

Glyphosate

Strategic Briefing for Lawyers and Activists

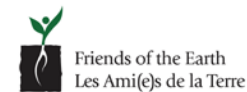
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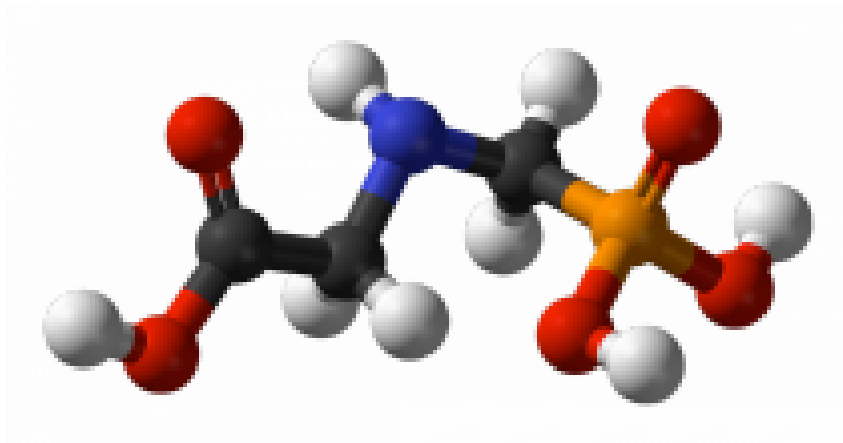
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Glyphosate

