Children’s Environmental Health Units
# TABLE OF CONTENTS

## BACKGROUND AND PURPOSE

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>1</td>
</tr>
<tr>
<td>Definition of a Children’s Environmental Health Unit</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of this Document</td>
<td>2</td>
</tr>
<tr>
<td>Children and the Environment</td>
<td>3</td>
</tr>
<tr>
<td>Children in developing countries</td>
<td>4</td>
</tr>
<tr>
<td>The Special Role of Health Providers in Environmental Protection</td>
<td>5</td>
</tr>
</tbody>
</table>

## ACTIVITIES OF A CEHU

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educate the Public about the Impacts of Environmental Exposures on Children’s Health</td>
<td>7</td>
</tr>
<tr>
<td>Alert the public to existing or potential risks and the appropriate responses</td>
<td>7</td>
</tr>
<tr>
<td>Develop educational materials adapted to local needs and different media</td>
<td>7</td>
</tr>
<tr>
<td>Organize workshops, lectures, and other events on environmental health topics</td>
<td>8</td>
</tr>
<tr>
<td>Train Health Providers and Engage with the Health Community</td>
<td>9</td>
</tr>
<tr>
<td>Develop and make available training materials for health providers</td>
<td>9</td>
</tr>
<tr>
<td>Conduct trainings on the prevention, diagnosis, treatment, and management of environmentally-related exposures and diseases in children</td>
<td>10</td>
</tr>
<tr>
<td>Develop Networks on Children’s Health and Environmental Health to Gain Knowledge and Share Experiences</td>
<td>10</td>
</tr>
<tr>
<td>Conduct campaigns to promote children’s environmental health, involving a variety of stakeholders</td>
<td>11</td>
</tr>
<tr>
<td>Provide Consultative Medical Services</td>
<td>11</td>
</tr>
<tr>
<td>Provide advice and referrals on cases involving either individual children or groups of children</td>
<td>12</td>
</tr>
</tbody>
</table>
Provide guidance on laboratory services ................................. 13
Maintain standard data about all cases handled by the unit ...... 14
Consult with Government Agencies about Situations to Address and Policies to Adopt ........................................... 14
   Alert agency officials about existing or potential environmental hazards and steps to address them ............. 14
   Provide technical and policy advice to decision-makers and agencies related to children’s environmental health ...... 15
OPERATION OF A CEHU ...................................................... 15
   Funding ........................................................................... 15
   Staffing ........................................................................... 17
   Facilities .......................................................................... 18
   Economies of Scale .......................................................... 19
RESOURCES AND TOOLS ................................................... 20
   Outreach and training materials ......................................... 20
CONCLUSION ................................................................. 20
   References ....................................................................... 21
   Acknowledgements .......................................................... 23
BACKGROUND AND PURPOSE

**Background**

Health care providers are well placed to detect, treat, and prevent environmentally-related diseases and health conditions. Few mechanisms and structures are in place to enhance the recognition of environmental influences on human health, serve as repositories and sources of information for those concerned about children’s health and the environment, and promote action towards healthier and safer environments for children of today and adults of the future.

For health professionals to effectively protect children from environmental threats, specialized training is useful. Evidence shows that health providers are generally not provided the training that they need to address the complex environmental health issues with respect to air, water, soil, and products (Pope & Rall, 1995). Diarrhoeal diseases often recur frequently when underlying causes such as contaminated water are not taken into account by the health provider, understood by the community or adequately addressed by governments. The complexity of children’s environmental health (CEH) issues is compounded by the combination of legacy environmental issues, such as water quality and sanitation service delivery, with modern challenges such as transboundary contamination by persistent toxic substances, ozone depletion and hence ultraviolet and ionising radiation, global climate change, and exposure to endocrine-disrupting chemicals. For children in developing countries, the presence of all such risks represent a ‘triple burden of disease’ – a high level of communicable diseases, the increasingly severe burden of non-communicable diseases, and emerging risks from new diseases and additional stressors from the social and physical environment.

