



Environmental Health Institute of Canada
Institut de santé environnementale du Canada

Exploring the Links between Early Environmental Exposures and Chronic Disease: Implications for Public Health Policy and Practice

Workshop Report

**March 8, 2012
Delta Chelsea Hotel, Toronto**

Report of the CPCHE/EHI-Canada Workshop on Exploring the Links between Early Environmental Exposures and Chronic Disease: Implications for Public Health Policy and Practice

Introduction

On March 8th, 2012, the Canadian Partnership for Children's Health and Environment (CPCHE), with the Environmental Health Institute of Canada (EHI-Canada) serving as the lead CPCHE partner, held a workshop in Toronto entitled *Exploring the Links between Early Environmental Exposures and Chronic Disease: Implications for Public Health Policy and Practice*. The workshop brought together 40 participants with a wide range of expertise from various sectors to explore the implications of the emerging body of scientific evidence linking early (i.e., preconception, prenatal and childhood) exposures to toxic substances with the later development of chronic diseases. The workshop agenda can be found in [Appendix 1](#). The list of workshop participants is attached as [Appendix 2](#).

The stated workshop objectives were:

- to discuss the potential benefits and/or challenges of placing greater emphasis on the prevention/reduction of early environmental exposures as a component of a chronic disease prevention strategy;
- to facilitate the exchange of knowledge and perspectives among diverse stakeholders with expertise/interest in the area who can move knowledge to action.

The workshop built upon the findings from a recent *Scoping Review*¹ published by the Canadian Environmental Law Association (CELA) and other CPCHE partners, profiling the scientific evidence linking exposure to toxic pollutants in the womb or during childhood with the later development of major chronic diseases, including cardiovascular disease, diabetes, cancer, asthma and neurodegenerative diseases including Alzheimer's and Parkinson's. The workshop provided participants with an opportunity to explore, through expert presentations and interactive discussion, the implications of this growing body of evidence for public health policy and practice.

During the opening session, Erica Phipps, CPCHE Partnership Director, noted that the workshop also built upon the outcomes of a multi-year collaboration between CPCHE and the Ontario Chronic Disease Prevention Alliance (OCDPA). Through that collaboration, which was funded by the Ontario Trillium Foundation and officially concluded in mid-2011, the partner organizations in the two networks exchanged information and perspectives on the links between children's environmental health protection and chronic disease prevention. Key outcomes included a multi-stakeholder [Forum](#) on the topic (October 2009), a [joint statement](#) from health and environmental organizations on the known and suspected health effects of early exposures to Bisphenol-A, presented at an international meeting hosted by the Government of Canada in November 2010, and the [Scoping Review](#) of the scientific evidence, released in June 2011.

¹ *Early Exposures to Hazardous Chemicals/Pollutants and Associations with Chronic Disease: A Scoping Review*. Canadian Environmental Law Association, Environmental Health Institute of Canada, Ontario College of Family Physicians. Toronto, June 2011.

The workshop was divided into three sections with the morning focused primarily on introducing participants to the current state of knowledge. Topics included chronic disease prevention challenges and current approaches to address them, and an overview of associations between early exposures to toxic substances/pollutants and later development of chronic disease, and discussion of emerging scientific concepts, including low-dose exposures, endocrine disruption and epigenetics. During the afternoon, participants formed small groups to discuss the relevance and implications of the scientific evidence for policy, practice and public health outreach. The workshop concluded with a panel of “thought leaders” who shared their reflections on key themes and possible future steps.

This following section of the report provides a brief overview of some of the main points from the expert presentations. The presentations can be found in their entirety in [Appendix 3](#).