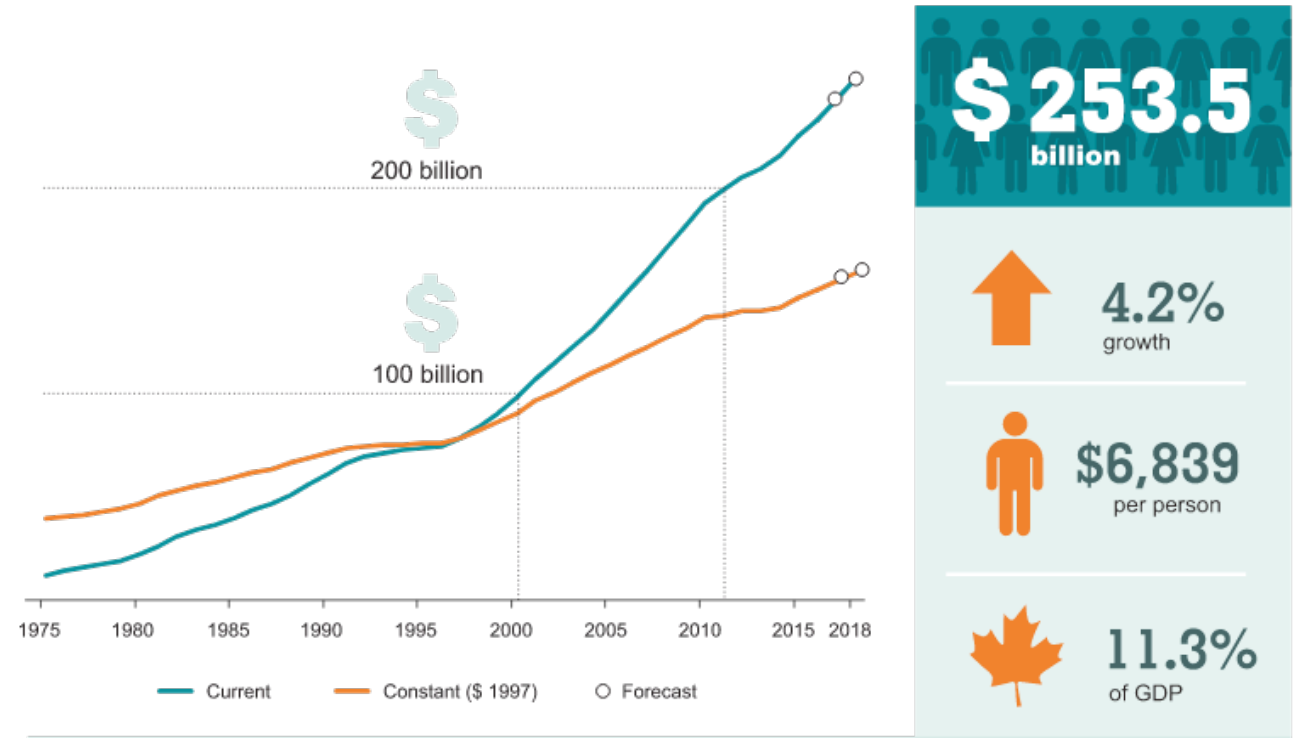


Glyphosate + Adjuvants (for penetration, spreading, sticking) = Roundup

Overview

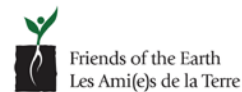
1. Health care costs
2. Glyphosate use
 - Unknown, but at least 5-fold higher than bleach, and 25-fold higher any other pesticide
3. Cancer – Why WHO/IARC is probably correct
4. Microbiome (Glyphosate is an antibiotic)
 - bowel disease, colorectal cancer ++
 - soil microbiome and crop quality
5. Pregnancy, fertility
6. Food quality, implications for new Food Guide

How much does Canada spend on healthcare?

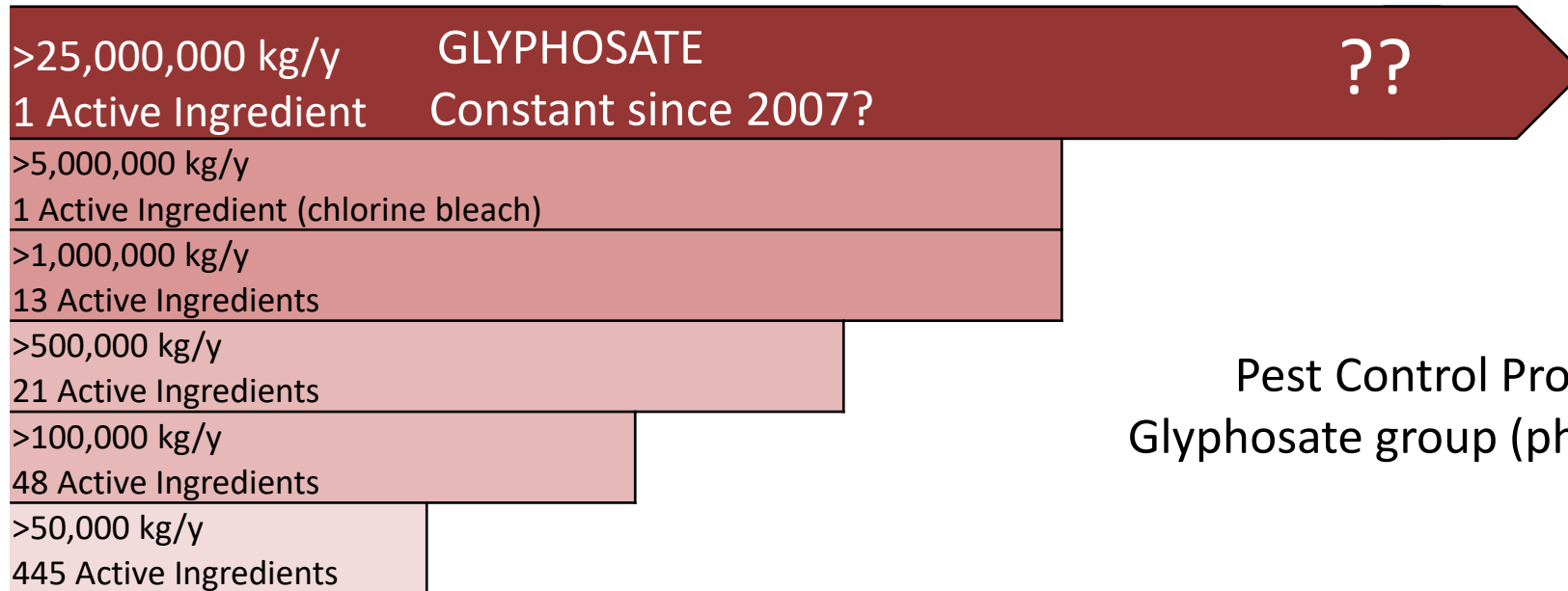


Source
National Health Expenditure Database, Canadian Institute for Health Information.