**Definition of a Children’s Environmental Health Unit**

A Children’s Environmental Health Unit (CEHU) is a centre that advances the ongoing training of health care providers, the ongoing education of the public and other sectors concerned about CEH on the protection of children from environmental threats, the management of children with known or suspected exposure to environmental stressors, and the diagnosis, management, and treatment of children with illnesses that are derived from environmental stressors.
Purpose of this Document

This document provides an introduction to Children’s Environmental Health Units (CEHUs). It is intended for governmental officials, health professionals, public health officers, environmental officers, decision-makers, community groups, non-governmental organizations and other stakeholders interested in improving children’s environmental health. It offers an overview of the services CEHUs may provide to children, parents, the wider community, paediatricians, health professionals and governmental officials involved in health or environmental programs to enable them to effectively and cooperatively address environmentally-related exposures and diseases. Because this document is designed to serve the needs of local health agencies in different societies with different resource availability, it may need to be customized in order to reflect local needs and access to resources. This document does not provide statutory requirements.

The materials presented do not represent official WHO recommendations and are based on a compilation of experiences since 1997 from the first CEHUs in North America where the model originated, known as the “Pediatric Environmental Health Specialty Unit” (PEHSU) network, and from similar ventures being developed in South America (Wilborne-Davis, Kirkland & Mulloy, 2007; Paulson et al., 2009), in Europe (Ortega-García et al., 2005), and in the Republic of Korea (Oh & Lee, 2009). Although most of these CEHUs are located in industrialized countries that have fewer challenges than less industrialized countries from water and sanitation, food safety, and vector-borne diseases, the model of providing education and consultation can readily be adapted to fit the environmental issues present in any country.
Children’s environmental health merits special attention because children are disproportionately exposed and vulnerable to a range of environmental hazards. Children’s exposures to environmental health hazards occur in many different settings: in the home, in the playground, at school, and in the wider environment (Chaudhuri & Fruchtengarten, 2005). Their exposures to toxicants in food, air, water, and soil are greater than that of adults, because they ingest more food and water and breathe more air in relation to body weight than adults do; they also engage in frequent hand-to-mouth behaviours and live and play close to the ground, where contaminants may be present (American Academy of Pediatrics, 2003; Landrigan & Garg, 2005). Once exposed, they are more vulnerable to toxicants’ effects, because their immature metabolic pathways are less able to metabolize, detoxify, and excrete harmful substances (American Academy of Pediatrics, 2003; Landrigan & Garg, 2005). Environmental hazards can easily disrupt children’s rapid growth and development (Tellerias & Paris, 2008). Development of organ systems in foetuses and infants is of particular concern, since they change rapidly and cannot be easily repaired once damaged by environmental toxicants (American Academy of Pediatrics, 2003; Landrigan & Garg, 2005). Direct and indirect effects of childhood environmental exposures often persist throughout adults’ lives (Gluckman et al., 2005a; Gluckman et al., 2005b; Gluckman et al., 2008).

Environmental hazards include bacteria and parasites, such as those causing cholera and malaria; neurotoxicants such as lead and mercury; air pollutants such as second-hand smoke and volatile organic compounds, and natural toxins such as aflatoxins, in addition to physical hazards to which children may be exposed in the built and work environment. Children’s behaviour may also increase the risks of exposure. Young children’s normal hand-to-mouth activities and risk-taking behaviour as the child enters adolescence can result in increases in poisonings and injuries. Schools built on undesirable land and or within close proximity to heavy traffic or fields where pesticides are used may pose further health hazards to children. Children can also be exposed to environmental risk factors at home, for example, when the child is carried in the back while the mother is cooking; or when children are exposed to chemicals that remain in their parents’ clothes and hands after they leave work.
Reducing children’s exposures to environmental hazards can substantially decrease the global burden of disease. The World Health Organization (WHO) estimates that over 30% of the global burden of disease can be attributed to environmental factors (Smith, Corvalán & Kjellstrom, 1999; Prüss-Üstün & Corvalán, 2006). In children 0-4 years old, who account for only 10 percent of the world’s population, 36% (31-40%) of the overall disease burden is attributable to modifiable environmental risk factors; that fraction is 34% among children 0-14 years of age. In terms of mortality, the environmental attributable fraction is 37% for children 0-4 years of age, and 36% for children 0-14 years. Diarrhoea, malaria, and respiratory infections together contributed to 24% of all deaths in children under 15 years of age. These environmentally-mediated diseases cause more than 4.7 million deaths in children under five every year (WHO, 2002). Such a large burden is unacceptable (WHO, 2004), and addressing it can help achieve the Millennium Development Goal target of reducing the under-five mortality rate by two-thirds between 1990 and 2015 (UNICEF, 2007).

