

ENVIRONMENTAL THREATS TO REPRODUCTIVE HEALTH: SCIENCE AND SOLUTIONS

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Nothing to Disclose



What Are Sperm Telling Us?

Scientists are concerned by falling sperm counts and declining egg quality. Endocrine-disrupting chemicals may be the problem.



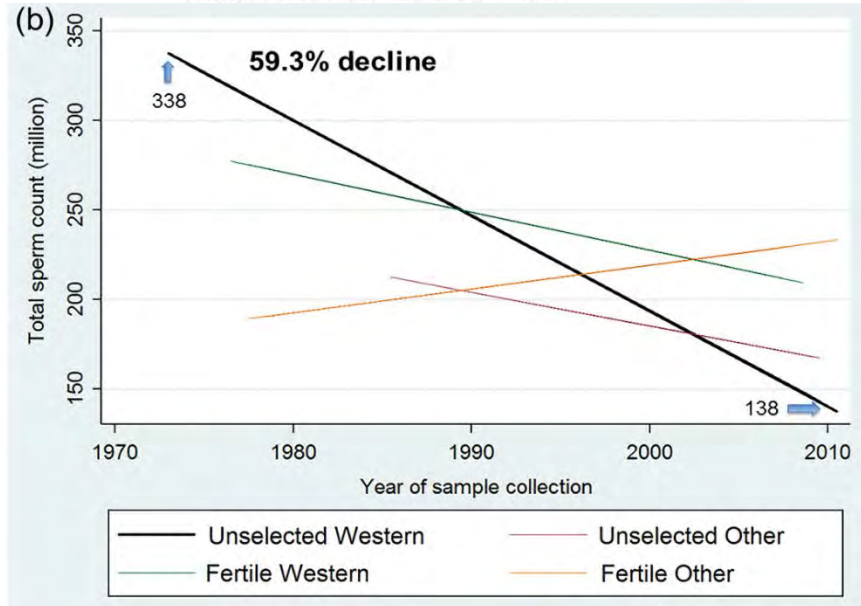
By Nicholas Kristof
Opinion Columnist

Feb. 20, 2021



Temporal trends in sperm count: a systematic review and meta-regression analysis

Hagai Levine ^{1,2,*}, Niels Jørgensen ³, Anderson Martino-Andrade ^{2,4}, Jaime Mendiola ⁵, Dan Weksler-Derri ⁶, Irina Mindlis ², Rachel Pinotti ⁷, and Shanna H. Swan ²



Reproductive Capacity Under Strain

An illustration showing several sperm cells with long tails swimming towards a large, textured, pinkish-red egg cell. The background is dark blue.

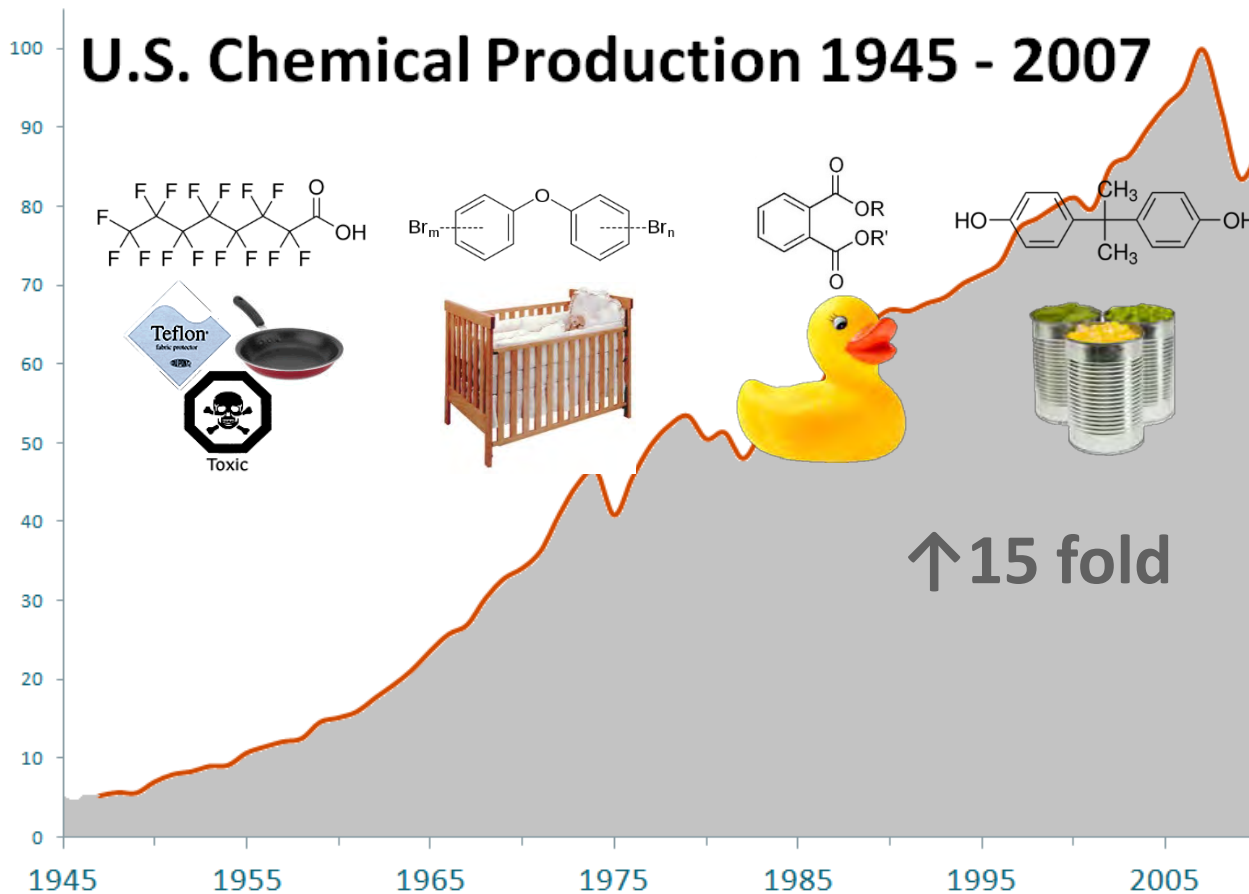
Scientific indicators of **declining reproductive function** and increasing rates of reproductive illnesses since the mid-20th century

