

Recommendations for the Development of Children's Health and the Environment Indicators in North America

Prepared by
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CEC Secretariat

Prepared for
CEC Trilateral Team on Children's Health and the Environment

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Introduction

In recent years, the link between children's health and the environment has become a major concern for many organizations. Since 1999, the Commission for Environmental Cooperation (CEC) Council, an international organization created by Canada, Mexico, and the United States, has recognized the need for greater coordination and cooperation to protect children from environmental threats in North America (see Exhibit 1). Council Resolutions 00-10[1] and 02-06[2] commit the member countries to work together as partners, describe a Cooperative Agenda to protect children from environmental threats, and identify priority areas for initial focus.

Exhibit 1. Important Milestones in the CEC Council's Special Initiative on Children's Environmental Health

Date	Milestone
June 1999	CEC Council announces special initiative on children's environmental health
May 2000	Symposium on Children's Health and the Environment in North America begins the process of identifying a common agenda for action
June 2000	Council Resolution 00-01 commits member countries to work together as partners to develop a common agenda and identifies respiratory diseases and exposure to lead and toxic substances as priority areas
June 2002	Council Resolution 02-06 establishes a Cooperative Agenda, which calls for development of an indicators report for North America and adds water-borne diseases as a priority area
July 2002	CEC Secretariat begins a feasibility study to develop and periodically publish a core set of indicators and establishes a Steering Group to oversee the feasibility study and make recommendations to the CEC Council
December 2002	Feasibility study on indicators of children's environmental health completed and reviewed by the Steering Group
June 2003	CEC council will adopt selected indicators at Council Session
2004 (expected)	First Report on Indicators of Children's Health and the Environment in North America

The Cooperative Agenda calls for the development of North American indicators of children's health and the environment. The CEC Secretariat, in collaboration with the member governments and other interested partners,[3] has completed a feasibility study to develop a core set of indicators for children's health and the environment. The CEC Steering Group has reviewed the

[1] http://www.cec.org/pubs_docs/documents/index.cfm?ID=209&varlan=english
[2] http://www.cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=858
[3] The governments of Canada, Mexico, and the United States, the International Joint Commission Health Professionals Task Force (IJCHPTF), the Pan American Health Organization (PAHO), the World Health Organization (WHO), and the Organization for Economic Cooperation and Development (OECD).

feasibility study and other relevant resources in developing this report's recommendations to the CEC Trilateral Team on Children's Health and the Environment.[4]

Children's Health and the Environmental Indicators Initiative

Objective and Target Audience

The CEC Secretariat plans to publish the first report on indicators of children's environmental health in North America in 2004. The report objective is stated on page 19 of the Cooperative Agenda:

> *To provide decision-makers and the public with periodic (e.g. every 2 to 3 years), understandable information on the status of key parameters related to children's health and the environment in North America as a means of measuring and promoting change.*

The CEC Steering Group recommends that the report be developed in two volumes. The main volume should target the public and policy-makers, and should be written in plain language. It should contain trends in environmental contaminants and related health effects in children to assist policy-makers in decision-making. It should also contain tips on how members of the public may avoid or reduce environmental risks to children's health. This volume should be accessible, interesting, and include references to useful websites. The text should avoid both pointing blame at any individual or group and advocating any one perspective.

The second volume should target scientists and others who work in the field. It should describe in detail the methodologies and data used to develop the report.

Criteria for Selection of Indicators

The Steering Group recommends that the CEC apply the following criteria in selecting indicators for the first North American report:

1. **Useful and relevant**. Each indicator must be related to a specific question or condition of interest that highlights a trend or caution regarding children's health and the environment.

2. **Scientifically sound and credible**. Each indicator must be unbiased, reliable, valid, and based upon high-quality data. The methodology for collecting the data should be robust and repeatable. There must be a credible link between the environmental condition that the indicator addresses and the health outcome (for example air quality and asthma rates).

3. **Availability**. It is agreed that because not all countries will be able to report on all indicators, countries will choose indicators from this list that are most appropriate and available from their national perspective (e.g. whether or not nationally representative) and based on

[4] Feasibility Study for the Development of Indicators of Children's Health and the Environment in North America, Indicator's Steering Committee Meeting Summary

information that already exists, since governments may be unable to commit resources for collecting new data.

4. **Applicable and understandable**. The indicator must be useful for policy-makers and a non-specialist audience.Each of the 12 indicators recommended below meet the above criteria and are considered attainable based on the Steering Group's examination of existing information in the three North American countries.