Children in developing countries

All children are especially susceptible to environmental risk factors but poor children are most at risk from environmental threats, and poor children in the poorest countries face the highest environmental burden. Children in developing countries lose 8 times more healthy life years per capita, than their counterparts in industrialized countries from environmentally-caused diseases. This higher environmental burden arises from disparities in:

- lack of adequate nutrition and sanitation
- mobility-related and transportation-related injuries, as well as unintentional injuries and poisonings
- indoor and outdoor air pollution
- vector borne diseases
- exposure to hazardous chemicals, and
- exposure to occupational hazards.

Environmentally-related diseases are further compounded by diminished access to health care often experienced in developing countries (Prüss-Üstün & Corvalán, 2006).
In situations of extreme stress such as war and conflict, environmental disasters, emergency situations and consequent displacement, environmental threats are typically increased. Such circumstances often pose almost insurmountable barriers to a child’s normal development in both physical and psychological terms (Bu-Hakah, 2005). Children in developing countries bear the brunt of disasters and suffer disproportionately from them because many nations lack: (i) the means to prepare for them, (ii) the capacity to cope with their impact and (iii) funds to repair or rebuild shattered health and sanitation infrastructure afterwards.

The disparities of environmental burden of disease between children in industrialized and developing countries may worsen as the global climate changes. Evidence is mounting that many of the main killers of children (malaria, diarrhoea, and malnutrition) are highly sensitive to climatic conditions. The Intergovernmental Panel on Climate Change predicted in 2007 that climate change will further strain water supplies and worsen agricultural conditions in many parts of the world, and will alter the spatial distribution of some infectious disease vectors. Countries already struggling to provide clean water, ensure adequate food supplies, and address malaria are likely to find it even more difficult to cope with the expected changes related to climate change.

**The Special Role of Health Providers in Environmental Protection**

Health providers have a very special role in environmental protection. They can educate parents and relatives on health issues, promote awareness regarding health and well-being and successfully discuss these issues with politicians (Ortega-García et al., 2007). However, some health providers may be inadequately trained to address children’s environmental health issues. They may need additional knowledge on the prevention, diagnosis, management, and treatment of environmental exposures and environmentally related illnesses (WHO, 2010). Paediatric health providers often lack sufficient knowledge and experience with environmental health risks, while health providers for adults may not be sufficiently knowledgeable about children, who are not just little adults (Wilborne-Davis, Kirkland & Mulloy, 2007). The lack of awareness of this difference among health professionals makes the adequate management of environment-related children’s health problems difficult. CEHUs
represent one practical response to this challenge (Ortega-García et al., 2007). CEHUs and the health professionals who staff them can be a trusted source in a community for environmental health information.

There are relatively low-cost ways to reduce the high expenditures associated with environmental exposures and environmentally-related diseases. Many interventions, such as teaching community members about safe household water storage and filtration, proper ventilation and cleaning of homes, can generate substantial benefits with relatively little investment. Additionally, these interventions can often be complementary to existing outreach programmes. Other interventions, such as helping a community improve hygiene measures and sanitation systems or assisting a local government with pollution-control policies, require more resources over a long time frame, but can then significantly reduce a community’s future disease burden.

In addition, inadequate environmental protection is expensive in any society. Prevention of exposure will benefit the economy as well as the children. A study by Landrigan et al. (2002) estimated that costs of the environmentally attributable fractions of four diseases (lead poisoning, asthma, cancer, neurobehavioural disorders) among US children was approximately 54.9 billion US dollars (range: 48.8 - 64.8 billion US dollars) per year in 1997.

**ACTIVITIES OF A CEHU**

Although each CEHU’s exact role will vary depending on local needs and resources, core activities include the following: (i) educate the public about the impacts of environmental exposures on children’s health; (ii) train health care providers and engage with the health community; (iii) provide consultative medical services; and (iv) consult with government agencies to address environmental hazards through policies that take into account the unique vulnerabilities of children.