- ↑ Difficulty conceiving & maintaining pregnancy
- ↑ Rates testicular cancer
- ↓ Sperm counts

Woodruff TJ, Carlson A, Schwartz JM, et al. *Fertil Steril* 2008;89:e1-e20; Schettler T, Solomon G, Valenti M, et al. *Generations at Risk. Reproductive Health and the Environment*. Cambridge, MA: MIT Press 1999; Crain DA, Janssen SJ, Edwards TM, et al. *Fertil Steril* 2008;90:911-40; Colborn T, Dumanoski D, Myers JP. *Our Stolen Future*: Penguin Books USA, Inc. 1996. Image from fineartamerica.com



U.S. Chemical Production 1945 - 2007

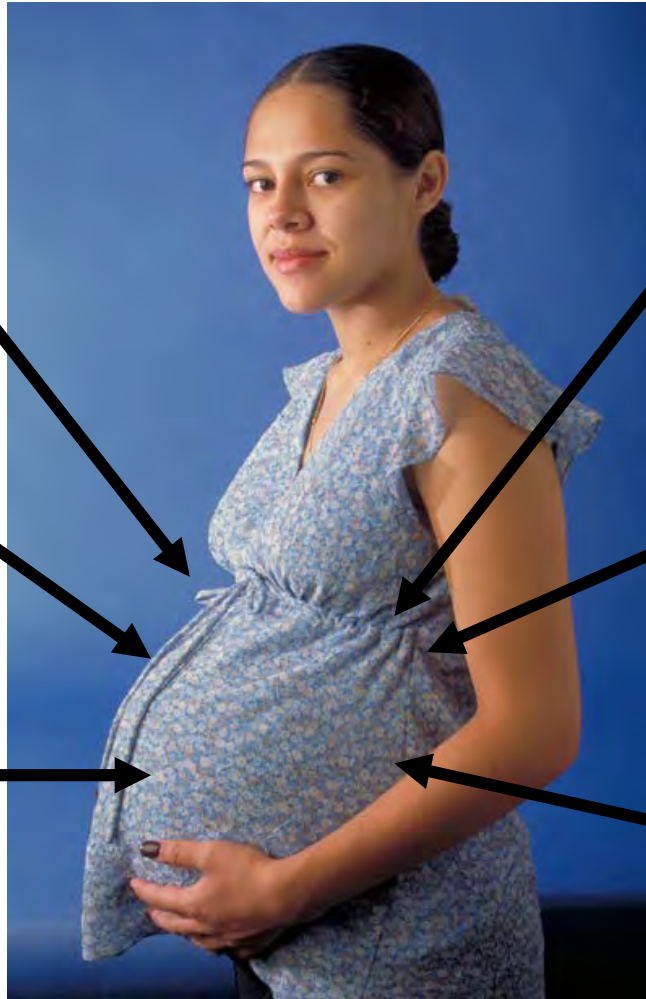


↑ 15 fold

Federal reserve data on chemical production is only offered as relative production, which is unit-less. A specific reference year is chosen and values are calculated relative to that years production. In this particular data set 2007 is the reference year and is assigned a value of 100.

Data from: U.S. Federal Reserve Board, Division of Research and Statistics

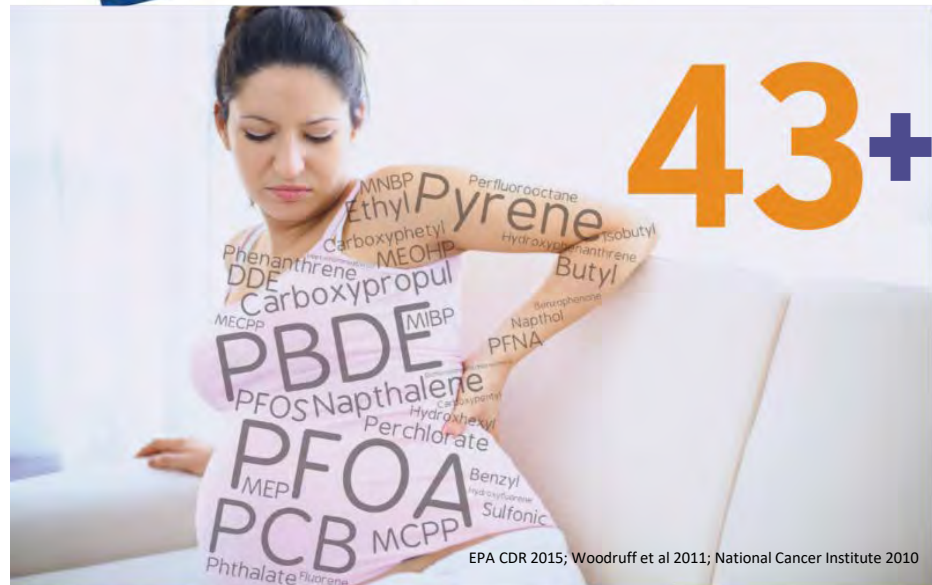




~30,000 lbs of industrial chemicals produced for **each person** in the U.S. **each year**



