



Childhood Cancer & the Environment

A project to educate and activate health professionals to address environmental influences on childhood cancer



Childhood Cancer Prevention

CHE Alaska Webinar

April 24th, 2025



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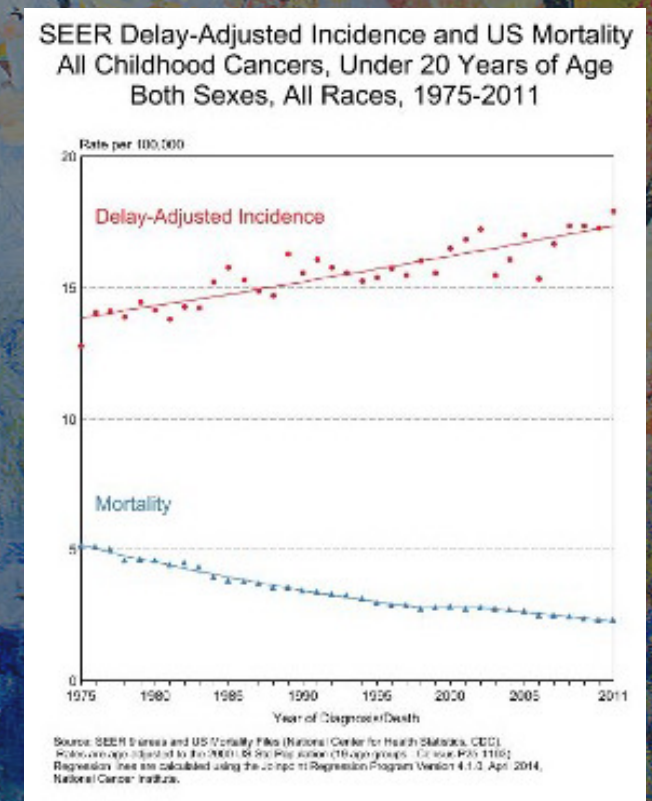
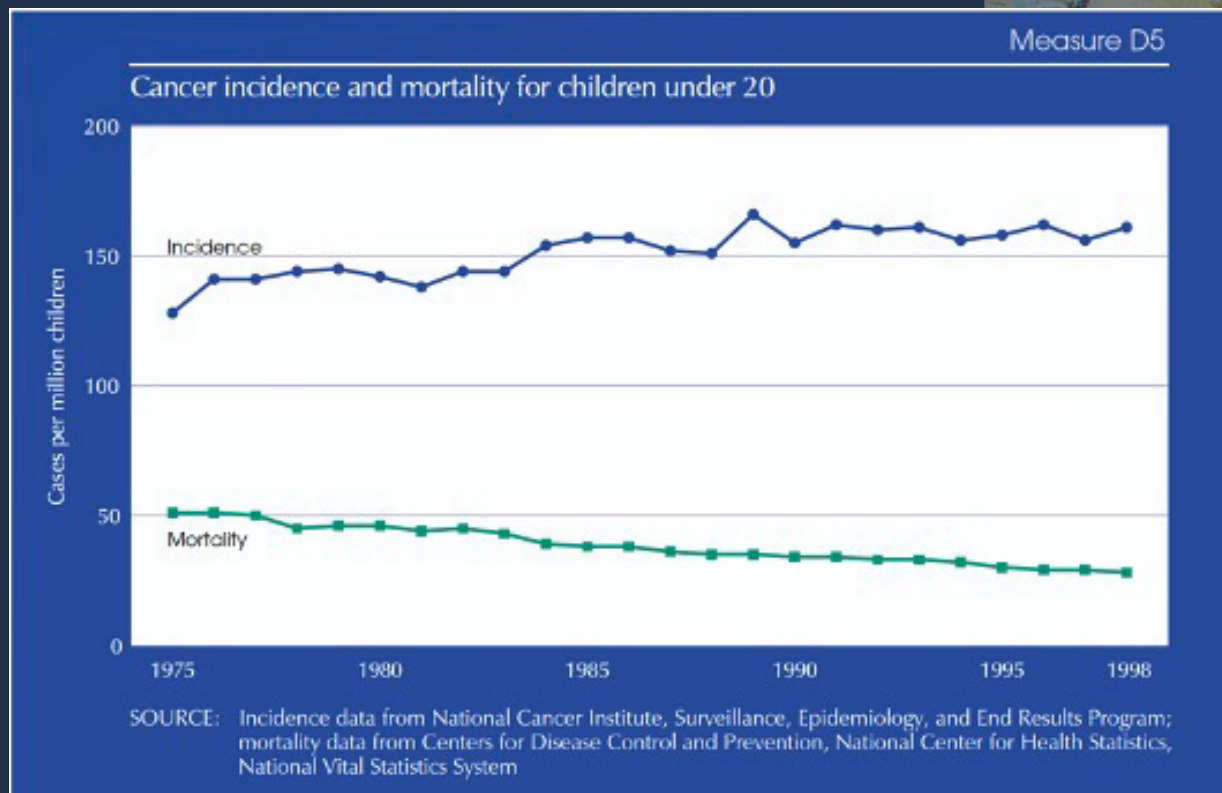




No disclosures

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The annual incidence of childhood cancer increased from 1975 until about 1990. The frequency of the disease appears to have become fairly stable overall since 1990. America's Children and the Environment 2003, US EPA









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Childhood Leukemia: An Ounce of Prevention


By [Mark Miller MD, MPH](#); [Catherine Metayer, MD, PhD](#); and [Gary Dahl, MD](#)

The nearly miraculous news is that great strides have been made in the treatment of childhood acute lymphocytic leukemia, and now nearly 90% of children are cured. The dark side, however, is that the incidence of childhood leukemia (age 0-14 years) in the United States has increased an average of 0.7 percent per year since 1975.^[1] During the 35 years between 1975 and 2011, there has been a 55% increase in the number of children diagnosed annually (per capita, age adjusted) with this most common form of cancer in childhood. Though a cure is now expected for most children, side effects both short and long-term and secondary cancers later in life are common. The emotional and financial costs for these children and families is considerable.

“Although the causative role of cigarette smoking in deaths from coronary disease is not proven, the Committee considers it more prudent from the public health viewpoint to assume that the established association has causative meaning than to suspend judgment until no uncertainty remains.”

Surgeon General’s Report on Smoking and Health 1964

Roadblocks Facing Childhood Cancer Prevention



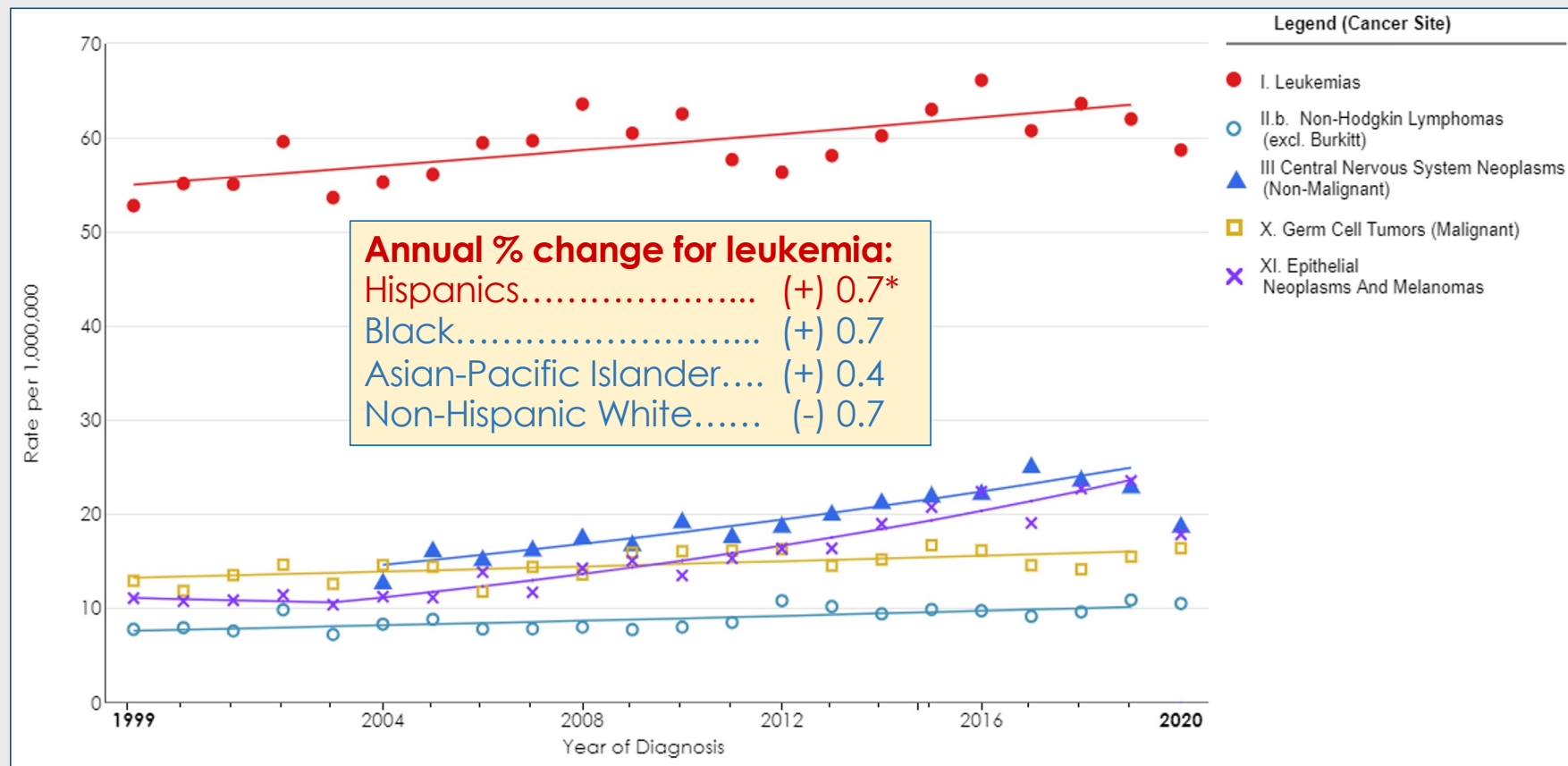
“ Most childhood cancers are caused by DNA changes (mutations) that happen early in the child’s life, sometimes even before birth. Because of this, there are not many known risk factors or ways to prevent childhood cancers. ”