CEHUs can also form effective networks. In the Republic of Korea, the Environmental Health Centre Network implemented by the Ministry of Environment has allowed individual centres to focus on research and management of childhood diseases pertinent to the country’s individual health concerns. Cooperating with these centres, the Ministry continuously makes efforts to promote preventive measures through evidence based policies (Paris et al, 2009) In North America, the CEHU network is
becoming a powerful way to address many complex issues efficiently and with one authoritative, science-based voice. A strong network allows individual CEHU directors to specialize in different environmental health issues, providing consultation to other directors as needed and lowering costs for all.

**Educate the Public about the Impacts of Environmental Exposures on Children’s Health**

CEHUs can help reduce the risks associated with environmental exposures and the burden of environmentally-associated illnesses by educating the public about how to limit or prevent exposures and how to identify problems that may be caused or exacerbated by environmental hazards. In order to do this, CEHU staff should be knowledgeable about children’s environmental health issues in general, and should identify and monitor issues that are of particular concern in the communities they serve. Specifically, CEHUs can conduct the following activities to educate the public:

**Alert the public to existing or potential risks and the appropriate responses**

CEHUs can educate members of the public about how to recognize and respond to environmental hazards. These may be existing problems, such as a lack of clean water, or potential problems, such as a new facility that will be using hazardous chemicals. In all cases, educational efforts can emphasize steps the public can take to reduce their risk of harmful exposures, and avoid creating anxieties or panic. CEHUs may also wish to create, or facilitate the creation of, information networks through which community members can share ideas and concerns.

**Develop educational materials adapted to local needs and different media**

Educational materials are important to inform the public about environmental health risks and strategies to address them. CEHUs can create, in collaboration with public health authorities, materials addressing local environmental health issues and adapt them for the cultural backgrounds and education levels of the various populations. Booklets,
brochures, and posters can be distributed at local events and through health care providers. It may be advisable to create different versions of information – for instance, prevention-focused material for the general public, and information about mitigation and treatment for parents whose child has just been diagnosed with an environmentally related illness.

Television, radio, and local print publications may reach a wider audience. CEHUs could develop announcements or ads regarding the most important and widespread children’s environmental health issues, and ask local media outlets to air or print them for free as a public service. For audiences seeking information online, CEHU websites can be a valuable resource; ideally, websites will include information in HTML format, so it can be easily read online, and in PDF format, so it can be downloaded and printed.

**CASE EXAMPLE**

In New Jersey, USA, a child care centre was inadvertently set up in a building that was formerly used as a factory for making mercury-containing glass thermometers. The state health department called upon the regional CEHU to assist with a plan for exposure assessment, medical screening, and risk communication to the potentially affected families. The CEHU designed a screening program for the children, led community meetings, and assisted the state and federal government in designing clear, understandable communications materials for parents and community members (Paulson et al 2008). Another example of the work of the CEHUs in the US was the development of a training program for community health workers (“promotoras”) about the risks of pesticide exposure in a region of the country with high levels of agricultural pesticide use (Paulson et al., 2008).

**Organize workshops, lectures, and other events on environmental health topics**

Workshops and other events provide an opportunity for CEHU staff to demonstrate prevention strategies – such as pest-control techniques or cleaning methods to remove hazardous substances from homes – and engage with members of the community. If there are multiple organizations working on the same issue (e.g., schools, community groups, and/or a local governmental agency), bringing their representatives together to deliver a coordinated message to the public will minimize resource expenditures and ensure that a uniform and consistent message is delivered. Incorporating environmental health messages into community events can also reach an audience that might not seek out the information otherwise. For example, Mexico’s CEHU organizes a community outreach program that uses health fairs, street theatre, and clowns to spread messages about garbage and pest control and drinking water protection.
Train Health Providers and Engage with the Health Community

Health providers, from local health workers to nurses and physicians, need to be educated about the risks associated with environmental exposures. In many cases, exposures cause harm without resulting in overt diseases (e.g., adverse neurocognitive outcomes related to low-level lead exposure, or long-term decrements in lung function related to exposure to air pollution). Only by understanding these adverse outcomes can health providers become advocates for primary prevention. In this way, both health providers and the general population will learn to connect environmental exposures with health outcomes and work to increase environmental protection.