Most chemicals in the marketplace have not been tested fo



EPA CDR 2015; Woodruff et al 2011; National Cancer Institute 2010

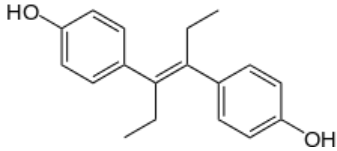


“to a disturbing extent
babies
are born
‘pre-
polluted’”

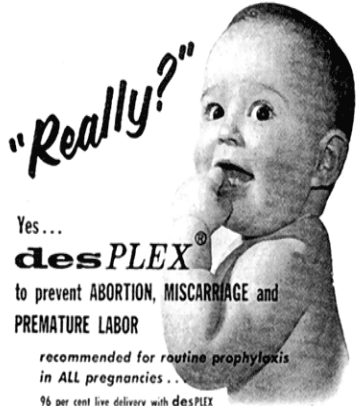


Pharmaceuticals

Diethylstilbestrol



Medscape www.medscape.com



Yes...
desPlex[®]
 to prevent ABORTION, MISCARRIAGE and
 PREMATURE LABOR

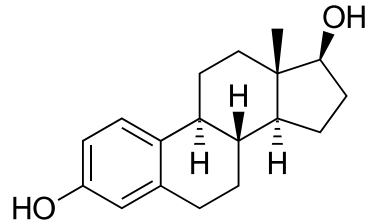
recommended for routine prophylaxis
 in ALL pregnancies...

96 per cent live delivery with desPlex
 in one series of 1200 patients*—
 —bigger and stronger babies, too!†

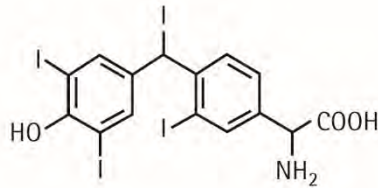
No gastric or other side effects with desPlex
 — in either high or low dosage†,‡,§

Source: J Midwifery Womens Health © 2003 Elsevier Science, Inc.

Hormones

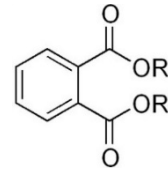
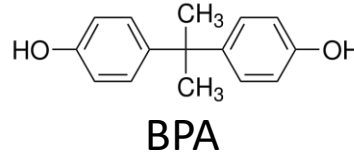


Estradiol

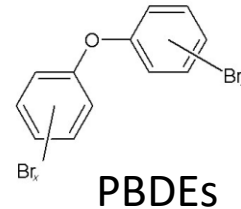


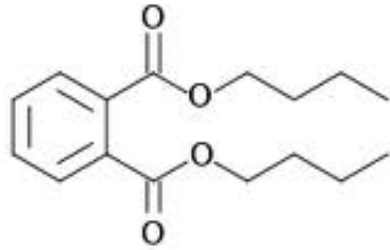
Thyroid hormone

Industrial Chemicals

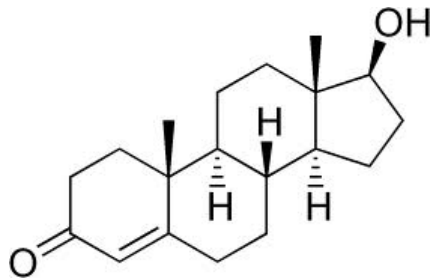


Phthalates





Dibutyl Phthalate



Testosterone



PHTHALATES

Cosmetics



Shampoo, lotion,
nail polish and other
personal care products



Toys



Baby products including
lotion, shampoo,
powders and teethers



Medical equipment
including tubing,
blood bags, and
plastics in the NICU



Building materials
including vinyl
flooring, wall paper,
paint, glue and adhesives

Automobiles (phthalates are
responsible for
the 'new car' smell);



Enteric coatings
of pharmaceuticals

Scented products such as
candles, detergent
and air fresheners



Art supplies including
paint, clay, wax and ink





Contains:

Phthalates



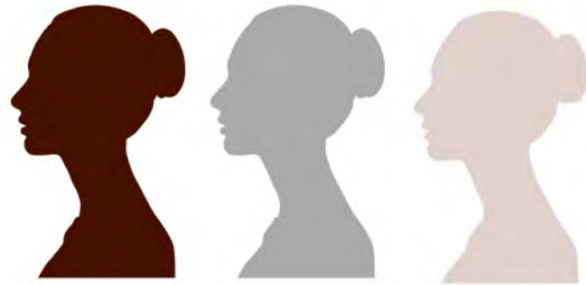
Some health effects linked to phthalates:

- Male reproductive health effects (e.g. sperm effects)
- Reduced fertility
- Learning and behavior effects
- Obesity and diabetes

These chronic diseases are on the rise



Racial Disparities in Phthalates Exposure



Beauty product-related phthalate exposure was **more than 30% higher in Black women**



