Notes:

• please add details of the date, time, place and sponsorship of the meeting for which you are using this presentation in the space indicated;

• this is a large set of slides from which the presenter should select the most relevant ones to use in a specific presentation. These slides cover many facets of the problem. Present only those slides that apply most directly to the local or regional situation. Where relevant, adapt the information, statistics and photos within each slide to the particular context in which this module is being presented. For instructions on how to use this module visit: https://www.who.int/publications/i/item/WHO-CED-PHE-EPE-19-12-02;

• The paediatric environmental history is one module from a larger training package focused on children’s environmental health. Throughout The paediatric environmental history, a number of different modules are suggested that contain additional relevant information. Consult these other modules where relevant. To see the full package visit: https://www.who.int/teams/environment-climate-change-and-health/settings-populations/children/capacity-building/training-modules;

• many aspects of The paediatric environmental history module are found in other training modules, particularly the Children are not little adults and Why children modules. If this module is being used along with these or other training modules in an interactive setting, it may also be useful to organize the presentation by using the illustrative case studies;

• the World Health Organization (WHO) reference number for the module The paediatric environmental history: training for health care providers, third edition is WHO/HEP/ECH/CHE/23.12;

• for more information on WHO’s work on children’s environmental health, please visit: https://www.who.int/health-topics/children-environmental-health.
This module is an introduction to the paediatric environmental history (PEH), a part of the standard medical history with additions relevant to potential environmental exposures that can, and should, be adapted to specific local contexts. This module reviews the need for the PEH, discusses how to develop and take the PEH, includes case studies to illustrate how the PEH can be used, and discusses how the PEH can be beneficial.

At the end of this presentation, learners will:
• recognize the importance of taking the PEH;
• understand how to incorporate the PEH into paediatric care;
• understand the potential barriers to taking the PEH and some ways to overcome these barriers.

Photo:
• © WHO / Anna Kari. Children play in a Slum area in North Jakarta, Jakarta, Indonesia.
Note:
When selecting the slides to include in your presentation, please choose only those of relevance to the region and/or interests of your audience.

This training module includes the following sections:
• the importance of the paediatric environmental history (PEH), including a background and introduction to the tool;
• incorporating the PEH into health care;
• potential barriers to taking the PEH, and some ideas to overcome them;
• case studies.

Photo:
• © WHO / Ala Kheir. Dr Mohamed attends to Arsema and her mother Alem at ZOA clinic in Um Rakuba Refugee Camp, eastern Sudan. Arsema was born in the camp and Dr Mohamed and the staff at the clinic followed her pregnancy.
Outline

- Importance of the paediatric environmental history (PEH)
- Incorporating the PEH into paediatric care
- Barriers to taking the PEH
- Case studies

This module starts with the important of the paediatric environmental history (PEH). This section also includes an introduction and background of the PEH.

Photo:
- © WHO / Ala Kheir. Dr Mohamed attends to Arsema and her mother Alem at ZOA clinic in Um Rakuba Refugee Camp, eastern Sudan. Arsema was born in the camp and Dr Mohamed and the staff at the clinic followed her pregnancy.
Healthy children need healthy environments

Health, wellness and thriving are produced by a constant interaction and adaptation between our genes and our environments

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Healthy children need healthy environments.

The Preamble to the Constitution of the World Health Organization (WHO) states that “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. Furthermore, as a guiding principle, it states that “healthy development of the child is of basic importance” (1). Health, wellness and the ability to thrive are produced by constant interactions and adaptation between human genes and the surrounding environments (represented by the bidirectional arrow on the slide).

The early 20th century saw many significant public health advances that extended human life expectancy around the world. Increased access to safe drinking water, adequate sanitation and hygiene services; waste, hazardous chemicals and pest management; improvements in medical treatment and prevention, such as antibiotics and vaccines; and increased access to electrical services have all played a role in preventing disease and premature mortality. These technological improvements have also contributed to reducing human exposure to some harmful environmental hazards (2).

As public health infrastructure has advanced over the past century, scientific understanding of the complexity of the lifelong interactions between genes and the environment has increased. In particular, environmental exposures during early life, including preconception, prenatal, infancy, early childhood and adolescence stages, may have potentially life-long health impacts and have been the focus of increasing research. Many specific environmental hazards, and the multiple ways children are among the most vulnerable to these hazards, are explored in detail in the individual modules included within WHO’s children’s health and the environment training package for the health care sector (3).

Note: consult the additional modules in reference (3) as required, or as relevant to your context. Children are not little adults and Why children modules may serve as a useful introduction to some key aspects of children’s environmental health.

References:
Paediatricians understand the importance of children’s environments in relation to their health. Exploring and understanding the constant interplay between genes and environments of developing children informs paediatric care (1).

Traditionally, paediatricians primarily considered the social environment in relation to children’s health and development. During the 20th century, family and other social settings (illustrated by the dark blue circle on the slide) were among the most studied environments when investigating child health. Paediatricians understand that the family unit is important to the survival and health of infants and children (1).

To a lesser extent, paediatricians have concentrated on community level interactions, for example in school and during play (illustrated by the yellow circle on the slide). Much less evident is the physical environment in the hierarchy of consideration, yet it can permeate everything. Children breathe, drink and eat the physical environment (illustrated by the green circle on the slide) (1). Evidence of the associations between the physical environment, children’s health and occurrence of disease and illness has significantly increased over the late 20th and into the 21st century (2).

The World Health Organization (WHO) has been working on incorporating environmental factors into children’s health care for more than 20 years, focusing on chemical, physical and biological risk factors, such as air pollution, global climate change, lead, and microbial contamination of water sources. These may be hazardous to children’s health and development and may cause lifelong health outcomes. These environmental threats are present – and coexist – in the places where children spend most of their time; where they live, grow, play, learn, and, in some circumstances, work (3).