Rationale for Choosing Categories of Child Health and the Environment Indicators

Through the elements and activities of the Cooperative Agenda on Children's Health and the Environment Project of the Commission for Environmental Cooperation, it has been identified that asthma and respiratory disease is an important cause of morbidity and also mortality for children in North America. In some regions the prevalence of asthma has increased fourfold over the previous three decades. The toxic effects of lead have been identified as a neurodevelopmental risk to the growing fetus and young child. Children are exposed to lead, in paint in older homes, emissions from smelters and other industrial processes, pottery with leaded glaze and various consumer products such as inexpensive jewellery, imported crayons and mini blinds.

The effects of exposure to toxic substances have been identified as causes of childhood death, illness and hospitalization as well as early evidence linking toxic substances with development conditions in children. Council resolution 00-10 directed the CEC and its member countries to focus on these above three effects as a priority for cooperative action to protect children from environmental threats. Waterborne diseases were subsequently added as an area for indicator development, as this had been mandated by the CEC Council and also as the World Health Organization reported that waterborne illnesses worldwide were a major cause of mortality in children.

Using a Common Global Indicator Framework

The Steering Group recommendations reflect the children's health and the environmental indicator model developed by the World Health Organization.[5] The Group concluded that the WHO's Multiple Exposures Multiple Effects (MEME) model best captures the complex interactions between the environment and children's health and the flexibility required for preparing the North American report.

Recommendations on the Indicators

The Steering Group recommends 12 indicators for the first report of children's health and the environment indicators in North America. The recommended indicators span the four priority areas identified by the CEC Council: asthma and respiratory diseases, effects of lead, effects of exposure to other toxics substances, and water-borne diseases. It is agreed that because not all

[5] World Health Organization. Making a difference: Indicators to improve children's environmental health. Geneva: World Health Organization, in press.

countries will be able to report on all indicators, countries will choose indicators from this list that are most appropriate and available from their national perspective. In some cases the indicators are purposely general to allow flexibility in specific measures reported on. Exhibit 2 provides an overview of the indicators. Attachment 1 provides more detailed discussions of each indicator.

For each indicator recommended below, the Steering Group recommends presenting trends, rate of change, and statistical significance whenever possible.

Exhibit 2. Overview of Recommended Indicators

Priority Area	Indicator Name	Type of Measure	Description/Comment
Asthma and Respiratory Disease	Percent of children living in urban areas where air pollution levels exceed relevant air quality standards	Exposure surrogate	Obtainable by cross-referencing air quality data with census data for urban areas such as cities with fixed site monitoring stations. Either national or WHO air quality standards can be used.
	Indoor Air Quality	Exposure surrogate	Measure of children exposed to secondhand smoke in Canada and the US, and biomass fuels in Mexico.
	Prevalence of asthma cases	Effect	Can be the number of children under 18, 14, 5, or a combination of ages. In Canada and US, information is obtained by household surveys. In Mexico, doctors report cases on a diagnosis form.
Effects of Lead and Other Toxic Substances on Children's Health	Blood lead levels (presented by range, e.g., below detectable level; detection limit - 2.5 ug/dl; > 2.5-10 ug/dl; > 10 ug/dl)	Exposure	Although lead may have health effects at lower levels, 10 ug/dl is considered a trigger for public health intervention.
	Children living in homes with a source of lead	Exposure	Sources of lead reflected in the indicators may vary by country, depending on the major sources of concern and data availability.
	Pesticides (body burden, residue levels on food, use or sales)	Exposure	Best measure is body burden, followed by residue levels on food and use data. Sales data is not desirable.
	Pollutant Release and Transfer Register (PRTR) data	Exposure	PRTR data exist in all three countries. These data can highlight releases of a range of chemicals.
Water-borne Diseases and Children's Health	Percent of children (households) served with treated water	Exposure	Counts how many children/ homes/people have access in their home to water piped from a centrally treated system. Alternative indicator could be children (households) without access to treated water.

Priority Area	Indicator Name	Type of Measure	Description/Comment
	Percent of children (households) served with sanitary sewers	Exposure	The percentage of children (households) who have sewage removed from their immediate surroundings will require further discussion and refinement.
	Morbidity (number of childhood illnesses attributed to waterborne disease)	Effect	
	Mortality (number of child deaths attributed to waterborne disease)	Effect	
	Percentage of children served by drinking water systems in violation of local standards	Action	Consider additional criteria, such as systems with <x violations per year, number of days in violation, etc.