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Annual Pesticide Sales (2007 – on)



Pest Control Products Sales Reports (PMRA)
 Glyphosate group (phosphonic/phosphinic acids)
 49,000,000 kg/y in 2016

Glyphosate use in USA increased approx. 100-fold since mid-70s (Vandenberg *et al.* 2017. *J Epidemiol Community Health*)

Can glyphosate cause cancer?

International Agency for Research on Cancer (IARC)

- 2015 – Probable Human Carcinogen (2A)

Health Canada (and other regulators)

- Probably *not* a human carcinogen, based on (highly uncertain) exposure levels
- IARC is said to be irrelevant because exposure is not considered

... BUT

BUT IARC considered Canadian *real life* - epidemiology

Cancer Epidemiology, Biomarkers & Prevention

Non-Hodgkin's Lymphoma and Specific Pesticide Exposures in Men: Cross-Canada Study of Pesticides and Health

Vol. 10, 1155-1163, November 2001

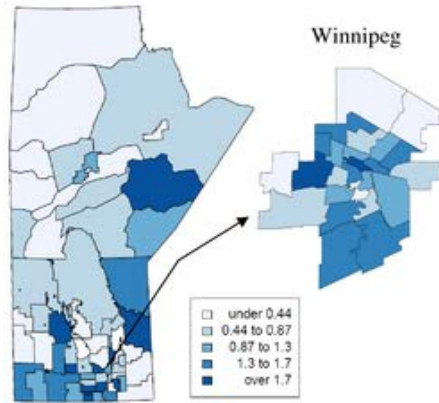
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“a dose-response relationship”
for glyphosate and non-Hodgkin's lymphoma

Several other international studies linked glyphosate and cancer

A

LL Standardized Incidence Ratio in Manitoba



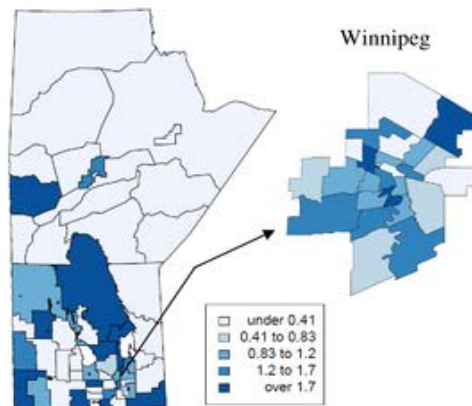
Blood Cancers in Manitoba children:

Lymphoid leukemia (LL), and Hodgkin lymphoma (HL) incidence (1984–2013)

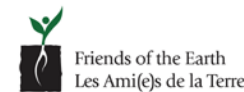
Lymphoid leukemia incidence rates in Manitoban children and adolescents increased 1.4% per year, 1984–2013.