Zota et al. *Fertility and Sterility* 2018





Fueling Plastics

**How Fracked Gas,
Cheap Oil, and
Unburnable Coal
are Driving the
Plastics Boom**



Petro-chemical connection

Plastic Supply Chain

ETHYLENE CHAIN



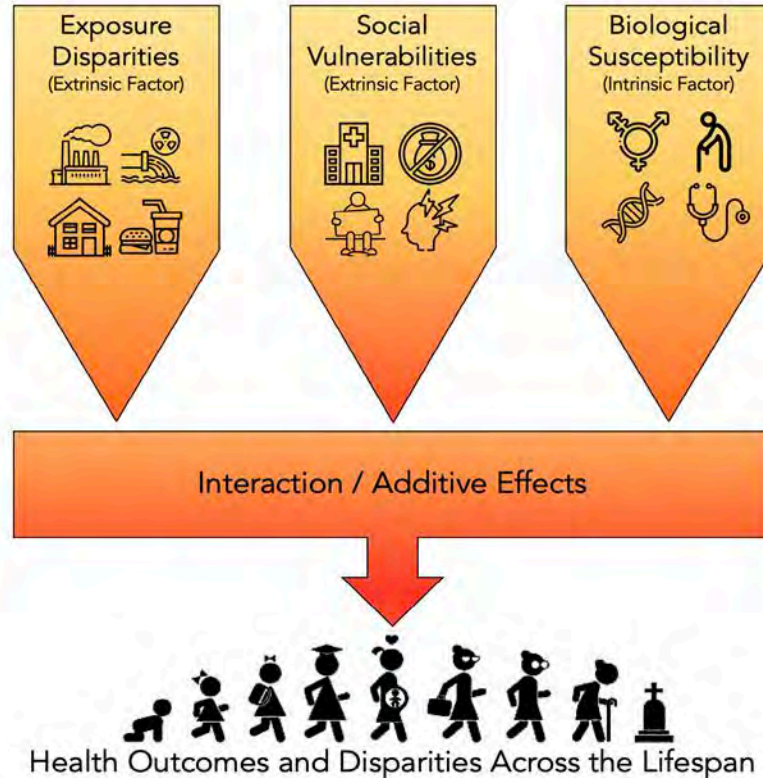
Plasticizers

We offer the industry's broadest range of high-molecular-weight (HMW) plasticizers. Jayflex® high-molecular-weight plasticizers provide an optimum balance of properties with outstanding performance and permanence.



Triple Jeopardy and Environmental “Risksapes”

Social Context: Social inequality, segregation, discrimination
Demographics: Race/ethnicity, immigration status, income, wealth, geography



Morello-Frosch et al., 2011
Gee and Payne-Sturges, 2004
O’Neill et al. 2003
IOM, 1999



Manufactured pharmaceuticals are required to have data to show **safety** before use



Manufactured chemicals do **NOT**





INTERNATIONAL FEDERATION OF GYNECOLOGY & OBSTETRICS

Recommendations for Preventing Exposure to Toxic Chemicals

Recommendation 1: Advocate for policies to prevent exposure to toxic environmental chemicals

Advocate for policies to prevent exposure to toxic environmental chemicals

Work to ensure a healthy food system for all

Recommendation 2:
Work to ensure a healthy food system for all

Recommendation 3:
Make environmental health part of health care

Make environmental health part of health care

Champion environmental justice

Recommendation 4: Champion environmental justice



California



SFGate.com ARTICLE COLLECTIONS

Y Collections



SACRAMENTO
Gov. signs bills to track bullets ban toxic toys
 Some bullets must be marked, chemical in toys is banned

U.S.A.



The Washington Post TODAY'S NEWSPAPER
 Subscribe | PostPoints

Lawmakers Agree to Ban Toxins in Children's Items

By Lyndsey Layton
 Washington Post Staff Writer
 Tuesday, July 29, 2008

Congressional negotiators agreed yesterday to a ban on a family of toxins found in children's products, handing a major victory to parents and health experts who have been clamoring for the government to remove harmful chemicals from toys.

TOO
 Resize
 Yahoo! Buzz
 COME
 142 Comments
 COMMENTS ARE CL

boston.com THIS STORY HAS BEEN FORMATTED FOR EASY PRINTING

Bush signs bill banning lead from kids' toys Associated Press

Law boosts funds for safety panel
 By Associated Press | August 15, 2008

WASHINGTON - President Bush yesterday signed consumer children's toys, impose the toughest standard in the world



Overseas



Last Updated: Tuesday, 5 July, 2005, 11:06 GMT 12:06 UK

[E-mail this to a friend](#)

[Printable version](#)

Europe bans chemical use in toys

The European Parliament has voted to permanently ban the use of a group of chemicals to soften children's toys following health concerns.

Phthalates have been linked to damage to the reproductive system, and an increased risk of asthma and cancer.



Chemicals used in children's toys

Canada Bans BPA From Baby Bottles

By Lyndsey Layton and Christopher Lee
 Washington Post Staff Writers
 Saturday, April 19, 2008; Page A03

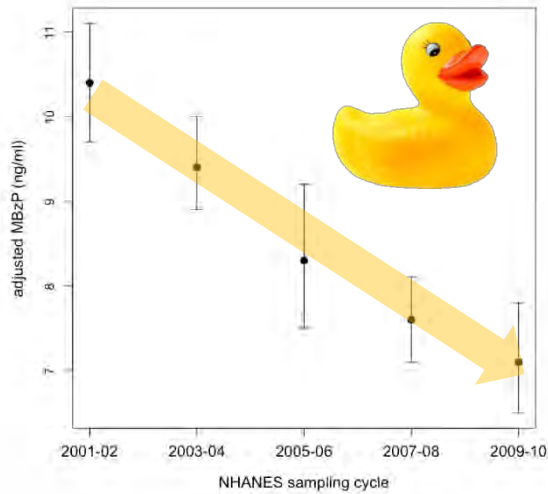
Canada yesterday became the first country to ban a widely found chemical from use in baby bottles, spurring a leading Democrat in the U.S. Senate to call for legislation that would prohibit use of bisphenol



