

A Systems Approach to Cancer Prevention

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Collaborative on Health and Environment

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Lowell Center for Sustainable Production

Sustainability Solutions Science

Collaboration with Toxics Use Reduction Institute

Public Health Framework +

- Surveillance – Who is at risk?
- Risk and protective factors—What are causes?
- Interventions on modifiable risk factors—What works for whom?
- Implementation—Scale up effective interventions

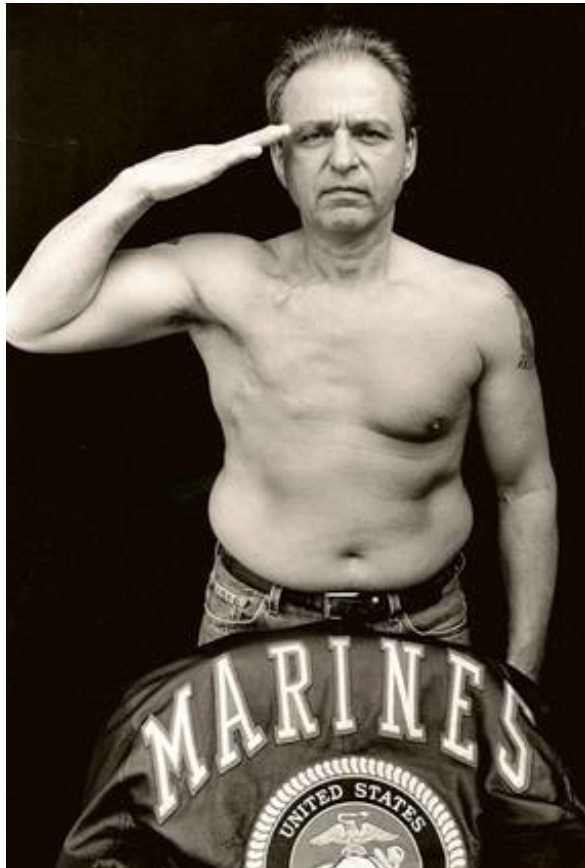
+ *Strategic engagement for systems change*

National/regional/local systems change initiatives

Premises

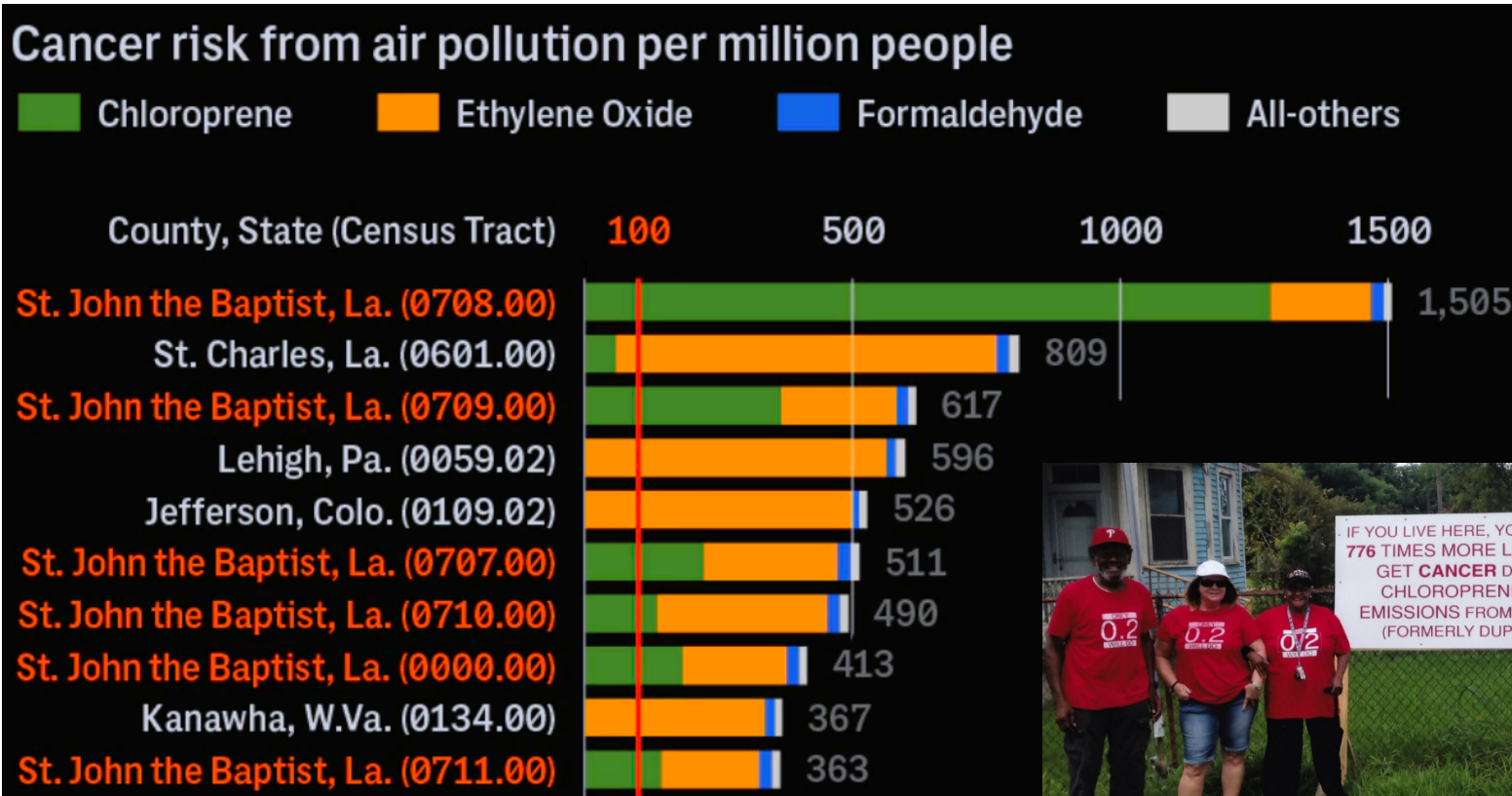
- For many environmental chemicals, we have enough evidence to act now. Ongoing research is also needed.
- There is a need and opportunity for a dramatic shift from reliance on hazardous chemicals to materials and technologies that do not contribute to cancer and other chronic diseases, with focus on disproportionately impacted communities.
- Cancer-focused constituencies have been largely on the sidelines in research, clinical practice and advocacy regarding environmental chemicals, but are powerful potential partners.
- Reducing environmental carcinogens *and* scaling safer materials should be integral to research, clinical practice, and cancer prevention policy.
- An analysis of the system that produces, uses, and emits environmental carcinogens, and provides health care to people impacted by cancer, provides insights into how to catalyze change. A collaborative network can translate analysis into action.

