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Mélanie Lemire—Be honest, transparent, culturally relevant, and take time, and then more time

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Abstract

This essay is part of a series of essays that are based on interviews conducted for this special issue with people who practice risk communication related to human or natural hazards as part of their professions.

1 | IMMERSION INTO RISK COMMUNICATION CHALLENGES WITH PEOPLES OF THE AMAZON

Mélanie Lemire arrived in the Amazon to work on a project focused on examining the levels of mercury and selenium in fish and local foods, and the movement of mercury through the food chain. These pollutants expose Amazonian riparian communities who rely on subsistence fishing to increasing risk. There is widespread environmental concern about the exposure of coastal communities as a consequence of slash-and-burn agriculture and related deforestation. These practices lead to the release and leaching of mercury from soils into places such as the Tapajós River basin, the focus of Lemire's work. Huge quantities of mercury are released into the environment, streams, and rivers where biomethylation and bioamplification expose the fish-consuming communities. The overarching issues were whether people and biota were exposed to adverse levels of mercury, and how to reduce exposure and mitigate the harmful effects of mercury on riverside populations' health. The project involved both examining mercury levels in different fish and determining mercury levels in the blood of local residents, many of whom consumed large quantities of fish. The project also studied the impacts of mercury and fish, and local food nutrients on health. It was initially a straight-forward scientific project. What they found, however, was that science alone was not enough.

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> There was essentially no public health organization in the region, the researchers had to do everything, from the science to the risk management and communication. We had an interdisciplinary team that had to be scientists and risk communicators. We had to gain their trust to participate. We had to go back to the participants and report their mercury blood results, and to explain to them what it meant and what could be done to reduce mercury exposure. We also explained to communities the global findings of the project and what could be done to reduce mercury load in local aquatic ecosystems. And there was no local health organization that had the time or willingness to do that and no 'warning traditions.'

The scientists, as is often the case, were put in the position of trying to communicate the intricacies of a complex food chain that bioaccumulates mercury, and the relationships between deforestation, mercury bioaccumulation, and bioamplification in fish species. This included discussion of how the size and age of the fish could affect the human risk of mercury exposure. Fish had never been viewed as a source of harm. The team was always cautious of not scaring off people from fish, but rather informing them about the specific ones with high mercury by using the core message: "Eat more fish that don't eat other fish." Despite these efforts, some mistakes were made. For example, they developed a color-scheme to use on brochures to communicate the levels of mercury in fish. From a "western perspective," they produced brochures that colored the fish that were high in mercury red (not recommended to eat), and those that were low in mercury green (safe to eat).

> This turned out to be a 'foreign' communication vision of risk from consumption of fish. The fisherman came back to us and proudly said – my fish is not red, so it is not high in mercury and I can eat it. Our message was thus not understood at that time, but we made sure to improve our communication tools each time we visited them. Risk communication is a great learning process!

In the end, the risk communication strategy they developed was more complex and provided information that relied on local knowledge rather than providing a fish chart to each community: fish caught in nondeforested areas and fish not eating other fish were lower in mercury. It turned out that the local people knew which fish were predatory (and thus accumulated high levels of mercury), and they could avoid those fish. Once they knew it was predatory fish, they replaced them in their diet with other fish species lower in mercury. Her research group also had individual meetings with people and with communities, and they developed two comic books that portrayed their message. Many adults and children attended meetings, read the comic books, and it was successful at that time. It was unclear whether the message persisted over time since the research project was completed. Ultimately, the lack of a local public health infrastructure made risk communication difficult and hard to sustain.

2 | NUNAVIK, NORTHERN QUEBEC—A POTENTIAL CLASH OF CULTURES

Dr. Lemire's expertise in environmental health in the Amazon, and in examining mercury and other contaminants and nutrients in foods, resulted in her being asked to identify the country foods responsible for most mercury intake in the Nunavik region of Northern

Quebec. “Country foods” is the term for foods that are hunted or gathered locally, usually by traditional methods. The science issue was whether mercury (or other contaminants) posed a risk to people or the environment, and which country foods were mainly responsible for mercury exposure. The risk communication challenge was how to avoid scaring Inuit away from country foods while figuring out who to prioritize when communicating, deciding what aspects of risk to emphasize, and determining whether group such as pregnant women (the group most at risk from mercury) needed their own focus.