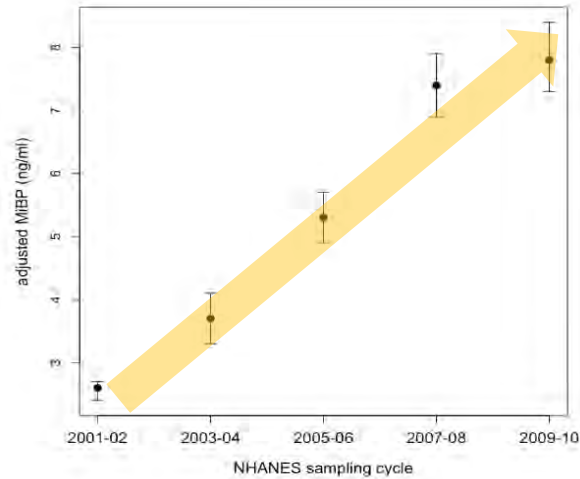
An Arcadia, Calif., store c
 California's state capital



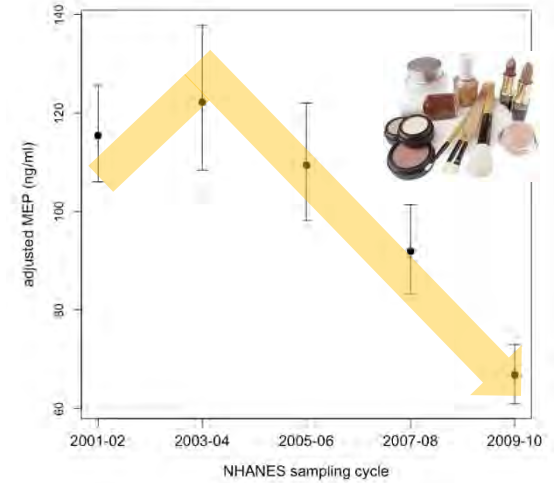
Banned Phthalates



Phthalates not Banned (Replacements)



Phthalates Targeted in Market Campaigns



Toxic Substances Control Act (TSCA) – law that governs ~40,000 industrial, commercial, consumer product chemicals



TSCA amended in 2016

- Federal actions override states
- Key decisions left to implementation
- Require addressing risk to susceptible subpopulations who *'...may be at greater risk than the general population of adverse health effects from exposure to a chemical substance or mixture, such as infants, children, pregnant women, workers, or the elderly.'*

Chlorinated solvents

Flame retardants

Phthalates

High Priority Chemicals Undergoing Review

p-Dichlorobenzene

Di-isobutyl phthalate (DIBP)

1,2-Dichloroethane

Dicyclohexyl phthalate

trans-1,2- Dichloroethylene

Dibutyl phthalate (DBP)

o-Dichlorobenzene

Butyl benzyl phthalate (BBP)

1,1,2-Trichloroethane

Di-ethylhexyl phthalate (DEHP)

1,2-Dichloropropane

Ethylene dibromide

1,1-Dichloroethane

1,3-Butadiene

4,4'-(1-Methylethylidene)bis[2, 6-dibromophenol] (TBBPA)

HHCB

Tris(2-chloroethyl) phosphate (TCEP)

Formaldehyde

Phosphoric acid, triphenyl ester (TPP)

Phthalic anhydride

Conclusions:

- Environmental chemical exposures ubiquitous and adversely affecting health inequitably
- Science alone cannot move systematic change but engagement by scientists and health care providers is critical
- Research and translation that leads to less biased science is needed
- Community partnership & support are key
- Public policy is necessary to create lasting and fair solutions for all



Thank You to Our Funders & Our Team

PRHE Faculty, Staff &

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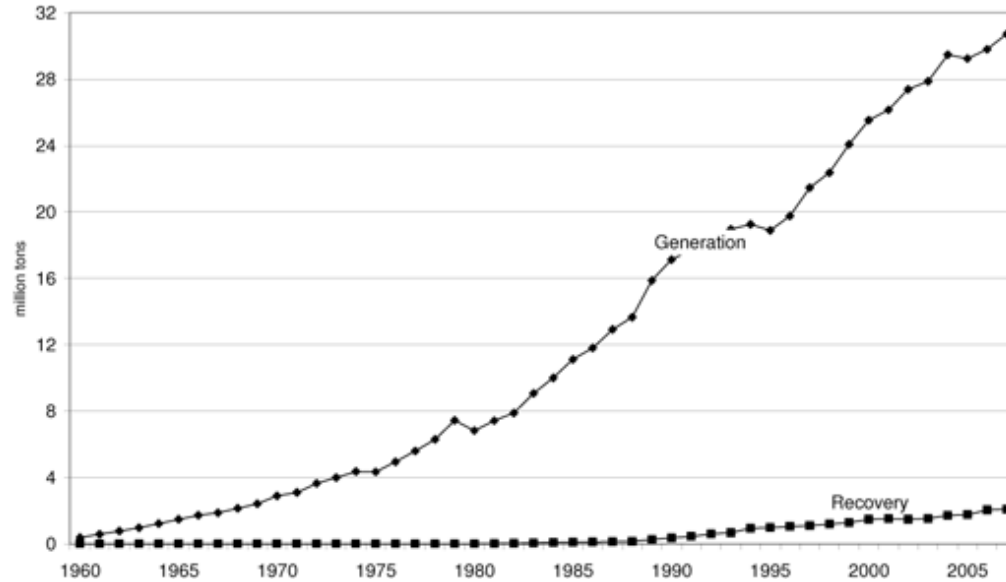
The Tides Foundation
The Marisla Foundation
The California Environmental
Protection Agency
The Passport Foundation
The JPB Foundation
The National Institutes of Health
The Clarence E. Heller Charitable
Foundation
National Institute for Environmental
Health Sciences

