Ann Neurol 2012;71:776-84; J of PD 2023;13:203-18; Environ Research 2018;166:348-62; Our World in Data available at: <https://ourworldindata.org/outdoor-air-pollution#outdoor-air-pollution-is-one-of-the-leading-risk-factors-for-premature-death>; American Lung Association available at: <https://www.lung.org/research/sota/key-findings>

# The rise of air pollution coincides with the description of Parkinson's



Great Smog of London, 1952



Delhi, India, 2016

Sources: <https://www.britannica.com/event/Great-Smog-of-London>; <https://www.ndtv.com/delhi-news/delhi-haze-similar-to-1952-london-smog-data-says-some-parameters-close-1622045>

# Certain pesticides like paraquat are likely another cause

Estimated use of paraquat on U.S. Agricultural land, 2016



Sources: U.S. Geological Survey; Sadie Costello, Myles Cockburn, Jeff Bronstein, Xinbo Zhang, Beate Ritz, Parkinson's Disease and Residential Exposure to Maneb and Paraquat From Agricultural Applications in the Central Valley of California, *American Journal of Epidemiology*, Volume 169, Issue 8, 15 April 2009, Pages 919–926, <https://doi.org/10.1093/aje/kwp006>

In October, the *Guardian* released an exposé on paraquat, Parkinson's disease, and the companies that produce it

## Secret files suggest chemical giant feared weedkiller's link to Parkinson's disease

Documents seen by Guardian detail effort to refute scientific research into paraquat and derail nomination of key EPA adviser

by [Carey Gillam](#) and [Aliya Uteuova](#)



Source: Gillam C and Uteuova C. Secret files suggest chemical giant feared weedkiller's link to Parkinson's disease. The Guardian. 20 October 2022. Available at: <https://www.theguardian.com/us-news/2022/oct/20/syngenta-weedkiller-pesticide-parkinsons-disease-paraquat-documents>

## The makers of paraquat have known about its health risks for 50+ years

Year	Event
1955	Company identifies paraquat as a potent weed killer
1962	Company introduces paraquat (brand name Gramoxone) into UK and later the U.S.
1964	Company finds skin exposure to paraquat in very high doses in rabbits causes “weakness and incoordination”
1966	Company scientists find that large doses of paraquat in some rats and mice result in a stiff gait or tremors
1968	Poisoning deaths and suicides due to paraquat start to rise
1974	Regulators are concerned about workers “who might inadvertently lick small quantities of paraquat residue off lips, or inhale paraquat mist;” rumors circulate that some in EPA favor banning paraquat
1975	Meeting between companies reports that long-term spraying could injure the brain and spinal cord
1976	Autopsy of farmworker shows “degenerative changes” in the “cells of substantia nigra”
1985	Company memo reports scientific article showing “ <u>extraordinarily</u> high correlation of .967 was found between levels of pesticide use and Parkinson’s cases.” Memo warns that paraquat could become a huge legal liability like asbestos and says, “Parkinson’s can go on for decades”

Source: Gillam C and Uteuova A. Secret files suggest chemical giant feared weedkiller’s link to Parkinson’s disease. The Guardian. 20 October 2022. Available at: <https://www.theguardian.com/us-news/2022/oct/20/syngenta-weedkiller-pesticide-parkinsons-disease-paraquat-documents>



# These industry actions are designed to foster ignorance

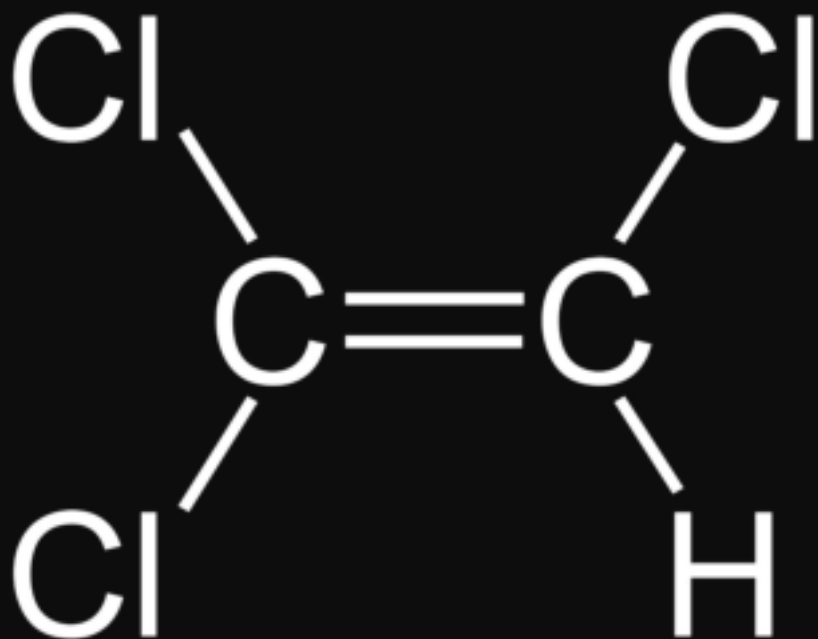


**Iain Boal**

## **Agnotology**

- Intentional production of ignorance or doubt, often for commercial gain
- Used by tobacco companies (“Doubt is our product”) to conceal health risks of smoking
- Later applied to climate change
- And for over 50 years to chemicals linked to Parkinson’s disease

Trichloroethylene may be another cause of Parkinson's



Trichloroethylene (TCE)





TCE has been used to...



Decaffeinate coffee



Degrease metals



Dry clean clothes

# TCE is associated with a 500% increased risk of Parkinson's, ...

## Solvent Exposures and Parkinson's Disease Risk in Twins

**Objective:** Several case reports have linked solvent exposure to Parkinson disease (PD), but few studies have assessed associations with specific agents using an analytic epidemiologic design. We tested the hypothesis that exposure to specific solvents is associated with PD risk using a discordant twin pair design.

**Methods:** Ninety-nine twin pairs discordant for PD ascertained from the National Academy of Sciences/National Research Council World War II Veteran Twins Cohort were interviewed regarding lifetime occupations and hobbies using detailed job task-specific questionnaires. Exposures to 6 specific solvents selected a priori were estimated by expert raters unaware of case status.

**Results:** Ever exposure to trichloroethylene (TCE) was associated with significantly increased risk of PD (odds ratio [OR], 6.1; 95% confidence interval [CI] 1.2–33;  $p = 0.034$ ), and exposure to perchloroethylene (PERC) and carbon tetrachloride ( $CCl_4$ ) tended toward significance (respectively: OR, 10.5; 95% CI, 0.97–113;  $p = 0.053$ ; OR, 2.3; 95% CI, 0.9–6.1;  $p = 0.088$ ). Results were similar for estimates of exposure duration and cumulative lifetime exposure.

