Baylor College of Medicine

Texas Children's Hospital®

DEPARTMENT OF PEDIATRICS

CENTER FOR EPIDEMIOLOGY & POPULATION HEALTH

CURRENT EPIDEMIOLOGIC EVIDENCE ON ENVIRONMENTAL EXPOSURES AND PEDIATRIC CANCER

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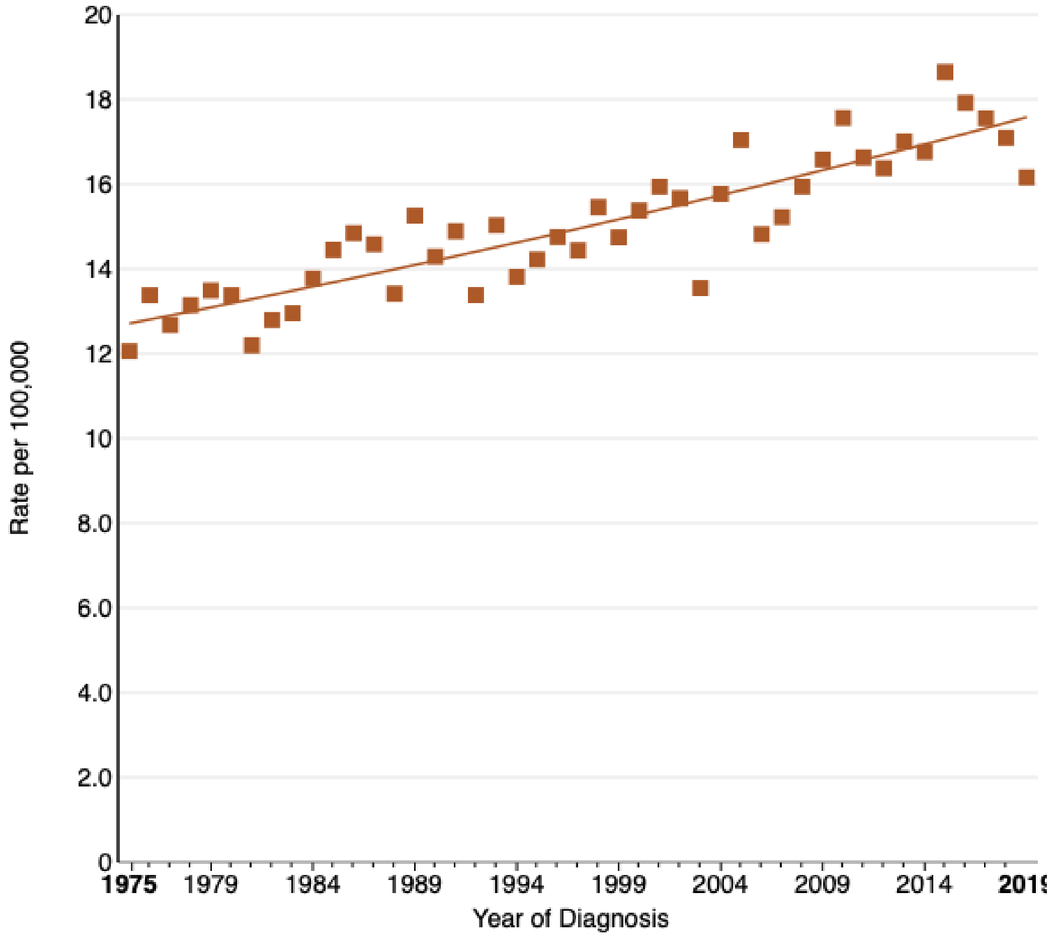
Childhood cancer incidence has increased by 45% since 1975 (0.8% APC)



Created by https://seer.cancer.gov/statistics-network/explorer on Thu Apr 06 2023.

- Only ~10% of these cancers are due to a known inherited pathogenic variant
- Growing concern over the contributions of environmental exposures
  - Small percentage due to exposure to ionizing radiation

IARC: Carcinogenic Hazards to Humans

Group 1	Carcinogenic to humans	126 agents
Group 2A	Probably carcinogenic to humans	94 agents
Group 2B	Possibly carcinogenic to humans	322 agents
Group 3	Not classifiable as to its carcinogenicity to humans	500 agents

https://monographs.iarc.who.int/

Group 1 Environmental Toxicants

- Ionizing Radiation
- Metals
- Organic chemicals, compounds, and substances
- Herbicides and pesticides
- Occupational hazards
- Food and plant-based compounds

Ionizing Radiation

	Pediatric Cancers	Adult Cancers
X and gamma radiation	Leukemia, CNS, solid tumors	Leukemia, DNA, numerous solid tumors
Radon	Leukemia	Lung, leukemia
Radium	Leukemia	Bone, paranasal sinus
Strontium	Leukemia, sarcomas	Bone, leukemia
Plutonium	***No studies to date***	Lung, bone, liver
Thorium	***No studies to date***	Liver/gall bladder, leukemia, pancreas, prostate

Pediatr Hematol Oncol 2022;39:193-202.