American Cancer Society

- Factors that are believed to increase the risk of childhood cancer include:
 - Radiation exposure
 - Secondhand smoke
 - Certain inherited syndromes

<https://www.cancer.org/cancer/childhood-cancer/causes-risk-factors-prevention.html>

Incidence Trends in the US



Source: US National Childhood Cancer Registry

Methodological Challenges



Childhood Cancer & Leukemia
International Consortium

Childhood cancers are rare compared to adults

Need for large studies

Case-control design is most efficient

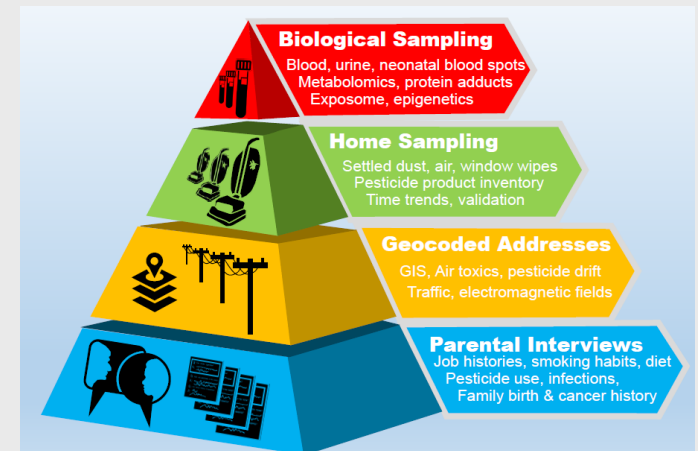
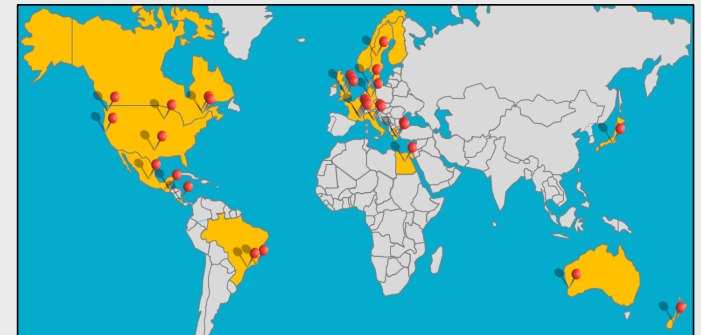
Retrospective assessment of exposure

Biomarkers studies are sparse

Challenges in accessing biospecimen

Most childhood cancers have a fetal origin

Need for prenatal/neonatal specimens

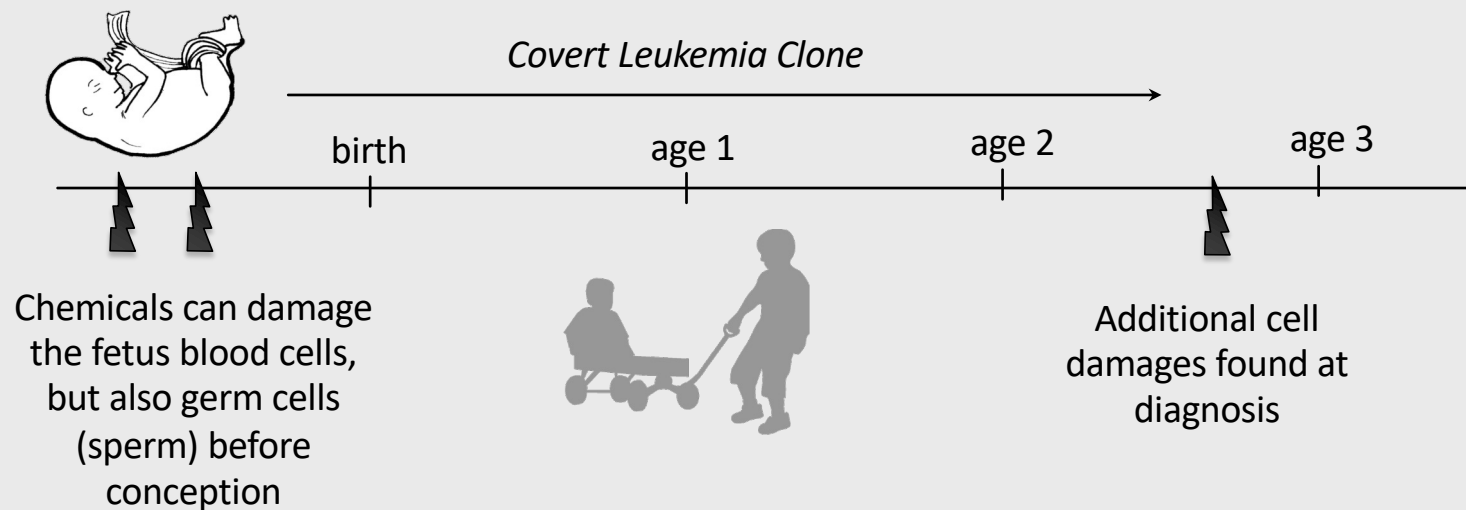


Natural History of Childhood Leukemia

INITIATING EVENTS
BEFORE BIRTH

PROMOTING EVENTS
AFTER BIRTH

LEUKEMIA
DIAGNOSIS



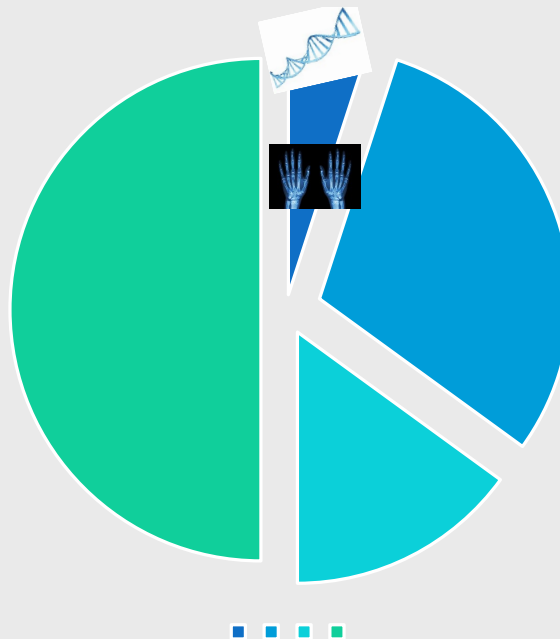
ETV6-RUNX1
RUNX1-MTG8
PML-RARA
CBFB-MYH11

ETV6-RUNX1
RUNX1-MTG8
PML-RARA
CBFB-MYH11

30 years ago

Known risk factors accounted for <10% of all childhood leukemia

genetic syndromes & x-rays



Childhood leukemia & other cancers

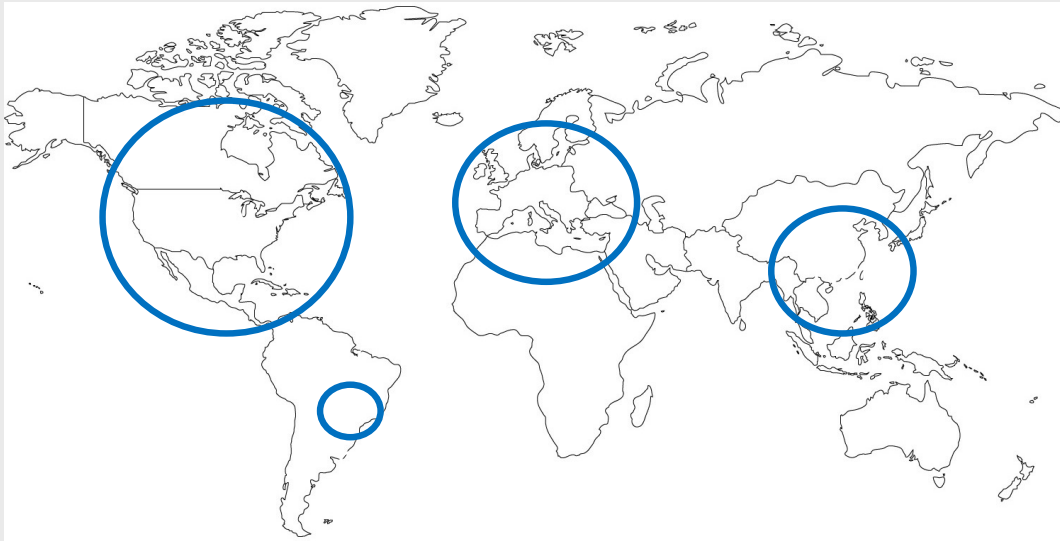
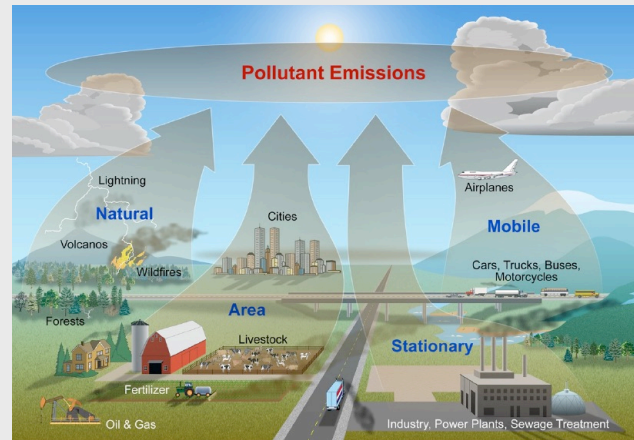
- Immune regulation/infections
- Fetal growth
- Environmental exposures
 - At home & work
 - Smoking
 - Paints
 - Solvents
 - Pesticides
 - PCBs/PBDEs
 - Indoor/outdoor pollution
- Dietary patterns (mother and child)
- Genetics
- Epigenetics



