

Toxic Threats: Preconception to Young Adults

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(Comments do not represent state of California)

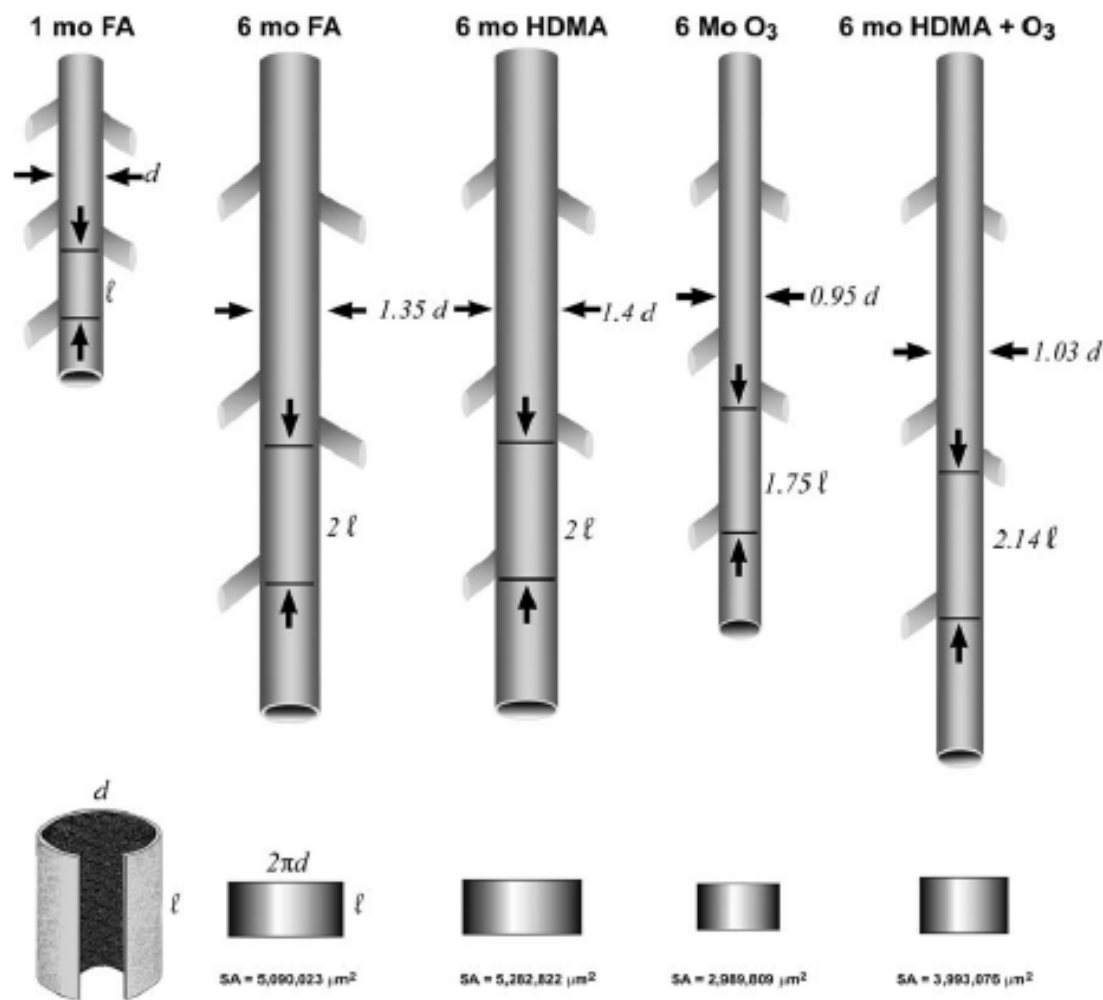
Director COTC,

Center for Integrative Research on Childhood Leukemia and the Environment

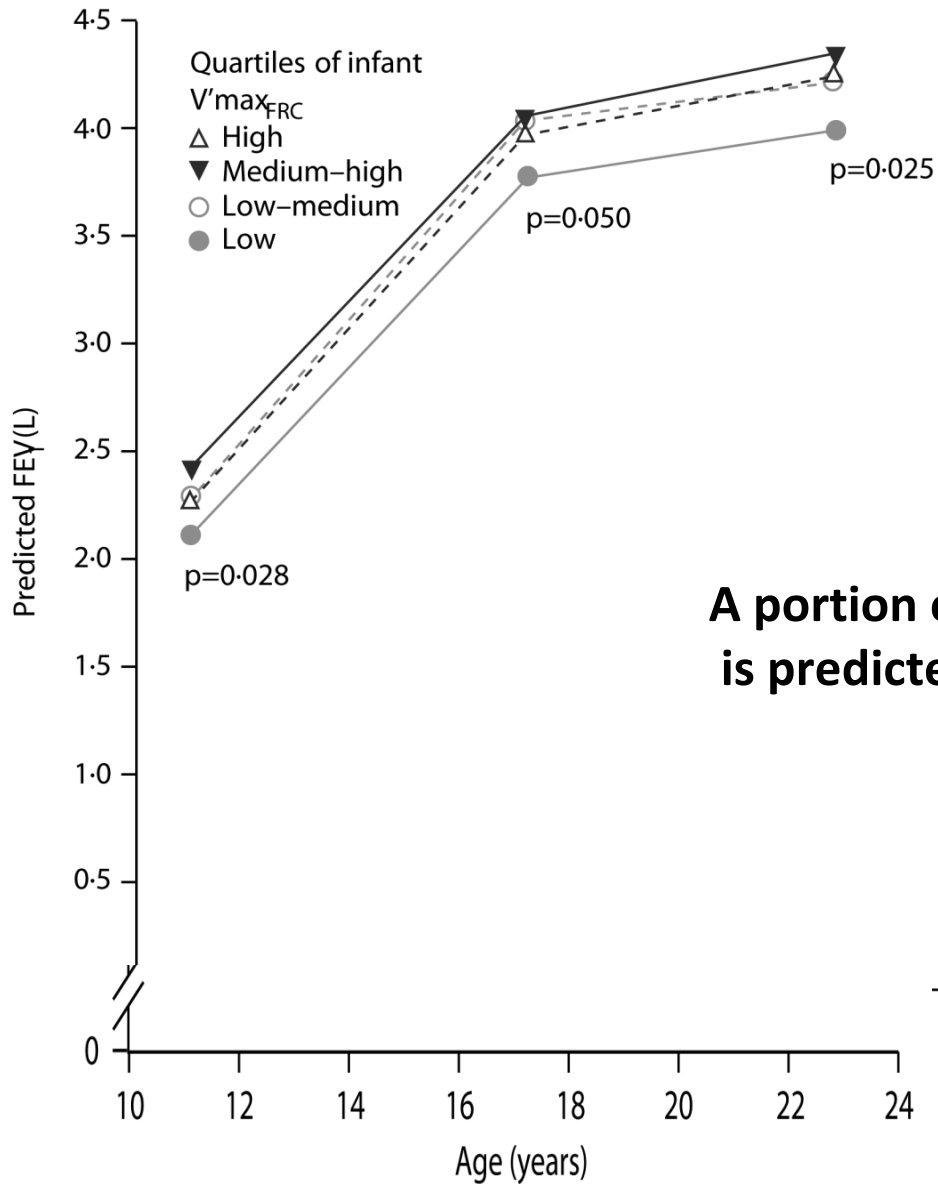
UC Berkeley

*Funded by Agency for Toxic Substances Disease Registry and US EPA through ACMT

Environmental exposures at critical developmental periods may permanently alter structure of airways



Reference: Plopper CG, Smiley-Jewell SM, Miller LA, Fanucchi MV, Evans MJ, Buckpitt AR, et al., 2007. Asthma/allergic airways disease: does postnatal exposure to environmental toxicants promote airway pathobiology? ([link](#)) Graphic used with permission.



**A portion of adult lung function ($\approx 14\%$)
is predicted by function at 2 months**

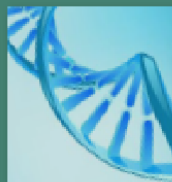
Adapted from The Lancet 370: Stern et al. Poor airway function in early infancy and lung function by 22 years: a non-selective longitudinal cohort study. Pg 761, copyright 2007