**Interpretation:** Exposure to specific solvents may increase risk of PD. TCE is the most common organic contaminant in groundwater, and PERC and  $CCl_4$  are also ubiquitous in the environment. Our findings require replication in other populations with well-characterized exposures, but the potential public health implications are substantial.

ANN NEUROL 2012;71:776-784

Time lag between exposure and diagnosis of Parkinson's can be 10-40 years

0 is associated with  
, 2022-04-12T18:44:35.381

## ... and causes cancer



*TCE is "carcinogenic to humans"*



*TCE is "known to be a human carcinogen"*



*TCE is a "carcinogenic in humans by all routes of exposure"*



*"Exposure to TCE was associated with excess incidences of liver cancer, kidney cancer, non-Hodgkin's lymphoma, prostate cancer, and multiple myeloma."*

# TCE was and is ubiquitous

## Occupations with possible TCE exposure

1. Aircraft/jet engine mechanics
2. Automobile factor
3. Computer specialists
4. Dry cleaners
5. Electronic manufactures
6. Embalmers
7. Metal treatment workers
8. Oil processors
9. Painters
10. Printers
11. Refrigerant manufactures
12. Sewerage workers
13. Shoe makers
14. Taxidermists
15. Textile and fabric cleaners
16. Water treatment workers
17. Weapons specialists
18. Varnish workers

## Commercial and consumer uses

1. Adhesives
2. Aerosol cleaning products
3. Carpet cleaners
4. Cleaning wipes
5. Degreasers
6. Decaffeinated coffee
7. Film cleaners
8. Glue
9. Gun cleaner
10. Inks
11. Lubricants
12. Paint and paint removers
13. Pepper spray
14. Pesticides
15. Refrigerant
16. Stain removers
17. Typewriter correction fluid
18. Wood finishes

## Industry uses

1. Automotive care
2. Dry cleaning
3. Degreasing
4. Furniture care
5. Manufacturing
  - Computer and electronics
  - Dyes
  - Fat and oil extracts
  - Jewelry
  - Machinery
  - Paint and coating
  - Paper
  - Perfume
  - Plastics
  - Refrigerants
  - Soap

## Doctors even used it to anesthetize patients



“Trilene (trichloroethylene) is a potent analgesic drug. Its margin of safety and ease of administration will ultimately make it a standard agent on all delivery floors. Trilene's wide variety of uses will probably allow almost every obstetrician to find a place for it in his obstetrical practice”

– Dr. Charles Flowers, Jr., *American Journal of Obstetrics and Gynecology*, 1956



Courtesy of Dr. Victor Poleshuck, Clinical Professor, Emeritus, Department of Obstetrics and Gynecology, University of Rochester  
Sources: <https://anesthesiamuseum.wordpress.com/cyprane-trilene-inhaler/>; <https://www.sciencedirect.com/science/article/abs/pii/0002937853906279>

# It is still with us today

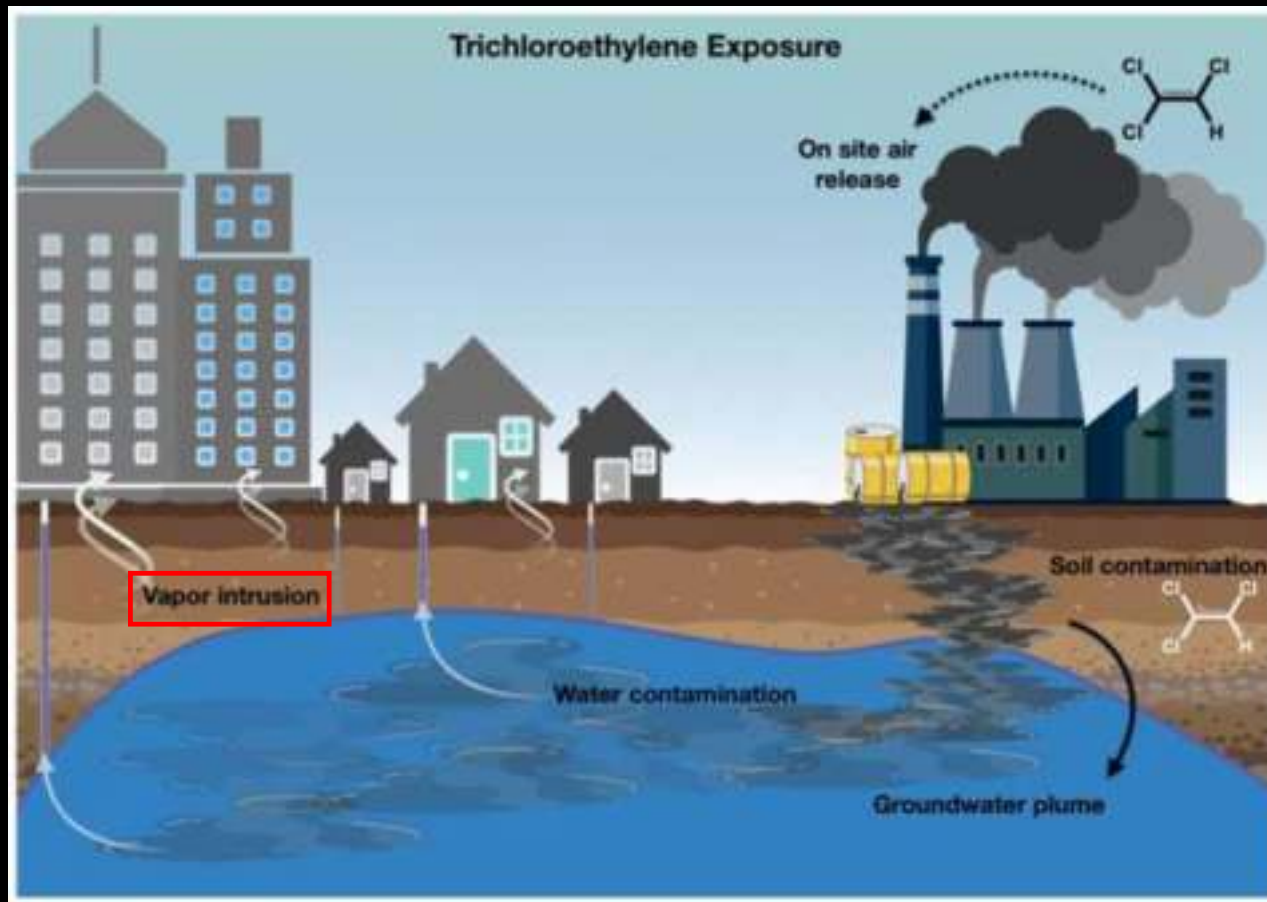
## Map of U.S. Superfund sites contaminated with trichloroethylene, 2018