B

HL Standardized Incidence Ratio in Manitoba



Ye et al., 2017 PLOS One

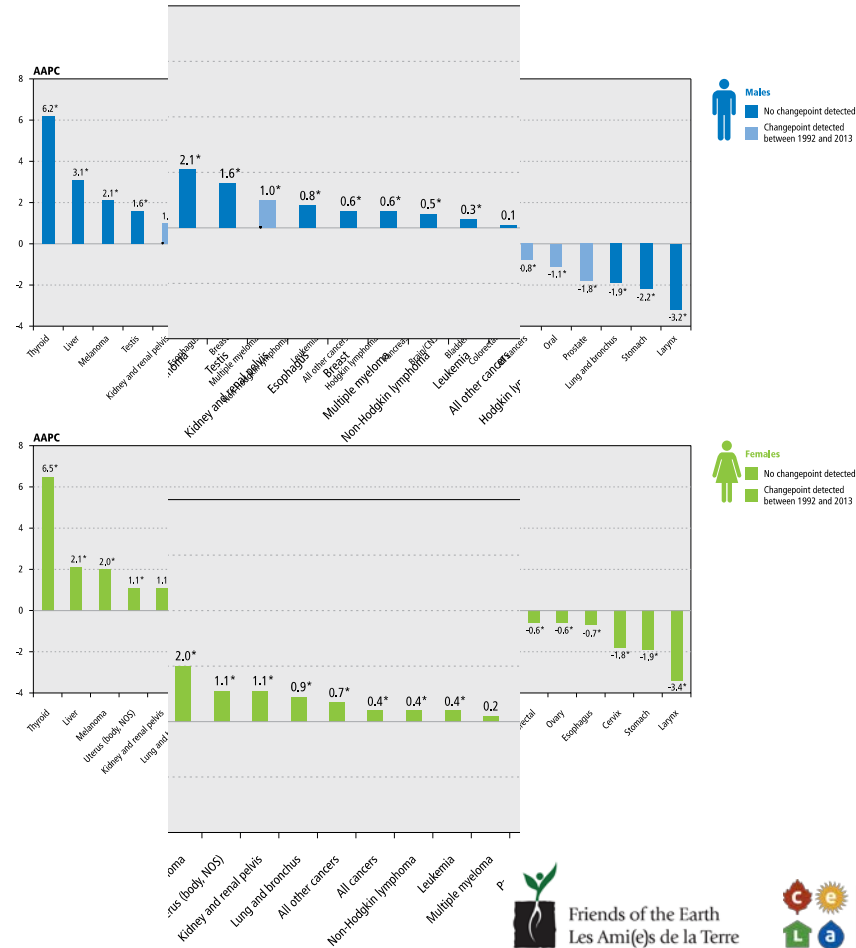


Canadian cancer incidence, 1992–2013 (CCS, StatsCan 2017)

Average annual percent change, age-standardized

Decreasing Incidence:
tobacco-associated cancers

Increasing Incidence:
thyroid, liver, melanoma, testis, uterus,
kidney/renal, eosophagus, breast,
hematological (including nHL),
“all cancers”



Colorectal cancer increasing since 1996 in Canadians under 50 y

6.7% per annum (15-29 y)

1.4% (30-39 y)

0.8% (40-49)

DESPITE

Significant decreases in alcohol consumption and smoking

Small increases in fruit and vegetable intake, and activity

Patel et al. 2017 Cancer Epidemiology

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Industry-Submitted Animal Studies Noted "Anal Staining" -> Not "Adverse" per PMRA

Microbiome is central to health – Glyphosate is an antibiotic & “Safe” levels damage intestinal microbiome

- **at environmental concentration of Roundup (0.1 ppb) ... *sex-dependent impact on rat gut microbiome***
Sex-dependent impact of Roundup on the rat gut microbiome. Lozano *et al.*, **2018** Toxicol Rep
- **“exposures to commonly used GBHs, at doses considered safe, are capable of modifying the gut microbiota in early development, particularly before the onset of puberty”**
The Ramazzini Institute 13-week pilot study on glyphosate and Roundup administered at human-equivalent dose to Sprague Dawley rats: effects on the microbiome. Mao et al. **2018** Environ Health DOI:10.1186/s12940-018-0394-x