The United Nations Children’s Fund (UNICEF) has also begun to include the influence of environmental factors into their work on children’s well-being. Using a concept similar to the illustration on the slide, UNICEF uses the following terms to describe environmental factors (4):

- the child
- the world of the child
- the world around the child
- the world at large.

There is growing international recognition that the physical environment affects health and wellness. How humans interact with and manage the physical environment has profound consequences on children’s health today and the health of future generations (2).
Note: for more detail on children’s special vulnerability to environment factors please see the modules *Children are not little adults* and *Why children.*

References:
Children live in complex environments throughout their entire lives. This slide shows how these environments can affect children’s health.

**Risk factors** can be physical, chemical or biological. Additionally, socioeconomic risk factors, such as poverty, overcrowding and violence, can also affect children’s environment and consequently their health. Children are exposed to physical, chemical and biological risk factors through specific **environmental media**, for example air, water, food and objects. The characteristics of environmental media are strongly related to the **settings** in which children spend their time. The characteristics of environmental media can differ significantly in **urban and rural areas**, for example access to safe drinking water, types of food consumed, commonly used objects, pesticides used and local industrial activities. These should be considered in the context of the places where children spend most of their time: home, school, outdoor areas and workplaces of both the child and their parents, other household members and carers (1,2).

Children are exposed to environmental media during everyday **activities and behaviours**, such as eating, drinking, playing, sleeping, learning, and working. Children’s particular behaviours must also be considered when exploring pathways of exposure to environmental risks, for example frequent “hand-to-mouth” activity, crawling and spending significant amounts of time on the floor (1,3).

Children may be at high risk of exposure to environmental factors due to their special **vulnerabilities**. This includes a number of physiological differences compared to adults, such as quicker breathing rate, higher consumption of food and water per unit of body weight, short stature placing them at increased exposure to contaminants that settle close to the ground and larger surface area; immature systems which may rapidly absorbed nutrients required for growth and development, but which may not be able to efficiently metabolize and eliminate some substances from the body; and developmental immaturity, which means that children may not be able to recognize hazards or remove themselves from dangerous situations (1,3).

Environmental risk factors may be associated with numerous adverse child **health effects**. This includes effects to children’s organs, systems, functions and their overall growth and development processes (3).

It is important to highlight that **several** risk factors may affect a child at once and may be present in more than settings where they spend time. A carefully tailored and locally appropriate paediatric environmental history (PEH) can help health care providers identify hazards and develop interventions to mitigate, reduce and eliminate them.

**Note:** if relevant, highlight the most significant environmental risks, relevant media and settings that are present and
may affect the health of children in your community.

References:

Photo:
• © WHO / Jawad Jalali. Afghan children show their fingers marked after they received drops of polio and finger mark by vaccinator in Asadabad, Afghanistan.
This figure illustrates some examples of the many environmental exposures that can affect children’s health. Children are exposed to numerous environmental hazards everyday. Some environmental hazards that parents are exposed to prior to conception may affect their offspring later in life. Some prenatal environmental exposures can have effects on fetal health and may be linked to childhood health outcomes. Environmental exposure continues throughout childhood, adolescence and into adulthood. Health effects may be immediate or may manifest later in life (1).

At the individual level, many environmental exposures are physical, chemical and biological, such as ultraviolet (UV) radiation from the sun, lead, mercury and vector-borne diseases. On national, regional and international levels, large societal trends such as climate change and increasing urbanization, globalization and inequities have led to global exposure to environmental hazards, affecting almost every child in the world. Due to wealth and resource inequities, however, children living in low-income countries (LICs) are exposed to a greater number of environmental risks and hazards compared to children in high-income countries (HICs) (2).

Health care providers and public health professionals play a key role in diagnosing, treating and protecting children from hazardous environmental exposures. Health professionals are in an ideal position to (1):

• identify children at risk to environmental hazards;
• advise parents on how to reduce these risks;
• advocate and recommend actions and solutions to policy-makers that protect child health.

Health care providers should be able to recognize and assess the environmental health threats present in the places where pregnant women, children and adolescents live, learn, play and work. It is essential to recognize that environmental threats to children’s health are greater in low-income populations and marginalized communities, in degraded environments and where populations are living under extreme stress (for example, during civil unrest, war or people living in refugee camps) (1).

Note: for more information on specific environmental exposures, see the additional individual modules in the World Health Organization (WHO) training package on children’s environmental health (3).

References:

Figure:
• © WHO
This map shows the under 5 mortality rate (per 1000 live births) in 2021 and highlights the global disparities in child mortality (1). A significant proportion of under 5 mortality is attributable to environmental hazards.

In 2021, an estimated 5 million children globally died before turning 5 years old. Almost half of these deaths (2.3 million) were in newborns (0–28 days). Communicable and infectious diseases continue to be leading causes of death in children under 5 years of age. While action is being taken to reduce childhood mortality, child mortality is highest in low-income countries. Children in sub-Saharan Africa continue to face the greatest risk of dying before turning 5 years old (1).

The most recent World Health Organization (WHO) analysis determined that in 2016 globally 28.1%, or almost 1.6 million, of all deaths in children under 5 were attributable to the environment (2). Some significant environmental hazards contributing to childhood mortality include (3,4):

- inadequate access to safe drinking water and sanitation facilities
- high levels of ambient and household air pollution
- vectors of disease, especially mosquitos
- polluting industries and informal recycling activities
- poor waste management
- hazardous chemicals.

There is also significant burden of disease in children attributable to the environment. The most recent WHO analysis determined that in 2016, 27.4% of global disability-adjusted life-years (DALYs) in children under age 5 were attributable to the environment (2). Assessing environmental risks to children and intervening appropriately can both save lives and improve the quality of children’s health and wellness. Child health care providers play a pivotal role in achieving this.