Sources: EPA; Barringer F. E.P.A. Charts Risks of a Ubiquitous Chemical. The New York Times. September 30, 2011.; Gash D., Rutland K., Hudson N. et al Trichloroethylene: Parkinsonism and complex 1 mitochondrial neurotoxicity. Annals of Neurology 2008; 63(2): 184-192 <https://doi.org/10.1002/ana.21288>



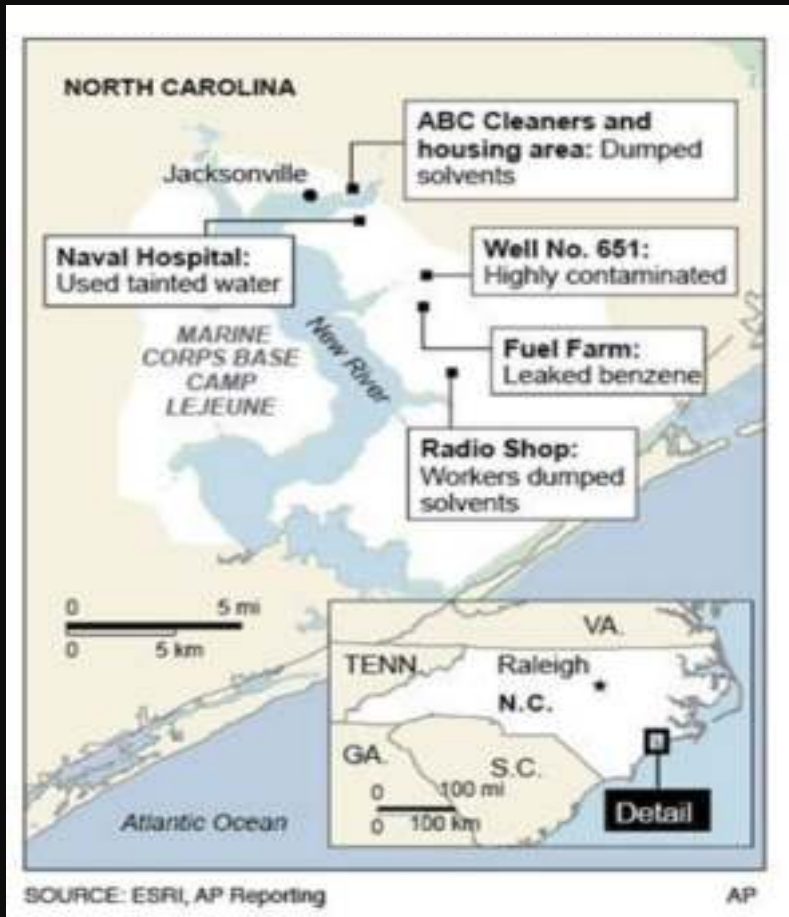
# TCE can contaminate the air, ground water, and homes



Source: JPD 2023;12:203-18



# TCE contaminated the Marine base Camp Lejeune



## U.S. MARINE CORPS BASE CAMP LEJEUNE

### Decades of Water Contamination Affects 1 Million

The Marine Corps Base Camp Lejeune in eastern North Carolina supports Marine Corps commands, a Navy command and a Coast Guard command... And it hosts the largest concentration of Marines and sailors in the world as the HOME OF EXPEDITIONARY FORCES IN READINESS...

But for 30 years in their own backyard... Camp Lejeune military and their family members faced an unseen enemy...

**IN A NUTSHELL**

**HARMFUL CHEMICALS GET INTO WATER SUPPLY**

Cleaning solvents, but not others, made their way into Camp Lejeune wells and water supply, along with pollution from leaking underground storage tanks.

**STAGGERING NUMBER OF CHEMICALS FOUND**

Whole organic compounds including ethylene dibromide (EDB), trichloroethylene (TCE), benzene and more than 100 chemicals were contaminating the base's water.

**THE UNSUSPECTING USE TAINTED WATER**

From at least 1957 through 1997, Marines and their families in many of the base's housing areas looked in and drank the contaminated water.

**TOXICITY LEADS MANY TO BECOME ILL**

The concentrations were up to 3,400x levels permitted by safety standards, leaving entire sections and families members to get sick, and sicker.

**1 million** Soldiers, military personnel and support staff, families and contractors — anyone who spent 30 days or more at Camp Lejeune between 1953 and 1987 were considered exposed.

## Slide 24

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- 0 ray found an infographic that he liked (googled campu lejune + TCE)  
 , 2023-01-09T20:42:21.732

Contaminated sites are everywhere ...

**Michigan has 7,300 toxic sites. Money for cleanups is almost gone.**



TCE from an automobile manufacturer dissolved into the groundwater and formed an underground plume

... including Ohio

## 1-in-4 Ohioans lives near toxic release facilities

Updated Apr 24, 2023, 10:06 am | Published Apr 19, 2022, 11:45 am

By [Zachary Smith, cleveland.com](#)

CLEVELAND, Ohio- Nearly a quarter of the population of Ohio lives near a toxic release facility, according to data from the [U.S. Environmental Protection Agency](#) analyzed by [Stacker](#).

Toxic release facilities are corporate sites that regularly release toxins into the surrounding land, air, and water — and often unbeknown to surrounding communities.