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



A Story of Health



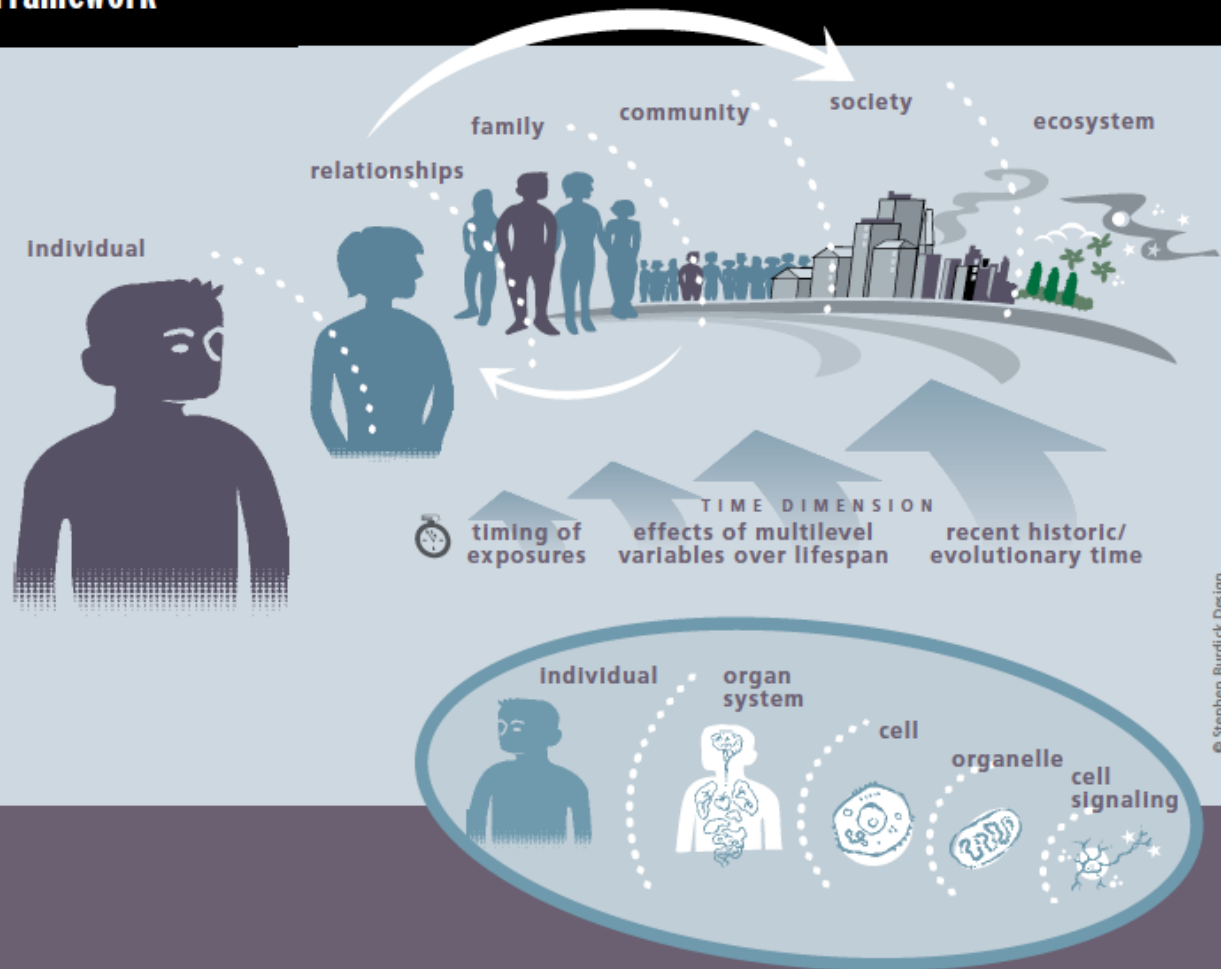
Story of Health
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INTRODUCTION Ecological Health Framework

The ecological framework can include multiple levels from sub-cellular to societal.

It is not hierarchical in the sense that one level is more important than another, but rather in the sense that individual biology is progressively nested within the person, family, community, society and ecosystem.

The interactions and feedback loops within, across, and among these levels are complex and variable. They exert their influences on health across time.



The ecological health framework also extends to the sub-cellular level.

© Stephen Burdick Design

ASTHMAGENS: Risk factors for the development of asthma

Some early life environmental risk factors have been identified.

For example, prenatal and early life exposure to social stressors, such as violence, can increase the risk of asthma as well as increase the impacts on respiratory health from allergens, air pollution, and tobacco smoke.

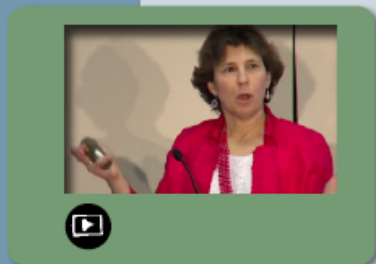
Secondhand smoke alone is a risk factor for new cases of asthma in preschool-aged children.

Karen was surprised to learn that some doctors are even concerned about acetaminophen and its relationship to asthma.

Brett has experienced many of these risk factors in his short life. More details about these can be found as you read his story.



[More Information on acetaminophen](#)



Stress affects our health. [Watch this video by Dr. Rosalind Wright](#) to see how social stressors, along with environmental factors, can be linked to asthma. (5 min.)

Rosalind J. Wright, MD MPH, Horace W. Goldsmith Professor of Pediatrics, Vice-chair, Clinical and Translational Research, Department of Pediatrics, Icahn School of Medicine at Mount Sinai



INFERTILITY Reiko & Toshio's Story



They discuss a range of other possible environmental exposures including endocrine disruptors. Dr. Patel says she will have the test results in about a week, so they set up another appointment.