**Note on terminology:** DALYs for a disease or health condition are the sum of years of healthy life lost due to disability and years of life lost due to premature mortality.

**References:**


Map:
• © WHO
Environmental hazards are not uniformly distributed across the world. Environmental hazards can vary with local conditions, such as:

- geography
- climate
- industry
- public health infrastructure
- traffic
- level of development and industrialization
- socio-economic status
- political stability.

Many high-income countries (HICs) have reduced the burden of traditional environmental hazards through improved access to services, waste and chemical management and regulation, and improvements in medical diagnosis, treatment and prevention, such as antibiotics and vaccines. Many low- and middle-income countries (LMICs) continue to face a significant burden of disease and mortality from traditional environmental hazards, such as diarrhoeal diseases, respiratory infections and malaria. Data shows that the overwhelmingly majority of the world’s children under 15 years of age were living in LMICs in 2021.

Emerging environmental hazards, however, have increased rapidly across the world and are affecting the health and development of children in LMICs and HICs. For example, in 2019, 99% of the world’s population was living in countries where the World Health Organization (WHO) air quality guidelines levels were not met. In 2021, a United Nations Children’s Fund (UNICEF) report estimated that almost every child is exposed to at least one climate and environmental hazard, such as heatwaves, cyclones, flooding and water scarcity. LMICs are experiencing the burden of both traditional and emerging environmental hazards. This means they continue to face a significant burden of disease and mortality from traditional environmental hazards, while also experiencing emerging hazards, some of which are more characteristic of HICs. In the diagram on the slide this is illustrated by the overlapping of the circles.

**Note:** highlight the traditional and emerging environmental hazards pertinent to your audience and the local community, country or region.

**Note:** the size of the circles and the overlapping section shown on the slide are not representative of the number of children experiencing the double burden of traditional and emerging environmental hazards. See the module *Why children* for estimates of the number of children under 15 years of age living in LMICs.
References:
All health care providers – paediatricians, family doctors, nurses, primary health care workers, and other relevant health care providers – are in a privileged position and play a key role in detecting environmental threats to children’s health as they are in direct contact with children, their families, and the wider community. The paediatric environmental history (PEH) is the health care provider’s primary tool to prevent, recognize and treat environmental-related diseases and health conditions (1).

Health care providers have specific roles and responsibilities in recording environmental and health data and should be able to use the PEH to (2):

- recognize clinical, subclinical and potential effects of environmental risk factors on children’s health. This requires the capacity to identify potential exposure to chemical, physical and biological agents, and their potential effects on children’s health and development;
- take a thorough exposure history by asking appropriate questions and recording the information in an appropriate place (the PEH);
- contribute to research and knowledge generation - data and information on environment and health that have been collected, collated and analysed can provide valuable information that may fill knowledge gaps and contribute to research;
- inform the community and decision-makers about environmental threats to child health, and advocate for change to improve environmental conditions and prevent further harm;
- work to prevent, reduce and eliminate harmful environmental exposures and related health conditions.

The regular use of the PEH by health care providers will enable more effective primary care of children, their families and communities, improve the quality of medical surveillance, and contribute to the prevention of environmental-related diseases and health conditions.

References:

Photos:
- Top: © WHO / Blink Media – Tali Kimelman. This photo was taken at the Unidad Pediátrica Ambiental (UPA) in
Montevideo, Uruguay. Dr Maria Moll is examining a 10-year-old child who has high blood lead levels from playing with metals, especially by putting them in his mouth, from his family’s metal recycling business.

- Bottom: © WHO / Esther Ruth Mbanzi. Health workers at Kapelebyong Health Centre IV provide a father with nutrition information, Uganda.
The second section of this module discusses ways to incorporate the paediatric environmental history (PEH) into paediatric care.

**Photo:**
- © WHO / Ala Kheir. Dr Mohamed attends to Arsema and her mother Alem at ZOA clinic in Um Rakuba Refugee Camp, eastern Sudan. Arsema was born in the camp and Dr Mohamed and the staff at the clinic followed her pregnancy.
Two underlying key concepts should always be considered when using the paediatric environmental history (PEH). First is the concept that children are not little adults is covered on this slide. Second, the concept of prevention (primary, secondary and tertiary) is covered on the next slide.

Children are often at increased risk for adverse health outcomes and developmental consequences from exposures to chemical, physical and biological hazards in the environment.

There is increasing recognition that children have special vulnerabilities to environmental hazards. The fetus, infant, child and adolescent may be exposed to environmental threats during critical periods of growth and development, often referred to as "windows of vulnerability". Exposure during these windows may cause disease during childhood, but may also have lifelong health impacts. These exposures may be biological, chemical or physical, and the health effects in children depend upon many factors (1,2).

Children’s special vulnerabilities can be divided into four overarching categories:

1. **Children often have different, and sometimes unique, exposures** to environmental hazards compared to adults. For example, breastfeeding (2,3).
2. **Children are anabolic.** They eat, drink and breathe more per unit body weight than adults. Consequently, pollutants in the environment may be delivered in higher doses to children than adults. Due to children’s *dynamic developmental physiology*, environmental exposures may be handled quite differently by an immature set of systems than how they are absorbed, distributed, metabolized and eliminated in mature, adult systems. Furthermore, during “windows of vulnerability,” a child’s physiology is changing, maturing, differentiating and growing. These "windows of vulnerability" have no parallel in adult physiology and create unique risks for children exposed to hazards that can permanently alter normal bodily function and structure (2,3).
3. **Children have a longer life expectancy** than adults. Therefore, they have longer to manifest a disease with a long latency period, and longer to live with toxic damage (3).
4. Finally, **children are often politically powerless.** With no political standing of their own, children must rely on adults to protect them from environmental hazards (4).