Metals

	Pediatric Cancers	Adult Cancers
Arsenic	*No association*	Lung, kidney, bladder, skin, liver, prostate
Beryllium	***No studies to date***	Lung
Cadmium	Leukemia, lymphoma	Lung, kidney, prostate
Chromium	Neuroblastoma, testicular GCT	Lung, nasal cavity, paranasal sinuses
Nickel	Leukemias	Lung, nasal cavity, paranasal sinuses

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Organic chemicals, compounds, and substances

	Pediatric Cancers	Adult Cancers
Benzene	Leukemia	Leukemia, myeloma, NHL
Benzopyrene	Leukemia, neuroblastoma	Lung
1,3-Butadiene	Leukemia	Hematolymphatic organs
Polychlorinated biphenyls (PCBs)	Leukemia	Liver, bile duct, breast
Tobacco [smoke]	Leukemias	Leukemia and numerous solid tumors

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Organic chemicals, compounds, and substances

	Pediatric Cancers	Adult Cancers
4-Aminobiphenyl	*No studies to date*	Bladder
Benzidine	*No studies to date*	Bladder
Bisether, chloromethyl esther	*No studies to date*	Lung
Coal emmissions	*No studies to date*	Lung, skin, bladder
Dichloropropane	*No studies to date*	Liver, bile duct
Ethylene oxide	*No studies to date*	Breast, lymphoma
Formaldehyde	*No studies to date*	Leukemia, nasopharynx, paranasal sinus

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Organic chemicals, compounds, and substances

	Pediatric Cancers	Adult Cancers
4-4’-Methylenebis (MOCA)	***No studies to date***	Bladder
Mineral & shale oils	***No studies to date***	Skin
2-Napthylamine	***No studies to date***	Bladder
Ortho-Toluidine	***No studies to date***	Bladder
Trichloroethylene (TCE)	***No studies to date***	Liver, biliary, NHL, kidney
Soot	***No studies to date***	Lung, skin, bladder
Vinyl chloride	***No studies to date***	Liver
Diesel/engine exhaust	***No studies to date****	Lung, bladder

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Herbicides and pesticides

	Pediatric Cancers	Adult Cancers
Pentachlorophenol (PCP)	Leukemia, lymphoma	NHL, nasopharyngeal, esophageal
Lindane	***No studies to date***	NHL
Tetrachlorodibenzo-p-dioxin	***No studies to date***	Lung, NHL, soft tissue sarcoma

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Occupational hazards

	Pediatric Cancers	Adult Cancers
Painting	Leukemia	Lung, mesothelioma, bladder
Wood & leather dust	Leukemia, CNS	Paranasal sinus, nasopharynx
Welding fumes	***No association***	Skin
Acid mist	***No studies to date***	Larynx, lung
Aluminum production	***No studies to date***	Lung, bladder
Auramine production	***No studies to date***	Lung, bladder
Iron & steel founding	***No studies to date***	Lung

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Occupational hazards

	Pediatric Cancers	Adult Cancers
Asbestos	***No studies to date***	Larynx, pharynx, lung, mesothelioma, ovary, colorectal, stomach
Coal production	***No studies to date***	Lung, skin, bladder
Erionite	***No studies to date***	Mesothelioma
Hematite mining	***No studies to date***	Lung
Silica dust	***No studies to date***	Lung
Rubber production	***No studies to date***	Leukemia, lymphoma, lung, stomach, bladder, larynx, prostate

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Food and plant-based compounds

	Pediatric Cancers	Adult Cancers
N-nitrosoamines	CNS	CNS
Alcohol	Leukemia, CNS, neuroblastoma	Breast, colorectal, larynx, liver, esophagus, oral cavity, pancreas
Aflotoxins	***No studies to date***	Liver
Aristocholic acid	***No studies to date***	Renal pelvis, ureter
Betel quid	***No studies to date***	Esophagus, oral cavity, pharynx
Salted fish	***No studies to date***	Nasopharynx

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Challenges

1. Difficult to estimate exposure during critical periods of development
   - Pre-conception, *in utero*, early childhood

2. Many of the IARC associations have not been fully evaluated among children and adolescents

3. Investigations to date have relied on self-reported questionnaire data and/or residential information

4. Pediatric cancers are less common and require large multi-institutional studies

Opportunities

1. Evaluate role of these exposures among vulnerable populations

2. Utilize novel analytic tools for biomarkers of exposure that can also pinpoint timing of exposure

3. Evaluate the interaction of the environment with the genome
   - Pre-conception, *in utero*, early childhood

4. Evaluate the effects of environmental exposures on outcomes and survival

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Thank You

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