Watch: Little Things Matter: The Impact of Toxins on the Developing Brain
Dr. Bruce P. Lanphear, MD MPH
Professor, Simon Fraser University

Little Things Matter
The impact of toxins on the developing brain
Dr. Bruce Lanphear, MD, MPH
Professor, Simon Fraser University

+
Bisphenol A (BPA) and how it can mimic estrogen
+ Example: DES

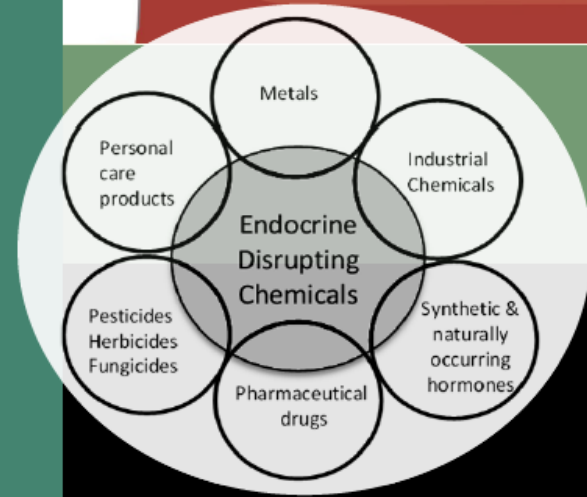
+
Bone disrupting chemicals: Fatty acids and osteoporosis

+
Parabens and reproductive health

Endocrine disruptors and infertility/reproductive health

Endocrine disruptors are chemicals that impact endocrine functions by interfering with the synthesis, secretion, transport, binding, action, or elimination of natural hormones in the body that are responsible for development, behavior, fertility, and maintenance of homeostasis (normal cell metabolism).

These disruptions can cause cancerous tumors, birth defects, and other developmental disorders. As the cells begin to grow and differentiate, there are critical balances of hormones and protein changes that must occur. The Endocrine Society released a statement on Endocrine-Disrupting Chemicals (EDCs) specifically listing obesity, diabetes, female reproduction, male reproduction, hormone-sensitive cancers in females, prostate cancer in males, thyroid, and neurodevelopment and neuroendocrine systems as possible effects of being exposed to EDCs.



INFERTILITY Reiko & Toshio's Story

Dr. Lopez mentioned other environmental exposures that might affect fertility, such as air pollution, and says there are some good resources that she can also send to Reiko.



Reiko thinks about her training runs around some of the major roads, and remembers the emissions from the trucks and cars. She wonders how that might have affected her.

Dr. Lopez suggests that a fertility specialist may be able to provide even more information.



Vulnerable populations and environmental disparities



Air pollution and fertility, reproductive health



[Link: ACOG Evaluating Infertility](#)

Links:

[ACOG American Congress of Ob/Gyn: Vulnerable populations and environmental disparities](#)

[FIGO Opinion International Federal of Gyn/Ob: Reproductive health impacts of exposure to toxic environmental chemicals](#)



Dibromochloropropane DBCP

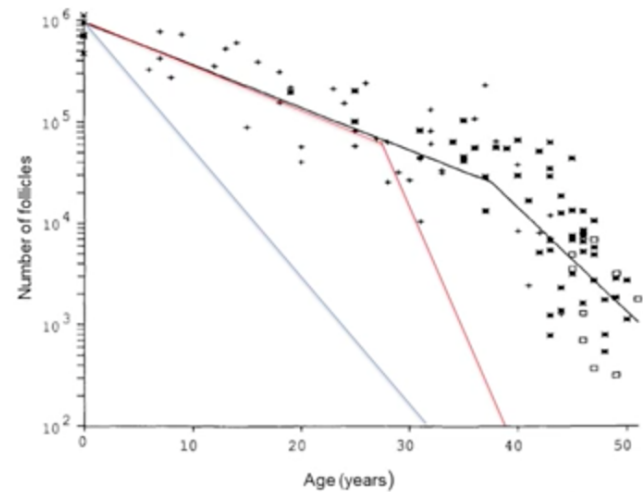
- Soil fumigant - Introduced 1950s
- Toxic to sperm and testis
- Caused male infertility in 1500 pesticide plant workers in U.S.
- Continued export after US ban
- Over 30 years later there are still wells in California near production plant requiring special filtration



Females – Born with Finite Number Oocytes in Primordial Follicles

- Called Ovarian Reserve
- Toxicants that decrease follicle pool can result in ovarian senescence and menopause
- Examples include:
 - PAHs
 - 2- bromopropane
 - Ionizing radiation
 - Chemotherapeutic agents

Age-Related Decline in Human Follicles



Adapted from Faddy and Gosden, 1992

Story of Health – find at: Western States PEHSU (<https://wspehsu.ucsf.edu>)

A Story of Health

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CHILDHOOD LEUKEMIA Stephen's Story

After talking with Tricia and examining Stephen, Dr. Jones was also concerned. She confirmed that Stephen appeared ill and that the cause could be a number of things. She said she needed laboratory tests to make an accurate diagnosis.