The situation in the Nunavik region differs greatly from that in the Amazon, culturally, politically, and economically. Unlike the Amazon communities she worked with, Quebec has a strong provincial and regional public health agency, including one in Nunavik, northern Quebec. It is also complex because there are different groups of health providers from different cultures including physicians (non-Indigenous), nurses (largely non-Indigenous), and midwives (mostly Inuit). There are also 14 different Nunavik communities that are isolated (except by plane) but just two hospitals, and four maternity clinics. Further, Quebec is a francophone province, whereas in Nunavik, the native language is Inuktitut and the second language is English. Thus, risk communication has to be done in several languages. Further, in Inuktitut, words like mercury do not translate very well. One of the important additional dynamics is the geographical separation between most of the people of Quebec, and the indigenous Inuit communities to the far north.

> The midwives are all from the Inuit villages and are highly respected; most of the nurses are from down south. Several nurses work for private agencies, and not the government. Some of the nurses have no specific training in cultural sensitivity and have too many people to interact with. When we asked them how we could share information with them about the benefits and risks of country foods, several said they want one-pagers, short and sweet, whereas Inuit health professionals and physicians were more interested in understanding the issue and accessing more in-depth information (but also needed the one-pager!).

Dr. Lemire was responsible for examining the country foods consumed that were responsible for the highest levels of mercury intake, and in collaboration with Northern and Southern colleagues looking at the levels of mercury and other contaminants in the country foods. It turned out they preferentially liked Beluga whale meat and beluga *nikku* (locally air-dried meat). These are apparently a wonderful snack, but unfortunately the drying results in there being four times as much mercury per gram consumed. The mercury levels in Beluga meat are already very high (averaging about 1 ppm, above the health standards of 0.3–0.5 ppm, depending upon health agency, ATSDR, 1999), so the levels in Beluga jerky are quite high (4 ppm, Lemire e al., 2015). Culturally, and traditionally, Beluga is an important delicacy and staple food for Inuit. The Inuit are also limited in how many Beluga Whales they can kill because of fisheries quotas. Conversely, Beluga mattaaq, another greatly preferred food made of beluga skin and fat, is exceptionally rich in selenium (mostly selenoneine), as well omega-3 fatty acids and lipophilic vitamins, and it contains only moderate levels of mercury. As a whole, despite some foods having high levels of contaminants, country foods are also often of exceptional nutritional quality and are essential to fight anemia and food insecurity, which are prevalent in the North. The high levels of mercury and other contaminants in

country foods present risk implications that are not easily communicated in a complex political, economic, and social context. An added level of complexity is seasonality because the Beluga meat is largely eaten in the summer when they can capture the whales, and consequently, hair mercury levels among pregnant women in Nunavik are higher in summer. Thus, communication of the risk from mercury in Beluga meat should be reinforced for pregnant women during the summer.

> Rightly, the Nunavik Public Health Department, and the Nunavik Nutrition and Health focuses on promoting country foods consumption and their multiple benefits for pregnant women and their infants, while increasing women's awareness about mercury and providing targeted dietary counselling to invite them, when possible, to avoid consuming country food high in mercury (e.g., Beluga meat and *nikku*) for the few months before and during pregnancy, especially when Beluga harvesting season is coming. Risk communication is a delicate balance between providing information on levels of mercury in whale meat, potential risk, and promoting country foods.

3 | RISK COMMUNICATION AS AN EVOLVING PROCESS

In 2011, the Nunavik Nutrition and Health Committee released communication materials about the importance of decreasing consumption of country foods that are high in mercury and increasing the use of foods that are low in mercury. They hoped that this message would reach the Inuit Nunavik community, and result in changes in behavior. Although the physicians were interested in the details of mercury exposure, the message did not resonate with most of the Nunavimmiut (the Inuit of Nunavik). Moreover, it was reported that some nurses found the complexity of the message difficult to communicate to community members and found it easier to just say—do not eat country foods. This was not the intended message of Nunavik Public Health, or the Nunavik committee, as both public health groups are committed to promoting the consumption of country foods rather than processed foods of poor nutritional quality. This led to the realization that the public health community needed a more strategic approach.

In Nunavik, when an Inuit has elevated blood mercury (tested through a research project or after the request by a physician), the public health system initiates a clinical follow-up through local physicians, nurses, and midwives. After a broad consultation of public health professionals and Inuit colleagues in 2019, it became obvious that a more efficient way to conduct risk communication with pregnant women was through specific clinical follow-up and dietary counselling, when relevant. The communication issue with the pregnant women was the balance between having sufficient time to learn information about mercury exposure, and facing more severe and immediate problems, such as tuberculosis, suicide, and infectious diseases. Food insecurity (shortage) or anemia is also a significant risk. No one immediately sees the symptoms of mercury poisoning, nor the developmental delays, while the manifestations of tuberculosis and other infections, and food shortages are obvious. This resulted in an evolving process, according to Lemire.