The Chronic Disease Prevention Challenge - Dr. Howard Morrison, Director, Science Integration Division, Centre for Disease Prevention and Control, Health Promotion and Chronic Disease Prevention Branch, Public Health Agency of Canada

Dr. Morrison provided workshop participants with an overall picture of chronic disease in Canada and some of the challenges associated with its prevention and treatment. Also discussed were the determinants of health, i.e., the complex interaction of factors that contribute to an individual’s overall health. Many of the determinants of health that have been the focus of chronic disease prevention efforts are behavioural, including diet, exercise and smoking and, as such, emphasize the role of the individual in attaining (or failing to attain) good health. It is becoming increasingly clear, however, that there are factors outside of our control that may contribute to chronic disease. Chronic disease prevention efforts are starting to move “upstream” to other determinants, including genetics, socio-economic factors and the physical environment.

Dr. Morrison pointed to some of public health’s major successes. These include tobacco control and injury prevention. People are also generally living longer with chronic diseases because of better medications and interventions. While there have been successes, public health is still struggling to deal with chronic diseases, such as neurodegenerative diseases, mental illness and arthritis, that result in high social and economic costs. There has also been an increase in obesity and sedentarism, particularly among children and adolescents.

Much of the chronic disease burden could, in theory, be prevented, as we know a great deal about some diseases. There are, however, many challenges facing chronic disease prevention including the fact that many of the important policy levers are outside the domain of health departments. Legal challenges from vested interests can also significantly affect disease prevention because until the evidence base is strong enough, it can potentially be discredited. This has implications for government’s ability to pursue precautionary measures.

Dr. Morrison also spoke to some of the challenges of understanding the role of environmental contaminants in health outcomes. For example, there is generally no unexposed population that can serve as the control group: we are all exposed, even if at low levels.

Session 1: Associations between Early Environmental Exposures and Chronic Disease

Early Exposures to Hazardous Chemicals/Pollution and Associations with Chronic Disease: Overview of the Scoping Review – Kathleen Cooper, Lead Author and Senior Researcher, Canadian Environmental Law Association

Kathleen Cooper's presentation was divided into two parts. The first provided an overview of the contextual information in the *Scoping Review* including trend data on chronic disease in the aging population, placing environmental exposures in the context of the multiple determinants of health, and three overarching concepts including the developmental origins of health and disease, epigenetics and the evaluation of evidence.

The reality of widespread environmental exposure is confirmed in the results of population-based biomonitoring studies. Exposure levels are very low and consequences are uncertain but levels are highest in children and breastfed infants. Children have higher levels of exposure due to differences in behaviour and physiology. They are also more vulnerable because they are moving through critical stages of development

The multiple determinants of health is a holistic framing that captures 12 areas that contribute to health including genetics, gender, environment, social conditions, and so on. However, much complexity needs to be captured within the social and environmental determinants including interactions among them. In health promotion efforts there is a primary and often exclusive focus on behavioural or "lifestyle" risk factors including diet, exercise and smoking. While obviously important as risk factors for disease, analysis of the social determinants of health (SDOH) points to the primacy of social and living conditions. Worldwide, health follows a gradient of socio-economic status. Poverty is described as the greatest predictor of health with statistical data consistently showing that living in poverty results in a shorter lifespan and disproportionately worse health issues. Inattention to the SDOH can undermine individual behavioural choices to achieve better health, including the inability to adopt such choices at all.

The *Scoping Review* focuses on toxic substances but broader environmental issues are relevant including aspects of the built environment that contribute to car-dependent, sedentary lifestyles and resulting obesity, as well as air pollution and climate change. Likewise, the mechanized, centralized, fossil-fuel dependent food system is a major contributor to climate change and has changed the marketing and the very nature of food, also contributing to the obesity epidemic.

The environment acts as a cross-cutting determinant that interacts with other SDOH. Multiple examples exist such as greater air pollution experienced among poorer people with resulting higher levels of pollution-related hospitalizations and mortality rates. The effects from climate change are predicted to affect the most fundamental determinants of health – air, food, water and shelter – with disproportionately worse effects among the poor and the elderly .