EaRTH Center

Peggy Reynolds
Diana Laird
Susan Fisher
Jennifer Fung



Plastics generation and recovery in the US has been increasing since 1960s



Social Justice Movements (Re)Shape Research Priorities



Getty Images



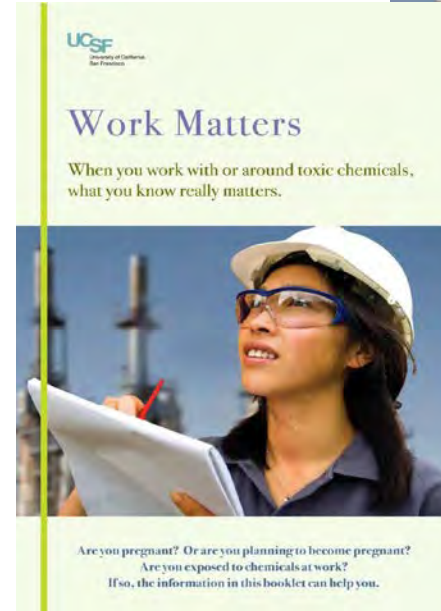
Julia Rendleman/Reuters



ACOG/ASRM Committee Opinion

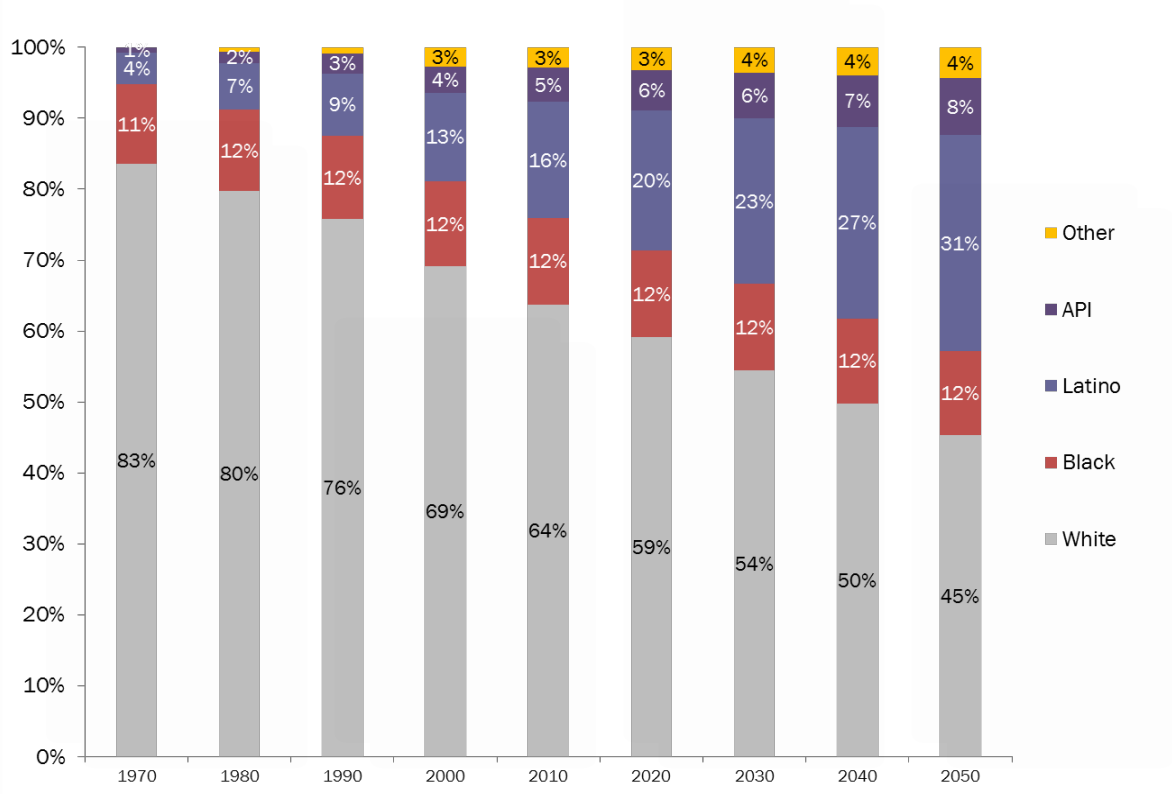
All exposures are not created equal

- Underserved & minority populations are disproportionately impacted
- Higher risk for occupational exposure

