

Di(2-ethylhexyl) phthalate (DEHP) in Canadians

December 2021



Health
Canada Santé
Canada

Canada

Health Canada is the federal department responsible for helping the people of Canada maintain and improve their health. Health Canada is committed to improving the lives of all of Canada's people and to making this country's population among the healthiest in the world as measured by longevity, lifestyle and effective use of the public health care system.

Suggested citation:

Health Canada. 2021. Di(2-ethylhexyl) phthalate (DEHP) in Canadians. Ottawa, ON. Available: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/environmental-contaminants/human-biomonitoring-resources/2-ethylhexyl-phthalate-canadians.html>

Également disponible en français sous le titre :

Santé Canada. 2021. Le phtalate de bis(2-éthylhexyle) (DEHP) dans la population canadienne. Ottawa (Ont.).

To obtain additional information, please contact:

Health Canada
Address Locator 0900C2
Ottawa, ON K1A 0K9
Tel.: 613-957-2991
Toll free: 1-866-225-0709
Fax: 613-941-5366
TTY: 1-800-465-7735
E-mail: hc.publications-publications.sc@canada.ca

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Health, 2021

Publication date: December 2021

This publication may be reproduced for personal or internal use only without permission provided the source is fully acknowledged.

Cat.: H129-119/4-2021E-PDF
ISBN: 978-0-660-40593-3
Pub.: 210376

BACKGROUND



What is di(2-ethylhexyl) phthalate (DEHP)?

DEHP (CASRN 117-81-7) is part of a class of synthetic chemicals known as phthalates. Phthalates are used as solvents in household products and as plasticizers to make plastics more flexible and resilient.



Where is DEHP found?

Globally, DEHP is used in many products, including plastic food packaging, toys and child-care articles, and construction and renovation products, such as lubricants and greases, adhesives and sealants, paints and coatings, and building materials.



How are people exposed to DEHP?

People can be exposed to DEHP and other phthalates when they inhale indoor air, ingest water, food, beverages, soil and dust. They can also be exposed when using consumer products. Other potential sources of exposure are breast milk and the mouthing of children's toys and articles.



How is DEHP measured in people?

DEHP is absorbed after being ingested and is rapidly broken down in the body to form metabolites. Metabolites of DEHP are commonly measured. They can include mono(2-ethylhexyl) phthalate (MEHP), mono(2-ethyl-5-oxohexyl) phthalate (MEOHP), mono(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), mono(2-ethyl-5-carboxypentyl) phthalate (MECPP) and mono[2-(carboxymethyl)hexyl] phthalate (MCMHP). Measurement of these metabolites in urine reflects relatively recent exposure.



What are the potential health impacts of DEHP?

Evidence from animal studies has shown that DEHP exposure may lead to developmental and reproductive effects. It may also affect the liver and kidneys. The International Agency for Research on Cancer has classified DEHP as possibly carcinogenic to humans.



What is the Government of Canada doing to lower human exposures to DEHP?

DEHP is identified as toxic under the *Canadian Environmental Protection Act, 1999*. It is on the List of Ingredients that are Prohibited for Use in Cosmetic Products. Regulations limit the use of DEHP in soft vinyl toys and child-care articles. Environment and Climate Change Canada and Health Canada's risk management approach for DEHP outlines additional existing and proposed regulations. The Government of Canada continues to monitor and assess DEHP.

DATA SOURCES

Table 1. Biomonitoring initiatives and their target populations

Initiative	Target population
Canadian Health Measures Survey (CHMS)	General Canadian population living in the 10 provinces
First Nations Biomonitoring Initiative (FNBI)	First Nations people living on-reserve south of the 60° parallel
Maternal-Infant Research on Environmental Chemicals (MIREC) study	Pregnant women and their infants recruited from obstetric and prenatal clinics in 10 cities across Canada
U.S. National Health and Nutrition Examination Survey (NHANES)	General U.S. population

This fact sheet presents nationally representative data from the CHMS. These data are compared with data from the FNBI, the MIREC study and the U.S. NHANES.