Additional context for the review of evidence for associations between early environmental exposures and chronic disease included describing the Development Origins of Health and Disease (DOHaD) and underlying mechanisms within the field of epigenetics. As well, key issues arise when evaluating the complex evidence related to environmental health issues.

The *Scoping Review* includes a detailed discussion of how evidence of environmental harm is evaluated including the traditional evidence pyramid and the Bradford Hill “Criteria” for assessing causation in environmental matters. While Bradford Hill clearly stated that these characteristics should not be considered hard and fast rules, many still feel that all must be fulfilled before action can be justified. Experts note that the criteria derive from mono-causal, reductionist approaches that create challenges for describing or evaluating multi-causal, complex and dynamic processes.

Part two of the presentation summarized the main results of the Scoping Review. Each of the five chronic disease areas was summarized first noting the known risk factors and then addressing environmental exposures, first in adults (animal or human data), then in early life. The five chronic diseases reviewed included cardiovascular disease, Type 2 diabetes, Alzheimer’s disease, cancer (focusing on three types), and asthma, all of which are at high prevalence and/or rising incidence in the population.

Among Kathleen Cooper’s overall observations were that changes over last 3+ decades generally correlate with rising trends in chronic disease and associated risk factors, including exposure to toxic substances, changes in food composition and the built environment, and increased poverty, stress, and obesity. As well, given that there is a continuum of shared, well-known risk factors across obesity, metabolic syndrome, cardiovascular disease, diabetes and Alzheimer’s disease, it is prudent to expect that environmental risk factors may also be shared. The DOHaD concept provides a solid theoretical foundation that is rapidly expanding to include early life exposures with profound implications including the prospect of permanent changes in disease susceptibility with passing on susceptibility to future generations. Moreover, the evidence in environmental cases challenges how evidence is typically evaluated, raising profound policy implications.

The CPCHE-OCDPA collaboration began with shared goals of health promotion and disease prevention, and much was learned from each other in key cross-cutting areas including the primacy of the social determinants of health, the DOHaD concept, and the risks of early environmental exposures. Key issues of shared importance appear to be low birth weight, nutrition, and endocrine disruption, particularly where this points to evidence of impacts on insulin signaling. The project built a solid foundation for further collaborative work on chronic disease prevention and policy advocacy.

The full *Scoping Review* and Executive summary can be found at www.healthyenvironmentforkids.ca.

Session 2: Environmental Influences on Health: Key Concepts and Emerging Science

Convention-Challenging Developments in Environmental Health Research: Implications of Emerging Knowledge of Low-Dose Exposures and Endocrine-Disrupting Chemicals – Dr. Bruce Lanphear,
Children’s Environmental Health; Distinguished Scientist, Child & Family Research Institute, Simon Fraser University

Dr. Lanphear noted that while environmental exposures to toxic substances are not the only factor contributing to chronic disease, they are major and often unrecognized risk factors for many chronic diseases. His presentation focused on evolving research on the effects of low-dose exposures to toxic substances. He cited the results of an expert panel convened by the National Toxicology Program in the United States that recently concluded that the scientific evidence is sufficient to link low-level lead exposures (<5 ug/dl) with IQ deficits and behavioural effects (e.g., conduct disorder and criminal

behaviors). Similarly, with respect to airborne toxicants and cardiovascular disease, the research shows that the steepest increments of adverse effects are at the lowest levels of exposures. These “supralinear” relationships, he contended, indicate that there are no safe levels for some of the most well established toxicants.

He also pointed out that reducing environmental exposures can have measurable beneficial effects. Analysis of data from the US shows a correlation between the decline in tons of lead used per year and a lowering of the murder rate; it has been estimated that over 50% of the decline in the crime rate is due to lowered blood lead levels. As another example, the ban on smoking in public spaces in Toronto has been correlated with reduced hospital admissions for acute myocardial infarctions and asthma.

Dr. Lanphear talked about the role of popular media, such as movies, in the initiation of harmful habits such as smoking. If these addictive behaviours are introduced at an early age, is it fair to say that they are personal choices?