Legacy Exposures: Cancer in Camp Lejeune, NC



- Drinking water contamination (1953-1987)
- Studies have found:
 - Increased risk of bladder and kidney cancer
 - Non-statistically significant increased risk of male breast cancer (strongest association w/ PERC)
 - Non-statistically significant associations for childhood cancer (leukemia and NHL) with maternal exposure during (1st trimester)
- VA established a presumptive service connection for specific cancers (e.g., bladder, leukemia, kidney, liver, NHL and MM) with service at Camp Lejeune (1953 -1987)

Ongoing Exposures: Cancer in St. John the Baptist Parish, LA

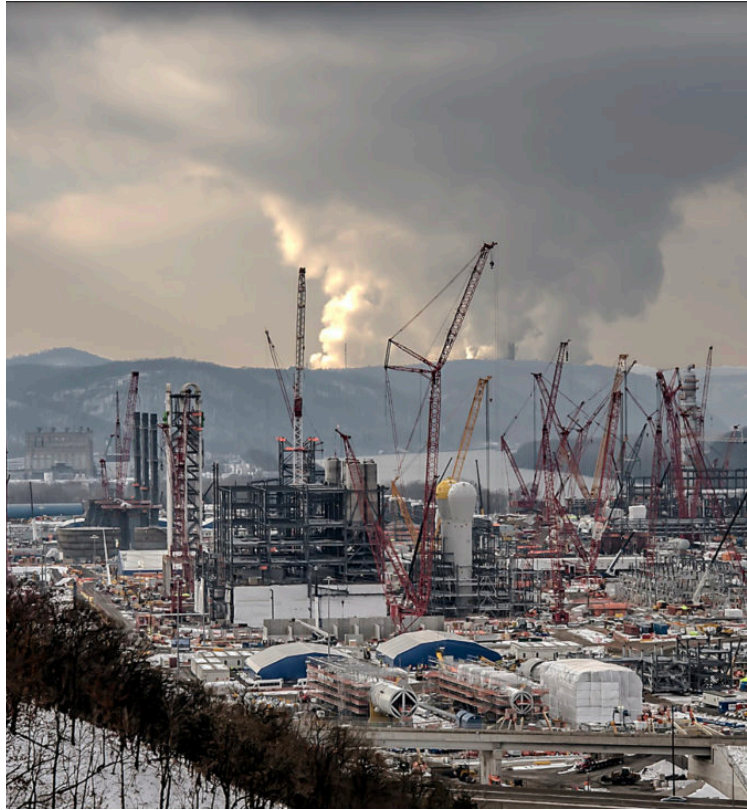


Source: The Intercept, 2014 National Air Toxics Assessment Data, U.S. EPA



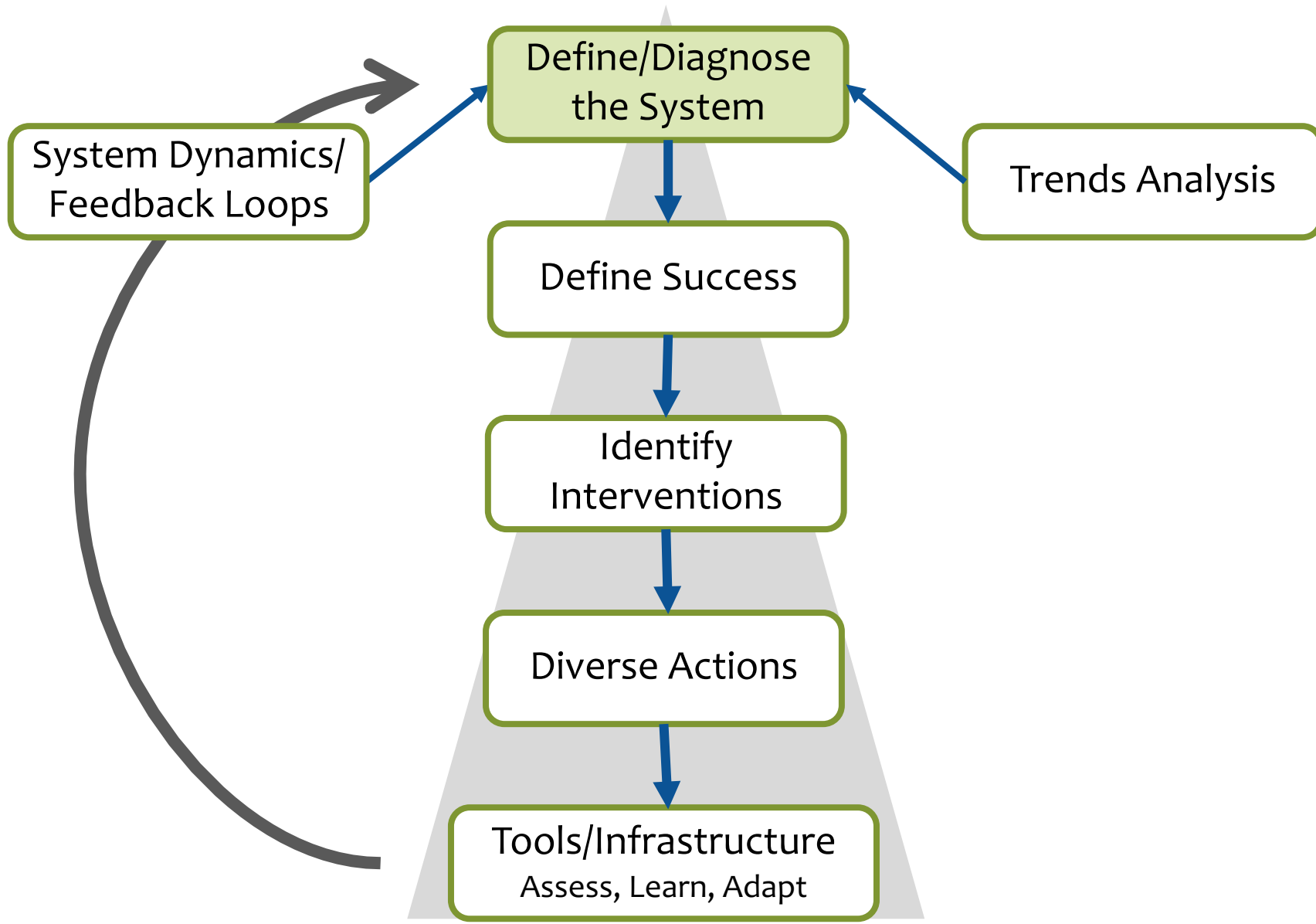
Of the top 10 census tracts in counties with the highest cancer risks due to industrial air pollutants, 6 are in St John the Baptist in LA

Future Exposures: UNGD and Plastics



Beaver County, PA Ethane Cracker
Source: Teake Zuidema/PublicSource

- Investments by oil and gas industry in “Unconventional Natural Gas Development” to generate feedstock chemicals for plastics and chemicals production—concentrated in Texas and Louisiana now expanding
- Fracking Investments in infrastructure for fracking natural gas from Marcellus Shale began in 2005.
- Life-cycle impacts of plastics production, exposing people from extraction through production, consumption, disposal
- Early science on cancer risks associated with fracking—chemicals and radioactivity
- Can strategic convening for systems change help prevent another “cancer alley” in the Ohio River Valley?