## Where are the companies in Summit County emitting the most toxic chemicals?

Updated Apr 24, 2023, 10:07 am | Published Apr 26, 2022, 1:02 pm

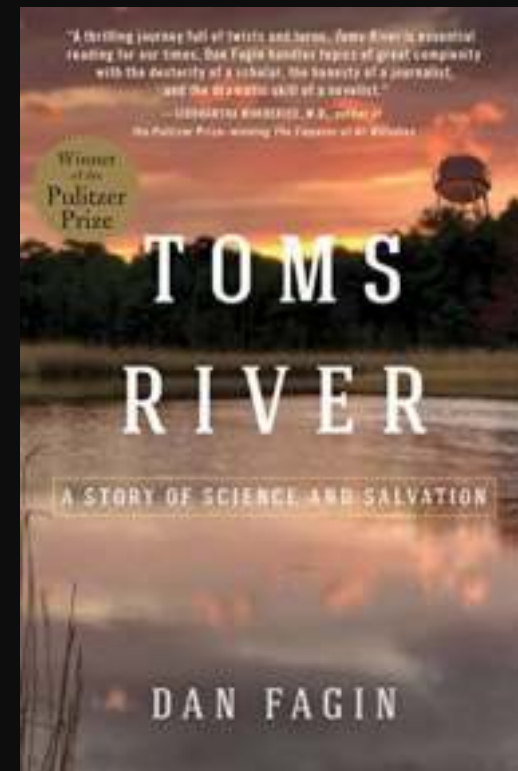
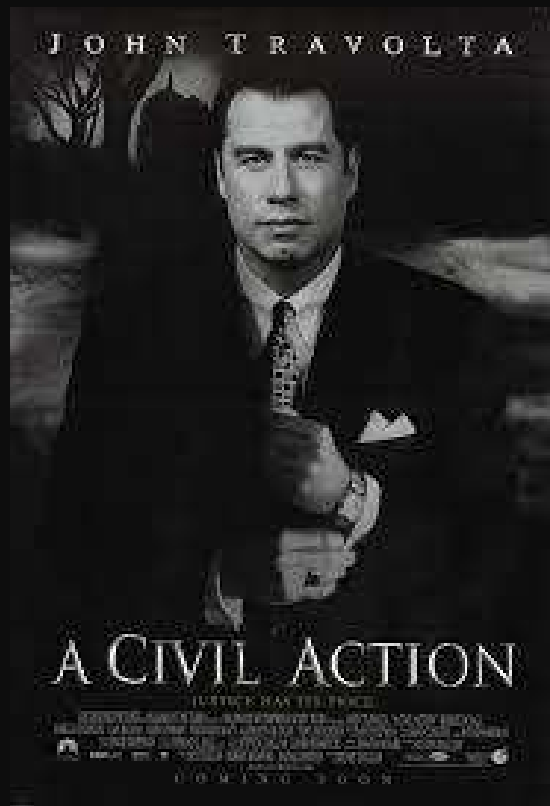
By [Zachary Smith, cleveland.com](#)

CLEVELAND, Ohio - Earlier this year, we reported that [a quarter of Ohioans lived near a facility that emitted toxic chemicals](#) into the land, water, or air. But where are those facilities in Summit County, and how close are they to where you live?

Summit County hosts 58 facilities that reported toxic releases in 2020 to the [U.S. Environmental Protection Agency](#). Combined, these facilities released 292,535 pounds of 60 separate toxic chemicals into the environment, the second-highest in Greater Cleveland, [following Cuyahoga County](#).

Sources: <https://www.cleveland.com/data/2022/04/1-in-4-ohioans-lives-near-toxic-release-facilities.html> and <https://www.cleveland.com/data/2022/07/where-are-the-companies-in-summit-county-emitting-the-most-toxic-chemicals.html>

# TCE-contaminated sites are found everywhere



Woburn, MA

# Outline

Parkinson's is rising

Parkinson's is largely man-made

Parkinson's is preventable



# To the extent Parkinson's is man-made, it can be human-ended



## Air Pollution

Nationwide emissions of common air pollutants decreased by >50% between 1990 and 2012



## Pesticides

Between 1968 and 1986, levels of dieldrin, DDT, and their metabolites dropped in fat between 75 and 90%



## Trichloroethylene

In 1981, levels of airborne TCE levels were among the lowest in Europe



60% decrease in the incidence of Parkinson's disease in the Netherlands, 1990-2000



Sources: Sirwan K. L. Darweesh SKL and colleagues . Am J Epidemiol 2-16;183:1018-26; Greve PA, Van Zoonen P. Organochlorine Pesticides and PCBs in Tissues from Dutch Citizens. 1990.; *Report on Carcinogens Background Document for Trichloroethylene*. National Toxicology Program; December 13-14, 2000. ; European Environment Agency, National Emission Ceilings Directive emissions data viewer 1990-2017. <https://www.eea.europa.eu/data-and-maps/dashboards/necd-directive-data-viewer-2> Accessed September 2019.

# We can create a world where Parkinson's is increasingly rare



## Contributions from previous generations

### Polio

1938 – A March of Dimes raised millions for polio

1955 – Jonas Salk develops a vaccine

Today – We live in a world largely free of polio

### Drinking and driving

1980 – MADD was founded following the death of a daughter

1988 – Drunk driving becomes illegal in all 50 states

Today – Drunk driving is socially unacceptable

### HIV/AIDS

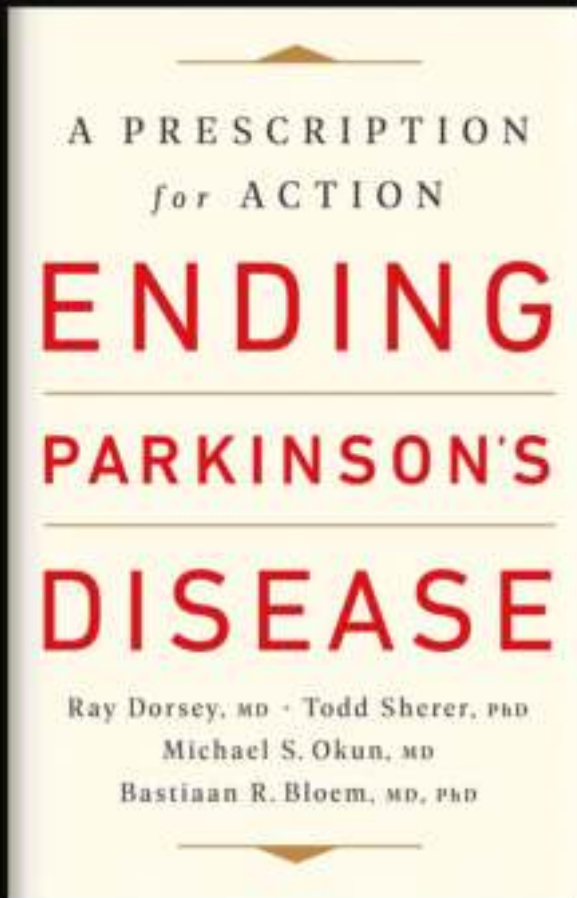
1987 – ACT UP adopts the motto of "Silence=Death"