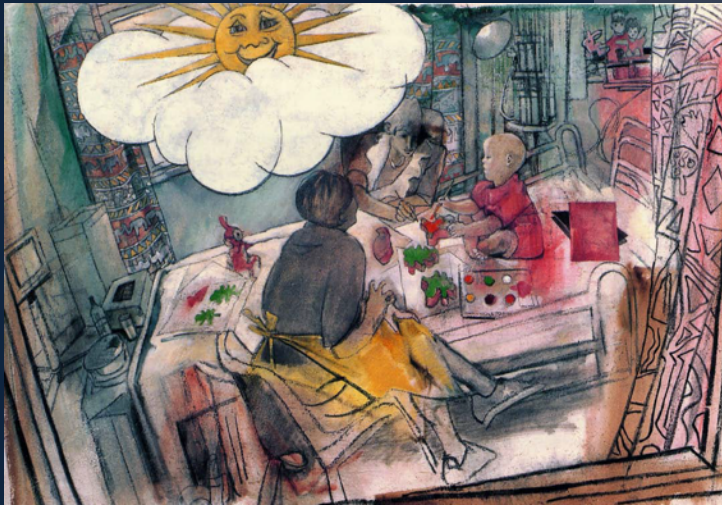
Dr. Jones ordered blood tests that could be done at the local hospital and called to make an appointment for Stephen to get his blood drawn that same day.

Tricia was upset and called her husband David with the news. She started to ask a lot of questions. Dr. Jones tried to calm her and said she would call her as soon as she had the results.

Tricia brought Stephen to the hospital laboratory for the tests and went home very worried.