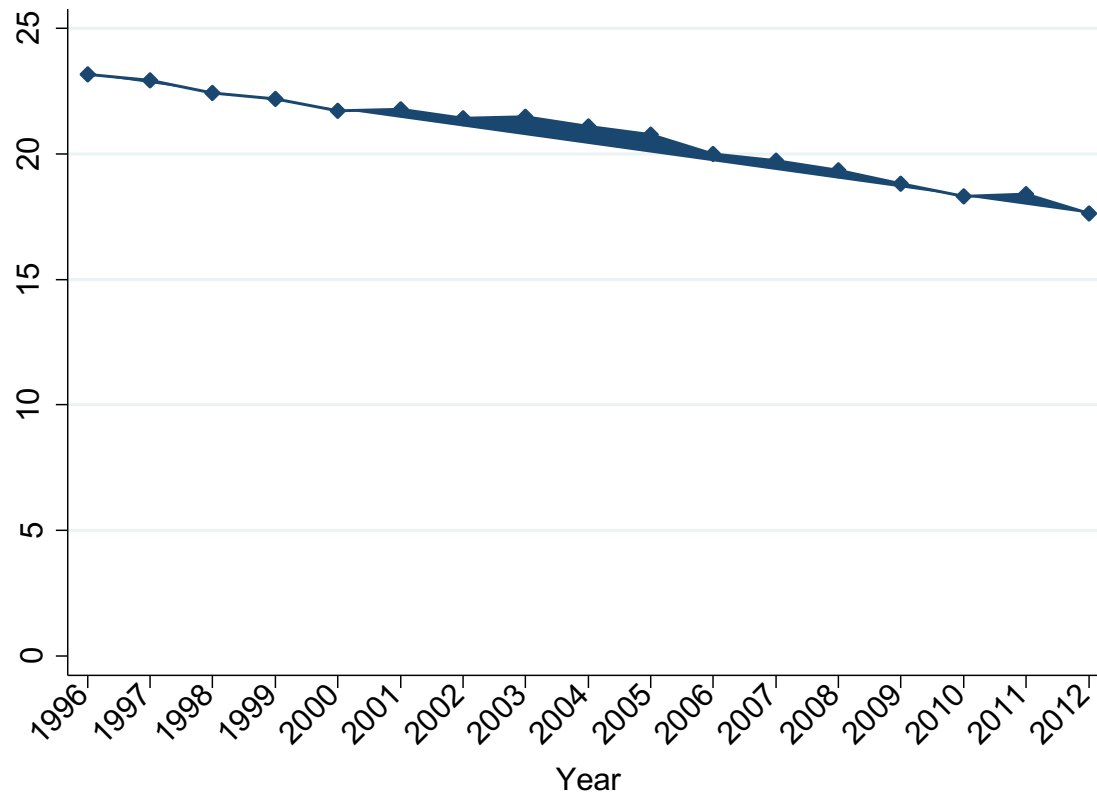
Systems Thinking and Action

Trend: Number of Chemicals Known or Suspected of Contributing to Cancer Growing

- Numbers of IARC-classified carcinogens — individual chemicals and mixtures, linked to particular cancers
- Limitations in current research designs
- Contribution of chemicals not classified as carcinogens to the development of cancers
- Lack of information on most chemicals and products
 - 100,000 chemicals in commerce; substantial toxicity information for only a small percentage
 - 90% of the 140,000 consumer products in use: little or no tox. data

[Occup Environ Med](#). 2018 Aug; 75(8): 593–603 [Environ Health Perspect](#). 2009 May; 117(5): 685-95
[J Natl Cancer Inst](#). 2011 Dec 21; 103(24): 1827–1839

Trend: Decrease in Cancer Incidence and Mortality Thanks to Decline in Smoking



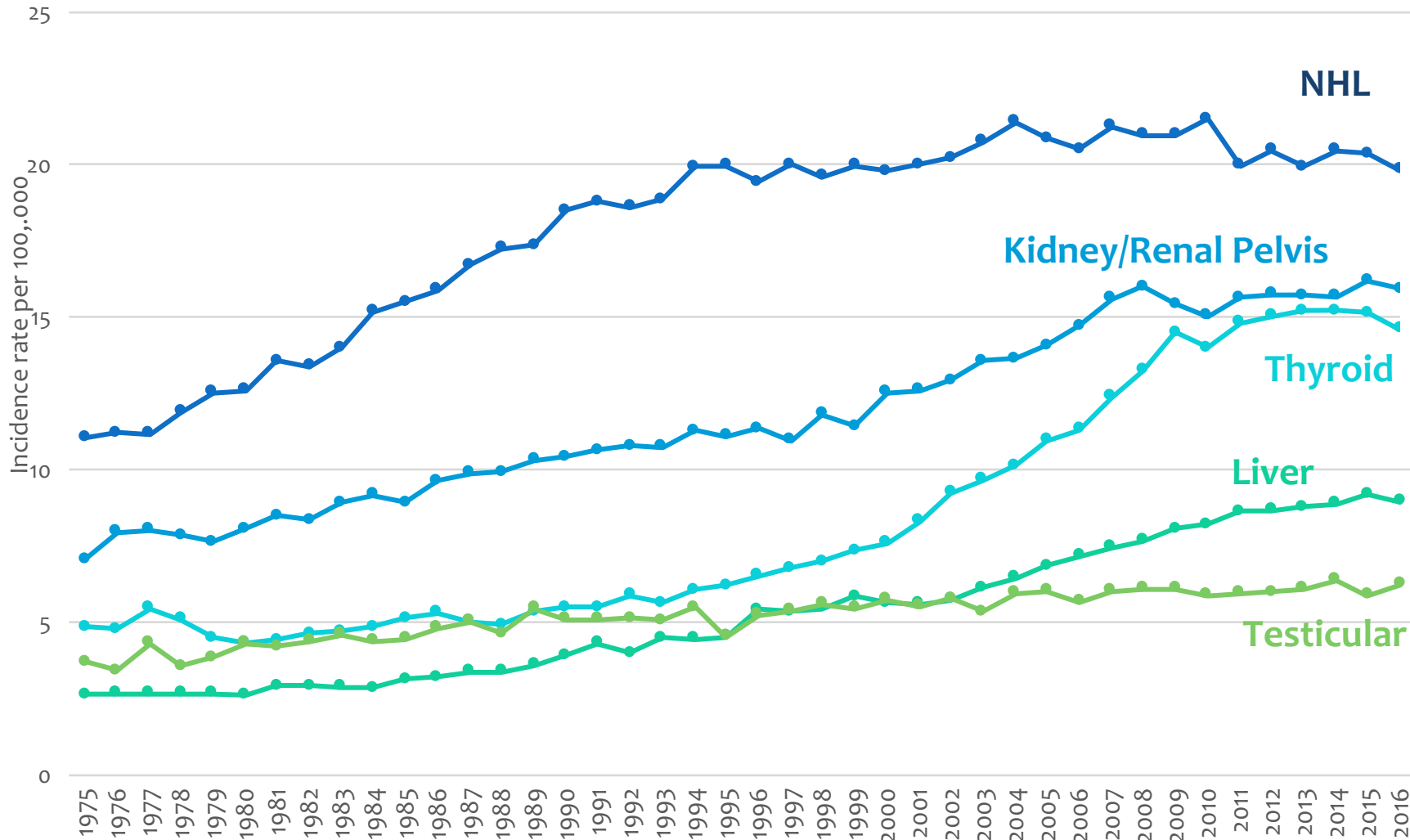
Average Smoking Prevalence for 612 SEER Counties