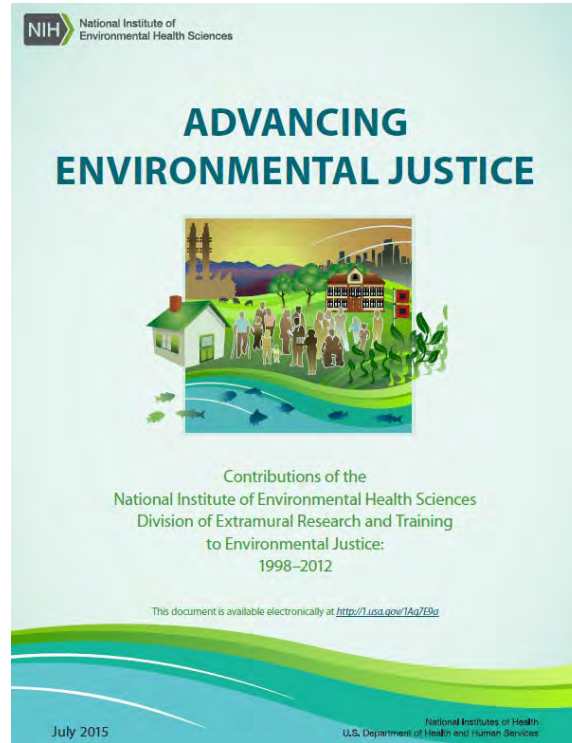


Changing demographics shapes conversations about environmental health and policy-making...

U.S. Changing Demographics, 1970-2050



Funding incentives for community-engaged



...change how scientists theorize and study environmental links to disease



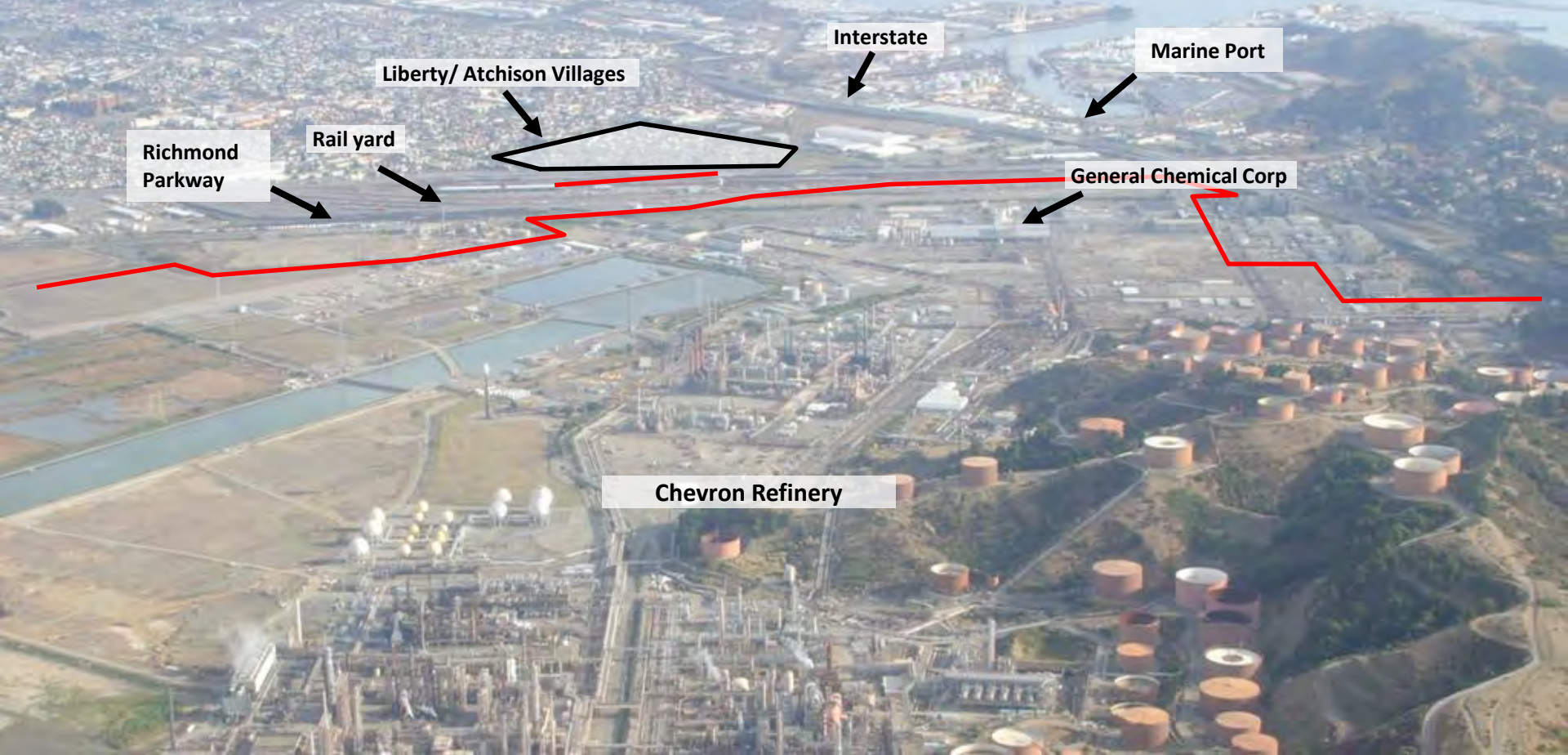
Scientists pushed by community research partners and EJ advocates to address cumulative impacts

Consider structural drivers of environmental degradation & links to health disparities:

- **Multiple hazards** where communities live, work, and play
 - e.g., chemical mixtures
- **Vulnerability** due to chronic social stressors
 - poverty, malnutrition, racism, discrimination, chronic health problems