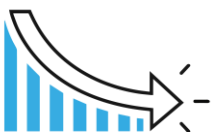
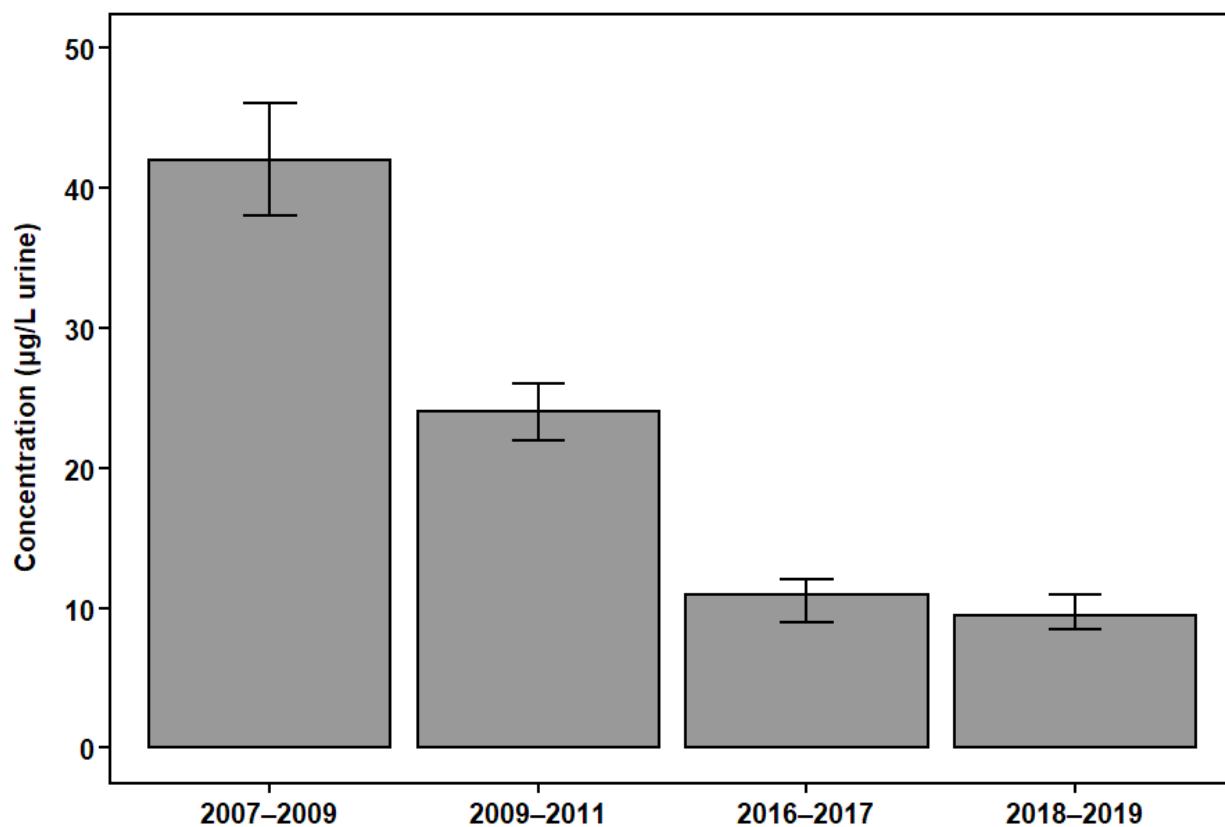
Table 2. Biomonitoring initiatives and their collection periods, participant age ranges, matrices sampled and biomarkers measured

Collection period	Age range (years)	Matrix	Biomarkers
CHMS			
2007–2009	6 to 49	Urine	MEHP, MEOHP, MEHHP
2009–2011	3 to 79	Urine	MEHP, MEOHP, MEHHP
2016–2017	3 to 79	Urine	MEHP, MEOHP, MEHHP
2018–2019	3 to 79	Urine	MEHP, MEOHP, MEHHP
FNBI			
2011	20+	Urine	MEHP, MEOHP, MEHHP
MIREC study			
2008–2011	18+	Urine	MEHP, MEOHP, MEHHP
U.S. NHANES			
2009–2010	6+	Urine	MEHP, MEOHP, MEHHP
2011–2012	6+	Urine	MEHP, MEOHP, MEHHP
2013–2014	6+	Urine	MEHP, MEOHP, MEHHP
2015–2016	3+	Urine	MEHP, MEOHP, MEHHP