The most striking success in [cancer] primary prevention is undoubtedly tobacco, where falling consumption has resulted in marked reductions in the incidence and death rates from ... tobacco-related cancers among men”

Framework for Understanding Cancer Prevention, Thun et al. 2017

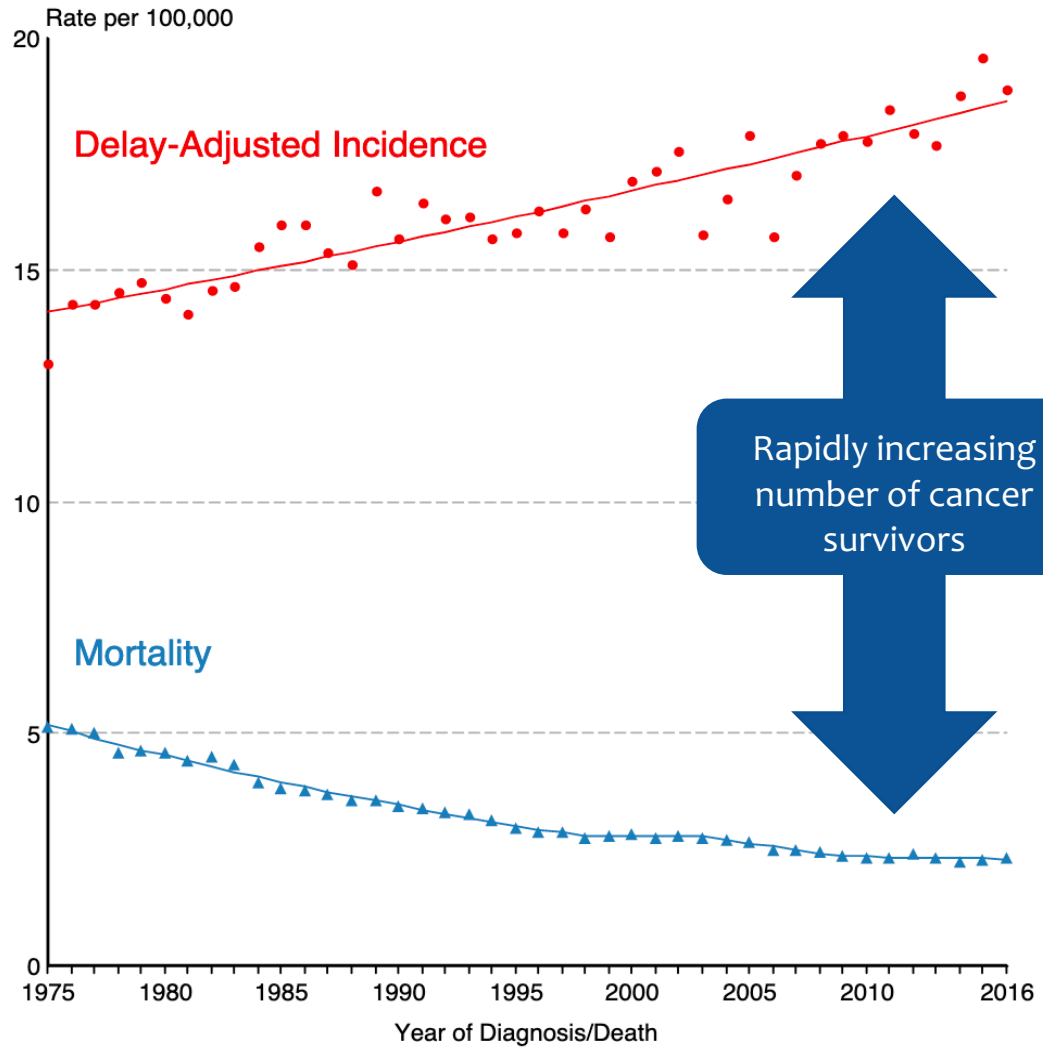
NCI SEER Delayed-adjusted, Age-Adjusted Incidence Rates 1975-2016

Both Sexes, All Races - NHL, Kidney Renal Pelvis, Thyroid Liver and Intrahepatic Bile Duct and Testicular