Note: for more information about children’s vulnerability to environmental exposures, see the modules *Children are not little adults* and *Why children*. For more detail on children’s absorption, distribution, metabolism and elimination, see the module *Chemicals and children*.

References:


Photo:
• © WHO / Esther Ruth Mbanzi. Magdaleen, 7, has a meal at home. She was treated for severe malnutrition at a local health facility and has now improved, Uganda.
The concept of prevention is essential when using the paediatric environmental history (PEH). Prevention, including primary, secondary and tertiary, is a standard part of the pedagogy of public health and medical education. In paediatric health care, primary prevention is emphasized in the delivery of well childcare, for example childhood immunizations, anticipatory guidance, and education for carers on nutrition and child development. Within the realm of children’s environmental health, primary prevention is the “gold standard” as many environmental hazards can have permanent health outcomes and treatments may be limited. Ideally, hazardous environmental exposures should be eliminated, consequently preventing associated disease and injury. When elimination of an exposure is not possible, secondary and tertiary prevention are important (1).

The hierarchy of primary, secondary and tertiary prevention in paediatric environmental health care may look like:

1. **Primary prevention (1,2):**
   - **Avoiding** hazardous environmental exposures:
     - understand your community and children’s local environmental hazards;
     - anticipate potential environmental dangers, for example annual flooding that leads to increase in infectious water-borne diseases;
     - Precaution is key as prevention of disease is better than treatment;
   - **Developmentally-appropriate anticipatory guidance,** consider:
     - guidance by age;
     - guidance by annual changes in weather patterns;
   - **Examples of primary prevention** to avoid hazardous environmental exposure and disease include:
     - killing or inactivating diarrhoea-causing pathogens, such as Giardia, by bringing drinking water to a roiling boil, removing from the heat, allowing it to cool naturally, without the addition of ice, and protected from post-treatment recontamination during storage (3);
     - routine childhood vaccinations to prevent infectious disease outbreaks linked to the environment, such as Polio (2);
     - use of child-resistant packaging on hazardous items, such as chemicals used in household cleaning (2);
     - use of insecticide-treated nets for malaria transmission control (4);
     - abatement activities to permanently remove lead paint (5).

2. **Secondary prevention (1,2):**
   - Include **environmental causes** in differential diagnosis of a disease or injury;
   - Include **environmental interventions** in treatment plans;
• Capitalize on a “teachable moment;”
  • for example, guidance on parental smoking cessation when treating childhood asthma exacerbation;
• Examples of secondary prevention to reduce the impact of a disease linked to the environment may include:
  • complete appropriate course of antimalarial medication to prevent progression to serious disease and reduce risk of transmission (4);
  • blood lead level testing of children at high risk of lead exposure and appropriate follow-up (5).

1. **Tertiary prevention** (2,6):
   • May be necessary due to permanent damage or chronic illness;
   • Case studies and examples can be used to fuel advocacy, environmental protection and policy changes;
   • Examples of tertiary prevention to minimize the impact of an ongoing disease or injury linked to the environment may include:
     • physical rehabilitation following injury (7);
     • use of anti-inflammatory drugs, such as certain steroids, to prevent and treat asthma (1);
     • chelation therapy in children under the age of 10 years who have blood lead levels equal to or greater than 45 micrograms per decilitre (µg/dL) to reduce immediate toxicity and further damage to health (5).

**Note:** the World Health Organization (WHO) defines the three levels of prevention as follows (6):
• **Primary prevention** aims to prevent disease or injury before it occurs by preventing exposures to hazards that cause disease or injury, altering unhealthy or unsafe behaviours that can lead to disease or injury, and increasing resistance to disease or injury should exposure occur;
• **Secondary prevention** aims to reduce the impact of a disease or injury that has already occurred by detecting and treating disease or injury as soon as possible to halt or slow its progress, encouraging personal strategies to prevent re-injury or recurrence, and implementing programmes to return people to their original health and function to prevent long-term problems;
• **Tertiary prevention** aims to soften the impact of an ongoing illness or injury that has lasting effects by helping people manage long-term, often-complex health problems and injuries in order to improve as much as possible their ability to function, their quality of life and their life expectancy.

**Note:** adjust the primary, secondary and tertiary prevention examples on this slide to suit your context.

**References:**

Photo:
With these underlying concepts in mind, what is the paediatric environmental history (PEH)? It is \textit{not} a single, one-time endeavour, but part of a \textit{comprehensive medical history that is updated often and used for prevention, diagnosis, treatment and follow-up as appropriate}.

Just as questions about growth and development, medical conditions and the child’s social environments are standard and updated regularly, so, too, should questions about the child’s \textit{physical environment}. Asking the right questions about a child’s physical environment requires appropriate knowledge of local, regional and global environmental hazards, their importance in different life-stages and local access to relevant resources for intervention.

The PEH is not a foreign tool to paediatric health care providers. For example, questions about second-hand smoke and allergens are common when evaluating refractory asthma. In many cases, however, questions about the physical environment, exploring basic elements such as air and water quality, food and housing quality, are often not mainstream or integrated into routine paediatric care.

\textbf{Systematizing a set of basic, concise questions into both well and sick paediatric health care and tailoring them to local situations, resources, needs and capacities is the primary goal of the PEH.}
The paediatric environmental history (PEH) is both a tool (set of questions) and an opportunity for interaction.

**The PEH is a tool for:**
- primary prevention;
- identifying and assessing children’s exposures;
- responding with therapeutic, preventive measures;
- increasing the knowledge base.

**The PEH is an opportunity for interaction with:**
- the child, their family and other carers, and the wider community;
- colleagues, including clinicians, nurses, midwives and other health care workers;
- environmental and public health professionals, researchers and educators;
- decision- and policy-makers, at local, regional and national levels.