Emerging Issue

The Steering Group recognizes the significant risks to children from mercury in all sources. Some fish species are a common source of exposure to methylmercury in many countries because mercury is persistent and readily bioaccumulates in the aquatic environment; this risk has to be balanced against the benefits of fish consumption and the existence of alternative sources of protein. Children borne to women with high concentrations of mercury in their blood may have an increased risk of potential adverse health effects, including development and cognitive effects. The Steering Group recommends further investigation into the feasibility of developing an exposure measure that is closely related to fish consumption and mercury.

Recommendations on the Implementation Process

The CEC Steering Group recommends consideration of a flexible, "continuous improvement" approach to implementation. The recommended approach allows existing data and methodologies to be used, while building towards a core set of harmonized indicators for the three countries.

In this approach, the priority areas, rather than the actual indicators, are the primary focus. The key is to work towards acquiring enough reliable information (via an indicator set) to assess the condition for that topic area by country. The approach allows for using different, but comparable, information sets for each of the areas of interest, while simultaneously working toward the goal of achieving a core set of harmonized indicators. Recognizing that regions within each nation have different sets of environmental conditions and problems due, for example, to weather patterns, geology, level and type of industrialization, degree of urbanization, eco-zone, and population density, the suggested approach also allows for regional as well as national assessments.

Continued involvement of the Steering Group is critical to the success of this approach. Interpreting the various data sets will require the judgment of experienced children's environmental health experts. The strengths, weaknesses, and gaps in the indicator sets and the data used to populate the indicators will need to be reviewed, with a view to harmonizing

indicator sets over time. The Steering Group also will need to continue reviewing priorities in light of new and emerging environmental threats to children's health and make recommendations to the CEC Council on the direction of future indicator efforts.

The Steering Group believes that the implementation process outlined in Exhibit 3 is the best path for developing the first North American report. Several steps could be conducted concurrently.

Exhibit 3. Recommended Implementation Process

Step	Description
I. Initiation of Report Project	
1. Obtain CEC Council approval and commitment	The commitment of the member countries at the CEC Council level is critical to ensure the appropriate involvement of senior decision-makers and timely access to the highest-quality and most relevant data.
2. Develop a project plan and timeline	The project plan outlines participation by the CEC nations, Council, the CEC CHE Trilateral Team, Steering Group, and collaborators; roles and responsibilities; process for data collection and report preparation; schedules; and other information.
II. Data Definition and Collection	
3. Identify specific indicators by country	Each nation articulates a set of indicators for each priority, including indicators of exposure, effect, and action, following the MEME model. Ideally, several indicators will be used for each priority. Some countries may not have any indicators for some priorities in the first year or in subsequent years.
4. Populate the indicators in a flexible manner and using available data	Each nation gathers data to populate the indicators, beginning with existing data. The data collection methodologies need not be identical for each nation, but each approach must be fully documented. Where data are not available to fill an indicator, that indicator can be left unpopulated. Each nation should use information of the greatest depth and highest quality to populate its indicator set, even if other nations currently cannot obtain information of comparable depth and quality.
5. Member countries report indicators to CEC	Each nation provides a report that describes the indicators selected, the data collection and analysis methodology, and the results.
6. Data systems	The CEC Secretariat develops databases and other systems for archiving the data and making it available to the public. The databases will provide a basis for comparing all future reports.

Step	Description
III. Preparation of Draft Report	
7. Develop a Request for Proposal (RFP) for report consultant; select and hire consultant	The RFP describes the required qualifications, the scope of work required, and the information needed for potential consultants to submit proposals. The Steering Group in consultation with the Trilateral Team serves as a panel to select a consultant. The CEC Secretariat negotiates a contract with the consultant and serves as the contract manager.
8. Develop a report outline	The consultant develops an outline of the draft report and submits it to the Steering Group in consultation with the Trilateral Team for review. The consultant prepares a final outline incorporating the review comments.
9. Develop draft report	The consultant prepares an initial draft report. The Steering Group and the CHE Trilateral Team will review and comment on the draft report. The consultant will prepare a revised draft report incorporating the comments. The CHE Trilateral Team and the Steering Group will approve the final draft for peer review.
IV. Peer Review	
10. Development of RFP for issue experts; select and hire issue experts	The RFP describes the required qualifications, the scope of work required, and the information needed for potential issue experts to submit proposals. The Steering Group serves as a panel to select the experts. The CEC Secretariat negotiates a contract with each issue expert and serves as the contract manager.
11. Experts conduct peer review	The issue experts conduct a peer review of the draft report and submit comments to the Steering Group. The Steering Group informs the CHE Trilateral Team if the peer review suggests that one or more indicators are questionable (e.g., due to poor data quality) so that the member countries and the CEC Secretariat may identify appropriate corrective actions. The CEC Secretariat works with the consultant to revise the draft report based on the peer review comments.
V. Preparation of Final Report	
12. Develop draft public comment report	The consultant prepares a draft public comment report and submits it to the Steering Group in consultation with the Trilateral Team for review. The consultant prepares a final draft for public comment incorporating the review comments.
13. Public comment	The CEC Secretariat conducts a process to obtain public comments on the draft report, collects and collates the public comments, and works with the consultant to make all revisions required to the final report based on public comment.

