SUMMARY

ENVIRONMENTAL CONTAMINANTS: PERSISTENT ORGANIC POLLUTANTS AND CONTAMINANTS OF EMERGING ARCTIC CONCERN

QANUILIRPITAA? 2017

Nunavik Inuit Health Survey

The Inuit of Nunavik are exposed to persistent organic pollutants (POPs), a group of synthetic industrial compounds that are carried to northern latitudes by oceanic and atmospheric transport and then biomagnified in Arctic food webs. POPs include organochlorine pesticides, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and per- and polyfluoroalkyl substances (PFASs). Global levels of many of these compounds have been decreasing over the last two decades after national and international efforts, such as the United Nations Environment Programme (UNEP) Stockholm Convention on Persistent Organic Pollutants, which banned a list of POPs. However, as these pollutants can persist for a long time in the environment, there are still elevated levels of several POPs in the Arctic that could elicit downstream health impacts. Moreover, recent evidence suggests that long-chain perfluoroalkyl acids (PFAAs) are on the rise in the Arctic. PFAAs are contaminants in the PFAS family that likely result from the degradation of other unregulated PFASs. In the *Qanuippitaa?* Nunavik Inuit Health Survey in 2004, older age and consuming larger quantities of marine mammals were identified as important determinants of Nunavimmiut exposure to organochlorines (including PCBs), and perfluorooctanesulfonic acid (PFOS, the first PFAA released on the market). Elevated exposures to these POPs in Nunavik have been associated with several health effects, including cardiometabolic and endocrine outcomes in adults, and subtle developmental impairments in children.

The objectives of this report are: (i) to document plasma levels of POPs among Nunavimmiut aged 16 years and over by age and sex in 2017; (ii) to compare these results to those of the 1992 Santé Québec Survey and the 2004 *Qanuippitaa?* Nunavik Inuit Health Survey, other Inuit populations in Canada, and the general Canadian population; and (iii) to examine associations between potential determinants of exposure and plasma concentrations of POPs among Nunavimmiut.

Plasma levels of organochlorines (including PCBs) have decreased by half since 2004, and PBDEs were largely not detected in 2017. PFOS decreased by more than threefold between 2017 and 2004. In 2017, concentrations of organochlorines were lower than they had been in Nunavut, Nunatsiavut, and the Inuvialuit Settlement Region in 2007-2008. However, several organochlorines were 7 to 10-fold higher among Nunavimmiut in 2017 than the latest general Canadian measurements in 2007-2008. Additionally, mean PFOS was 1.5 higher, and long-chain PFAAs (i.e. PFNA, PFDA and PFUdA) were 4 to 7-fold higher in Nunavik in 2017 compared to the general Canadian population in 2017-2018.

All POPs levels were higher among older Nunavimmiut, and the general trend pointed to higher POP concentrations in younger men compared to younger women and in older women compared to older men. Hexachlorobenzene and toxaphenes (two organochlorines) as well as long-chain PFAAs levels were higher in women. Mirex (another organochlorine), and two other PFAAs (PFOA and PFHxS) levels were higher in men. Concentrations of all organochlorines (except mirex) were higher in Hudson Strait versus Hudson Bay and Ungava Bay villages. On the other hand, higher PFOS concentrations were observed in Hudson Bay and Hudson Strait versus Ungava Bay villages, and higher concentrations of long-chain PFAAs were noted in Hudson Bay versus Ungava Bay villages.

All POPs were associated with marine mammal and/or fish/seafood consumption. Mirex, PCBs, and PFAAs levels were also associated with wild bird consumption. Similarly, all POPs were associated with increasing long-chain omega-3 polyunsaturated fatty acids in red blood cells. Toxaphenes and chlordane compounds levels in particular were approximately 10-fold higher in the fourth quartile of RBC n-3-PUFA compared to the first quartile. Additionally, the increase across quartiles was markedly stronger for PFOS and long-chain PFAAs compared to PFOA and PFHxS. This supports previous observations regarding the contribution of country food consumption to POP exposure, and particularly the contribution of consuming marine foods which are exceptionally rich in high-quality fats and proteins. More in-depth multivariate analyses are needed to explore these findings.

All POPs, except *p,p'*-DDE (an organochlorine), were associated with living in a house in need of major repairs. No POPs were associated with smoking status. Further studies are required to investigate other possible sources of POPs exposure, including market foods and food packaging, market products (such as cosmetics for PFASs), local water sources, and indoor furniture and residential dust.

These findings indicate that despite the decrease in legacy POP exposure by approximately half between 2004 and 2017, concentrations of many POPs in Nunavik remain several fold higher than among the general Canadian population. Furthermore, evidence points to an increase in exposure to long-chain PFAAs, which are an emerging public health concern in the region. Assessing temporal trends of POPs in general as well as identifying sources of exposure to PFAAs and their possible health effects are required to advocate against the production and use of these persistent chemicals worldwide.

Qanuilirpitaa? 2017 is a population health survey carried out in Nunavik from August to October 2017. A total of 1 326 Nunavimmiut aged 16 and over from all 14 villages participated to this survey.

Nakurmiik to all Nunavimmiut who contributed to this important health survey!

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