Many chemicals are
known to cause
cancer in adults



Air Pollution



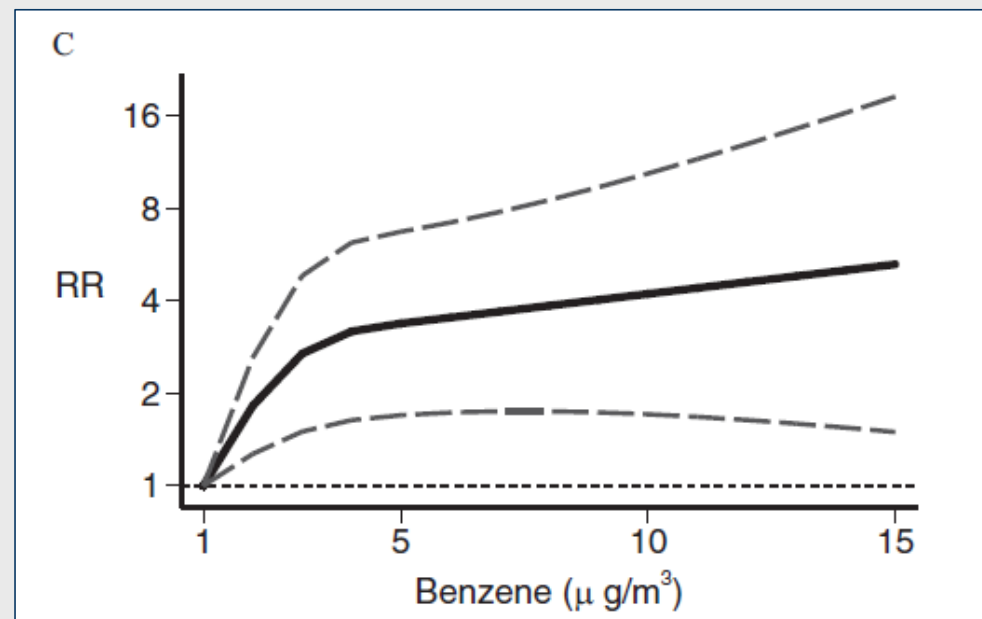
Epidemiologic results vary

- Cancer subtype
- Age at exposure
- Region and period
- Exposure assessment method
 - *traffic density*
 - *proximity to industrial sources*
 - *air monitors*

Leukemia: Meta-analysis of Air Monitor Data

	Benzene <i>7 studies max</i>	1,2 Butadiene <i>2 studies max</i>
Leukemia type		
Lymphoid (ALL)	No association	↑ risk
Myeloid (AML)	↑ risk	↑ risk
Age at diagnosis		
0-5 years	↑ risk	↑ risk
6+ years	No association	n/a
Window of exposure		
Prenatal	↑ risk	↑ risk
After birth	↑ risk	n/a

Acute myeloid leukemia



Source: adapted from Filippini et al.. Association between Outdoor Air Pollution and Childhood Leukemia: A Systematic Review and Dose-Response Meta-Analysis. Environ Health Perspect. 2019 Apr;127(4):46002.

Hazardous Air Pollutants

- **Spatial risk analysis in Texas (1990-2002)**
- “*The study supports the increase of childhood hepatic cancer risk [..and not other cancer sites] in areas of intense HAP release. **The standard morbidity ratio (SMR) for hepatic tumors was 1.87 (0.95, 3.98)** for county-years with greater than 100 tons of HAP releases.*”

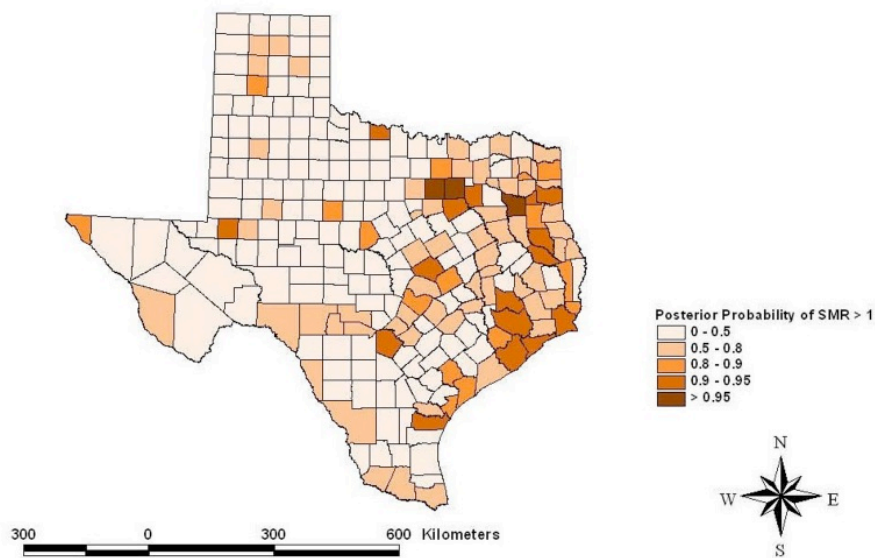


Figure 8
Spatial risks for hepatic tumors by county.

Source (with permission): Thompson JA, Carozza SE, Zhu L. Geographic risk modeling of childhood cancer relative to county-level crops, hazardous air pollutants and population density characteristics in Texas. Environ Health. 2008 Sep 25;7:45. doi: 10.1186/1476-069X-7-45

Oil & Gas - Fracking



- Chemical & radiological contamination of air & water
- **Study in Pennsylvania 2007-2012**
 - Living within a 2km buffer of the birth address anytime from preconception to one-year prior diagnosis => 70% INCREASED RISK OF ACUTE LYMPHOBLASTIC LEUKEMIA
 - Higher risk during the perinatal period

Paternal Occupational Exposures to Organic Compounds & Childhood ALL



Latino Fathers only

Expert exposure assessment	Cases	Controls	OR [*]	95% CI
Any organic compounds	107	102	1.72	(1.22-2.44)
-- Benzene	30	20	2.03	(1.11-3.70)
-- Chlorinated hydrocarbons	31	17	2.53	(1.36-4.71)
Combustion exhaust/PAHs	64	56	1.70	(1.16-2.57)

* OR adjusted for child's age at diagnosis/reference date, sex, maternal race, and household annual income

Metayer, Env Research (2016)

Home Use of Paints & Childhood ALL

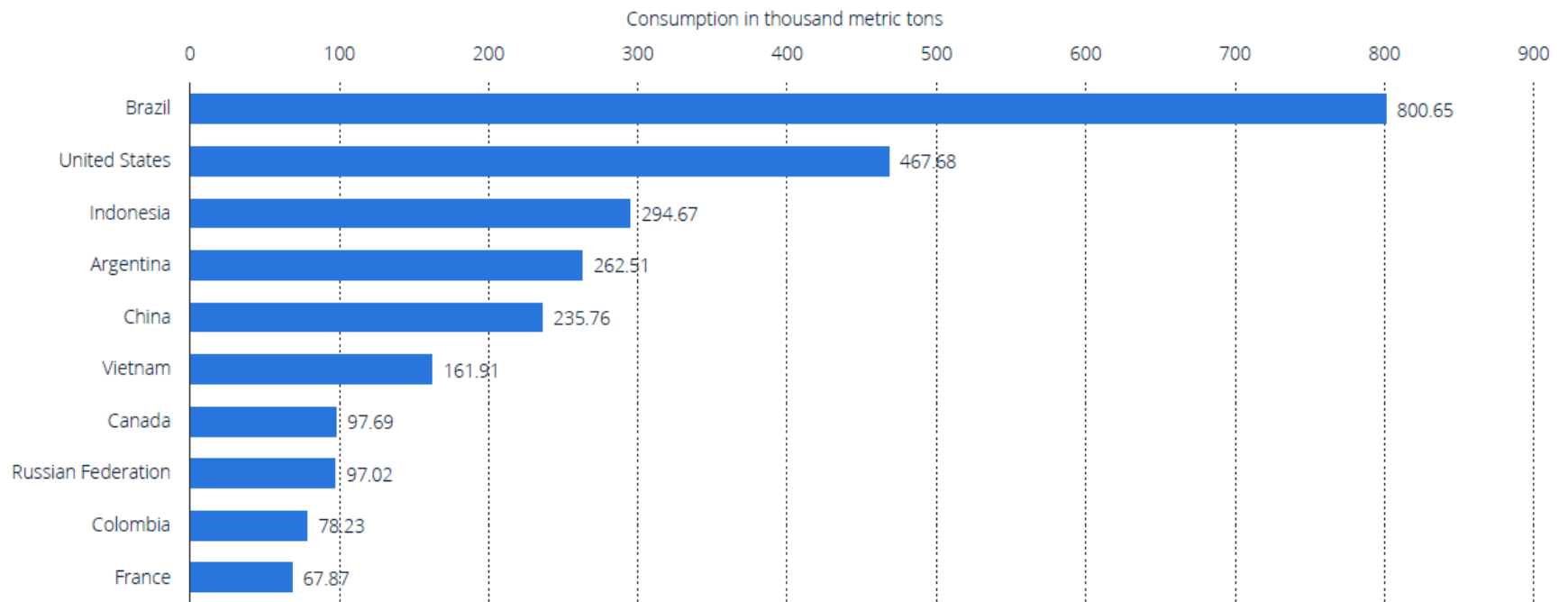


Time window	Exposure	# Cases	OR*	95% CI
Before conception	Any paints	3,000	1.42	(0.92-2.19)
	Water-based paints	1,146	0.87	(0.72-1.04)
	Oil-based paints	1,146	1.27	(1.03-1.57)
	Professional	608	1.53	(1.03-2.26)
Pregnancy	Any paints	1,962	3.91	(1.54-9.90)
	Water-based paints	1,387	0.96	(0.80-1.15)
	Oil-based paints	1,387	1.22	(0.98-1.53)
	Professional	1,305	1.66	(1.21-2.28)
After birth	Any paints	35	1.12	(1.07-1.39)
	Water-based paints	1,157	1.01	(0.83-1.23)
	Oil-based paints	1,157	1.17	(0.94-1.45)
	Professional	928	1.46	(1.18-1.80)

* OR adjusted for child's age at diagnosis/reference date, sex, maternal race, and household annual income

Leading countries in agricultural consumption of pesticides worldwide in 2022 (in 1,000 metric tons)

Global pesticide agricultural use 2022, by leading country



Note(s): Worldwide; 2022

Further information regarding this statistic can be found on [page 8](#).