Where there are overt signs of disease (e.g., lower respiratory tract infection with exposure to cooking smoke or the presence of gastrointestinal symptoms related to the exposure to certain pesticides), health care providers trained to recognize and respond to the signs of environmentally-related diseases can assist with providing the diagnosis and allow the patient to quickly begin the appropriate treatment.

CEHUs have the power to educate health professionals about how to recognize and respond to environmentally-related illnesses, and may target their educational effort at those in training for health professions. Specifically, CEHUs could conduct the following activities to educate health care providers:

Develop and make available training materials for health providers

CEHUs may develop training materials for health providers on children’s environmental health issues, or adapt existing materials (such as those prepared by WHO for developing countries and those from the American Academy of Pediatrics and the North American CEHUs). A variety of materials could be made available, with different versions geared to the different educational levels of the health providers who will be using them. Booklets and fact sheets can be distributed to health facilities; CEHUs that have websites can also make these available in PDF format for downloading. Videos can also be useful, provided that adequate facilities exist for viewing (either in health facilities or over a fast internet connection).
Materials may focus on both the prevention of environmentally-related illnesses in children (e.g., instructing providers to educate children’s parents about food safety), the recognition and diagnosis of diseases and prevention of child mortality, morbidity and disability related to environmental threats.

**Conduct trainings on the prevention, diagnosis, treatment, and management of environmentally-related exposures and diseases in children**

Training programmes and workshops for health professionals may include education about the health hazards and the impacts and potential scenarios of harmful exposures (chemical, microbial and physical) through the environment. Health professionals need training to recognize the risks associated with harmful environmental exposures as well as the clinical manifestations of those exposures. They can be trained to ask the appropriate questions and take detailed environmental histories. In addition to diagnosing environmentally-related illnesses, the providers can identify likely sources of exposure and instruct children’s caregivers in strategies to reduce or avoid them. Trainings can prioritize instruction on the high-risk situations, populations, and behaviours of the communities in which they are conducted. Additionally, health professionals in CEHUs can be trained in risk communication.

Environmental health officers and public health professionals can be trained to undertake technical inspections of homes and workplaces to identify sources of potentially hazardous exposures and recommend solutions. They can also give advice about “take home exposures”. In the case either of the parents works with pesticides or in mining, for instance, they should be informed that they can carry contaminants home on their clothes, shoes, and other objects.

**Develop Networks on Children’s Health and Environmental Health to Gain Knowledge and Share Experiences**

In addition to training health providers in their communities, CEHUs may communicate, cooperate and collaborate with other CEHUs and participate in networks that address children’s health and/or environmental health. Collaborative arrangements with other CEHUs or similar institutions can allow for the joint development and implementation
of advocacy, educational, training, and research activities. Participation in other networks and forums can advance the exchange of knowledge and experience and may provide a useful platform for the discussion of case studies. CEHUs can also work with other CEHUs and related environmental or occupational health centres to exchange case data; share evaluation and treatment information; train health providers; and respond to major exposure accidents. Such collaboration is particularly important when addressing environmental health issues that extend across local, regional, or national borders. Shared training through the network, for instance, can make these units expand and grow. A successful example of these is the network between units in North America, covering Mexico, US and Canada.

**Conduct campaigns to promote children’s environmental health, involving a variety of stakeholders**

CEHUs can conduct campaigns on the children’s environmental health issues most important to their areas, and involve community members, parents, non-governmental organisations, the private sector, and the health and environmental sectors. For example, if there is local contamination from a smelter or a mine that is harming children, a CEHU could work with parents, lawyers, and others to try to contain the emissions. As risk communication can be difficult and sensitive in cases involving the health of communities and children, evidence-based advocacy and communication are necessary. Some CEHUs may wish to promote specific public health policies (or the update of existing policies) or urge their countries’ governments to comply with international agreements dealing with children’s environmental health and rights to a healthy and safe environment. Communication with the media can also be very effective for advocacy in this area.