RESULTS

Canadian population

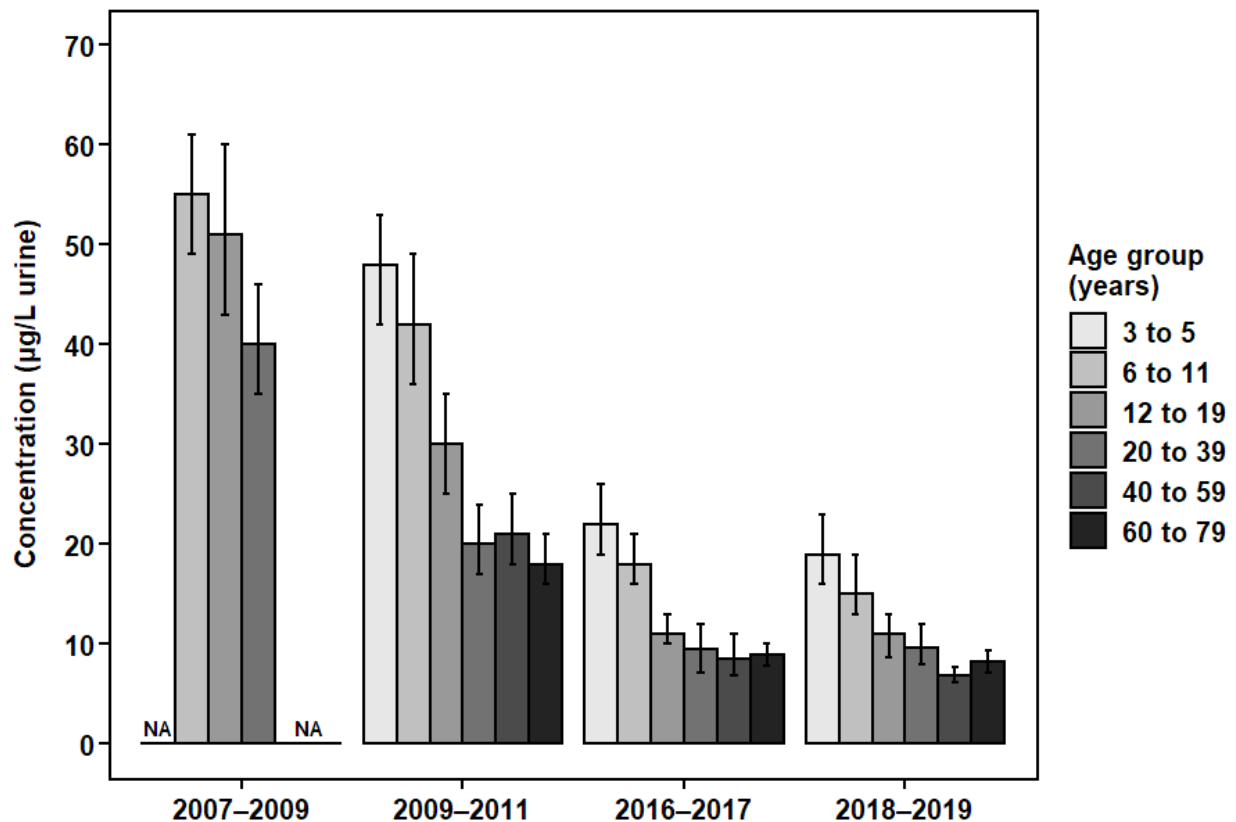
Figure 1. DEHP concentrations in the Canadian population aged 6 to 49. This figure shows the geometric mean concentrations of DEHP in the Canadian population from the CHMS (2007–2019). DEHP was calculated as the sum of 3 metabolites (MEHP, MEOHP and MEHHP). Each metabolite was measured in urine ($\mu\text{g/L}$).



There was a statistically significant decreasing trend ($P < 0.001$) in DEHP concentrations in the Canadian population aged 6 to 49. Concentrations declined by 77% between 2007–2009 and 2018–2019.