Note: Effects on earth microbiome may cause higher mycotoxins in foods

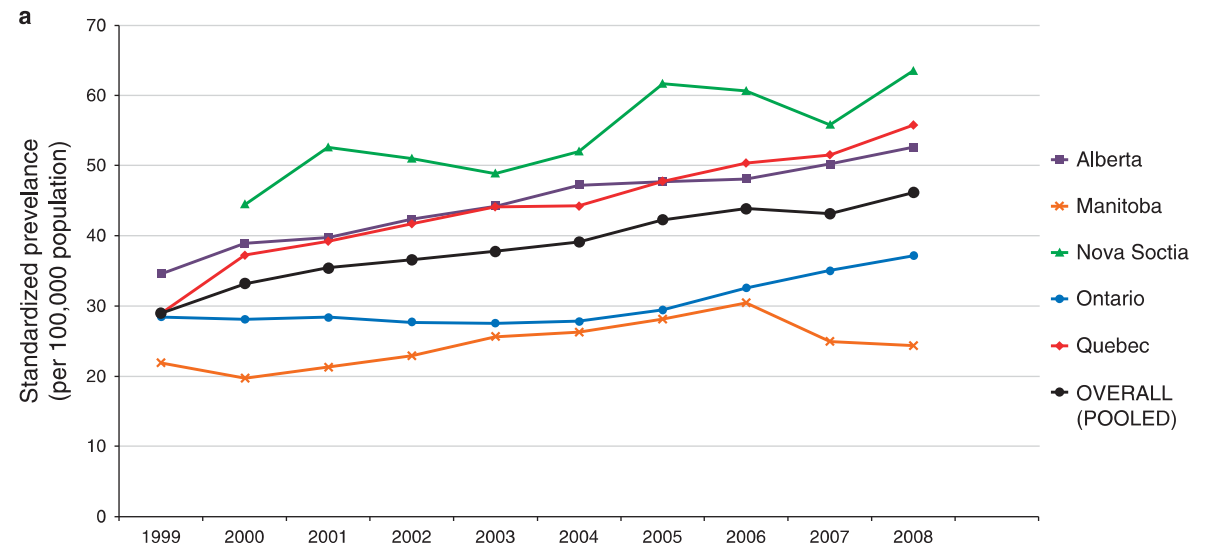
Rapidly increasing - Childhood onset inflammatory bowel disease (IBD)



Canada among highest prevalence of childhood IBD globally

- **Increased 4.6% annually** from 1999-2010 in youth under 16 y
- Driven by **7% increasing incidence annually** in children under 6 y

Trends in Epidemiology of Pediatric Inflammatory Bowel Disease in Canada: Distributed Network Analysis of Multiple Population-Based Provincial Health Administrative Databases
<http://www.nature.com/ajg/journal/v112/n7/full/ajg201797a.html>



Glyphosate linked to Spontaneous Abortion, Early Birth, Infertility

Late abortion associated with pre-conception glyphosate exposure

“... Effect of Pesticide Exposure on the Risk of Spontaneous Abortion in an Ontario Farm Population”

Arbuckle *et al.* (2001) *EHP* 109(8): 851–57.

More than 90% of pregnant women had detectable glyphosate

Levels correlated significantly with shorter pregnancy

“Glyphosate exposure in pregnancy and shortened gestational length: a prospective Indiana birth cohort study”

Parvez *et al.* (2018) *Environ Health*. <https://doi.org/10.1186/s12940-018-0367-0>

Glyphosate interferes with implantation in rats, via estrogen receptor

“Epigenetic disruption of estrogen receptor alpha is induced by a glyphosate-based herbicide in the preimplantation uterus of rats”

Lorenz *et al.* (2019) *Molecular Cellular Immunity*. 480:133-141

Canada's New Food Guide: Higher consumption of foods with glyphosate residues, mycotoxins *and* *cadmium?*

Cadmium is high in:

- Prairie soils
- Fertilizer (Canada has highest limits globally)
- Common crops hyper-accumulate Cd; organic food has less Cd
- (examined by Environment Canada in 1990s; documented since / e.g., Benbrook)
- Glyphosate mobilizes cadmium from soil (Zhou et al., 2004, Chemosphere)
- Glyphosate, mycotoxin and cadmium levels are monitored in Canadian *exports* (Canadian Grain Commission)

What about Canadians' food?

New Food Guide recommends higher consumption of foods that may be sprayed with glyphosate before harvest, with higher permitted residues.

Thank you!

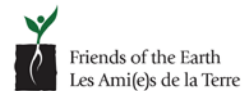
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