Data and evidence from the PEH may also motivate:
- specific interventions at the individual and family level, for example to remove or reduce an exposure;
- further enquiry, such as discussions with colleagues about similar cases or observations;
- contact with other professionals who may have information or advice on the situation observed;
- informing the responsible authorities about situations observed.

The PEH is **not** a new concept in health care. Health care providers throughout the world have learned to ask relevant questions about the patient’s environment. However, in light of new knowledge, evidence and exposures, and increasing concern regarding environmental risk factors, the environmental questions suggested in the PEH are detailed and aimed at collecting and recording information in a more systematic manner.

**Note:** the confidentiality of clinical data must always be respected according to medical ethics and any local or national laws.

**Photo:** © WHO / Christine McNab. Heather Heinrichs examines baby Chloe, currently the youngest baby in Hay River,
Canada. Chloe’s mother Brandy Buggins looks on. Heather, a midwife, follows babies up for six weeks after their birth. Chloe is in great health.
The most efficient way to develop a paediatric environmental history (PEH) is to begin with a standard PEH and modify it to reflect local conditions, needs, resource availability and health care delivery systems.

The questions included in a PEH should be specific to the local situation and take into consideration three key areas:

1. What are the main potential environmental hazards?
2. How, when and where are children exposed to environmental hazards?
3. What are the main health effects or risks?

Ideally, a PEH should be developed through dialogue among local health care providers and in consultation with experts in epidemiology, environment, psychology and data collection. In addition, involving the community and informing decision-makers and other local groups can be useful for long-term planning and effective prevention interventions. The questions included in the PEH should address the main environmental hazards present in the places where children spend most of their time, beginning with their homes, day cares and schools.

In developing the questions, format, and protocol of the PEH, it is helpful to remember the context of local community structure and culture, the resources available at the community level and the structure of the local health care delivery system.

The PEH can be an important tool for identifying and addressing local public health problems. For example, a community with water quality issues will benefit from health care providers identifying and documenting children and families at risk, assisting them with solutions and informing authorities of the extent of the problem. Routine use of the PEH may help with identifying and investigating disease clusters and their possible environmental causes.

When possible, a PEH that is customized locally from a general template at the village, town, city, state, province, country or even regional level has significant advantages. If specific questions are abstracted from a larger developed questionnaire and used broadly, then they can be collated and analysed over different levels of populations. Such harmonized data collection protocols or formats may facilitate the analysis and interpretation of data collected across many clinics, enabling epidemiological and other studies (within the country, or even internationally). The more robust and consistent the use of a locally, regionally or nationally harmonized PEH, the more valuable it can be as a research tool to further our understanding of children’s environmental health.

References:
1. Questions and answers: children’s environmental health - the paediatric environmental history [website].


**Photo:**
• © WHO / Joao Soares Gusmao. A young boy and a young girl at a water source, Timor-Leste.
While the focus of this training module is the use of the paediatric environmental history (PEH) in clinical care, it can also be an invaluable research tool. A number of questionnaires have been developed to study specific environmental risks or exposures throughout the children’s life stages, for example prenatal, infancy and adolescence (1–3).

Research questionnaires can inspire questions at the clinical level, and the collection of clinical data can feed into research efforts. The harmonization of the clinical PEH with larger research efforts is a powerful method to understand and support children’s environmental health and guide environmental health policies now and in the future.

References:

Photo:
- © WHO / Noor/ Benedicte Kurzen. Tina's Academy International School students were vaccinated by a team of health workers dispatched by the government in and around Owa-Alero, which has been one of the places with a high number of yellow fever cases, Nigeria.
There are many entry points for integrating the paediatric environmental history (PEH) into clinical care:

1. questions about the physical environment of a child can begin with each new patient as part of the standard intake information;
2. well child visits can include anticipatory guidance about environmental hazards which are tailored to the child’s age, the season and the local environment, and can increase parent’s and other caregiver’s awareness of these hazards;
3. the PEH is an important tool to employ when parents have specific environmental concerns. Importantly, sick visits should always include an assessment of environmental hazards in both diagnosis and management of illness or injury.
The decision about who takes the paediatric environmental history (PEH) will depend on the characteristics of the local health system, availability of health workers and other resources. As the PEH is an ongoing effort, different methods and individuals may be used depending on the circumstances and reasons for the visit. People who take the PEH may include:

- health care professionals working with infants, children and adolescents including paediatricians, family doctors, intake nurses or aids, primary health care workers, residents, medical and nursing students, and midwives who follow-up with pregnant women;
- social workers or environmental officers who visit the home, school, playground or other places where children spend their time;
- self-administered parent or caregiver questionnaires may be possible in some settings and can provide a starting point for discussion at any clinical visit.

Environmentally-trained staff in health care facilities can also offer tremendous advantages, as they are in a position to identify and assess any potential threats in a child’s environment, inform health care providers and authorities, and educate parents, teachers and communities.

Note: the confidentiality of clinical data must always be respected according to medical ethics and any local or national laws, regardless of who takes the PEH.

Photo:
- © WHO / Yoshi Shimizu. A team of health workers visits a remote nomad family as a part of their outreach health services in Mongolia.
Templates for the paediatric environmental history (PEH) have been developed by experts around the world that can help provide a starting point for local PEH templates. “The Green Page” was developed by the World Health Organization (WHO) and represents a place to record a core set of basic environmental details. It can be used as a starting point for developing a local PEH that is appropriate in a particular location, clinic, country, or setting (1).