> The current approach (that will be implemented in the coming year after COVID) is to make blood mercury testing available to pregnant women or women planning on

> becoming pregnant, if they want to. If needed, dietary counselling will be provided with information on mercury levels in different types of country food they eat (and in different parts of animals such as whales), and let the pregnant women make their risk decisions. 90% of pregnant women face food insecurity at sometimes during the year, and they have to make their own decisions about what to eat and what is available to eat at that time. We are planning to develop information tools specific to each health professional group (i.e., physicians, nurses, midwives, translators), and to incorporate Inuit midwives' knowledge about country food consumption during pregnancy into these tools. Tools will also be developed for pregnant women and women elders, which play a key role during their pregnancy.

Dr. Lemire and the other Nunavik Public Health colleagues are all committed to improving the health of Nunavimmiut. They recognize the importance of developing communication tools for different groups, including the knowledge of midwives, who are community members and highly respected. Gaining trust among different groups occurs over time, with humility, and when taking time to consult, listen, and integrate all perspectives about these important issues to jointly foster healthy pregnancies and healthy babies. Trust has to be earned.

> I just put on my rubber boots, as if I was in my home village, and talk about the importance of local foods, and about my father as a hunter. I followed in my mentor's footsteps, which gave me some credibility. I talk to them as an equal since every trip to Nunavik is a great learning experience. It is reciprocal, I provide some information and they provide some information. I spent time with Nunavik communities over many years, and I can't wait to go back once COVID is behind us to further pilot test our new information tools.

Transparency, honesty, and humility, backed by documentation of her results provided Lemire with entré into the local Inuit communities, Nunavik Nutrition and Health Committee, and from them, to nurses, doctors, and midwives.

4 | WE NEED EACH OTHER, WE ARE ALLIES

The long and time-consuming process of working as a scientist with both federal and local health organizations, as well as local Inuit, has taught Lemire that it works best as a mutual, trusting collaboration. Lemire discussed several instances where local knowledge informed the science, and where this contributed to providing more information for better risk management and risk communication by Nunavik Public Health colleagues and the doctors, nurses, and midwives, as well as to the Inuit themselves. One example is particularly interesting. There is controversy in the literature generally about the protective role of selenium against mercury toxicity (and vice versa, Burger & Gochfeld, 2013; Ralston & Raymond, 2018). This led Lemire to examine selenium and selenoneine levels in the blood of Inuit and in the country foods (e.g., Beluga Whale mattaaq), and to provide this information to the hunters themselves.

Selenium and selenoneine levels were significantly higher in women than in men, which seemed odd to Lemire as a scientist (Little et al., 2019). When she discussed these results

with local hunters, they mentioned that women traditionally eat the mattaaq from the tail of beluga, and raised the hypothesis that maybe the tail is higher in selenoneine. Interviews in communities indeed revealed that there was a gender difference in consumption patterns. It was an Inuit tradition that only the women ate the tail parts (including the skin), and an elder mentioned that was likely for celebrating the killing of the whale and to thank women. This led Lemire and her colleagues to examine the levels of selenoneine in mattaaq from different parts of the whale. Sure enough, preliminary data show that the levels of selenoneine in the tail of Beluga Whale were much higher than the mattaaq from other parts of the whale (Lemire, unpublished data). It is a clear example of the importance of knowledge from both the environmental scientist and the Inuit hunters. This information was communicated to several Nunavik colleagues and hunters. Why the levels are higher in the tail of the whale is being examined. Whether women or pregnant women will change their consumption patterns is also not clear as this is recent information, and more research is needed to understand the health effects of selenoneine with respect to mercury. The lesson, however, is clear.

> We all have knowledge that when combined, provides a clearer understanding of a situation. The Inuit have an amazing sense of observation. They see things and understand, and they ask good questions. My role is to provide the data on nutrients and contaminants in country foods, as well as risk levels, and let them make their own decisions. We need each other, we are allies.