Trend: Increases in new cases of specific cancer types

Trend: Childhood Cancer Deaths Falling, but Incidence Rising

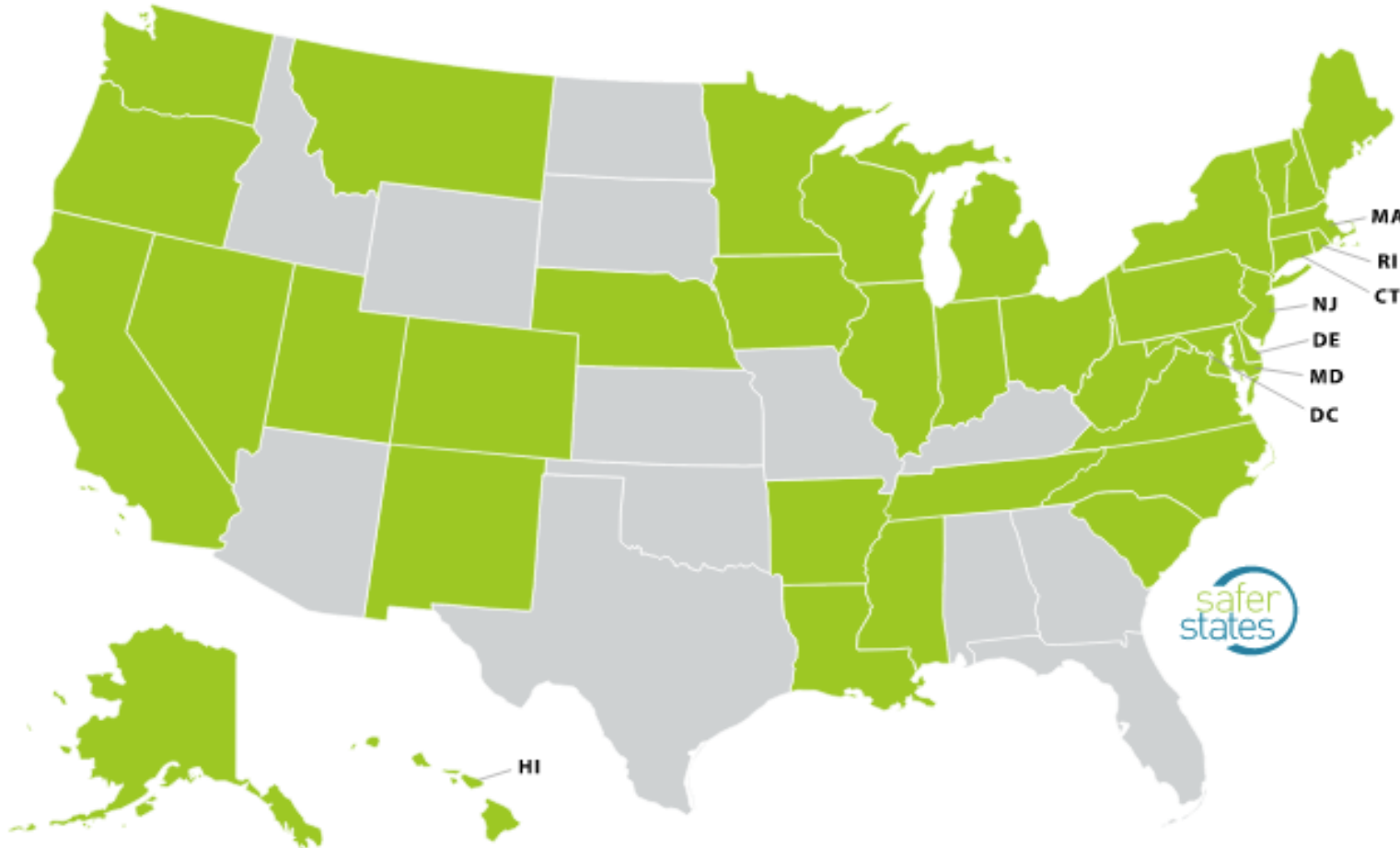


Source: SEER 9 areas and US Mortality Files (National Center for Health Statistics, CDC). Rates are age-adjusted to the 2000 US Std Population (19 age groups – Census P25-1103). Regression lines are calculated using the Joinpoint Regression Program Version 4.7, February 2019, National Cancer Institute.

Trend: More Science on Environmental Contributors to Prognosis, Recurrence, Morbidity

- Prognosis/Survival
 - In vitro studies suggesting BPA increases aggressiveness of breast cancer tumors *Cancer Res.* 2008 Apr 1;68(7):2076-80
 - Reduced survival of lung cancer patients with higher average air pollution exposures (NO_2 , $\text{PM}_{2.5}$ and PM_{10}) over follow-up period after diagnosis *Thorax.* 2016 Oct; 71(10): 891–898.
 - Reduced survival of breast cancer patients with stage 1 disease exposed to PM air pollution *Cancer Epidemiol Biomarkers Prev.* 2019 Apr;28(4):751-759
- Morbidity
 - Chemotherapy-treated childhood cancer survivors have higher rates of respiratory hospitalizations *Int J Environ Res Public Health.* 2019 Mar 26;16(6):1081.

Trend: States Leading the Way



23 states are considering **83 policies** to protect people from toxic chemicals

169 state policies have been adopted in **35 states**

States in green are those that have adopted or are considering positive policy changes in 2016

Massachusetts Toxics Use Reduction Act

- Requires:
 - Reporting
 - Prioritizing list of hazardous chemicals
 - Toxics Use Reduction Planning
 - Alternatives assessments
 - Community and small business grants
 - Policy development and outreach
 - Substantial reductions in carcinogens
- Results:
 - Since 1990, use of carcinogens by Massachusetts industries declined 32%
 - Releases to the environment declined 93%

OPPORTUNITIES FOR
CANCER PREVENTION:
**Trends in the Use and
Release of Carcinogens
in Massachusetts**



TURI
TOXICS USE REDUCTION INSTITUTE
UMASS LOWELL

METHODS & POLICY
REPORT #29

JUNE 2013

www.turi.org

Trend: Retailer Action to Improve Chemical Safety



- Reducing or eliminating chemicals of high concern in consumer products
- Strengthening or adopting new chemicals policies
- Aligning around common list of chemicals of concern
- Benchmarking corporate performance
- But, 50% of major retailers not taking action



Environmental Strategy Center



Consumers • Retailers

Industry/Supply Chain Efforts

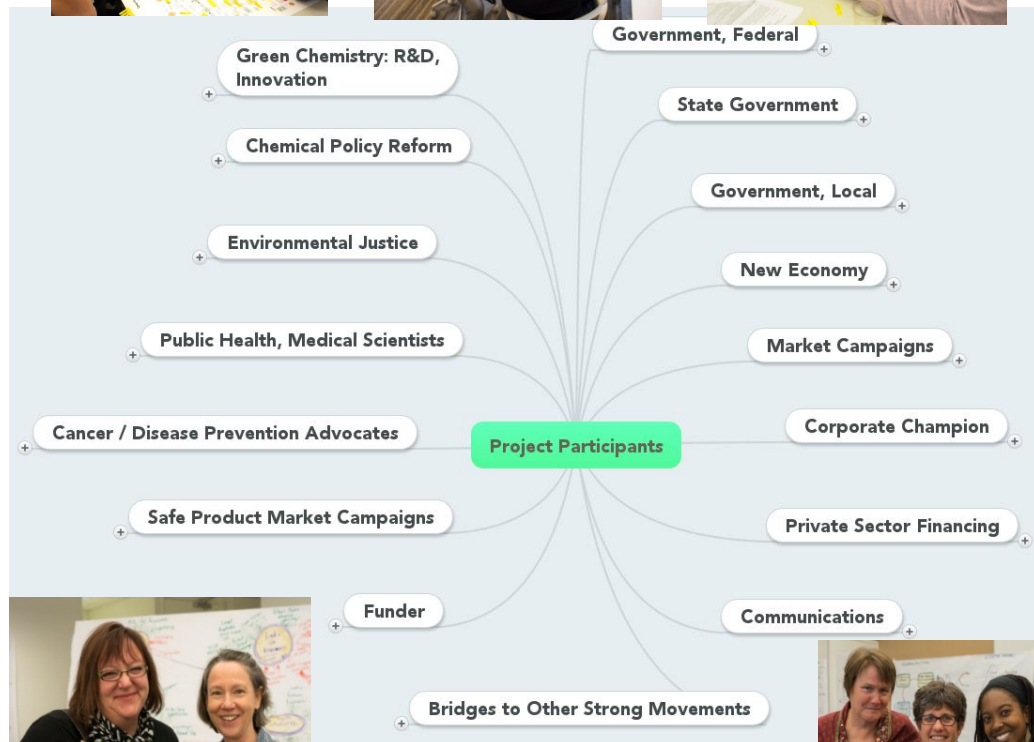
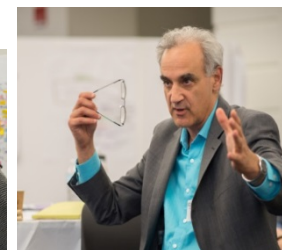
Trend Summary