Some interesting points to consider from the Green Page include (1,2):
1. the data collection form is green, to make it clearly visible within clinical records (relevant to primary health care centres that keep paper records);
2. it contains a combination of potential environmental risks, but also those elements that are essential resources for prevention of exposure and care (for example, access to electricity to minimize household air pollution or clean water for drinking and hygiene purposes);
3. assessment of the child’s environment may require training and knowledge of local environmental data to prioritize or select the most appropriate items included in a local PEH;
4. the Green Page may be completed from at least three sources of information:
   a. a set of questions made within the clinic;
   b. a list of key observations at home, school, playground or community visits;
   c. collection of reliable information from scientific, government or community data;
5. the template here contains a space to estimate the risk qualitatively - the "ABC" of environmental risks (part III of the form). The ABC assessment requires training and the development of specific criteria using intersectoral expertise, as well as diverse sources of data:
   • A = Clean
   • B = Average
   • C = Contaminated
6. with more that 50 items, it looks complex and is unlikely to be used at a clinical setting as it is, but it offers inspiration for possible lines of enquiry, innovation and data collection in a variety of settings;
7. it should not be considered a PEH as there are some items that cannot be transformed into questions or completed in the clinical setting.

The next three slides discuss each section of the Green Page in more detail, give examples of questions and illustrate methods of data collection that can be used to determine children’s environmental exposure.

References:

Figure:
- © WHO.
The questions included in a paediatric environmental history (PEH) go beyond those in a standard paediatric clinical questionnaire, such as enquiries about breastfeeding, general nutrition and second-hand smoke.

This slide shows some example categories and questions from the World Health Organization’s (WHO) Green Page to consider (1,2):

1. **Category:** The built environment in homes, schools and community areas, and water, sanitation and hygiene (WASH)
   a. **Possible questions:**
      - Is the area at high risk of flooding?
      - Is there high humidity? Can you see surfaces moulds?
      - Any old, damaged or peeling painted walls or furniture at home?
      - What kind of toilet is used at home? Is the toilet indoors or outdoors?
      - What sanitation services are available? Are you aware of any sewage problems?
      - Do you have handwashing facilities at your home, including water and soap?
      - Do you have tap water? Is it potable? If not, where do you get drinking water from?

2. **Category:** Air quality
   a. **Possible questions:**
      - Do you live near heavy traffic?
      - Do you notice any smoke in the surrounding areas? Or indoors?
      - Does anyone smoke tobacco in the home?
      - What fuels and technologies do you use in the home for cooking, heating or lighting? Do you notice air pollution within the home from cooking, heating or lighting activities?
      - Do you have a working carbon monoxide detector at home?

3. **Category:** Food and diet
   a. **Possible questions:**
      - Does the child consume excessively fatty foods?
      - Pregnant women, breastfeeding women or young children’s diet based on high-risk fish (fish high on the food chain or marine mammals)?
      - Are fruit and vegetables washed before being eaten?

4. **Category:** Family or child’s occupation or work
   a. **Possible questions:**
      - Do any artisanal, small-scale activities or work occur in the child’s home?
      - What is the parent or caregiver’s occupation? Is there potential for any take-home exposure?
      - Does the child work? If so, what kind of work do they do? Do they engage in any high-risk
activities, such as open burning, pesticide application, handling heavy metals, operating heavy machinery?

5. **Category**: Waste  
   a. **Possible questions**:  
      - Are there any landfills or dumps nearby?  
      - What local waste management systems are in place? Do you notice open burning near your home or surrounding areas?  
      - Is any waste stored at home? Does any recycling work occur in the home? Are batteries or e-waste recycled in the home?

6. **Category**: Other concerns  
   a. **Possible questions**:  
      - Are you aware of any infectious disease outbreaks in your area, for example diarrhoeal disease?  
      - Are there any common vector-borne diseases, for example malaria or dengue fever?  
      - Is your area at risk of climate-related events, for example flooding, drought, cyclones, or extreme temperatures?  
      - Do you have any domestic animals? Do they stay inside the home?  
      - Do you have livestock? Do they come inside the home? Do you notice any animal excreta near drinking water sources?  
      - Do you notice any industrial vapours, smoke or noise emissions near your home?  
      - Do you know of any industries present in your area, for example mining or agriculture?  
      - Are you aware of pesticide application in your area?

**Note**: adapt the example questions on this slide to reflect environmental risks that are relevant for your context, area or audience.

**Note**: for more information and ideas of questions that could be included in a PEH please see the following modules: Ambient air pollution, Children and chemicals, Electrical/ electronic waste and children’s health, Global climate change and child health, Household air pollution, Indoor air pollution, Lead, Mercury, Occupational risks and children’s health, Pesticides, Persistent organic pollutants, Sanitation and hygiene, Water.

**References**:  

**Figure**:  
- © WHO.
This section of the Green Page aims to gather sufficient information to complete an individualized risk assessment of the child’s environment (“ABC of environmental conditions”). This section aims to identify environmental risks and protective factors at home, school, day care, recreational areas, workplaces and other community areas, through in-person visits and observation. There are several points that need to be considered when assessing children’s environmental risks during home visits:

- to appropriately complete this task, it may be necessary to incorporate new or different items on the checklist or develop a new tool as part of regular home visit report;
- communication and interactions between paediatricians and primary health care clinics and those who prepare such reports, such as community or social workers or environmental technicians, should be reinforced;
- completing this information may take time and is unlikely to be completed in one site visit to any location;
- the information recorded in such visits can inform future child health and development follow-up, anticipatory guidance and medical advice on environmental health and preventing exposure to environmental hazards.

Note: this section of the Green Page uses the “ABC of environmental conditions,” which is a scheme for easily ranking or grading environmental conditions in a child’s clinical record. This requires careful criteria development before implementation and should be done in a coordinated manner with appropriate local professionals and experts.

References:

Figure:
- © WHO.
The final section of the Green Page provides a place to record a set of data regarding availability of public services. This could be done at local, regional or national level, and may be collected through scientific or governmental reports or other reliable sources. This information could be completed jointly with community, municipal and government stakeholders (1,2). Although this section is the final section of the Green Page, it may be useful for health care workers to have this information prior to seeing a patient. Local environmental knowledge can help confirm findings at the patient level or help direct a line of questioning towards the most likely environmental risk factor.