He also talked about research findings on endocrine-disrupting chemicals, including a study in which mice exposed to BPA became obese, despite the fact that they and the control group had the same caloric intake. Research has also shown changes in fetal mammary tissue in laboratory animals as a result of exposure to BPA consistent with breast cancer.

The question of how much evidence is needed before we take action to protect human health was explored. With evidence that environmental toxicants are causing health effects, is it justifiable to wait for action? Dr. Lanphear questioned the amount of evidence required for action by exposing this as a societal value. He posited that society has accepted the requirement of a significantly high level of evidence before managing substances, however this is based on a belief system rather than an absolute truth. He concluded that our society is faced with a problem of narrative, rather than a lack of evidence. There is a need to rethink the regulatory process and shift to a more precautionary approach. He identified a role for public health experts to contribute to the conversation since he proposes silence in this area only furthers the belief and does not support precaution.

In summary, Dr. Lanphear stated that public health is not investing enough in our children. He concluded that the antecedents of chronic disease often have their origin during fetal development or early childhood; the effects of environmental toxicants are often systemic; and many diseases and disabilities associated with environmental toxicants are preventable. Further he proposed that taking action before precise mechanisms of toxicity are fully understood could significantly reduce health impacts. He noted that by permitting ongoing exposures to known or suspected toxicants, we are in effect conducting experiments on our children.

Dr. Lanphear left workshop participants with a few key questions for further consideration:

1. How much evidence is necessary to take action to protect human health?
2. Do we need to understand the mechanisms of toxicity before we regulate or ban a product suspected of causing harm?
3. Who should bear the cost of surveillance and research to prove a chemical or product is safe?
4. Who should bear the cost of adverse consequences of consumer products?

Epigenetics and Gene-Environment Interactions – Erin Hodge, Toxicologist, Environmental and Occupational Health, Public Health Ontario

Erin Hodge provided workshop participants with an overview of epigenetics and gene-environment interaction. While DNA contains the instructions for building all the parts of the body, it is not the only story. The epigenome is what directs our cells to become skin or lung tissue, for example, which is why it is so important to the human development process. Our DNA remains fixed for life. However, the epigenome responds to signals from the outside world including diet and stress, and environmental.

There are varying definitions of epigenetics, perhaps in part because there is a need to avoid overly simplistic explanations of how a cell functions. The field of epigenetics has expanded dramatically over the past several years however, it is only one aspect of cell biology and function. DNA methylation and histone modification are most frequently given as epigenetic mechanisms, but small inhibitory RNA also affects gene expression and is garnering increased attention. Regardless of how these mechanisms are classified, they all can respond to environmental stressors. In order to understand how these processes affect DNA expression, it is necessary to be familiar with the processes of DNA replication, transcription and translation, which form the central dogma of molecular biology.

Chemicals that enter our bodies, as well as other stressors, such as famine or lack of nurturing, can affect the epigenome. For example, work from Jirtle *et al.* has shown that feeding mice dams genistein from soy increases DNA methylation in specific areas and has a protective effect against obesity in the pups. Research in epigenetics helps to elaborate mechanisms by which environmental exposures may influence functioning of cells and tissues, as well as human diseases, and speaks fundamentally to mechanism and mode of action, which are key concepts in toxicology and in determining how different chemicals may affect health. Epigenetic processes are highly important in development (parts of the epigenome are actually heritable through germ cells) and in numerous human diseases.

Erin Hodge stressed the complexity of cellular mechanisms and responses to environmental signals, and suggested that people may over-estimate the contribution of variation in genetic make-up to the development of diseases such as cancer. Not long ago, it was believed that cancer was a genetic disease but now we know that there are other factors at play. Genetics in general is a complex field and it can be difficult to make clear conclusions.