- Proliferation of hazardous chemicals; increasing numbers of agents identified as contributing to cancer
- Increasing population-level exposure data, but no comprehensive system for exposure characterization. Documentation of disproportionate exposures
- Increasing rates of non-smoking-related cancers and cancers strongly associated with environmental exposures; emerging evidence on contribution of environmental exposures to mortality and morbidity of patients
- Federal regulatory capacity limited; state policies are exciting laboratories
- “Market-based” replacement of carcinogens promising; consumer campaigns are important drivers; scale needed

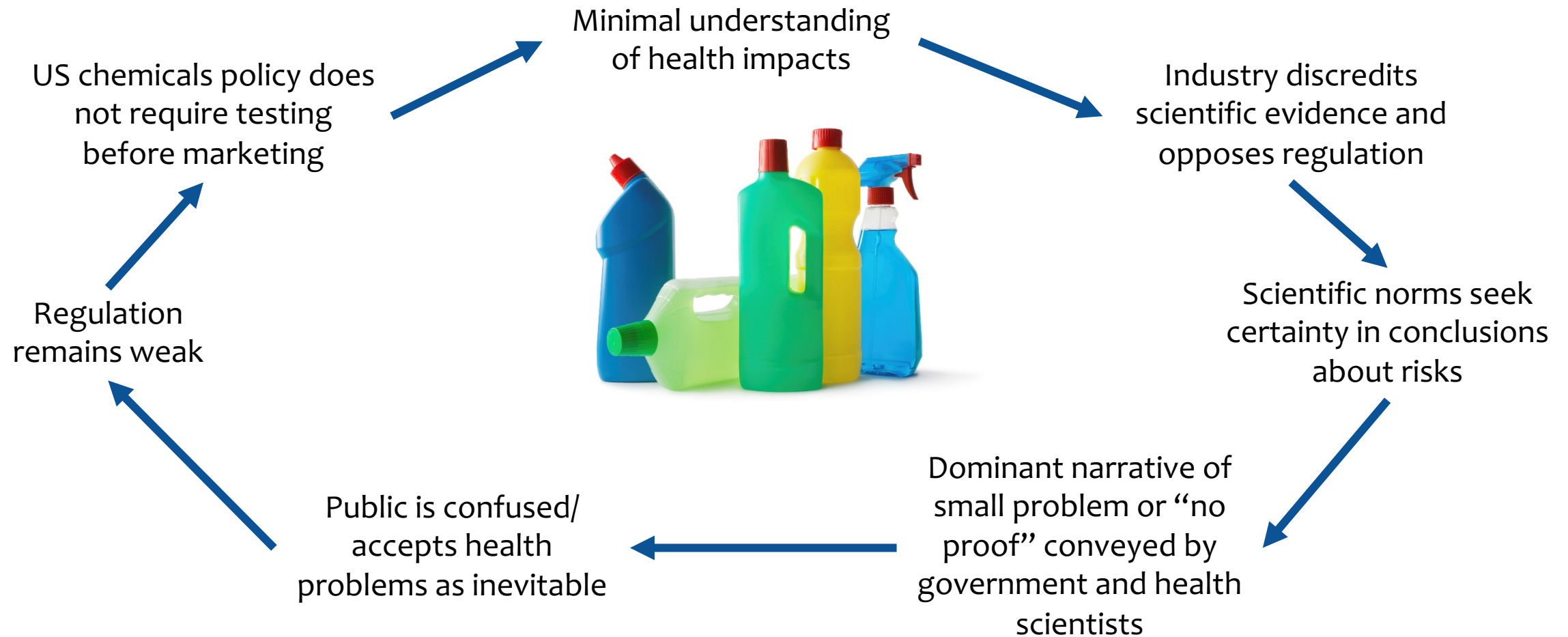
Analyzing System Dynamics & Mapping

- Drivers of supply and demand
- Health scientists and practitioners
- Government agencies
- Affected Communities