Canadian population, by age group

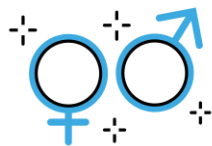
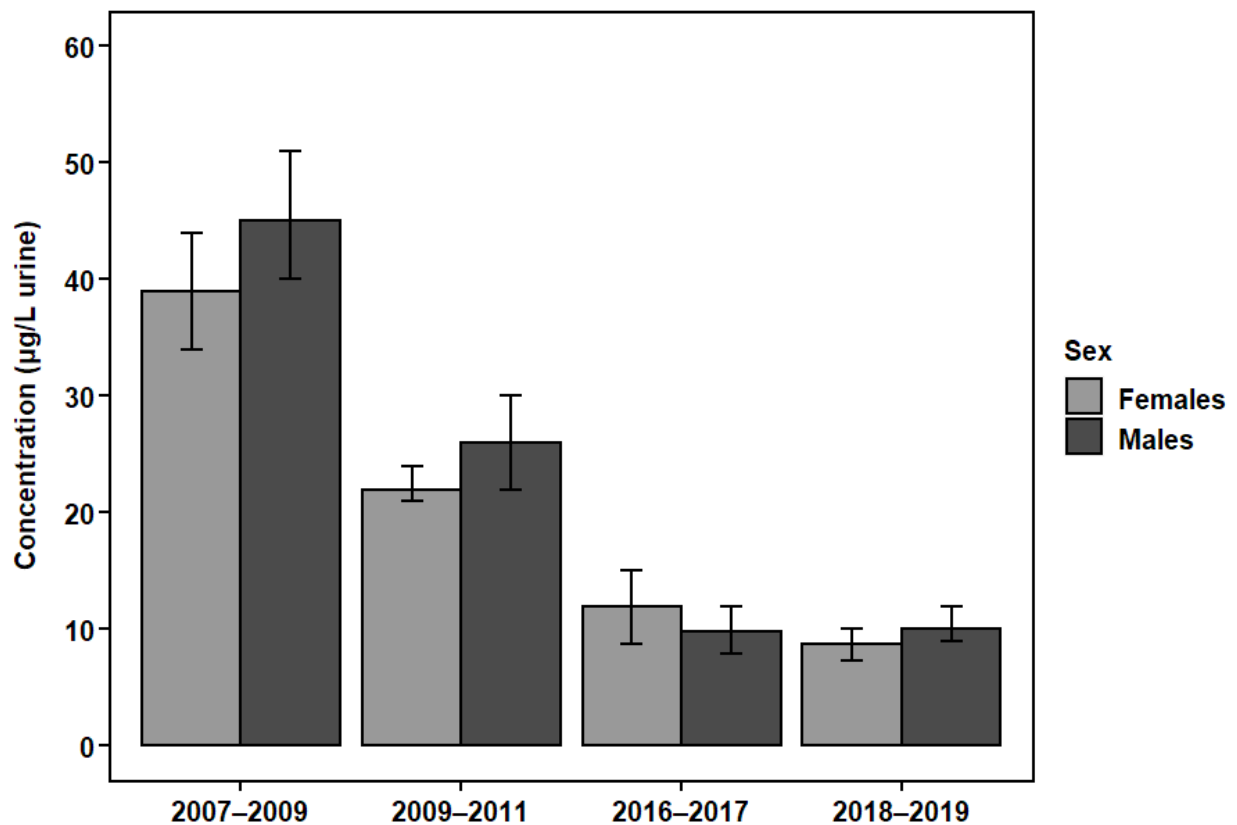
Figure 2. DEHP concentrations in the Canadian population, by age group. This figure shows the geometric mean concentrations of DEHP in the Canadian population by age group from the CHMS (2007–2019). DEHP was calculated as the sum of 3 metabolites (MEHP, MEOHP and MEHHP). Each metabolite was measured in urine ($\mu\text{g/L}$). DEHP metabolites were measured in individuals aged 6 to 49 in 2007–2009. Concentrations were therefore not available (NA) for individuals aged 3 to 5, 50 to 59 or 60 to 79.



Concentrations of DEHP were higher in children than in adults in the Canadian population.