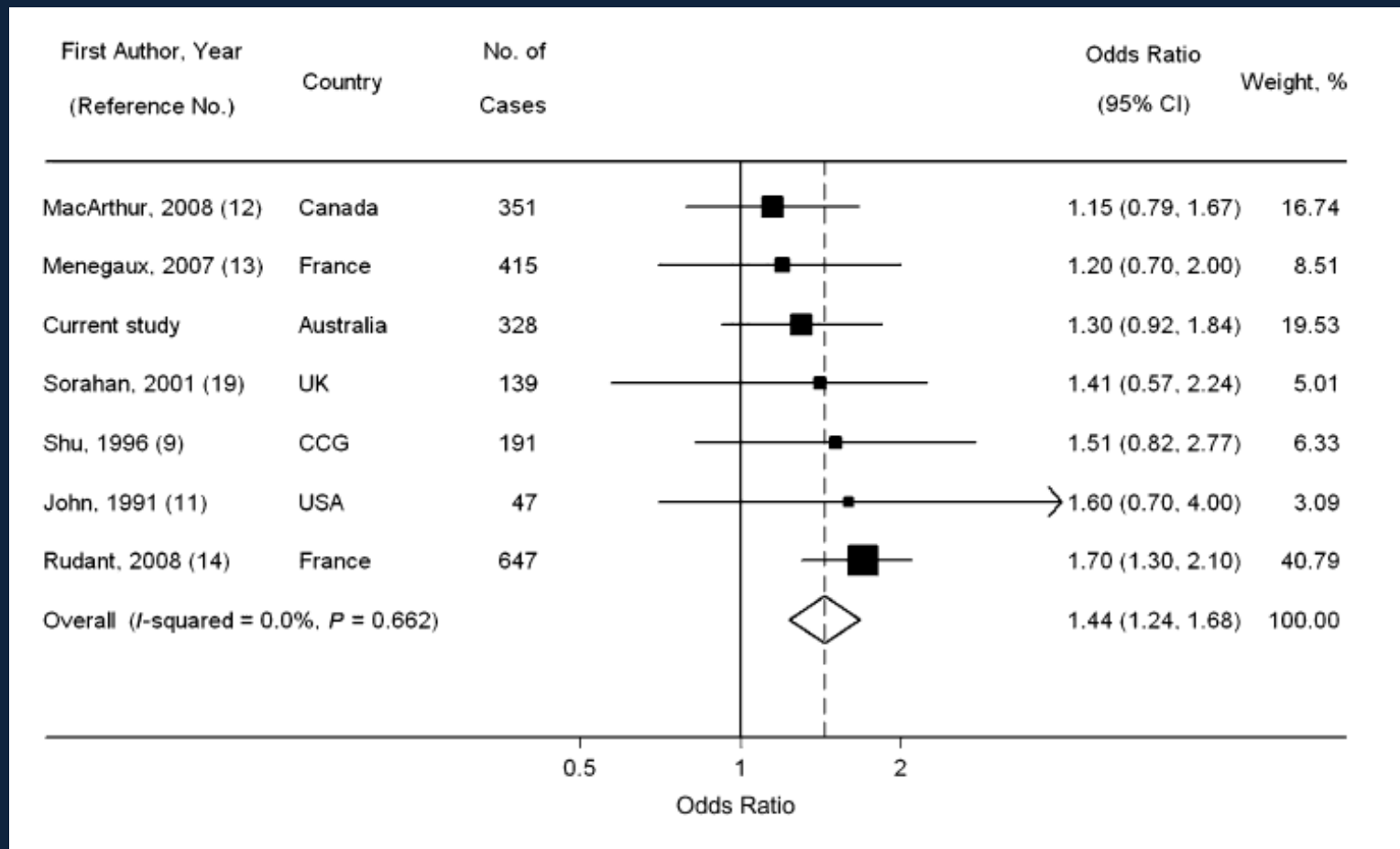


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Story of Health: Paintings by Susan Macfarlane used with permission
Special thanks to Dr. Geoffrey Farrer-Brown and Euan MacKay

Meta-analysis ALL and Paternal Smoking around Conception (> 20cpd vs. none)



ALL Joint Effect of Pre- and Postnatal Exposure to Tobacco Smoking

	Controls	Cases	
Exposure to tobacco smoking	N = 975	N = 767	OR^a (95% CI)
No exposure during both periods	670	498	1.00 (—)
Paternal prenatal smoking only	127	98	0.91 (0.68–1.22)
Child's passive smoking only	74	46	0.80 (0.51–1.09)
Exposure during both periods	88	115	1.50 (1.01–2.23)
	<i>P</i> -value for interaction		0.02

^aOR adjusted for child's age at diagnosis/reference date, sex, and Hispanic status, maternal race, and household annual income.

Preconception/Early Prenatal Exposure and Childhood Leukemia

- Any paint exposure 3 mos < conception (5 studies) ALL OR 1.54 (1.28- 1.85)
- Father – Preconception smoking
 - AML 1.37 (1.07-1.76)
 - ALL 1.44 (1.24- 1.68) meta-analysis not CLIC
- Folate supplementation mother (primary education or less)
 - ALL 0.47 (0.33-0.68)

Bailey et al., Cancer, Causes, and Control 2015
Metayer, AJE, 2016;184(4):261–273
Milne et al., Am J Epidemiology 2012
Metayer, Epidemiology, 2014



Figure 1. Incidence of childhood leukemia in California by race-ethnicity, 1988-2012.