Cancer Free Economy Network

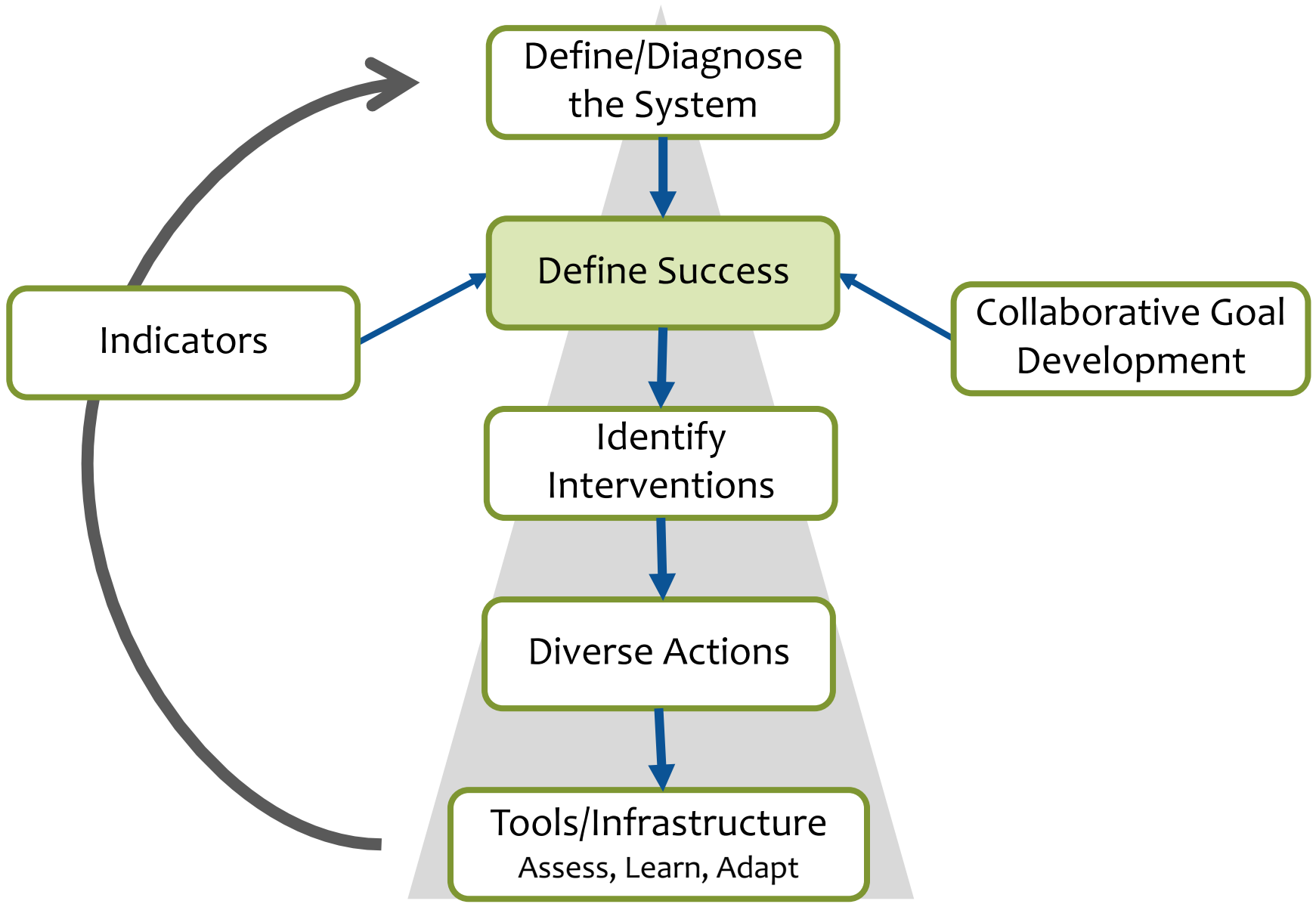


System Dynamics: Example of Feedback Loops Impeding Progress



System Dynamics: Example of Feedback Loops Driving Progress





Systems Thinking and Action

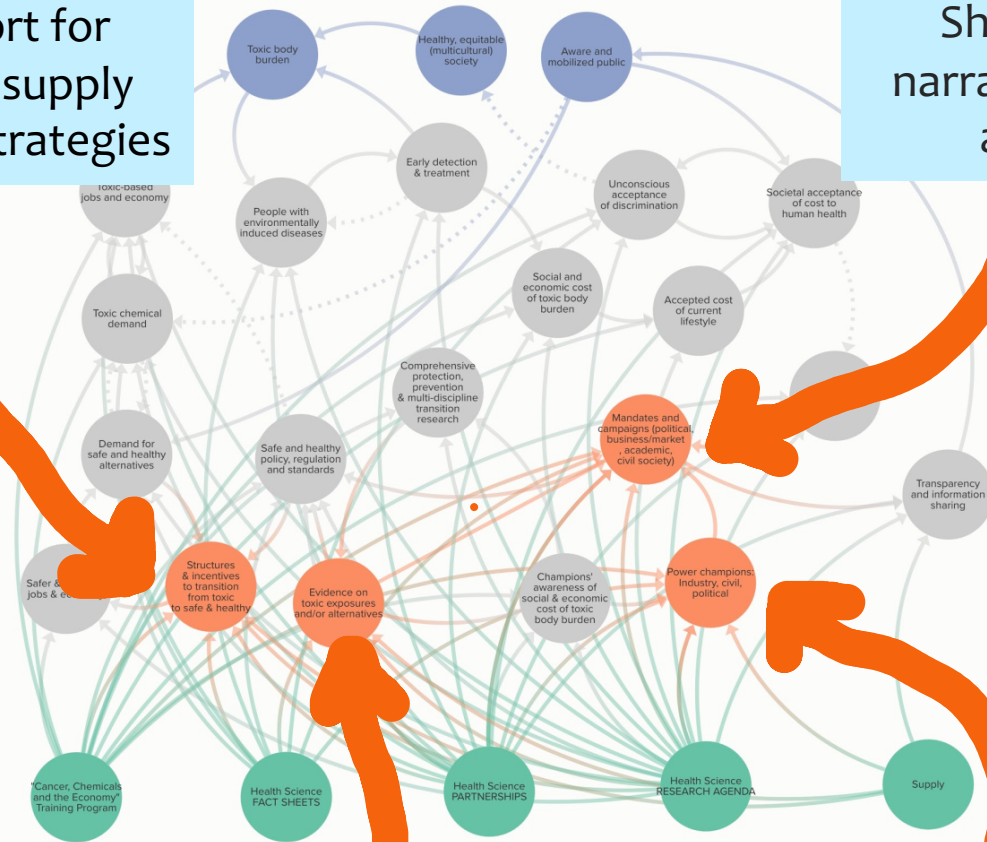
Define Success: Collaborative Goal Development

- Generational Goals
 - Use in other countries to drive and guide policy-making
- Business BHAGs
- Climate Change
- Cancer Free Economy Network Guiding Star
 - Within our generation, we will lift the burden of cancer and other diseases by driving a dramatic and equitable transition from toxic substances in our lives, our communities, and our economy to safe, and healthy alternatives for all.

High Leverage Interventions

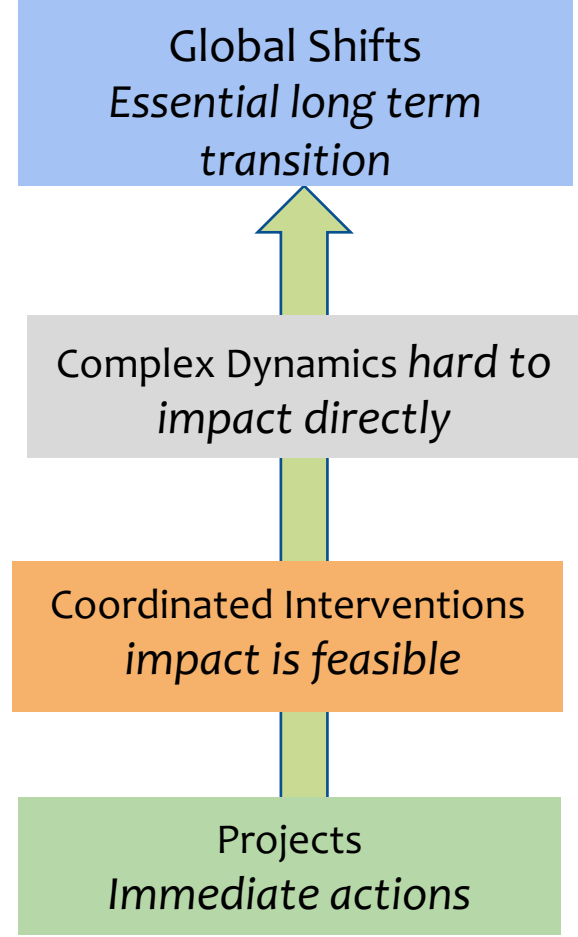
Shift the Market
Build support for coordinated supply and demand strategies

