A Systems Approach to Cancer Prevention

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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

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 Parish, LA.

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

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If you live here, you may be 779 times more likely to get cancer due to chloroprene air emissions from Denka (formerly Dupont).
Future Exposures: UNGD and Plastics

- 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


- 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?

Beaver County, PA Ethane Cracker
Source: Teake Zuidema/PublicSource
Systems Thinking and Action

Define/Diagnose the System

Define Success

Identify Interventions

Diverse Actions

Tools/Infrastructure
  Assess, Learn, Adapt

Trends Analysis

System Dynamics/Feedback Loops
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

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

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$_2$, 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
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.

Source: Safer States
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%

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
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

- US chemicals policy does not require testing before marketing
- Minimal understanding of health impacts
- Industry discredits scientific evidence and opposes regulation
- Scientific norms seek certainty in conclusions about risks
- Dominant narrative of small problem or “no proof” conveyed by government and health scientists
- Public is confused/accepts health problems as inevitable
- Regulation remains weak
System Dynamics: Example of Feedback Loops Driving Progress

Motivates consumers, cancer advocates, state governments, retailers to reduce toxics

Evidence on health impacts of toxic chemicals and availability of safer alternatives

Incentivizes development of less hazardous products and safer jobs

Provides examples and motivation for further investment
Define/Diagnose the System

Define Success

Identify Interventions

Diverse Actions

Tools/Infrastructure

Assess, Learn, Adapt

Collaborative Goal Development

Indicators

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

**Global Shifts**
Essential long term transition

**Complex Dynamics** hard to impact directly

**Coordinated Interventions** impact is feasible

**Projects**
Immediate actions
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

- Alternatives to PFAS in packaging
- Equity principles and policy planks

**HEALTH SCIENCE**
Multidisciplinary research agenda, evidence of impacts on health

**BUILDING POWER**
Mobilize vulnerable communities, workers, & allies

**SHIFTING MARKETS**
Creating incentives & demand for and supply of healthy alternatives

**POLICY & LEGAL**
Promote policies & legal strategies to protect everyone’s health

Trainings for community and movement leaders
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

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. 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.
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
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

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
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