Responding to a question from a participant about the potential role of biomarkers in providing early signals before a chronic disease or condition fully manifests, she responded that while worthy of exploration, the use and proper understanding of biomarkers can be extremely complex, given that each organism will respond somewhat differently to the exposure. Implementing biomarkers as the basis of a surveillance program or numerical criteria will require someone with the acumen to assemble the interdisciplinary experts needed to successfully develop such work.

Session 3: Exploring the Implications for Health Promotion and Disease Prevention

During the afternoon breakout session, participants were assigned to small groups and invited to discuss the following three broad questions for consideration:

1. Should the prevention/reduction of early environmental exposures become a strategic element of chronic disease prevention in Canada? What might be some key messages and/or strategies

for “making the case” for its inclusion? What might be some compelling reasons against its inclusion?

2. Should this emerging knowledge about early exposures-chronic disease linkages be integrated into health promotion/chronic disease prevention efforts? If so, what might some key messages for prospective/new parents and others? What might be some reasons for not incorporating this information into health promotion messaging?
3. What are the implications of this emerging evidence for the environmental health and chronic disease research agendas in Canada?

Several key themes emerged during the breakout session. This section introduces only some of the issues highlighted throughout the discussions. These themes do not necessarily reflect consensus but rather identify some of the potential opportunities and barriers that may exist for placing more emphasis on the prevention of early environmental exposures as a strategic element of chronic disease prevention in Canada.

Theme 1: Public education and engagement

Educating the public encourages individuals and families to become more fully engaged in political discourse and action. Empowering individuals to take action, ask questions and make informed decisions can have a positive impact on the prevention of chronic disease in relation to early environmental exposures.

Information about the effects of toxic substances has the potential to overwhelm. Health promotion messaging in this area needs to be carefully crafted to build on existing messages, to not create fear and to provide the public with realistic actions they can take to reduce exposures/risks. A need was identified to provide more clarity around preferred outcomes and what currently could be added to health promotion messages. An important factor will be the success of coordinating and adding important information to what people already know, given that scientific understanding is constantly evolving. For example, the public may believe that lead has been dealt with and may be unaware that exposure is still possible today.

Ensuring consistent, coordinated messaging – so as not to duplicate efforts or frustrate the target audience with conflicting messages – was also identified as important. Clear, simple statements that empower action are likely to be most effective.

With respect to new and prospective parents, there were diverse views on how best to convey the message. Some suggested the need to keep messaging simple and avoid raising concerns where the causal associations are not fully established. Others felt that the messaging should not shy away from presenting more scientific information, as parents are capable of understanding and making informed decisions.

Many workshop participants felt that messaging should clearly explain and empower so as to avoid inciting fear and anxiety. Individuals should be equipped with enough information to make better decisions and a sense of tangible actions they can take to reduce risks. It is also important to ensure that parents, in particular, are not scared away from what are considered critical behaviours (e.g. breastfeeding).

Responses to a survey among service providers who work with prospective parents and young families, gathered at a March 1st briefing presented by CPCHE on the scientific evidence summarized in the *Scoping Review*, suggest that parents would be interested in, and would benefit from learning about, the links between early environmental exposures and chronic disease. Respondents expressed some concerns about the difficulty of translating this complex topic into understandable information for parents, and the risk of overwhelming or causing anxiety. Nevertheless, all respondents were of the opinion that reducing early environmental exposures should become a part of health promotion and/or chronic disease prevention. A summary of survey responses gathered at the March 1st briefing is provided in [Appendix 4](#).

Theme 2: The need for policy advocacy and regulatory change

While public health education was recognized as an important component in addressing chronic disease prevention, participants also identified a need for accompanying policy change. Regulation and legislation can achieve exposure reduction across the board for the general public, whereas educational materials may only reach those with access to information and are only effective for exposures within individual control. There was discussion around the idea that where strong evidence exists, higher level policy and regulatory change should be pursued. In cases where less evidence is available, educational promotion may be the place to start. There was broad agreement that a strategy for chronic disease prevention should contain both education and policy advocacy components.