Source(s): FAO; ID 1263069



Childhood Cancer & Leukemia International Consortium

Parents at work

- ~8,000 ALL cases | 14,000 controls
- Pesticide exposure based on job exposure matrix using occupational and industry codes, and data from industrial hygienists for a subset
- Paternal exposure during periconception: **OR=1.20 (1.06-1.38)**
- Maternal exposure during pregnancy: **OR=1.01 (0.78-1.30)**

Bailey et al., Int J Cancer, 2014

Parents & children at home

Time period	Acute Lymphoblastic Leukemia (ALL)		Acute Myeloid Leukemia (AML)	
	# Cases	OR (95% CI)	# Cases	OR (95% CI)
Before conception	2785	1.4 (1.2, 1.5)	173	1.5 (1.0, 2.2)
During pregnancy	5055	1.4 (1.3, 1.5)	345	1.5 (1.2, 2.0)
After birth	4162	1.4 (1.2, 1.5)	198	1.1 (0.8, 1.5)

Adjusted for age, sex, birth year group, ethnicity, highest level of education for either parent +/- birth order.

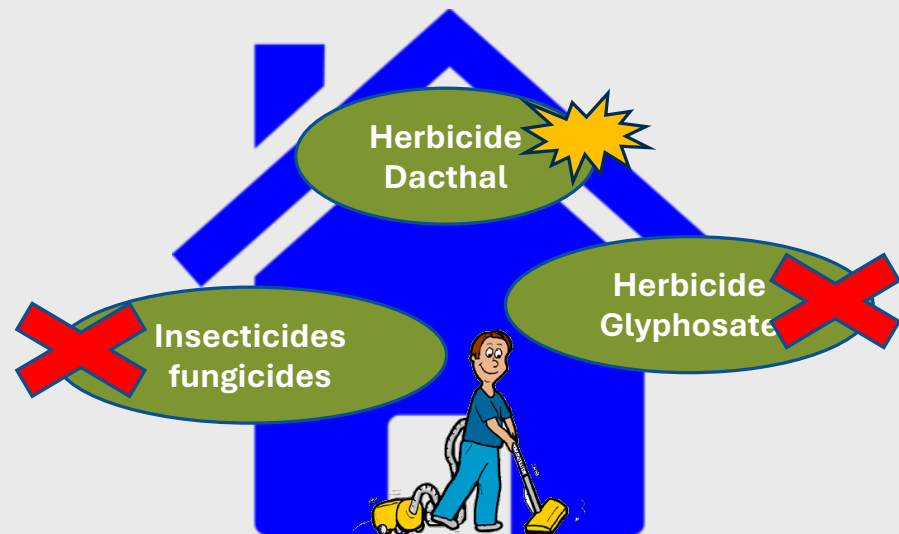
Source: Adapted from Bailey et al, IJE, 2015

Pesticides in Home Dust

- Dust is a reservoir of chemicals
- Young children are exposed via
 - Ingestion
 - Inhalation
 - Skin contact



- **Measured chemicals ~ 500 homes**

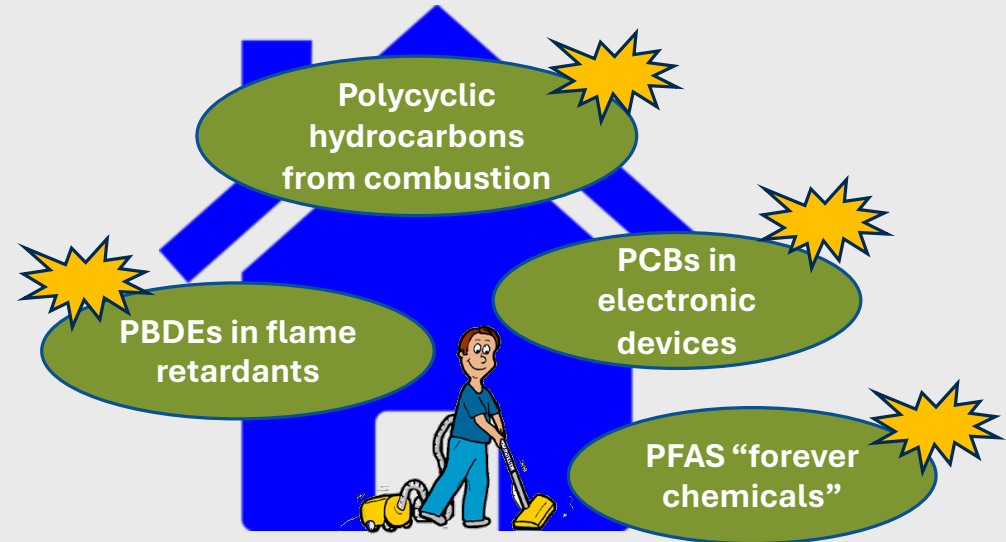


Metayer, JESEE, 2013

Madrigal, Environ Res, 2021

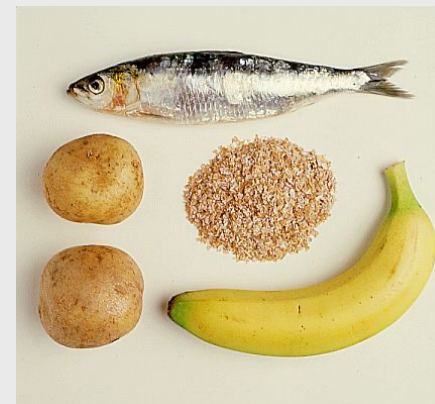
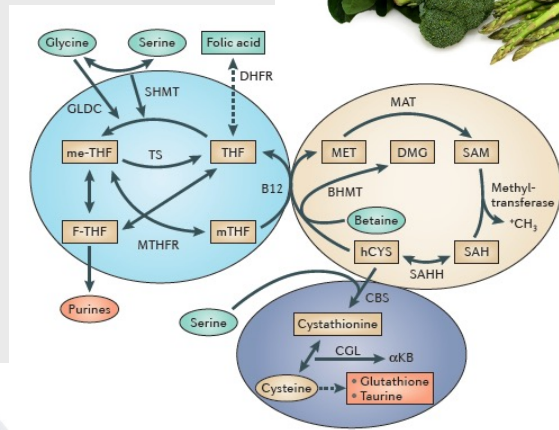
Ward, EHP, 2023

Other Chemicals in Homes



Deziel et al., Environ Res 2014
Ward et al., EHP 2013 & 2009
Metayer et al., IJE 2025

Sources of One Carbon (Folate) Metabolism Nutrients



Prenatal Vitamin and Folate supplementation and Risk of Childhood Leukemia



	Vitamins (Any Time)					Test for Interaction	Folic Acid (Any Time)					Test for Interaction
	No. Studies	No. Exposed		OR	(95% CI) ^a		No. Studies	No. Exposed		OR	(95% CI) ^a	
		Controls	Cases					Controls	Cases			
Parental education^c												
Overall ^b	12	6640	4336	0.85	(0.78–0.92)		8	2164	1228	0.80	(0.71–0.89)	
None/Primary	12	873	447	0.72	(0.60–0.88)	$P = 0.14^d$	8	352	132	0.47	(0.33–0.68)	$P = 0.01^d$
Secondary	12	2649	1879	0.78	(0.68–0.88)		8	660	410	0.73	(0.59–0.90)	
Tertiary	12	3118	2010	0.97	(0.86–1.09)		8	1152	686	0.96	(0.82–1.12)	

^aAdjusted for age, sex, ethnicity, parental education, and study. OR for parental education is adjusted for age, sex, ethnicity, and study

Metayer, Epidemiology, 2014

Prenatal vitamin intake and childhood ALL

Singer, Cancer Causes Control, 2016

	Latina mothers	Non-Latina whites
Intake	234 cases, 296 controls	265 cases, 374 controls
None	Ref.	Ref.
Moderate intake	1.12 (0.44-2.84)	1.25 (0.75-2.07)
High intake	0.36 (0.17-0.74)	0.76 (0.50-1.16)

Conditional logistic models adjusted for father's education, mother's education, household income, maternal age at child's birth, and nutrient intake from food. N= number of discordant pairs/triplets *For folic acid, moderate intake is >0 & <600 µg and high intake is ≥600 µg. For vitamins B12, B6, and riboflavin, moderate intake is >0 & <5 µg B12 and <1.5 mg B6 and riboflavin, and high intake is ≥5 µg B12 and ≥1.5 mg B6 and riboflavin.