Environmental Inequality and Cumulative Impacts in Richmond, CA



Richmond Parkway

Rail yard

Liberty/ Atchison Villages

Interstate

Marine Port

General Chemical Corp

Chevron Refinery

Methodological challenges to answering environmental justice questions:

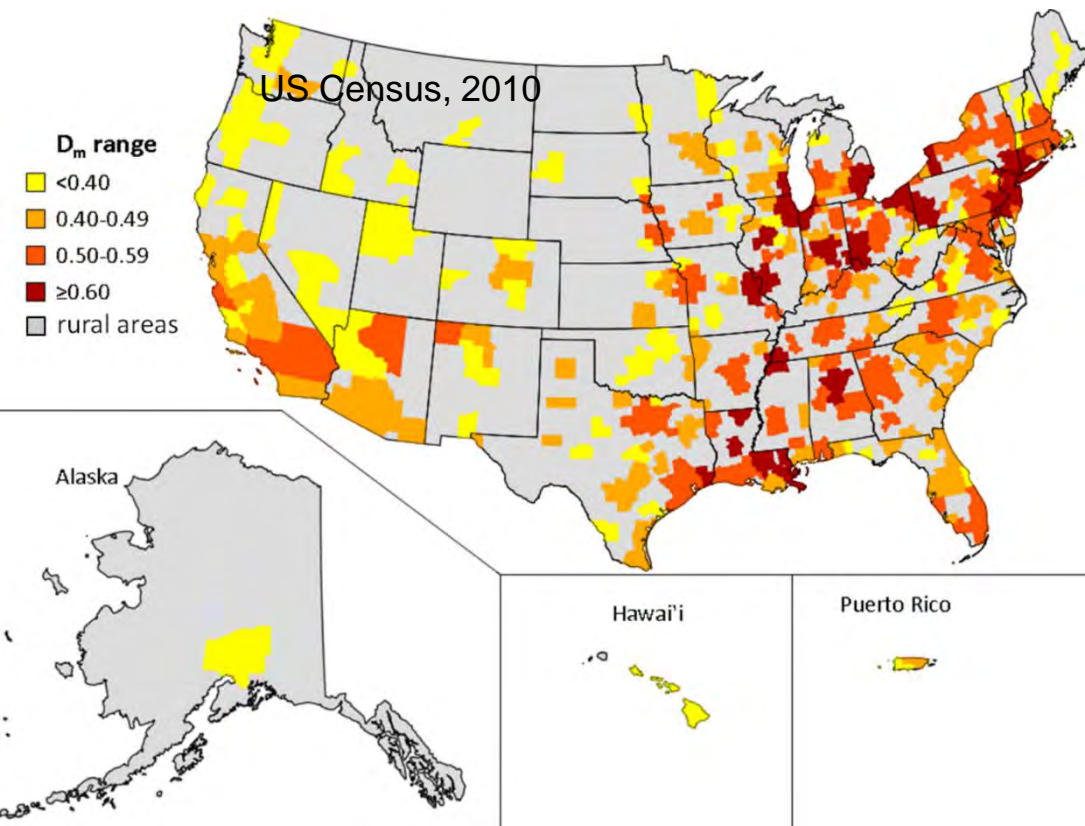
- Lack of statistical power in some cohort studies
- Limited geographic scope of many cohorts
- Time & resources required for data collection and analysis
- Short-term needs for “data judo” to inform decision-making
 - Large administrative data sets conducive to answering questions about structural determinants
(e.g., redlining, racial residential segregation, income inequality)
 - Cohort data can elucidate contributions of environmental and social stressors of relevance to health inequities at the individual level
(e.g., perceived stress, biomarkers, neighborhoods)

EJ analysis requires both approaches



Racial Segregation in US Cities:

Multi-group Dissimilarity (D_m) by Metropolitan Area in the United States



Most chemicals NOT effectively regulated

Food, drugs, pesticides



Everything else:

Toxic Substances Control Act (TSCA)

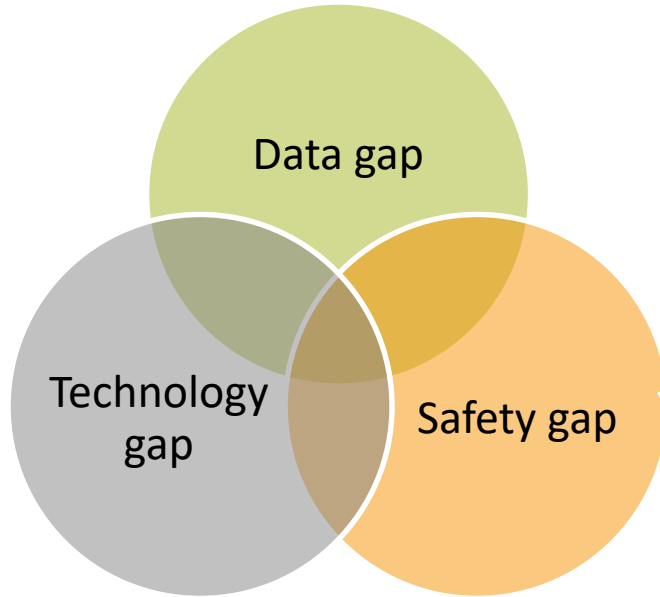


Since 1976, under TSCA EPA has been able to partially regulate:

- a) No chemicals
- b) 5 chemicals
- c) 500 chemicals
- d) 5,000 chemicals



1976 TSCA very weak



- 20,000 new chemicals introduced
- 85% no health hazard data
- No deadlines for EPA review or action on chemicals
- Asbestos not able to be banned