1995 – First protease inhibitors approved for HIV

Today – HIV is both preventable and treatable



## We must end our silence



1. **Join** PD Avengers: [www.pdavengers.com](http://www.pdavengers.com)
2. **Sign up** for our newsletter: [www.endingPD.org](http://www.endingPD.org)
3. **Tell** your representatives to:
  - **Ban** paraquat, trichloroethylene (TCE), and perchloroethylene (PCE)
  - **Endorse** the National Plan to End Parkinson's Act
4. **Read** *Ending Parkinson's Disease*
  - Available on Amazon (proceeds go to prevent and end Parkinson's)
  - If you cannot afford a copy, email us ([info@endingPD.org](mailto:info@endingPD.org)), and we will send you one
5. **Hold** wrongdoers accountable
6. **Tell** us your story: [info@endingPD.org](mailto:info@endingPD.org)

# Outline

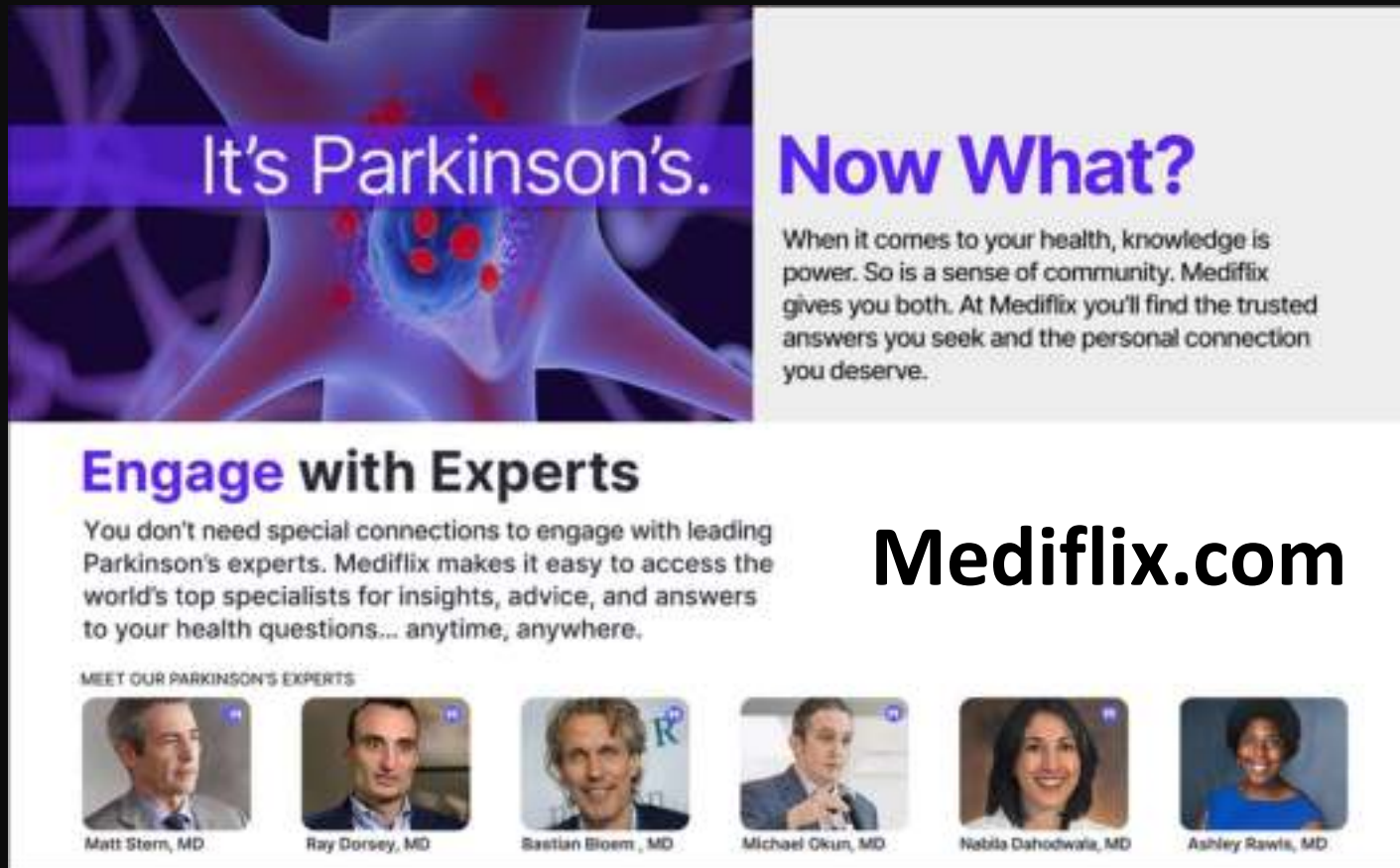
Parkinson's is rising

Parkinson's is largely man-made

Parkinson's is preventable

## Appendix

Now anyone anywhere can access expert content on Parkinson's disease



**It's Parkinson's.**







## Now What?

When it comes to your health, knowledge is power. So is a sense of community. Mediflix gives you both. At Mediflix you'll find the trusted answers you seek and the personal connection you deserve.

### Engage with Experts

You don't need special connections to engage with leading Parkinson's experts. Mediflix makes it easy to access the world's top specialists for insights, advice, and answers to your health questions... anytime, anywhere.