Change The Story
Shift dominant narratives on toxics and cancer



Expand Prevention Agenda
Grow economic and scientific capital on prevention

Strengthen Capacities/Build Influence
Connect to related fields and allies across the system



Cancer Free Economy Network

Multi-sector Teams Working Together
to Transform the System



- Science interpretation and support
- Strategic initiatives with cancer-focused organizations and health professionals
- Regional and place-based initiatives



HEALTH SCIENCE

Multidisciplinary research agenda, evidence of impacts on health



SHIFTING MARKETS

Creating incentives & demand for and supply of healthy alternatives

Alternatives to PFAS in packaging



BUILDING POWER

Mobilize vulnerable communities, workers, & allies

Trainings for community and movement leaders



POLICY & LEGAL

Promote policies & legal strategies to protect everyone's health

Equity principles and policy planks

Strategic Initiatives with Cancer-Focused Organizations and Health Professionals

Environmental Risk Factors for Bladder Cancer

What You Need to Know

Introduction

Bladder cancer is a complex disease with many risk factors such as age, gender, and genetics. Exposure to harmful chemicals can also put people at risk. People who smoke are two to three times as likely than non-smokers to be diagnosed. Yet, many bladder cancer patients have never smoked. Scientists are learning that other kinds of toxic chemicals in our environment—chemicals that we come into contact with where we live, work, and play—are important contributing factors and can increase a person's risk of developing the disease.

Based on a growing body of research, more than a dozen chemicals and other industrial agents have been linked to bladder cancer. People can be exposed to these chemicals in:



Water pollution: Three water contaminants have been studied and have the potential to affect

Just like smoking cessation campaigns have successfully lowered smoking-related cancers, reducing exposures to chemicals that cause bladder cancer represents an important opportunity for prevention, one that could result in fewer people getting the disease.

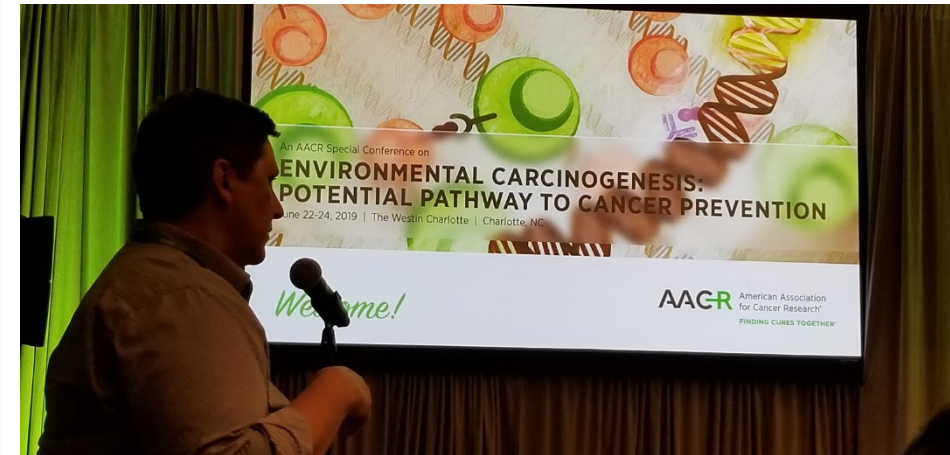
Water Pollutants & Bladder Cancer

Inorganic Arsenic

Arsenic can occur naturally in groundwater, but it also has been used in some pesticides. The International Agency for Research on Cancer (IARC) classifies arsenic in drinking water as a known cause of bladder cancer. This classification is largely based on studies of people living in Southeast Asia and South America where levels of arsenic in drinking water were especially high—many times higher than those typically seen in the U.S.



CANCER AND HEALTH LEADERS CALL FOR ACTION TO REDUCE THE BURDEN OF CANCER BY REDUCING ENVIRONMENTAL RISK FACTORS



SWPA Cancer and Environment Initiative

Diverse organizations coming together to prevent cancer by promoting research and advancing environmental carcinogens reduction

- Cancer/Environment Symposium, 2019
- 5 workgroups advancing priority projects across the region
- Quarterly gatherings to share learnings and advance the work
- Drawing on and informing the national Cancer Free Economy Network

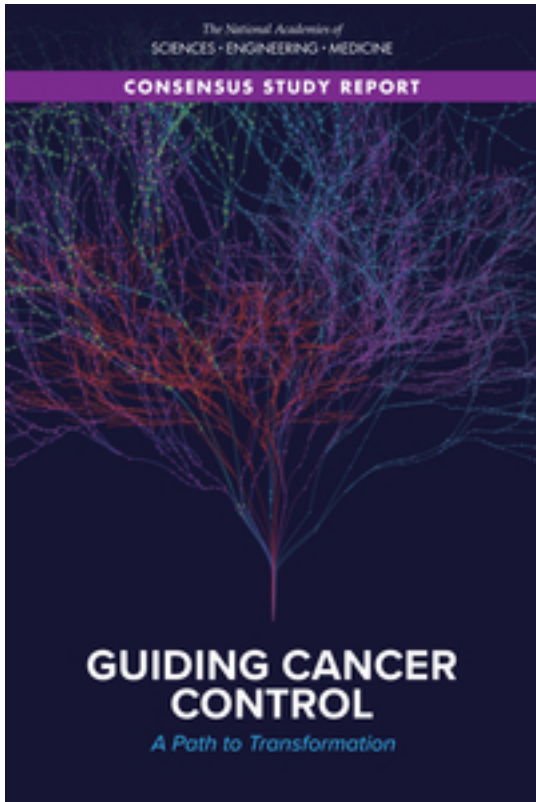


Photo credit: Mark Dixon, BlueLens



Photo credit: Anayana White

Cancer Prevention Policy: Opportunities for Integrating Environment



2019-2023
Pennsylvania
Cancer Control
Plan

CALIFORNIA'S COMPREHENSIVE BREAST CANCER PRIMARY PREVENTION PLAN

To develop and initiate implementation of a comprehensive plan to promote primary prevention of breast cancer in California

Conclusions

- Cancer-focused constituencies are concerned about environment and see opportunities to expand their work, but patience and persistence are required
- Systems thinking informs strategy and builds relationships
- Coordinated initiatives across the system are resilient
- Network structure and approach can both support work of partner organizations and directly-impacted communities, *and* provide opportunity for strategic collaborative initiatives

Get Involved + Stay In Touch



CANCER FREE ECONOMY
NETWORK

If you believe that we can do more to prevent cancer by
removing harmful chemicals

WE INVITE YOU TO JOIN WITH US.

Find out more at **CancerFreeEconomy.org**

Follow us on Facebook and Instagram @CancerFreeEconomy

and on Twitter @CFEnetwork

Acknowledgments

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