It is an interesting observation that in this situation with Indigenous Peoples, Melanie Lemire views her role as one of presenting information on nutrients and contaminant levels and on the risks associated with those contaminant levels, but not to take a leadership role or to tell people what to do. The objective is to increase knowledge in the Indigenous Peoples, but not to change their culture or what they eat. It is rather to provide them with enough information to make informed decisions, and, when appropriate, to advocate alongside them against environmental injustices. She functions as an honest broker, bringing sound science data on both contaminant levels and risks to a range of agencies, groups, and Nunavik peoples—letting all groups arrive at their own decisions about reducing or balancing their risks. She is now part of the Canadian experts on Minamata Convention Evaluation Effectiveness Committee and the Human Health group of the Artic Monitoring Assessment Programme. By joining these committees, she hopes to contribute to promoting bans on emerging harmful contaminants, such as long-chain PFAS, in order to protect the exceptional quality of country food.

5 | OVERALL LESSONS IN RISK COMMUNICATION

*Trust is critical, takes a long time to develop, and requires that there be no perceived conflict of interest. That is, Lemire found it important to refuse funding from mining companies and other entities that might compromise her independence (or perceived independence).

*Developing trust takes time, investment, and humility. You need to listen and learn from others, not just talk at them.

*Scientists need to learn how to collaborate with local Public Health authorities and share risk information so that the risk management and communication tools they develop integrate local priorities and knowledge, not only the culturally biased perspective of scientists from outside of a community.

*Risk communication tools need to be well-prepared, adapted to each target group, revised by multiple local colleagues and pilot-tested in communities. It is necessary to find the balance of sharing information about risks and benefits of different choices without telling people what to do.

*Risk communication is about sharing information and insight, not teaching people about scientific results.

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Biography

Mélanie Lemire graduated from the Université du Quebec a Montréal with a PhD in Environmental Sciences. During her PhD, she worked with riverine communities in the Amazon where mercury exposure is an ongoing health problem for humans, biota, and ecosystems. During her postdoctoral fellowship, she was introduced to Nunavik, the homeland of Inuit in Northern Quebec, Canada. Since then, she has been involved with transdisciplinary, intersectional, and participatory work that focuses on the study of environmental contaminants, ocean change, and nutrition related to the health of Inuit, First Nations, and coastal populations in Canada. While her science deals with the risks of consuming wild-caught foods (fish and game) as sources of mercury, polychlorinated biphenyls (PCBs), and other more recent contaminants like long-chain perfluoroalkyl sulfonic acids (PFASs), she has found that her risk communication needs to balance the risks from contaminants in food, and nutrition and food insecurity, with centuries-old cultural practices and local food preferences. She has thus faced some of the same risk communication issues with Indigenous and non-Indigenous coastal populations in hot tropical environments and in cold northern climes where outsiders are often viewed with suspicion. Her findings are used to inform decisions and decision-making tools, and to aid in government programs and policies. She is the Littoral Research Chair, an Associate Professor in the Department of Social and Preventive Medicine at Laval University, and a researcher at the Population Health and Optimal Health Practices axis at the CHU de Quebec-University Laval Research center and at the Institute for Integrative and Systems Biology. She represents a new generation of environmental scientists and public health professionals faced with risk communication challenges where long traditional practices may be threatened by global environmental changes and there is a need to interact in multiple languages and cultures.

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR) (1999). Toxicological profile for mercury. Agency for toxic substances and disease registry. Atlanta, Georgia: US Public Health Service.

Burger J, & Gochfeld M (2013). Selenium/mercury molar ratios in freshwater, marine, and commercial fish from the USA: Variation, risk, and health management. Review of Environmental Health, 28, 129–143.

Ralston NV, & Raymond L (2018). Mercury's neurotoxicity is characterized by its disruption of selenium biochemistry. Biochimica et Biophysica Acta (BBA)—General Subjects, 1862, 2405–2416. 10.1016/j.bbagen.2018.05.009 [PubMed: 29753115]

Lemire M, Dwan M, Laouan-Sidl AE, Muckle G, Pirkle C, Ayotte P, & Dewailly E (2015). Local country food sources of methylmercury, selenium and omega-3 fatty acids in Nunavik, Northern Quebec. Science of the Total Environment, 509-510, 248–259. [PubMed: 25135671]

Little M, Achouba A, Dumas P, Ouellet N, Ayote P, & Lemire M (2019). Determinants of selenoneine concentrations in red blood cells of Inuit from Nunavik (Northern Quebec, Canada). Environment International, 128, 13–23. [PubMed: 31029975]