Tailoring the message, along with the need to use policy windows effectively, were identified as priorities in advocating for change at the regulatory level. The most effective way to ensure early environmental exposures and chronic prevention become part of the political agenda will involve ensuring a multi-disciplinary approach and well-timed message delivery.

Toxic substances in Canada are often assessed and managed on an individual basis, a process that takes time. Many participants felt there should be a shift away from this approach. While we may not have an understanding related to the specifics of each chemical, we do have an understanding at a pathology level to be able to regulate groups of substances. Diverse views were shared around whether the current regulatory approach for assessing toxic substances in Canada incorporates precaution, particularly as it relates to health effects on children. There was also discussion around the need to shift the burden of proof from the regulator to the producer or proponent of a chemical, similar to the current regulatory approach in the European Union.

Theme 3: The need for strategic partnerships

Collaboration amongst diverse experts and stakeholders, including toxicologists and epidemiologists, was identified as an important factor for successful integration of environmental exposure reduction and chronic disease prevention. Participants expressed the need to have the right groups involved when discussing how early environmental exposures contribute to the development of chronic diseases later in life. As such, gaining a clear understanding of the different organizations and stakeholders currently involved in research or advocacy work related to early environmental exposure would be an important step. It was also noted that parents can be a great source of expertise in terms of the opportunities and barriers for healthy environments so they should be included in the conversation.

Collaborative, multi-stakeholder involvement would also be necessary in order to contribute to broader organizational and regulatory buy-in over the long-term. Workshop participants identified resistance,

related to the belief that there may not yet be enough evidence to connect early environmental exposures and the development of chronic disease, as a potential barrier for support from some organizations.

Creating opportunities for cross-sectoral discussion is one way in which a better understanding of the internal culture of chronic disease prevention and other relevant organizations may be achieved.

Theme 4: Building internal capacity and support within the chronic disease prevention sector

Some participants spoke about factors within chronic disease organizations that pose challenges to the effective uptake and integration of evidence of the role of early environmental exposures in the development of chronic disease. Organizations may lack internal capacity to analyze and translate into usable information the emerging scientific evidence in this area. Competing priorities in terms of chronic disease prevention strategies and messages, a desire to keep a focused and disciplined mandate, and the need to focus on issues that resonate with people who suffer from or have survived the disease and other potential financial contributors to the organization are among the other factors that were noted. As there is the potential for push-back from industry and other stakeholders, organizations will need a strong evidence base in order to fully put their support behind this emerging area of science.

Some organizations may primarily focus on finding a cure for disease and a focus on preventing early exposures may not yet have a strong place in their current agendas. The need for internal champions to help promote understanding of the role of environmental exposures was identified as a potential means of fostering a shift in culture and decision-making within chronic disease prevention organizations on this topic.

Theme 5: Prioritizing competing strategies and research

The need for a holistic or systemic approach to addressing early environmental exposures as a chronic disease prevention strategy was understood to be important. Participants broadly agreed however, that establishing research priorities is necessary to ensure that the most optimal outcome is achieved. Given that funding opportunities are limited while research can be reflective of competing priorities, pursuing more targeted opportunities where evidence may be the strongest could be an effective step. In addition, focusing on multi-disciplinary research opportunities could allow for a broader funding base and in turn, stronger impact across a number of sectors. For example, obesity prevention may overlap with priorities for addressing climate change (e.g., the role of the built environment). Where this is the case, a more systemic approach and focus should be pursued.

Theme 6: Promotion of lifelong health

An important strategic factor for many participants was a need to focus on the promotion of lifelong health rather than exclusively either early or late life stages. Primary prevention early in life will have positive impacts over the course of one's life and will help take the emphasis off chronic disease prevention strategies at the point where it may already be too late to address certain conditions.