Canadian population, by sex

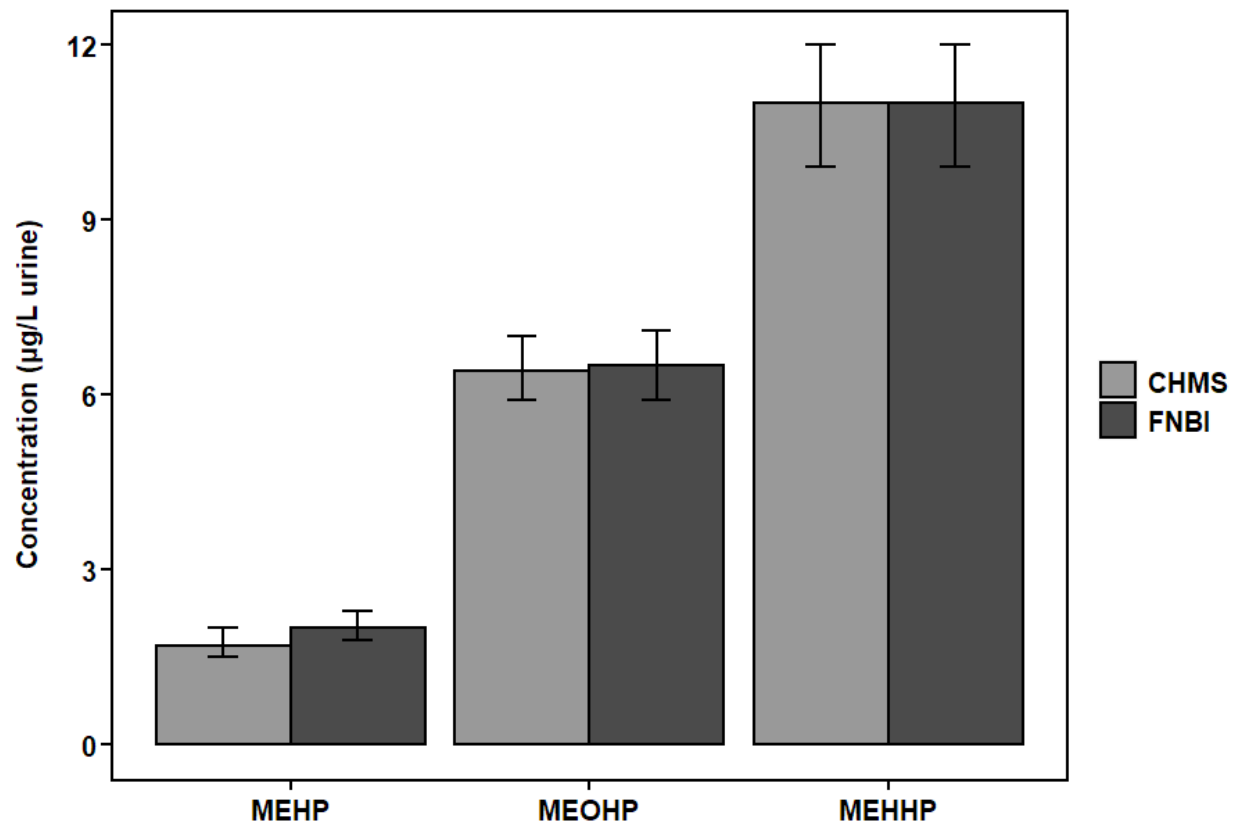
Figure 3. DEHP concentrations in the Canadian population aged 6 to 49, by sex. This figure shows the geometric mean concentrations of DEHP in the Canadian population by sex from the CHMS (2007–2019). DEHP was calculated as the sum of 3 metabolites (MEHP, MEOHP and MEHHP). Each metabolite was measured in urine ($\mu\text{g/L}$).



Concentrations of DEHP were similar between females and males in the Canadian population.

Comparison of the general population and First Nations on-reserve population in Canada