**Provide Consultative Medical Services**

CEHUs work to ensure that children with suspected or known environmentally-related illnesses get appropriate care, but this does not necessarily require patients to come to the CEHU to be seen. In the USA, for example, CEHUs serve a wide geographical region and provide consultative medical services via the health providers already serving that area. In most situations, the diagnosis of a paediatric environmental health
issue will come from a very detailed and specific environmental health history, with limited diagnostic findings from physical examination and standard laboratory tests (blood count, blood chemistries, or radiographs). CEHU staff can advise local health care providers about the questions to ask patients and the tests to conduct, and then advise them about further actions based on the responses and results. There may be specific instances when a CEHU provides direct medical services, but the CEHU does not necessarily need to be structured to manage large numbers of patients. The CEHU is more likely to do the following:

**Provide advice and referrals on cases involving either individual children or groups of children**

Knowledgeable staff can respond to anyone seeking information about children and environmental health – e.g., parents, teachers, pharmacists, nurses, doctors, other health providers, public health officials, and government agencies – and provide information appropriate to the questioner’s level of understanding. The staff also has a wide breadth of knowledge, or be able to quickly access a large store of information. Much of the necessary information is available via the internet. The staff is able to provide information and unbiased advice regarding the techniques available for monitoring and remediating environmental hazards, diagnosing environmentally-related illnesses, and treating children who have been exposed to harmful substances.

Sometimes, an environmental event will involve a community of children and families and will be an emergency situation, man-made (i.e. war and conflict) or natural (i.e. flooding). When this occurs, the CEHU may be asked to recommend what steps should be taken and to coordinate among providers or agencies that should be involved. The CEHU may provide referrals for medical exams or laboratory services; involve social workers who can help children move to safer environments; or coordinate with public health officials about clean-up. Some severely ill patients will require emergency care and/or need to be moved via ambulance, and these cases will require coordination with transport services and the receiving hospital.
The indications for referring to a CEHU could include:

a) Uncertainty about the nature and extent of the exposures involved
b) Uncertainty about the environmental relationship with a particular health problem
c) Need for assistance in risk communication
d) Need for specialized diagnostic and therapeutic interventions (pediatric toxicology, chelation therapy)

g) Consideration of a new environmentally-related disease or disease of unknown origin (Ortega-García et al., 2005).

A school located next to an agricultural area would be an example of a situation where CEHU involvement could be beneficial. Teachers or parents may raise concerns about the exposure of the children to pesticides applied to the crops. The question might be, “What are the risks to the children associated with pesticides drifting from the field into the school yard, and should anything be done to prevent or limit the exposure?” The CEHU could work with the farmer, and perhaps local agencies, to determine which pesticide is being applied. The CEHU could access information about both the possible acute toxicities associated with the exposure as well as the risks associated with long-term, low-dose exposure. Resources might include the WHO documents on environmental burden of disease and the US National Library of Medicine’s Environmental Health & Toxicology website. If the information reveals the risk of acute or long-term toxicity to the school children, the CEHU could then formulate recommendations for the farmer, the school, the children, the parents, and governmental agencies for how to minimize or eliminate the risk.

**Provide guidance on laboratory services**

Because any laboratory tests required will tend to be complex, many will need to be sent to central reference labs rather than being conducted locally. In the US for example, CEHUs generally do not provide laboratory services themselves, but they advise local providers about which tests to order, help them interpret the results that are returned, and provide guidance about communicating with patient caregivers based on those results.
Maintain standard data about all cases handled by the unit

CEHUs could record information about cases of both potential and confirmed hazardous exposures and diseases that are brought to the CEHU. A database documenting the full evolution of each case, including likely or confirmed sources of exposures, can allow CEHUs to detect geographic, seasonal, population-related, or other patterns of illness. Such monitoring can help identify sources of environmental exposures and allow CEHU staff to target their education and prevention efforts to particular populations or neighbourhoods or to vary their efforts by season. Data can also be a powerful tool. Evidence of high rates of illness among children living close to a hazardous site can help persuade local officials to fund cleanup efforts, and evidence of a systemic environmental health problem can convince decision-makers to adopt policies to address it.