MEET OUR PARKINSON'S EXPERTS

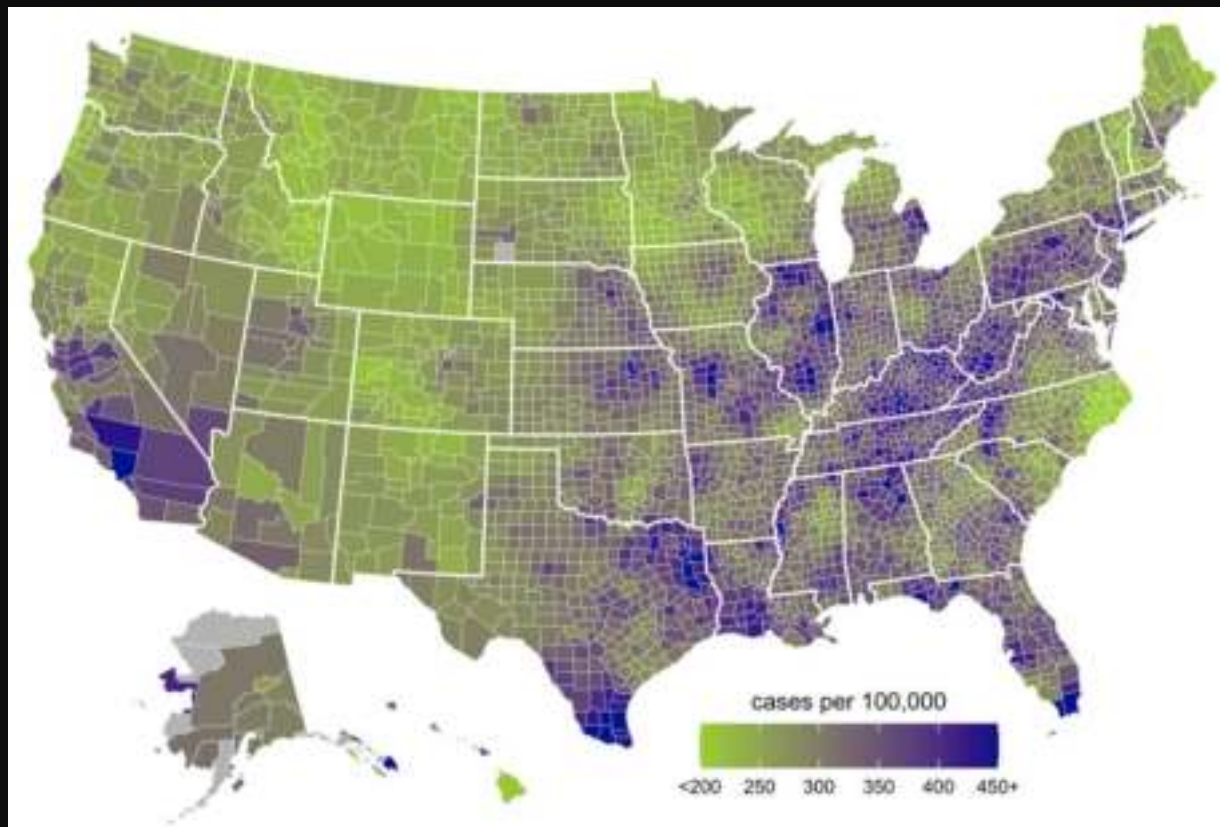
 Matt Stern, MD	 Ray Dorsey, MD	 Bastian Bloem, MD	 Michael Okun, MD	 Nabila Dahodwala, MD	 Ashley Rawls, MD
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# Mediflix.com

Note: Dr. Dorsey has an ownership interest in Mediflix

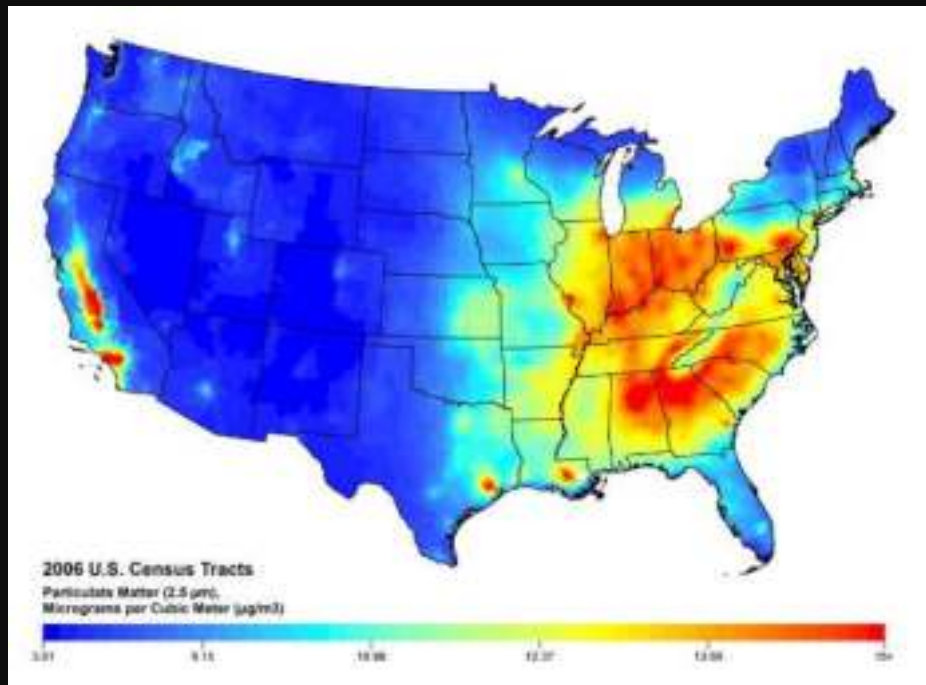
# Parkinson's may be man-made as well

**Incidence (new cases) of Parkinson's disease in the U.S., 2012**

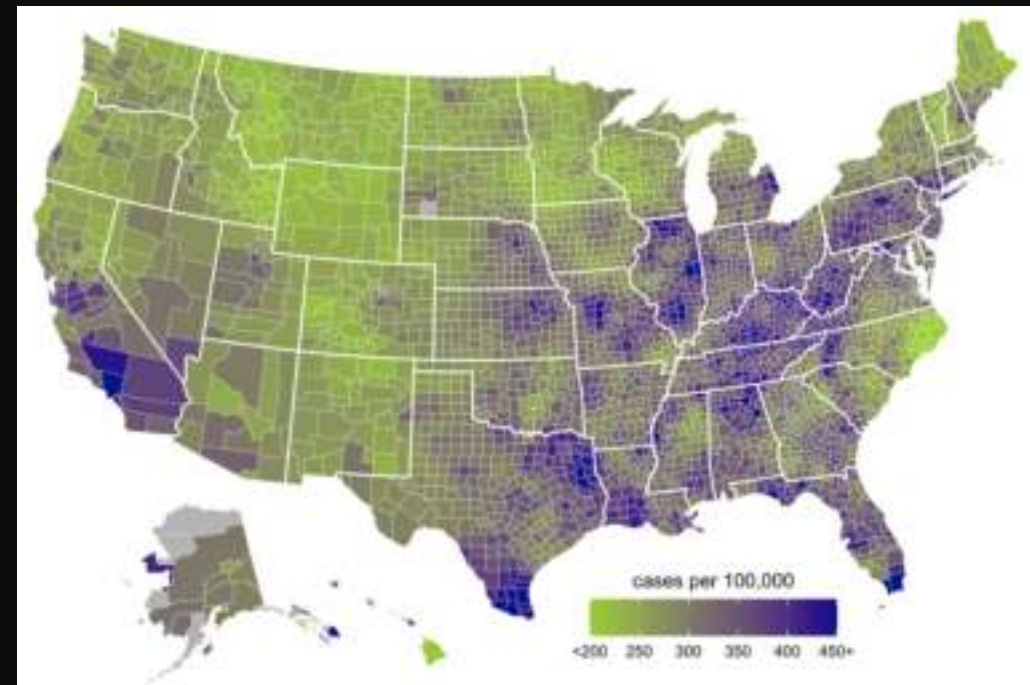


Source: <https://www.nature.com/articles/s41531-022-00410-y/figures/2>

The incidence map correlates with maps of air pollution, ...