Gonseth, Epigenetics, 2015; 10(12):1166-76

► Methylation marker of prenatal folate intake

Reduced maternal folate intake around conception was associated with increased methylation and, in turn, decreased gene expression at 3 loci of folate-associated genes:

- *TFAP2A*, a gene critical for neural crest development
- *STX11*, a gene implicated in acute myeloid leukemia
- *CYS1*, a candidate gene for cystic kidney disease

CLIC consortium meta-analyses: Breastfeeding reduces the risk of childhood lymphoblastic leukemia

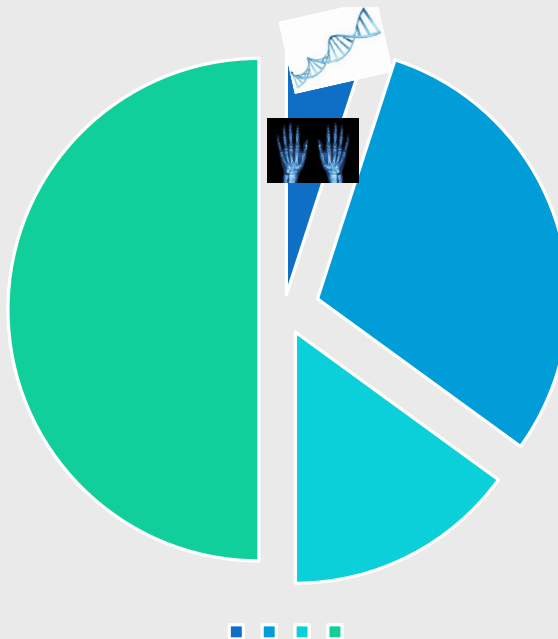


		Pooled analysis	
	% (case:control)	Crude OR (95% CI) ^a	Adjusted OR (95% CI) ^b
Breastfeeding duration ^c (N = 10 782 cases; N = 16 588 controls)			
Never	35.4:34.5	1.00	1.00
<4 mo	27.2:26.9	0.96 (0.90-1.02)	0.98 (0.92-1.04)
4-6 mo	12.8:13.7	0.87 (0.80-0.94)	0.88 (0.81-0.96)
7-12 mo	24.6:24.8	0.86 (0.80-0.92)	0.85 (0.79-0.92)
Exclusive breastfeeding duration ^d (N = 3278 cases; N = 7072 controls)			
Never	45.8:44.2	1.00	1.00
<4 mo	36.8:38.8	0.88 (0.80-0.97)	0.91 (0.83-1.01)
4-6 mo	14.1:13.7	0.72 (0.63-0.83)	0.73 (0.63-0.85)
7-12 mo	3.4:3.3	0.70 (0.55-0.89)	0.70 (0.53-0.92)

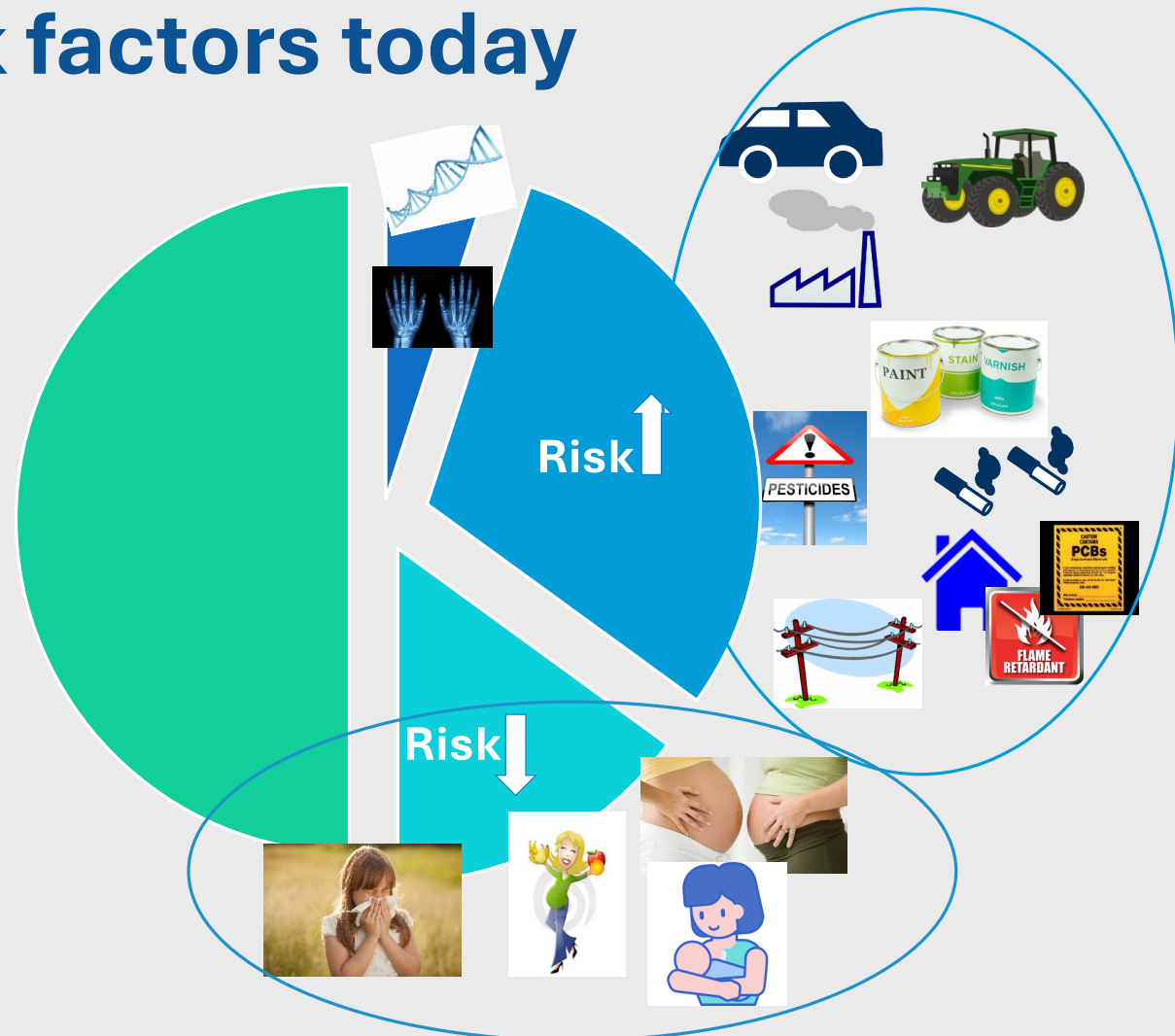
30 years ago

Known risk factors accounted for <10% of all childhood leukemia

genetic syndromes & x-rays



Known risk factors today



Cumulative Impact



International Journal of
Molecular Sciences



Int J Mol Sci. 2024 Mar 14;25(6):3284

Review

Environmental Pollution and Risk of Childhood Cancer: A Scoping Review of Evidence from the Last Decade

María del Pilar Navarrete-Meneses ¹, Consuelo Salas-Labadía ¹, Fernando Gómez-Chávez ² and Patricia Pérez-Vera ^{1,*}

Overview of the etiology of childhood cancer and future directions

Thanh T. Hoang^{a,b,c}, Michael E. Scheurer^{a,b,c} and Philip J. Lupo^{a,b,c}

Curr Opin Pediatr. 2025 Feb 1;37(1):59-66

	Air Pollution	Tobacco	Pesticides	Vitamins/BF
Leukemias	√√	√√	√√	√√
Lymphomas	√√		√√	
Brain tumors	√	√	√	√√
Neuroblastoma	√	√√	√	
Retinoblastoma	√√	√√	√	
Wilms tumor	√√		√	
Hepatoblastoma		√√		

Take-away



Data support associations between certain chemicals and **increased** risks of several childhood cancers



Data support association between dietary factors and **decreased** risks of several childhood cancers



Assessment in epidemiologic studies can be imprecise and may underestimate true associations.



Exposomic studies are ongoing to better understand existing and novel etiologic pathways

Ripples

1 CIRCLE/ WSPEHSU (*focus region 9*)

- a) Outreach to Latino communities/ young adults
- b) Outreach to clinical community

2 Funding for work by CDC “Trevor’s law”

- a) Expansion to full country and beyond
- b) Train PEHSU Champions and early practice clinicians
- c) Expand developed material
- d) Partner with CEHN

3 Develop consultative service

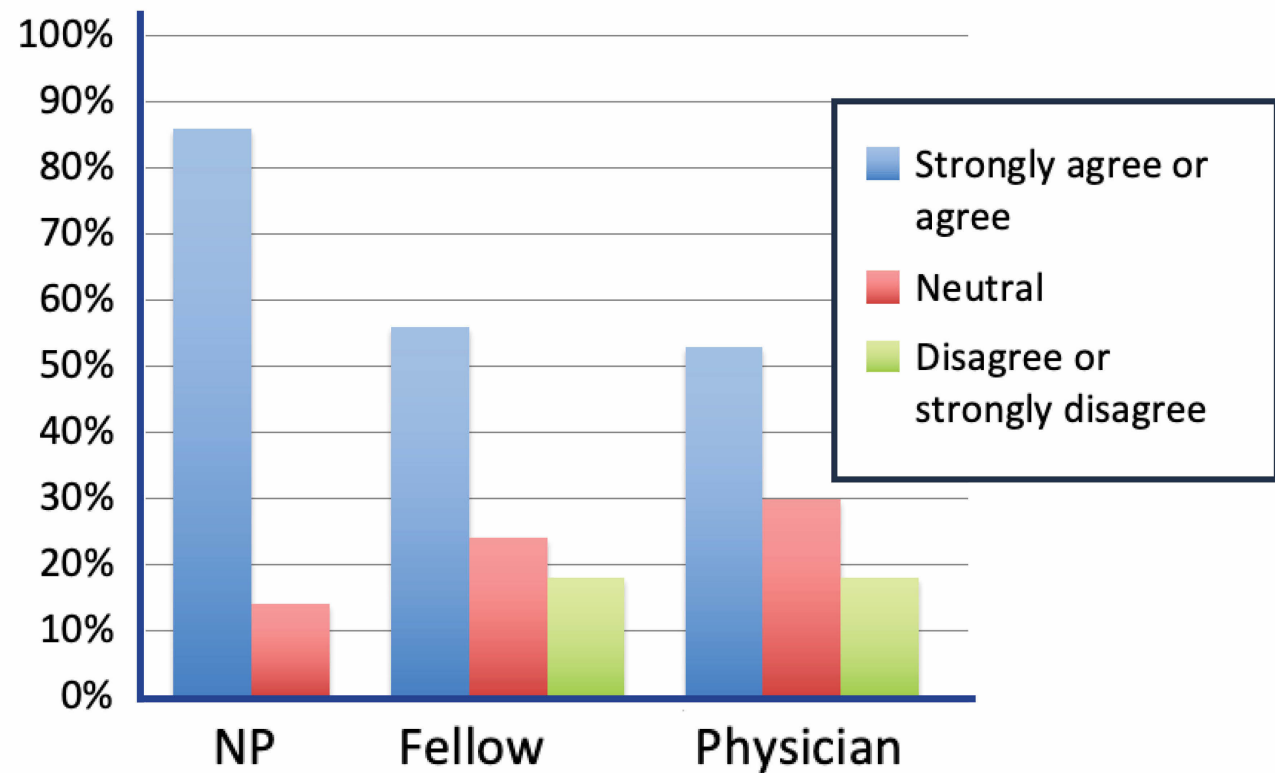
- a) Baylor Medical College/Texas Children’s Hospital
- b) Mercy Children’s Hospital, Kansas City