Consult with Government Agencies about Situations to Address and Policies to Adopt

When an environmental hazard is present in a community, the local CEHU may bring it to the attention of government officials and assist them if necessary. This may occur in the case of a sudden event, such as a chemical spill, or may be in response to an ongoing problem, such as contamination from a waste site. Specifically, the CEHU may:

Alert agency officials about existing or potential environmental hazards and steps to address them

Depending on the scope of the problem, officials at the local, regional, or national level must be well-informed. For instance, Ministries of Health and/or Ministries of Environment may be notified about elevated blood lead levels in children, the potential effects of such high lead levels, and suggested steps to be taken to reduce children’s lead exposures and to prevent future lead poisonings. If schools or other community facilities are suspected to be contaminated, the CEHU can assist the officials in charge of the buildings with testing and any necessary remediation.

Authorities may also be advised about potential exposures and the preventive measures that can be taken to avoid them. For instance, if a new facility that will be processing hazardous chemicals is scheduled to open, officials may advise the surrounding community about potential
risks and actions they should take in the event of an accidental release; any safety practices that the facility may be required to adopt; and any safeguards necessary for the transportation and disposal of the hazardous substances in use.

It is helpful for CEHUs to be familiar with the appropriate offices or agencies addressing various environmental issues, ranging from food and water to toxic substances. A new CEHU may wish to seek advice from other health care providers or organizations about the appropriate contact people for different issues.

**Provide technical and policy advice to decision-makers and agencies related to children’s environmental health**

At times, officials will have agreed to address an environmental hazard but require advice about how best to do so. When new laws or regulations are under consideration, CEHUs can inform decision-makers about policies that other governments have adopted and what the outcomes have been, or direct them to recommendations developed by health organizations. CEHUs can also assist local agencies that are designing or implementing interventions to improve children’s environmental health.

**OPERATION OF A CEHU**

Operations will vary depending on the resources available and the children’s environmental health issues that are addressed. Despite these differences, sustainable sources of funding, adequate facilities, and sufficient staff to address a range of children’s environmental health issues are important. To leverage limited resources, CEHUs can engage in collaborations with other CEHUs and participate in larger networks.

**Funding**

CEHUs may acquire funds from sources such as the private sector, governments or communities, provided that no conflicts of interest exist. Over the long term, financing from governments or community partners can make CEHUs sustainable. When requesting funding, CEHUs can seek money to cover personnel, career development, and participation in educational activities, in addition to general operating budgets. In Spain, the CEHUs are included in the department of paediatrics in...
university hospitals and are completely supported by governments of the Autonomous Communities. The Agency for Toxic Substances and Disease Registry and the Environmental Protection Agency sponsor the CEHUs in the US, which are formal collaborations between an academic department of paediatrics and a clinic affiliated with the Association of Occupational and Environmental Clinics. In Mexico, the country’s environmental agency provides some support, but most of the funding is raised locally; in Canada, all of the funding is locally raised.

For units being established in settings with constrained resources, small units that require smaller quantities of financial assistance are preferable to large ones that will require a large amount of capital. They may also opt to adopt the local development framework described by the World Bank (Helling, Serrano & Warren, 2005) and be managed and operated with the full participation of community members. Close coordination and collaboration with management of other CEHUs in industrialized nations or CEHUs with more funding capabilities is useful.

Financial contribution from the industrialized country could include:

- Start-up funds or ‘seed money’ to facilitate the establishment of a CEHU
- Funds for travel to a conference or participate in a workshop in a related field
- Support for activities related to child environmental health within the country
- Project-specific funding
- Allocation of funds towards the employment of an appropriately-qualified staff member.

In-kind contributions from the industrialized country could be in the form of:

- Secondment of doctors, nurses, health professionals, laboratory staff for a period of time that will enable knowledge and information exchange
- Professional exchange programmes, whereby health professionals from different CEHUs exchange workplaces for a given period of time. Thus the health professional would work in another country’s CEHU and would experience first-hand the day-to-day functioning
of the host CEHU, while sharing best practices or experiences from their home country

- Financing from community partners to address issues of sustainability
- Partnering with other units from the same or other countries, creating networks that can jointly raise funds.

If opportunity permits, units can receive funding through:

- Donations
- Government funding
- Fee-for-service activities
- Volunteer participation (in kind).