Additionally, some of this information could be completed through questions or self-administered questionnaires using evidence and information from the previously mentioned stakeholders. For example:

- What is the status of community water, sanitation and hygiene services?
- Is clean drinking water accessibility for the population serviced by this clinic?
- Is there any risk of well water contamination?
- Are community sanitation measures appropriate?
- Do homes have access to electricity?
- What are the main fuels used for heating, cooking or lighting?
- Is there heavy traffic in proximity to residential areas?
- Is there any local data on ambient air pollution?
- Can families reach the clinic?
- Does the neighborhood have safe and accessible waste collection?

References:

Figure:
- © WHO.
Short screening questionnaires can be useful to evaluate children’s environmental risks. These questionnaires should be constructed to reflect appropriate local and national risks. Key factors to consider when identifying environmental risks and developing such questionnaires include (1):

- sources of environmental contaminants
- local industry
- industrialization
- urbanization
- cultural aspects.

This slide shows one example from Uruguay of how a short questionnaire might be concentrated to a specific environment risk (in this case chemicals, particularly lead) and how it might be used. In order to provide an applicable tool for the primary care level, the Paediatric Environmental Unit at the Unidad Pediátrica Ambiental (UPA) in Montevideo, Uruguay developed a short screening questionnaire with 10 questions, six of which are designed to identify risks for lead exposure. Lead was prioritized in this questionnaire due to known local environmental evidence and risks (1,2).

This questionnaire is given to all patients in the waiting room by students or nurses during their primary care visits. Parents, caregivers or pregnant women may also be asked these questions while in the waiting room or office. Any questions answered with YES are referred to the Paediatric Environmental Unit. If the answer is YES for any of questions 1–6, a blood sample is taken to measure lead levels in the child or pregnant woman. If questions 9 and/or 10 is answered YES, the Paediatric Environmental Unit provides counseling and materials regarding second-hand smoke prevention and smoking cessation to the patient and family (2).

References:
2. Unidad Pediátrica Ambiental. Cuestionario corto de riesgos ambientales (urbanos) [Short questionnaire on environmental risks (urban)]. Montevideo: Facultad de Medicina, Universidad de la República (in Spanish).

Figure:
- © Unidad Pediátrica Ambiental. Reproduced with permission.
Another way to integrate the paediatric environmental history (PEH) into clinical practice is by including environmental topics in routine anticipatory guidance during well child visits. This will help make consideration, discussion and inquiry about environmental risks and exposures a routine part of clinical care, and stimulate regular discussion. These should be tailored to the patient’s age, local seasons, location and the child’s specific environment.

The example on the slide gives an example for a 6–9 month well baby visit and discusses poison prevention, avoidance of excess sun exposure and ensuring minimizing pesticide exposure on foods. This example comes from the Pediatric Environment Health Toolkit, an interactive webpage developed by the Pediatric Environmental Health Specialty Unit at the University of California at San Francisco, United States of America. This website can be explored for ideas and adopted into routine well child care and includes (1):

- guidance on select environmental hazards;
- anticipatory guidance by age group until adolescence;
- key concepts relevant to children’s environmental health.

Reference:

Figure:
- © University of California, San Francisco.
As medical education often neglects environmental causes of disease or illness in favor of more emphasized infectious- or nutrition-related causes, it is useful to have reminders of environmental possibilities for clinical care.

This slide displays a handy mnemonic for taking an environmental history, ACHHOO (an English expression used when someone sneezes), which triggers questions about (1):

- Activities
- Community conditions
- Household conditions
- Hobbies
- Occupations
- Oral behaviours.

This is especially useful during sick visits as it reminds the clinician to ask about any possible environmental links to illness. It is particularly important when there is a recurring, or deteriorating, condition with strong environmental links such as asthma, or a mysterious problem without an obvious cause. ACHHOO is also useful when the most common causes of any given condition are ruled out, leaving uncertainty on how to proceed with a diagnosis and treatment plan. Before accepting something as idiopathic, all avenues, including environmental exposures and conditions, should be thoroughly explored.

Note: the acronym ACHHOO was developed by Western States Pediatric Environmental Health Specialty Unit (at the time it was University of California at San Francisco Pediatric Environmental Health Specialty Unit) in collaboration with the California Chapter 1 American Academy of Pediatrics Environmental Health Committee (Dr. Mark Miller, University of California San Francisco, personal communication, 28 September 2022).

Reference:
While individual agencies and health systems can develop their own paediatric environmental history (PEH) tool, it is helpful to have ready-made templates as a start. **All PEH tools need to be tailored to the local environmental risks or conditions, but many environmental issues are important across communities.**

Two examples of PEH templates and approaches from the the United States of America are presented on the slide.

1. The Agency for Toxic Substances and Disease Registration (ATSDR), part of the United States of America’s Centers for Disease Control and Prevention, considers the PEH a key element in preventing and reducing harm to children from toxic exposures. The ATSDR has developed comprehensive case studies and guides to the use of the PEH in clinical paediatric care. It also offers suggestions for incorporating environmental issues and causes into both anticipatory guidance, and diagnosis and management of acute and chronic illness (image on left of slide) (1–3). ATSDR has also developed the Pediatric Environmental Health Toolkit Training Module, developed for health professionals interested in paediatric environmental health anticipatory guidance (4).

2. An example PEH developed by the National Environmental Education Foundation in the United States of America is available in both English and Spanish (images on the right of slide) (5).

Additionally, the American Academy of Pediatrics has been publishing *Pediatric Environmental Health* (a handbook for clinicians) for almost two decades and it contains many resources that can help to tailor a PEH for locally relevant issues, including a chapter dedicated to taking an environmental history (6).