4 Collaboration with Prep 4 Gold and other foundations

- a) Help develop Childhood Cancer Prevention Conference
- b) Developing collaborative network

Survey of Pediatric Oncology Fellows, Attendings, and Nurse Practitioners.

In your opinion, are environmental exposures important contributors to childhood cancer?





Knowledge Gap

- 89% report getting questions from families
- ~ 1/2 uncomfortable discussing environmental exposures
- 92% would find it helpful to have information about environmental exposures

Zachek et al. J Pediatr Hematol Oncol 2015

Story of Health eBook

Stephen's Story – Childhood Cancer

A Story of Health

Childhood Cancer: Stephen's Story



A Story of Health

CHILDHOOD CANCER Stephen's Story

FACTORS ASSOCIATED WITH RISK FOR CHILDHOOD LEUKEMIA

Dr. Baker is careful to note that, "Scientists and policy makers will continue to study and debate for years to come whether these associations are truly causal. And, there are also ethnic and demographic factors associated with leukemia risk. Interactions among risk factors and their common co-occurrence make it even more difficult to establish the cause of leukemia in a particular person or to identify the most important determinants of leukemia in a population. But, many environmental exposures associated with leukemia are also associated with other health problems, such as neurodevelopmental disabilities, asthma and other respiratory diseases, and reproductive disorders. For all these reasons, most people would want to avoid exposure as much as possible. The association with cancer is an additional reason."

He adds, "Some of these exposures simply cannot be reduced by individual action alone. Rather, in some instances, policy interventions that reduce exposures across the entire population will be necessary and more effective."

Childhood cancer risk also generally shares a number of common themes that we have seen in other disorders highlighted in *A Story of Health*, such as greater susceptibility during certain periods of development, underlying genetic risk factors, and gene-environment interactions.

- + Caesarian section and immune function
 - + Causes and consequences of immune phenotypes that influence risk
 - + Oil and gas proximity
- Watch: Can we reduce exposure to risk factors associated with childhood leukemia and other cancers?



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States Pediatric Environmental
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Director, Children's
Environmental Health
Center, Office of Environmental
Health Hazard Assessment,
California EPA

Multiple Factors Associated with Risk to Childhood Leukemia



References, Birth Characteristics:

Milne E, et al. Fetal growth and childhood acute lymphoblastic leukemia: findings from the Childhood Leukemia International Consortium (CLIC). *Int J Cancer*. 2013 Dec 15;133(12):2968-79.

Pattel O, et al. International Child Consortium. Birthweight and Child Preliminary findings from the International Cancer Cohort Consortium (I4C). *Pediatric Perinatal Epidemiol*. 2015.

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wspehsu.ucsf.edu/SOHucsf

Rosa and Carlos get Married

INSIDE:
Recipes
Quick 'n
Healthy!



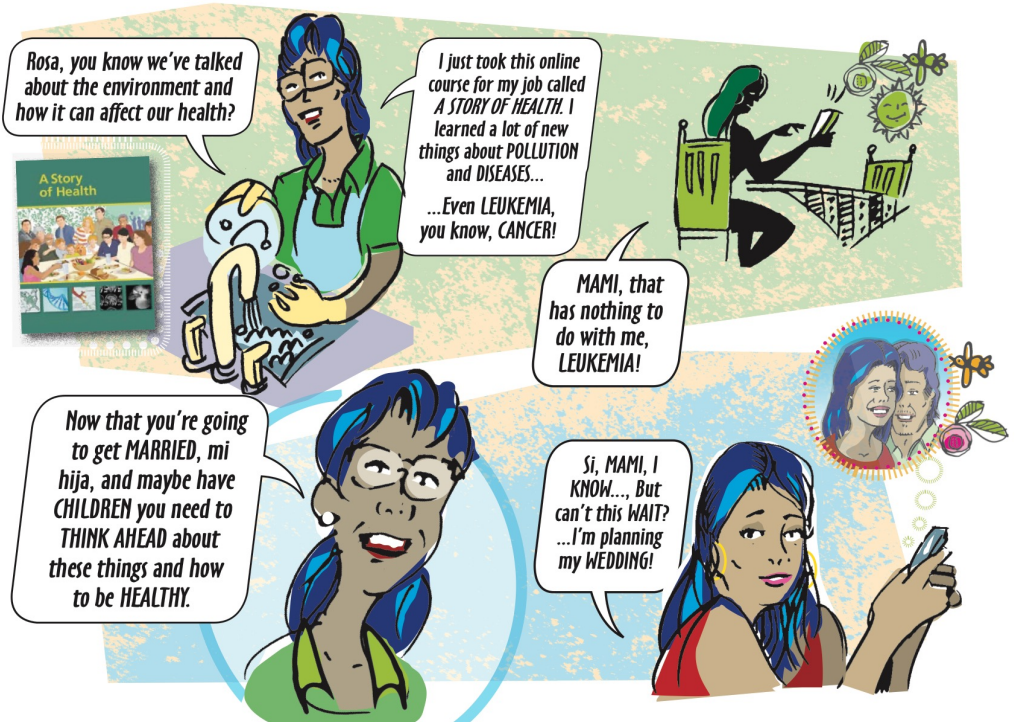
Improving Environmental Health Literacy
of Young Adults

OUR STORY SO FAR...



Comic book

A FEW WEEKS BEFORE THE BRIDAL SHOWER...



Ripples

1 CIRCLE/ WSPEHSU *(focus region 9)*

- a) Outreach to Latino communities/ young adults
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2 Funding for work by CDC “Trevor’s law”

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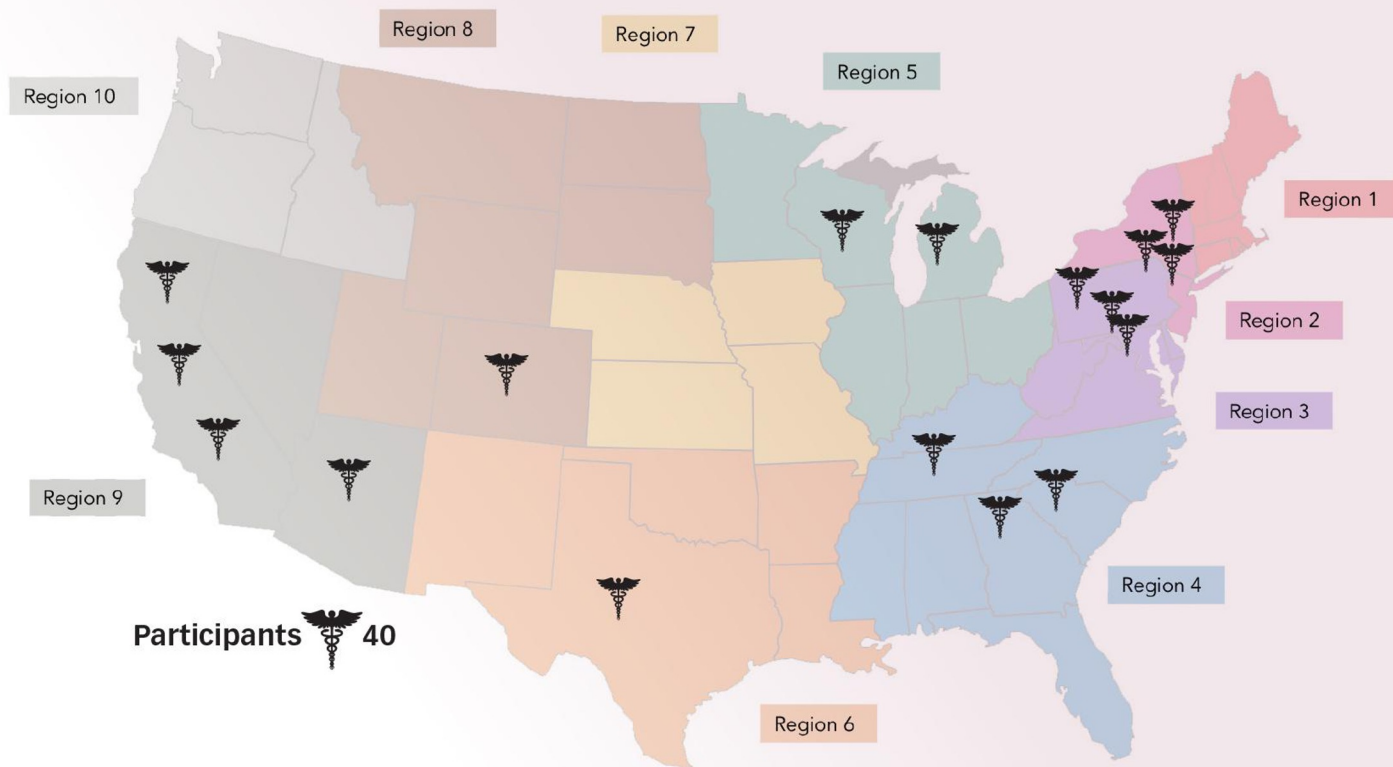
3 Develop consultative service