Air pollution (particulate matter), 2006



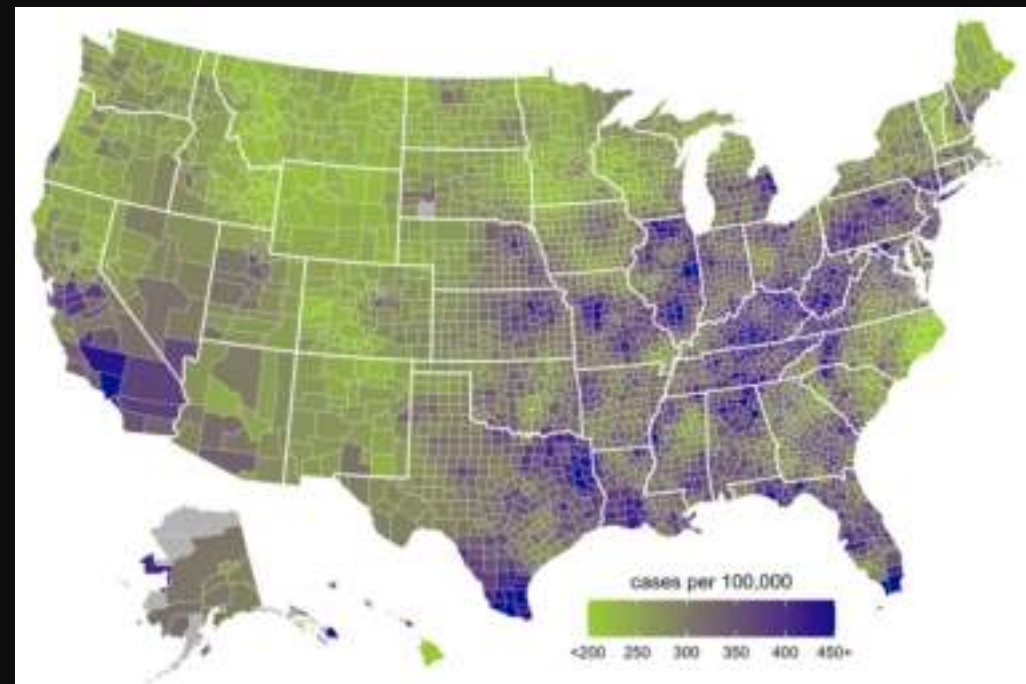
New cases of Parkinson's, 2012



... paraquat use, ...

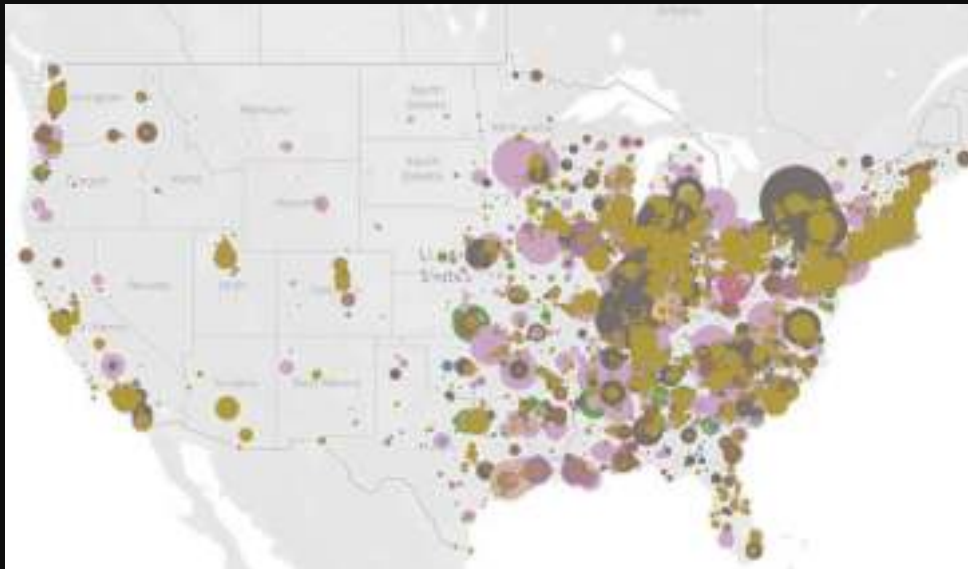


Paraquat use, 1992

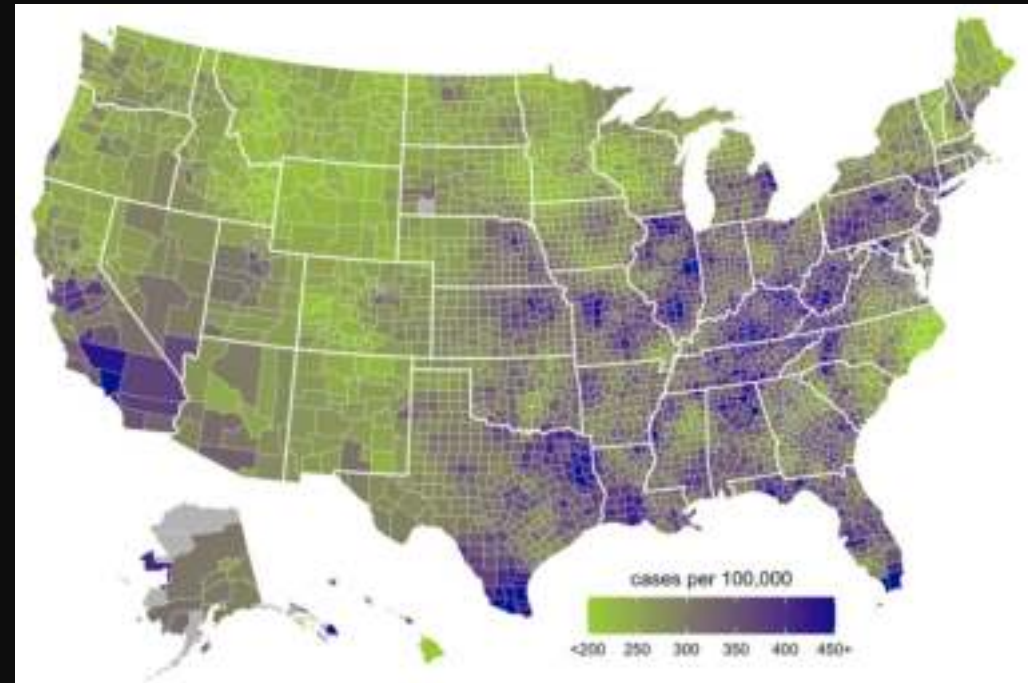


New cases of Parkinson's, 2012

... and release of chlorinated chemicals like trichloroethylene (TCE)