Step	Description
14. Preparation of final report	The consultant prepares a draft final report. The Steering Group and the CHE Trilateral Team will review, comment on the final report. The CEC Secretariat, taking into account the comments, prepares the final report.
15. Translation and publication	The CEC Secretariat translates and publishes the final report.

Supporting Documents

Briggs, David. *Making a Difference: Indicators to Improve Children's Environmental Health*. Prepared for the World Health Organization. Unpublished draft, 2002.

Canadian Institute of Child Health. *Feasibility Study for the Development of Indicators of Children's Health and the Environment in North America.* Report Prepared for the Secretariat of the Commission for Environmental Cooperation of North America. December 2002.

Commission for Environmental Cooperation of North America. *Meeting of the Steering Group for the Development of North American Indicators of Children's Health and the Environment, 9-10 December 2002.* Final draft, February 2003.

U.S. Environmental Protection Agency. America's Children and the Environment: A First View of Available Measures. December 2000.

Attachment 1: Discussion of the Recommended Indicators

Asthma and Respiratory Disease and Children's Health

- **Percent of children living in areas exceeding relevant air quality standards**. This measure is a surrogate for exposures to air pollutants at levels that may be associated with adverse health effects, including exacerbation of asthma and respiratory disease. This measure recognizes the different air quality standards in Canada, Mexico, and the United States. Because standards and data collection methods differ, the Steering Group recommends that the first report note such variations and recommend moving toward more consistent standards in the future.

- **Asthma prevalence**. This indicator would directly measure the prevalence of asthma in children, which has been linked to indoor and outdoor air pollution. The Steering Group recommends the use of survey data because hospital data may be unreliable. Canada and the United States use survey data. Mexico relies upon reports from doctors, who are required to submit reports of diagnoses to the Health Secretariat. The results are likely to be comparable, although the information is collected in different ways.

- **Indoor air quality.** The Steering Group recommends two measures to address indoor air quality – exposure to second hand smoke for Canada and the U.S., and use of biomass in homes for Mexico. Children who are exposed to secondhand smoke are at increased risk of a variety of adverse health effects. The Steering Group recommends indicators that measure exposure in public places (e.g., the number of cities with by-laws addressing secondhand smoke in public spaces) and/or exposure in homes (e.g., the number of children living in homes with smokers). A more direct measure of exposure, children's body burden data on cotinine, is available from the U.S. Children who are exposed to indoor use of biomass for cooking and heating are at increased risk of a variety of adverse health effects. This measure is available in Mexico. Although Environmental Tobacco Smoke (ETS) is not the only element influencing the development of asthma and other upper respiratory ailments, it is supported by strong and widely available data.

The Steering Group considered several other potential air quality indicators, including hospitalizations due to respiratory distress, regulations addressing emissions of air pollutants, and programs to reduce exposure to indoor air pollutants. The Group concluded that hospitalization data would be inaccurate, and the other two indicators would be difficult to interpret (e.g., are more regulations better than fewer, more comprehensive ones).

Effects of Lead and Other Toxic Substances on Children's Health

- **Blood lead levels**. This body burden measure is an important indicator of risk, reflecting current lead exposures. While lead concentrations in bone may be more closely related to adverse health outcomes than lead blood concentrations, data are not available on the former. Neither Canada nor Mexico conduct regular surveys of national blood lead level, but compilations of local/regional surveys conducted in response to specific concerns can be

compared to the U.S survey data. Information also can be disaggregated to show blood lead levels at different concentrations. The Steering Group recommends discussing the development of surveillance programs for lead as a data need.