Theme 7: The question of evidence

The question of how much evidence is necessary before moving forward with the promotion of early environmental exposure prevention was explored throughout the breakout session. It was noted that in

many cases enough may already be known to justify action related to increased management of and exposure prevention for many substances.

Some suggested that patterns in the evidence could be better utilized, rather than looking at each piece of the puzzle in a reductionist way. Where we understand one substance, there may be the potential to use patterns and information to better understand other chemicals.

Some participants felt that evidence needed to be strong and irrefutable in order to prepare for the inevitable resistance from a variety of sectors. A lack of clarity around evidence and data calls into question whether research will be compelling enough to make a strong case for policy change and preventive action.

Theme 8: Economic benefits of preventing early environmental exposures

Further exploring the economic benefits of pollution-reduction and the elimination of toxic substances in order to provide government and others with a clear cost-benefit analysis was also discussed. At the same time, only focusing on economic arguments can be problematic because they do not take other issues, including social and environmental factors, into account. Looking to existing models of reducing environmental contaminant use and release including Green Chemistry and the Toxics Use Reduction Institute (TURI) in Massachusetts may be beneficial. Some of the small groups also explored how consumption fit into the picture. In particular, some felt a message to move away from consumption-oriented consumer culture should be pursued.

Thought Leaders Panel: Reflections and Possible Future Directions

The panel discussion provided an opportunity for leaders in the field to reflect on some of the workshop's main themes and to present ideas for transforming current knowledge into future action. Panellists included:

Dr. Robin Walter, *Integrated Vice President, Medical Affairs & Medical Education, St. Joseph's Health Care & London Health Sciences Centre*

Dr. Daniel Rainham, *Professor and Elizabeth May Chair in Sustainability and Environmental Health, Dalhousie University*

Brian Stocks, *Former Air Quality Manager; Former Co-chair of the CPCHE-OCDPA Steering Committee*

Dr. Bruce Lanphear, *Children's Environmental Health; Distinguished Scientist, Child & Family Research Institute, Simon Fraser University*

Sue Turner, *Senior Specialist, Partnerships, Ontario Heart and Stroke Foundation*

What follows is a brief summary of the main points from the Thought Leaders Panel.

There has been recognition that relatively low-levels of exposure can have profound effects on the development of certain chronic diseases. Despite this, we tend to struggle with the question of how much evidence is needed before taking action on these issues. Even where a clear understanding of health endpoints exists, we find it difficult and at times overwhelming to move to action in preventing exposures.

An effective approach (for placing a greater emphasis on the prevention of early environmental exposures as a component of a chronic disease prevention strategy) should take into consideration how and when to intervene. There is a need to examine the system from a holistic perspective in order to identify where the most effective point of intervention should occur. It was suggested that we consider ways to shift the conversation to one about health-promoting environments, rather than solely focusing on reducing/avoiding hazardous environmental exposures.

Another important issue is one of communication. Within relevant organizations, including public health groups and those dealing with chronic disease prevention, there is a need to find internal champions who can provide a clear message to both internal and external stakeholders. When dealing with the general public, it is necessary that research and information are communicated in a way that helps the average person to better understand, creating a more knowledgeable public. Public messaging should be responsible and provide context.

Next Steps

The workshop concluded with some general observations from participants. It was acknowledged that there is currently no consensus about the precise path forward but there was general agreement among workshop participants that the role of early environmental exposures to toxic substances in chronic disease and lifelong health is a topic that warrants further exploration and discussion. A summary of participants' responses to the workshop evaluation and feedback survey is attached as [Appendix 5](#).

It was agreed that there is a need to start sooner rather than later to work towards collaborative efforts, that evidence and arguments must be presented in a strong and clear manner, and that there will be resistance and competing interests standing in the way of incorporating prevention of early environmental exposures as a component of chronic disease prevention.

Opportunities to share knowledge and perspectives are an important step in moving forward. As noted by Dr. Lynn Marshall in her closing remarks, "the way to begin is to begin."