Release of TCE and other chlorinated solvents, 1987



New cases of Parkinson's, 2012

# Parkinson's Prevention Project

**Vision:** A world where Parkinson's is increasingly rare

**Mission:** Identify and eliminate the root causes of Parkinson's disease

**What:** An independent, non-profit organization

**When:** Time-limited. Five years with option for one renewal

**Where:** Based in Rochester, NY, but with a national and global focus

**Why:**

1. Parkinson's is the world's fastest growing brain disease
2. Much of the disease is likely preventable
3. No organization and few resources are focused on disease prevention

**How:**

1. *Investigate* the environmental factors underlying Parkinson's disease
2. *Advocate* for policies and interventions to reduce exposure to these factors
3. *Educate* a broad range of stakeholders on the actions needed to prevent Parkinson's



A dozen dry cleaners in Rochester, NY, are contaminated with TCE or PCE



Source: New York State Department of Environmental Conservation

# Fortunately, vapor intrusion is addressable

Jane Horton outside her home in Mountain View, CA with her TCE-remediation system



Source: Courtesy of Michelle Le, *Mountain View Voice*

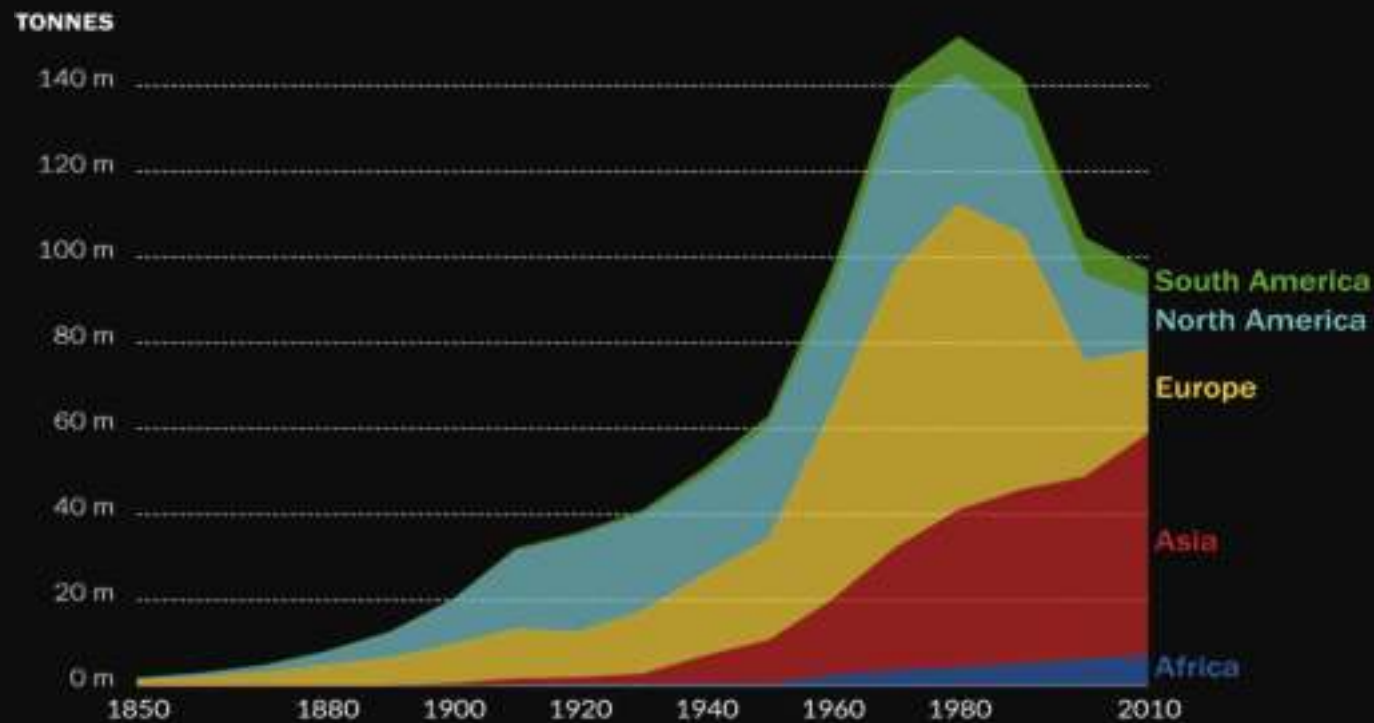
# Less than 15% of people with Parkinson's have identifiable genetic risk factor

	GENES LINKED TO PARKINSON'S	FREQUENCY IN PARKINSON'S	ENVIRONMENTAL INTERACTIONS
AUTOSOMAL DOMINANT	SNCA	<<1%	Paraquat Rotenone
	LRRK2	~2-3%	Paraquat
	VPS35	<1%	Rotenone
AUTOSOMAL RECESSIVE	<i>Parkin</i>	~1%	Paraquat Rotenone
	PINK1	<1%	Manganese
	DJ-1	<<1%	Rotenone
	ATP13A2, PLA2G6, PARK9, FBXO7	<<1%	Manganese
GENETIC RISK FACTOR	GBA	5-14%	MPTP

Sources: Klein C, Westenberger A. Genetics of Parkinson's disease. *Cold Spring Harb Perspect Med*. 2012;2(1):a008888.; Hernandez DG, Reed X, Singleton AB. Genetics in Parkinson disease: Mendelian versus non-Mendelian inheritance. *J Neurochem*. 2016;139 Suppl 1(Suppl 1):59-74. doi:10.1111/jnc.13593

# The migration of Parkinson's disease follows air pollution

## Global sulfur dioxide emissions by world region



Source: Hannah Ritchie and Max Rosner. Global sulfur dioxide (SO<sub>2</sub>) emissions by world region. Our World in Data. <https://ourworldindata.org/air-pollution>. April 2017. April 2019. Accessed September 2019.

... and over half of Superfund sites nationally

**Map of U.S. Superfund sites contaminated with trichloroethylene, 2018**



Sources: EPA; Barringer F. E.P.A. Charts Risks of a Ubiquitous Chemical. The New York Times. September 30, 2011.