- **Children living in homes with a source of lead**. Children are exposed to lead in homes from a number of possible sources. Household lead-based paint and lead piping are among the principal sources of childhood lead poisoning in the US and Canada; while in Mexico exposure comes from a variety of home-based micro industrial sources. A better measure of exposure would be the concentration of lead in household dust since the main route of exposure is ingestion of dust contaminated with lead from lead-based paint, emissions from the use of leaded gasoline, and other sources. However, these data are not comprehensive for any of the three nations and this does not capture non-dust exposures related to micro industrial processes. Therefore, the Steering Group recommends this surrogate measure to bring together available data, including information on the age of housing stock (Canada and United States) and on home-based micro industries that use lead (Mexico).

- **Pesticides**. Children may be particularly vulnerable to the effects of pesticides because of their unique susceptibilities and because they may be exposed to higher levels of pesticides than adults are. Children, relative to their body mass, generally eat more than adults, and they may be exposed more heavily to certain pesticides because they have a different and narrower diet than adults have. The best measure of exposure to pesticides would be the bio-monitoring data (i.e., pesticides found in children). Pesticide residue found on foods and pesticide use data could also be useful indicators. Commercial sales data is less appropriate since it does not address exposure per se or potential disproportionate effects on children.

- **Pollutant Release and Transfer Register (PRTR) data**.[6] This action indicator can be used to show trends in pollutant releases to the environment over time, but does not address exposure per se or potential disproportionate effects on children. Canada and the United States have established PRTRs that cover releases/transfers from many industrial activities. Mexico is establishing a similar program. CEC's PRTR program currently is working to improve the comparability of these data across the three nations. Currently, only data from the Canadian and US systems are comparable.

The Steering Group considered several other potential toxics indicators, including the incidence of lead poisoning, birth anomalies such as neural tube defects, legislation to limit emissions of toxic substances, and the number of inspections to enforce legislation. The Group concluded that these indicators may be difficult to implement and may not be linked to exposure in a cause-effect manner (e.g., birth anomalies). It also concluded that these measures could be provided as contextual information to be reported along with other indicators.

[6] Data reported by industrial facilities on certain chemical substances released to air, water, land or transferred off-site for further management.

Water-borne Disease and Children's Health

- **Percent of children (households) served with treated water**. This indicator provides an overview of the portion of children who may be most at risk of waterborne illness because they do not have access to treated water. This value of this indicator, however, is limited because not all treated water is "clean," and not all untreated water (e.g., well water) is not clean. Thus, this indicator could either under- or over-report exposure. In addition, some children may drink untreated water from private water systems at home, but treated water from public water systems in school and elsewhere.

Percent of children (households) served with sanitary sewers. This measure indicates the probability that children are in contact with untreated sewage and the likelihood of waterborne disease. This measure could be reported by the type of sanitary system (e.g., latrines, septic systems) or sewage treatment. Initial analyses will determine whether this indicator will work for the first report.▪ ▪

- **Morbidity (number of childhood illnesses attributed to waterborne disease)**. This indicator speaks to the health outcomes for children of exposure to unclean water. It is important to highlight that there are many more health outcomes that are not as severe as death that still need to be considered. While this indicator would be valuable, it may be difficult to implement. Incomplete or inconsistent reporting, the lack of systematic surveillance, and limitations in identifying specific cases of illness as being caused by waterborne disease may not allow the development of appropriate indicators. For example, many mild cases of waterborne disease may be self-treated, without reports ever reaching a medical officer of health. Similarly, many doctor-treated cases may not be identified as waterborne or may not be reported. These limitations and the lack of surveillance systems may make the morbidity data questionable for all three nations. These issues should be addressed with national experts during development of the report. Each country could be asked to specify the diseases (e.g., cholera, typhoid) that can be tracked, reported, and aggregated.

- **Mortality (number of child deaths attributed to waterborne disease)**. Mortality data may be more reliable than morbidity data. High-quality data are both available and comparable among the three nations. However, the number of deaths resulting from waterborne illness may be a better indicator of the quality of medical treatment than of environmental health.

- **Percentage of children served by drinking water systems in violation of local standards**. Children's risk of exposure to drinking water contaminants at levels that may have adverse health effects can be measured by identifying public water systems that violate drinking water standards. This indicator addresses only water sources with treatment requirements; it does not address water sources where treatment is not required. The Steering Group recommends using local standards for the first report and recommends moving toward a more stringent common standard in the future.

The Steering Group considered two other potential water quality indicators: the presence of fecal coliform in surface water and the percent of sewage treated before release into local water

bodies. The Group concluded that these indicators either are redundant with the recommended indicators or would be difficult to implement due to a lack of comparable data sets.