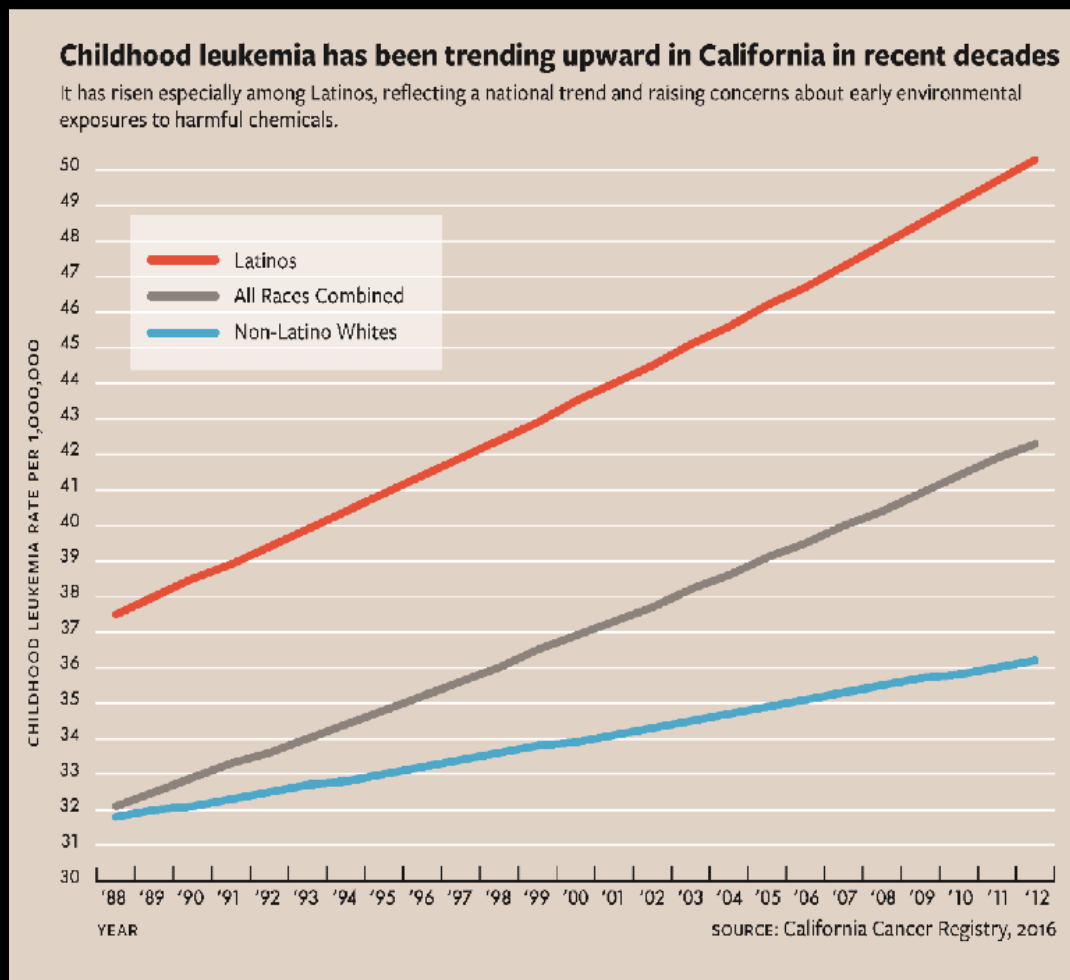


Figure adapted from Giddings B, Whitehead TP, Metayer C, Miller MD. Childhood Leukemia Incidence in California: High and Rising in the Hispanic Population. *Cancer* 2016.

IMPROVING ENVIRONMENTAL HEALTH LITERACY OF YOUNG ADULTS

[HOME](#) » [PROJECTS](#) » [IMPROVING ENVIRONMENTAL HEALTH LITERACY OF YOUNG ADULTS](#)

A project of the Center for Integrative Research on Childhood Leukemia and the Environment (CIRCLE) Community Outreach and Translation Core (COTC) at the University of California, Berkeley in collaboration with the Western States PEHSU.

PROJECTS

- **Improving Environmental Health Literacy of Young Adults**

- High and increasing rate of CL in Latino children
- Preconception and prenatal exposures important (as well as early childhood)
- Exposures related to other outcomes



Love in the Time of Toxicants

10 minute video

Outreach

- Community health workers
- Adolescents and young adults
- Pre-marital



<http://circle.berkeley.edu/translation-and-outreach/for-parents/>
<https://wspehsu.ucsf.edu/projects/improving-environmental-health-literacy-young-adults/>

Rosa and Carlos get Married

INSIDE:
Recipes
Quick 'n
Healthy!



Rosa y Carlos Se Casan

ADENTRO
Recetas
¡Fáciles y
saludables!



HOLA AMY!
You're due in a
couple of months,
si? And you're
taking the
FOLATE?

...So has Rosa been
complaining about
my ANTI-TOXICANT
campaign?



TOXI...
WHAT?!

OH! I hear you with your
FRIENDS on the PHONE...

"MAMI says:
No PAINT
FUMES in
the HOUSE!"
"Use GREEN
CLEANING
PRODUCTS!"
"NO SMOKING!"



YEAH! And
"Make PAPI
take off his
STINKY WORK
CLOTHES outside
the HOUSE!"
(They DO
smell BAD!)

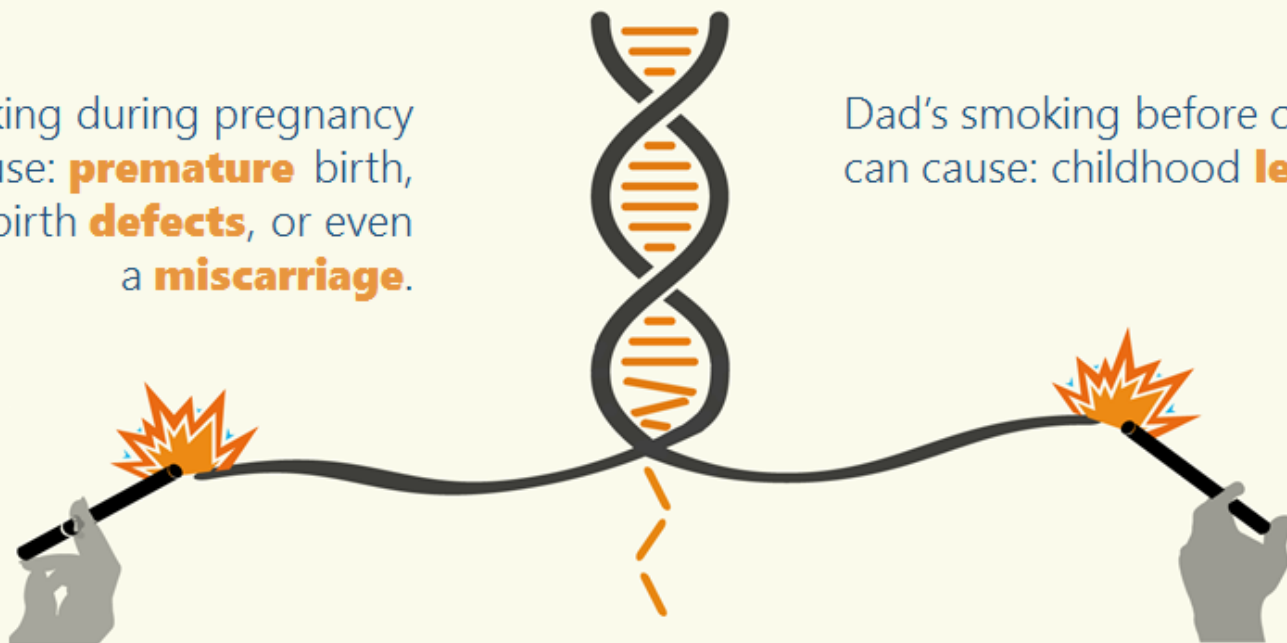
Everyone Knows that Mom's Smoking
During Pregnancy is Bad for Baby, but...