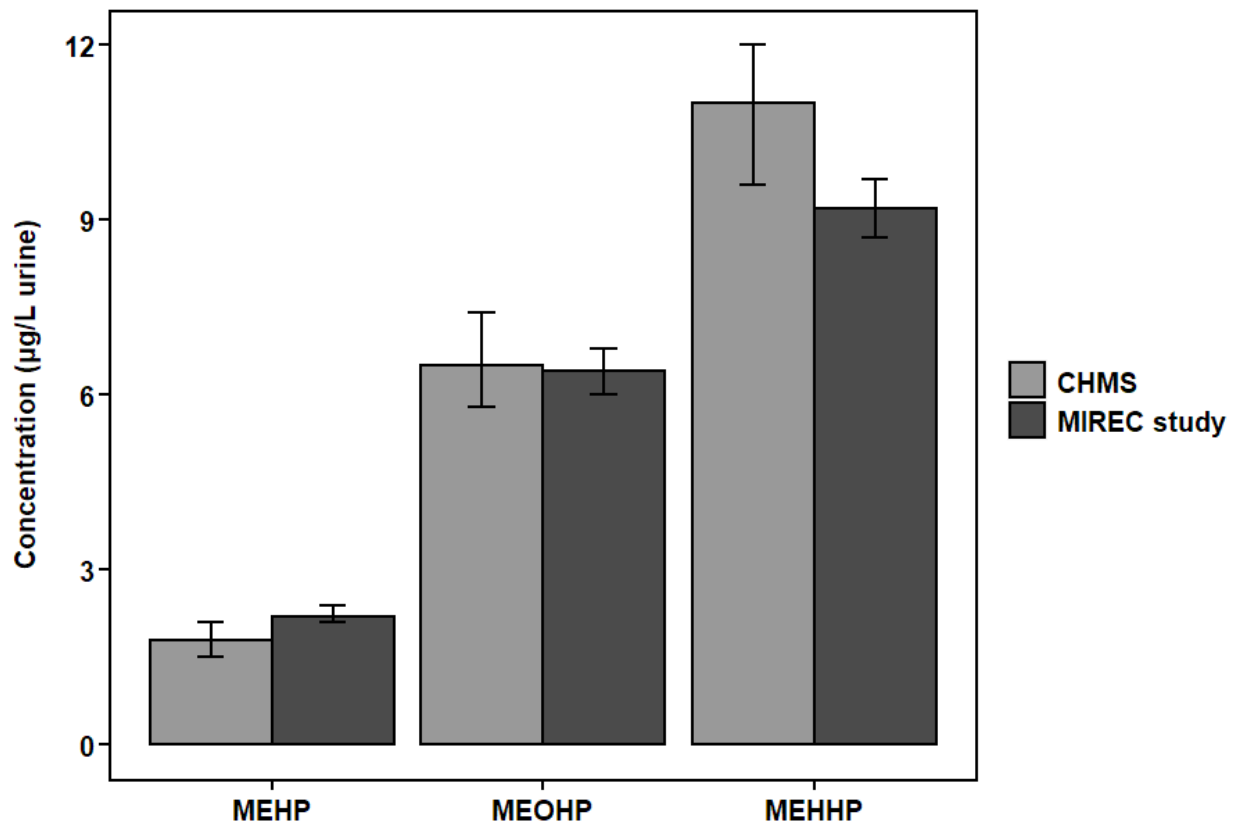
Figure 4. DEHP metabolite (MEHP, MEOHP and MEHHP) concentrations in the general population and First Nations on-reserve population in Canada. This figure shows the geometric mean concentrations of DEHP metabolites in urine ($\mu\text{g/L}$) in the general population aged 20 to 79 from the CHMS (2009–2011) and First Nations on-reserve population aged 20 and older from the FNBI (2011).



Concentrations of DEHP metabolites were similar between the general population and First Nations on-reserve population in Canada.