- a) Baylor Medical College/Texas Children’s Hospital
- b) Mercy Children’s Hospital, Kansas City

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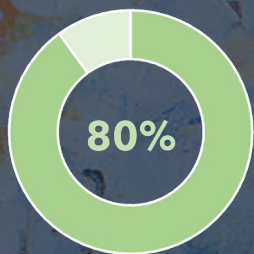
Workshop participants – Pediatric Oncology Fellows and NPs



Topics covered:

- Introduction to Env. Health
- Trends in childhood cancer
- The science on potential environmental influences on childhood cancer
- Investigating unusual patterns of cancer
- Cancer and environmental equity
- Communications strategies
- Taking an environmental history
- Ways to reduce exposures related to childhood cancer risk

Three months post-workshop surveys revealed:



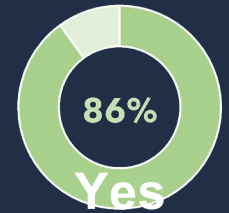
80% of attendees said that they made changes to their clinical practice and had shared workshop information with colleagues.

55% shared information with patients.

Over 80% said approach to answering family's questions had changed.

Attendees

Three months post training comments



- **Have your perceptions of environmental risks changed?**

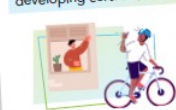
- "Completely ignorant before".
- "I have a lot more respect and consideration for parental concerns about environmental factors"

- **Key take away**

- "There is a lot that is known about the link between childhood cancer and the environment that is never discussed in formal medical education"
- "That the environment does indeed play a role in ALL."
- "Increasing disease burden in childhood cancer is related to environmental impact at various stages of development as early as fetal."

Get the facts about childhood cancer

Exposure to environmental hazards like these has been associated with an increased risk of developing certain childhood cancers.



Air pollution

Decrease outdoor air pollutant exposure.

- Check the **Air Quality Index (AQI)** and limit outdoor activity when air quality is poor.
- Avoid contributing to poor air quality by limiting wood fires and backyard burning.
- Reduce pollution from vehicles by carpooling, using public transport, biking, or walking when possible.

Decrease indoor air pollutant exposure.

- Limit sources of indoor air pollution (i.e., smoke, cleaning products, air fresheners, candles, dust).
- Ventilate (open windows, turn on exhaust fans when cooking) and filter (HEPA filters, air purifiers) indoor air.
- Check the EPA **Care for Your Air** website for tips on improving indoor air quality.



Radiation

Decrease unnecessary radiation exposure.

- Ask your child's healthcare provider about the risks and benefits of recommended medical imaging (X-ray, CT scan).
- Radon is an odorless, invisible radioactive gas naturally released from rocks, soil and water. It can get into homes and buildings through small cracks or holes in the foundation and collect indoors. Radon is the second leading cause of lung cancer in the U.S.



Get the facts about childhood cancer

Minimizing children's exposure to environmental hazards can lower risk for childhood cancer and other diseases.



Childhood Cancer & the Environment

childhood cancer factsheet

Children's Cancer & the Environment



Childhood Cancer & the Environment



A project to educate and activate health professionals to address environmental influences on childhood cancer

References from *A Story of Health: Childhood Cancer* eBook and CE course*
Update due for release August 2023

References and Resources for Childhood Cancer by Topic

Note: there are many topic overlaps

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*A Story of Health multimedia eBook explores how our environments interact with our genes to influence health across the lifespan. QR codes for health professionals are offered by the CDC.

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Air Pollution

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Childhood Cancer & the Environment NEWSLETTER

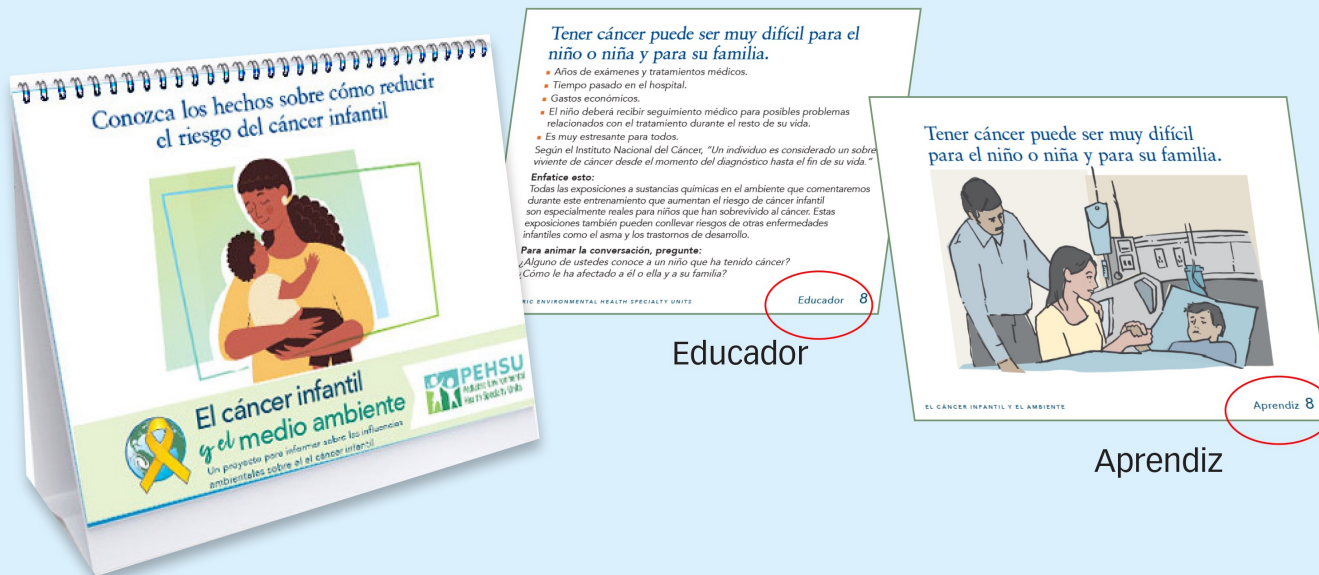


Sign up for the Newsletter

Resource materials

Major Outreach to Community Health Workers

Flipbook: Una herramienta para los promotores de salud



Ripples

1 CIRCLE/ WSPEHSU (*focus region 9*)

- a) Outreach to Latino communities/ young adults
- b) Outreach to clinical community

2 Funding for work by CDC “Trevor’s law”

- a) Expansion to full country and beyond
- b) Train PEHSU Champions and early practice clinicians
- c) Expand developed material
- d) Partner with CEHN

3 Develop consultative service

- a) Baylor Medical College/Texas Children’s Hospital
- b) Mercy Children’s Hospital, Kansas City

4 Collaboration with Prep 4 Gold and other foundations

- a) Help develop Childhood Cancer Prevention Conference
- b) Developing collaborative network



Creating a Pediatric Cancer and the Environment Consultative Service

- When our daughter was diagnosed with Wilms' Tumor, a kidney cancer, ... there was no one on staff at our hospital – one of the top cancer facilities in the country – who asked questions about home environment at intake, or gave us any specific environmental advice during or after active treatment. I was left to do my own research. Exhausted patients and caregivers rely on our doctors, nurses, child life specialists—and more—to guide us through this unique hell. I would vastly have preferred to collaborate on her care—as we were able to in every other realm—rather than arrive at my own environmental health conclusions.”

help many families.”

Alexandra Zissu, Environmental Health Journalist, Editor, Environmental Health Advocate

Environmental Exposures Impact Childhood Cancer Survivors

Exposure to PM_{2.5} in children treated with chemotherapy doubled risk for respiratory disease hospitalization

PM associated with increase in CNS and lymphoma mortality at 5 and 10 years



Photo: Story of Health

Ou JY, et al.. Int J Environ Res Public Health. 2019 Mar 26;16(6):1081; Phillips NS, et. al., JAMA Netw Open. 2023;6(5); Carceles-Ivareza A, et al., Env. Research, 2019; Cancer Epidemiol Biomarkers Prev 2020, 29:1929

Choose Outdoor Time Carefully

WWW.AirNow.gov

- Adjust activities on the basis of degree of ambient air pollution.
 - The Air Quality Index (AQI), provides a tool for this.
 - On the basis of local air quality at any particular time, individuals can make decisions to reduce time spent in physical activities outside or elect to do indoor activities.

https://weather.gc.ca/airquality/pages/index_e.html

AQI Basics for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

See the **Activity Guides** to learn ways to protect your health when the AQI reaches unhealthy levels.