DID YOU KNOW?

Dad's Smoking *Before* Conception Can Harm the Child, too?

Mom's smoking during pregnancy
can cause: **premature** birth,
birth **defects**, or even
a **miscarriage**.

Dad's smoking before conception
can cause: childhood **leukemia**.



Moms or dads who smoke increase the amount of
cancer-causing DNA changes in their children by 30%.

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

thanks...
merci danke
hvala arigato
gracias thank you...
hvala merci danke
grazie thanks... hvala
danke gracias merci
arigato... thank you
grazie... merci...

arigato
gracias
thanks
merci
grazie
danke
hvala
thanks
merci
grazie
danke
hvala
thanks
merci
grazie
danke
thanks
merci
grazie
arigato
thank you



INFERTILITY Reiko & Toshio's Story

Dr. Lopez includes information on the influence of toxic chemicals such as lead and the solvents in paints and other materials.

She again mentions the important nutrition issues they had discussed earlier.



Reproductive health effects of solvents



Reproductive health effects of lead



Key concept:
Unintended adverse consequences of improvements to the environment

Links:

- [TedX The Endocrine Disruption Exchange](#)
- [Generations at Risk](#) Reproduction Health and the Environment
- [CDC's Lead and Pregnancy](#)



Watch: Chemicals and Infertility
Tracey J. Woodruff, PhD, MPH
Director, Program on Reproductive Health and the Environment;
Professor in the Department of Obstetrics, Gynecology, and Reproductive Sciences at the University of California, San Francisco

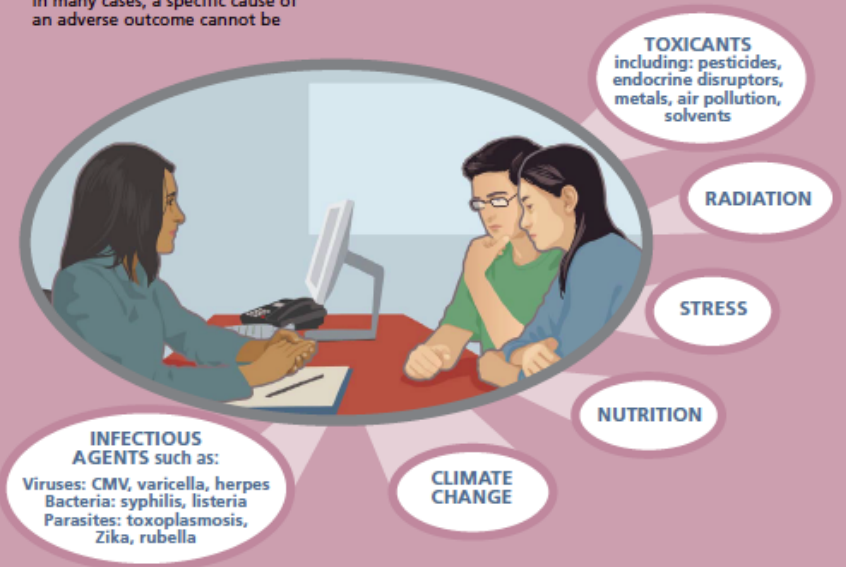
KEY CONCEPT:

Multiple environmental factors can influence reproductive health.

Environmental factors, alone or in combination with other variables, can have adverse impacts on reproductive health, increasing the risk of infertility, miscarriage, abnormal fetal growth, fetal death, preterm birth, birth defects or other developmental abnormalities.

In many cases, a specific cause of an adverse outcome cannot be

identified. With the exception of birth defect registries in some states, lack of comprehensive data collection pertaining to most abnormal outcomes makes epidemiologic studies intended to identify causal factors difficult to conduct.



CIRCLE at UC Berkeley

Catherine Metayer, Julia Vassey, Todd Whitehead (UC Berkeley), Brenda Giddings (CA Cancer Registry), Joe Wiemels (UCSF)

Western States Pediatric Environmental Health Specialty Unit (WSPEHSU at UCSF)

Maria Valenti, Steve Burdick, Vickie Leonard, Sharyle Patton,
Jose Camacho, Richard Carlton

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