**Staffing**

Each CEHU could consist of a core team of multidisciplinary health professionals, who could work part-time, plus a coordinator who could manage its operations and a cadre of consultants who could be called upon when needed.

The core team of health professionals could include, ideally, professionals from the following areas (Paris et al., 2007):

- *Children’s health professional with experience and interest in child health and the environment.* This could be one or more paediatricians or a paediatric nurse practitioner with appropriate supervision; their participation will most likely be part-time.

- *Environmental medicine (or occupational medicine) clinician.* This individual could be a physician or a nurse practitioner with appropriate supervision.

- *Nurse*

- *Community outreach worker.* This activity could be combined with that of the coordinator, provided the individual is skilled in engaging the community.

- *Coordinator.* Ideally, the coordinator would have a background in paediatrics and public health, environmental health, or nursing. This
individual would gather intake information from those contacting the CEHU for a consultation and will transmit the information to the appropriate individual on the CEHU staff. He or she would develop work plans, ensure that the CEHU’s activities fulfil its mission and adhere to its work plans, and manage communication with the public and the health community. This individual may be part-time, but a system needs to be in place so that queries can be handled in a timely fashion.

Other team members may include any of the following individuals, who would be part-time consultants, on call to the CEHU:

- **Clinical toxicologist.** Access to a toxicologist is essential unless the paediatrician or the environmental medicine (or occupational medicine) clinician has formal training in toxicology.
- **Child behaviour and development specialist**
- **Paediatric allergist**
- **Environmental medicine clinician (or occupational medicine, if unavailable)**
- **Other experts as funding allows and circumstances require.** For example, CEHUs may find it useful to work with a laboratory scientist, industrial hygienist, housing expert, environmental scientist or public health expert.

**Facilities**

CEHUs can be located anywhere, or they can be virtual. They may be housed within an existing facility – a children’s hospital or clinic, a children’s ward in a general hospital, a health care unit, or a government health clinic – or within a poison centre or research institute. Basic facility needs include:

- Computer with internet connectivity
- Telephone, with toll-free access if possible
- Reference materials (most of which are available online).

If a CEHU intends to offer examinations and other clinical services, a paediatric examination room with basic paediatric examination equipment
will also be necessary. If the CEHU is housed in an existing paediatric facility, it may be possible to use one of the facility’s existing exam rooms.

**Economies of Scale**

To effectively prevent and manage children’s environmentally-related illnesses, CEHUs should also work with a range of partners and stakeholders. They should foster strong working relationships with other professional and social institutions such as:

- Ministries of Health
- Ministries of Environment
- Full range of health providers and institutions – hospital departments, general practitioners, paediatricians, pharmacists, coroners and medico-legal experts, occupational physicians, epidemiologists, poison centres, etc.
- Medical and scientific societies
- Experts in information technology
- Local and central health authorities
- Other government bodies related to environmental health – housing, community development, schools, agriculture, labour, industry, transportation, etc.
RESOURCES AND TOOLS

There are many existing materials, studies, and international efforts about children’s environmental health. Information about them is available online at http://www.who.int/ceh

**Outreach and training materials**

WHO has developed a Training Package for Health Care Providers which includes training modules and information; modules covering general topics (e.g., taking an environmental history), specific tools (e.g., children’s environmental health indicators) and specific hazards (e.g., indoor air pollution, lead, moulds, pesticides, etc.). WHO has developed a paediatric environmental history form that providers can use to record information about the child, his or her environment, the community in which he or she lives, and other data.

Several CEHUs provide information on their websites about environmental hazards to which children may be exposed and ways to limit exposure. The U.S. Environmental Protection Agency website also contains a wealth of web pages, reports, fact sheets, and brochures about environmental health issues, and the EPA Office of Children’s Health Protection provides information specific to children.

**CONCLUSION**

Children’s Environmental Health Units educate health care professionals and others about preventing environmental exposures and about diagnosing and treating environmentally-related diseases. Their policy advice to government officials can strengthen governmental responses to environmental health problems. By maintaining databases and collaborating with partners in the health community, they can contribute to the knowledge base on children’s environmental health issues.
References


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