Comparison of women of child-bearing age and pregnant women in Canada

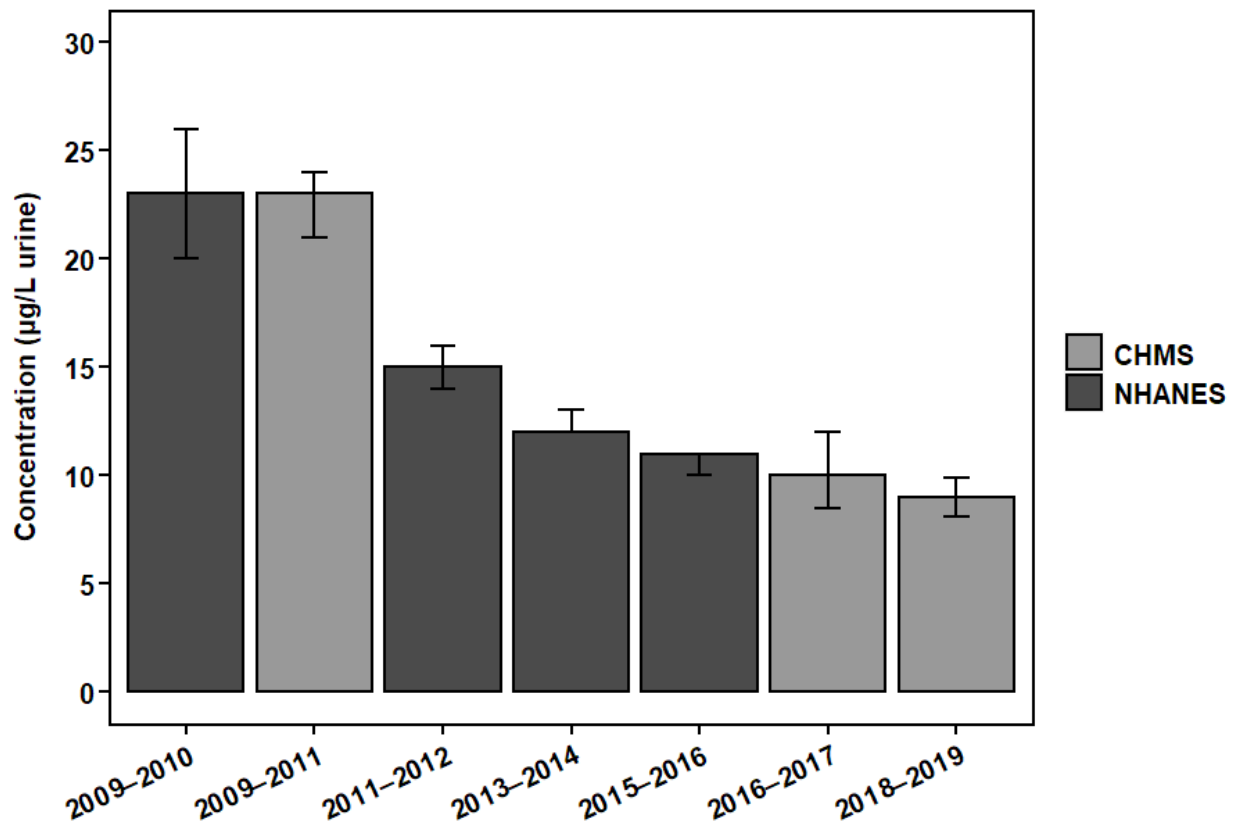
Figure 5. DEHP metabolite (MEHP, MEOHP and MEHHP) concentrations in women of child-bearing age and women in the first trimester of pregnancy in Canada. This figure shows the geometric mean concentrations of DEHP in urine ($\mu\text{g/L}$) for women of child-bearing age (18 to 49) in the general population from the CHMS (2009–2011) and for women in the first trimester of pregnancy from the MIREC study (2008–2011).



Concentrations of DEHP metabolites were similar between women of child-bearing age and women in the first trimester of pregnancy in cities across Canada.

Comparison of the Canadian and U.S. populations

Figure 6. DEHP concentrations in the Canadian and U.S. populations. This figure shows the geometric mean concentrations of DEHP in the Canadian population from the CHMS (2009–2019) and in the U.S. population from the NHANES (2009–2016). DEHP was calculated as the sum of 3 metabolites (MEHP, MEOHP and MEHHP). Each metabolite was measured in urine ($\mu\text{g/L}$). Note that there are slight differences between the surveys in sampling (such as the age ranges of participants) and analysis (such as the limits of detection).



Concentrations of DEHP were similar between the Canadian and U.S. populations.

ADDITIONAL INFORMATION

Arbuckle TE, Davis K, Marro L, Fisher M, Legrand M, LeBlanc A, Gaudreau, E, Foster WG, Choeurng V, Fraser WD, MIREC Study Group. 2014. Phthalate and bisphenol A exposure among pregnant women in Canada – Results from the MIREC study. *Environment International*, 68: 55–65.

Assembly of First Nations. 2013. First Nations Biomonitoring Initiative: National Results (2011). Ottawa, ON, Canada.

Centers for Disease Control and Prevention. 2021. National Report on Human Exposure to Environmental Chemicals. Atlanta, GA, USA.

Environment and Climate Change Canada and Health Canada. 2020. Risk management approach for 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester (DEHP). Ottawa, ON, Canada.

Health Canada. 2010. Report on Human Biomonitoring of Environmental Chemicals in Canada: Results of the Canadian Health Measures Survey Cycle 1 (2007–2009). Ottawa, ON, Canada.

Health Canada. 2013. Second Report on Human Biomonitoring of Environmental Chemicals in Canada: Results of the Canadian Health Measures Survey Cycle 2 (2009–2011). Ottawa, ON, Canada.

Health Canada. 2019. Fifth Report on Human Biomonitoring of Environmental Chemicals in Canada: Results of the Canadian Health Measures Survey Cycle 5 (2016–2017). Ottawa, ON, Canada.

Health Canada. 2021. Sixth Report on Human Biomonitoring of Environmental Chemicals in Canada: Results of the Canadian Health Measures Survey Cycle 6 (2018–2019). Ottawa, ON, Canada.