Corsi-Rosenthal Box: An inexpensive, effective air filter

C.DIY Air Filtration Cube

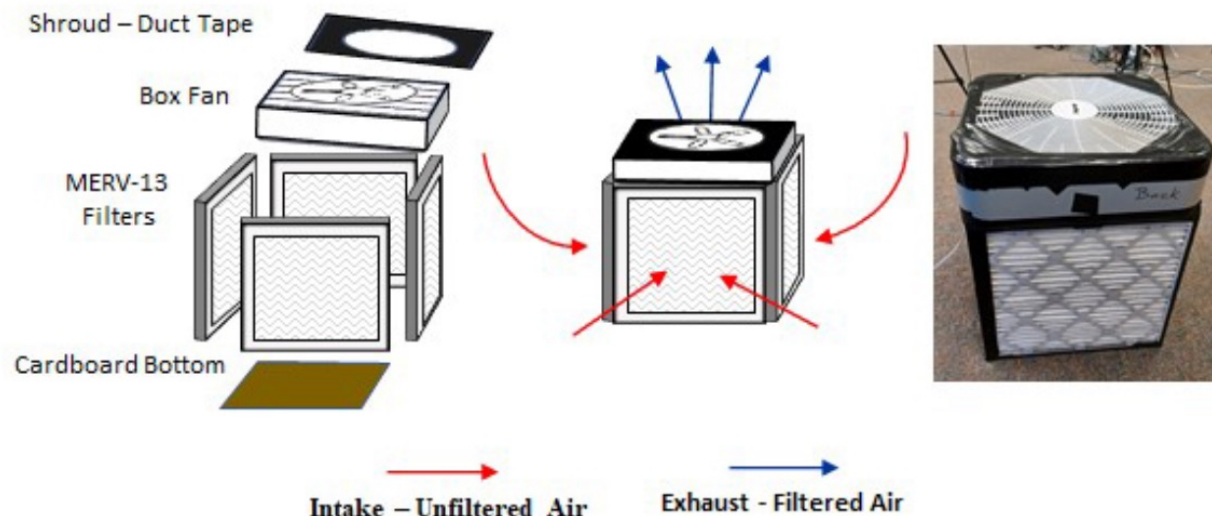


Image from NIOSH

<https://blogs.cdc.gov/niosh-science-blog/2023/02/03/diy-filtration/>



Creating a Pediatric Cancer and the Environment Consultative Service

Texas Children's Cancer Center/Baylor College of Medicine

- **Faculty survey**
 - 70% not comfortable discussing environmental risk factors
 - 96% say that such a service would be helpful and that they would use it.
 - 89% don't anticipate any problem with such a service.



Creating a Pediatric Cancer and the Environment Consultative Service

Texas Children's Cancer Center/Baylor College of Medicine

“After hearing of the plan to develop the consultative service, four families (on our advisory council) reached out and expressed thanks for addressing this topic. One family even stated: ‘I know many families have talked about it in the halls on the unit, but we could not find answers to this topic anywhere.’”

Ripples

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4 Collaboration with Prep 4 Gold and other foundations

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Second Historic Childhood Cancer Prevention Symposium



Presenting Sponsor:



February 10 -13 | Jan and Dan Duncan Neurological Research Institute at Texas Children's Hospital (NRI) | Houston, Texas

Outreach to the public, clinicians, policy makers, advocates, etc.

Podcasts

Well
Beyond
Medicine®
Podcast



Ep. 85: Environmental Factors and Childhood Cancer



Episode 2: Childhood Cancer, the Environment and the Role of Community Health Workers with Mark Miller, MD, MPH, and Erica Guerrero MS, MPAS, PA-C.

HELP AND HOPE
HAPPEN HERE

A Pediatric Cancer Podcast

To Benefit The Jimmy Fund



Help and Hope Happen Here

Mark Levine

Jonathan Agin, Gavin Lindberg, and Dr. Mark Miller will talk about the upcoming Childhood Cancer Prevention Symposium which will be taking place in February in Houston, Texas.

Blogs

POISONING OUR CHILDREN

Mark Miller: Stalwart Defender of Children's Environmental Health.

Jan 26, 2024

GUEST COMMENTARY

Childhood Cancer & the Environment: Opportunities for prevention

January 23, 2025



CHE
Collaborative for
Health & Environment



Mark Miller, MD, MPH
Lead, Childhood Cancer & the Environment Project, Western States Pediatric Environmental Health Specialty Unit, UCSF



Maria Valenti
Director, Health and Environment Literacy Project, Commonwealth

Videos



Outdoor and Indoor Air Pollution and Risk of Childhood Cancers



Newsletters



Periconception and Pregnancy Intake of Vitamins and Folate **Reduces** Leukemia Risk



- International study finds:
 - vitamin consumption reduces ALL risk by almost 30%.
 - Folic Acid supplementation reduces risk of ALL by over 50%.

Metayer, Epidemiology, 2014

Singer et al., British Journal of Nutrition, 2016

U.S. women of pregnancy age with sub-optimal RBC folate 2017-18

NHANES survey

- Little change from 2011 – 2016 despite introduction of voluntary fortification of masa

• Non-Hispanic White	15.2%	(9.8, 20.6)
• Hispanic	18.8%	(14.4, 23.2)

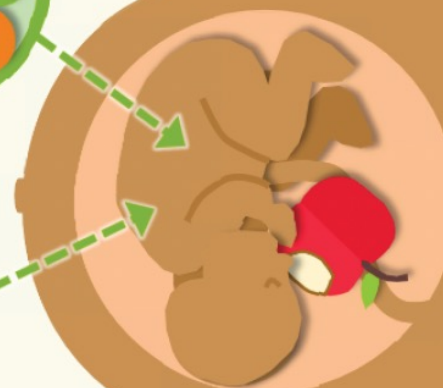
You can start protecting your children's health even before they are conceived, and during pregnancy.

What You Eat
Before and During
Your Pregnancy
PROTECTS
Your Child from Leukemia

While pregnant,
avoid drinks with
alcohol or caffeine.

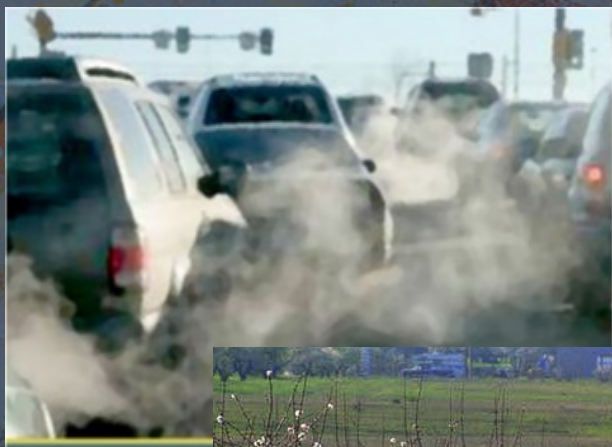


**Before and during your
pregnancy, eat lots of
fruits and vegetables.**
**Take a prenatal vitamin
containing folic acid.**



Start Protecting Your Children's Health **BEFORE They Are Conceived!**

Co-benefits of Reducing Exposures



Traffic: Preterm birth, decreased birth wt., asthma, respiratory development, cardiovascular dis., neurobehavioral disorders



Pesticides: Neurobehavioral disorders, asthma, adverse birth outcomes, adult cancer, reproductive toxicity

Tobacco, breast feeding, others



Inadequate folate early in pregnancy associated with neural tube defects, increase in autism risk, other birth defects

What if we get it right?

Ayana Elizabeth Johnson

What does
the **change**
look like?



A pregnant woman with dark skin and curly hair is shown from the chest up, wearing a red shirt. Her hands are gently resting on her belly. Overlaid on her belly is a word cloud of various factors. The words are in white and yellow, with some in a larger font size. The background of the slide is dark blue with faint circular patterns.

access to
healthcare

social
support

breast
feeding

clean early child
environments

nutrition

radiation

high risk genetic
screening

survivor
education

**chemical
risks**

CMV

occupational exposures

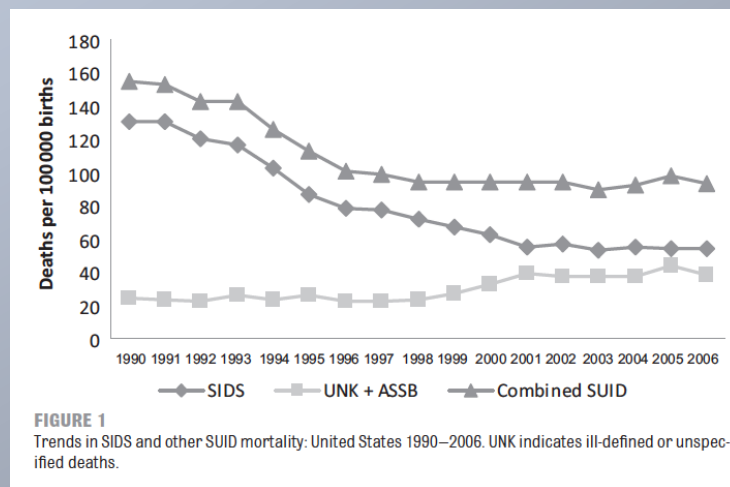
mental health
care

We must address
all of these factors

Can we do primary prevention of cancer?

- SIDS
 - Many wanted to wait
 - Though studies supported a decreased risk they asked, “What is the mechanism?”

AAP technical report SIDS
Moon R. Pediatrics. 2011
Nov;128(5):1030-9. doi:
10.1542/peds.2011-2284



Real Life Example of Childhood Cancer Prevention

Folic Acid Fortification of Grains 1996-98

Childhood Cancer Incidence Trends in Association With US Folic Acid Fortification (1986–2008)

Linabery et. al., PEDIATRICS Volume 129, Number 6, June 2012

- *Post fortification decreases in Wilm's Tumor (down 20%)
and Primitive NeuroEctodermal Tumors (down 40%)*

Folic acid food fortification is associated with a 60% decline in neuroblastoma in Ontario Canada

French et al., CLINICAL PHARMACOLOGY & THERAPEUTICS VOLUME 74, NUMBER 3

Thank you

Collaborators, co-developers of material, supporters

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- Catherine Metayer MD, PhD, UC Berkeley
- Center for Integrative Research on Childhood Leukemia and the Environment
- Childhood Leukemia International Consortium
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- Whitney Sterten-Hall, Omar Shakeel MD, Nicole Wood MD, Hannah Thompson MD MPH, Perry Sheffield MD MPH