**References:**


**Figures:**
- **Left:** © ATSDR.
- **Right:** © NEEF.
The third section of this module discusses common barriers to taking a paediatric environmental history (PEH) and ways to overcome them.

**Photo:**
- © WHO / Ala Kheir. Dr Mohamed attends to Arsema and her mother Alem at ZOA clinic in Um Rakuba Refugee Camp, eastern Sudan. Arsema was born in the camp and Dr Mohamed and the staff at the clinic followed her pregnancy.
There are a number of barriers to using the paediatric environmental history (PEH) more widely in clinical care, some are real and others are perceived. Some barriers are structural or systemic issues related to medical and nursing education and health care system capacity. Other barriers are more pertinent to individual clinics and health workers. Each barrier has solutions and many resources are available.

The main obstacles to the use of the PEH include:
- lack of awareness among health professionals and decision-makers of the effects that environmental hazards can have on the health, development and well-being of children, resulting in failures to prioritize considerations of the environment and health;
- lack of training and information on environmental health issues (for example, no formal training or access to sources of data);
- overstretched health facilities and lack of personnel and resources;
- emerging structural barriers, such as lack of financial reimbursement for addressing environmental concerns or algorithms designed into electronic medical records which exclude environmental causes in diagnosis and treatment;
- limited time available for paediatric consultation, resulting in the need to assess, diagnose and treat children in a short period of time;
- feeling ineffective, which may be linked to the limited ability or capacity to intervene clinically in environmental-related diseases (for example, ozone air pollution and asthma exacerbation).

Photo:
- © WHO / Nazik Armenakyan. Pediatrician Dr Ghazaryan examines Milena, 3-and-a-half months, during a preventive medical visit at the clinic in Yerevan, Armenia
Some systemic-level barriers may be overcome by:
- incorporating environmental health into the curricula of medical and nursing schools;
- increasing the awareness of health authorities;
- disseminating information on environmental issues;
- strengthening health facilities to promote environmental health through additional resource allocation.

Overcoming systemic-level barriers will look different from context-to-context.

Additionally, health workers can conduct home and school visits during their training. Many countries require newly graduated medical students to work for some years in rural settings before practicing in urban areas. These graduates may be excellent agents for promoting the use of environmental home and/or school audits in rural areas.

Emerging barriers (as mentioned in the previous slide) might include:
- financial reimbursement issues which fail to recognize the importance of the environment on health;
- limitations placed purposefully or inadvertently by the use of electronic medical records, decision algorithms or dropdown menus that neglect or minimize environmental health risks and concerns.

These barriers must be addressed proactively as they emerge.

Systemic solutions are most efficiently addressed at the municipal, regional or national level by educators, health system experts, policy-makers and politicians.

The next few slides discuss barriers that can be addressed by individual clinicians.

**Note:** if there are specific systematic barriers in your context to taking a PEH, discuss them here.
Clinic-level barriers are within the control of individual practitioners more so than systematic barriers. The two most significant barriers are:

- the limited time available to achieve multiple goals in any clinical encounter;
- general frustration and lack of feeling effective when it comes to many environmental-related health conditions and the exposures causing them.

Suggested actions to address these are explored in the next few slides. These actions are not exhaustive. Many creative ways to address limited availability and clinical frustration can be found.

**Photo:**
- © WHO / Nazik Armenakyan. Patient Mila, 2, pretends to treat herself with an otoscope during a doctor’s visit at Pediatrician Hrachuhi Ghazaryan’s office at Wigmore Clinic, Yerevan, Armenia.
One method to overcome limited time available in the clinic is to include environmental health information in the waiting area for both parents and children to see.

Posters such as those featured on the slide are one way to quickly stimulate awareness and questions. Magazines, handouts, informative videos, links to social media and other new technologies can also increase environmental awareness and knowledge among families waiting to be seen in the clinic. Games, books and short competitions for children as they wait can help engage young audiences.

Partnering with local schools to display winners of a poster contest on a key environmental risk is one way to increase community awareness, stimulate questions from parents and inspire action on environmental hazards. Finally, having a sustainable practice, emphasizing “green” choices through signage and actions taken in the clinic can provide more points of entry into discussion of the environmental and children’s health.

Figures:
- **Left:** © WHO.
- **Right:** © WHO.
Health care providers can save time by recruiting help to complete the paediatric environmental history (PEH). The PEH can be integrated within intake information for new patients either as a form completed before coming, online or during intake. Parents, caregivers, other staff members and volunteers from community organizations and groups may be available to complete elements of the PEH.

**Caregivers and parents:**
- complete survey online before clinical visit;
- complete survey as they wait in clinic waiting room.

**Empower staff:**
- train front desk personnel to assist with PEH questionnaires;
- encourage distribution of education materials when patients arrive.

**Students and volunteers:**
- train to support staff and clinicians;
- review and highlight environmental issues suggested by individual survey answers.

**Photo:**
- © WHO / Billy Miaron. Gumatho (left), a community health volunteer in Korr, goes through nutrition records with Lucy (right), a nutritionist at a health facility in Korr, Marsabit, Kenya. Gumatho helps monitor the health status of children in her community and ensures that they are enrolled for supplementary feeding if they are malnourished.
The more automatic and routine environmental questions are, the more time is saved. The more smoothly these environmental history questions are integrated into routine practice, the less they will feel extraneous and burdensome. Some ways to incorporate environmental questions include:

- Add critical environmental questions to vital signs, for example:
  - Second-hand smoke exposure
  - Drinking water source
- Include environmental questions on routine clinic forms, for example:
  - Newborn/breastfeeding and well child visits
  - Chronic problem visits, such as asthma
- Tailor electronic medical records, tablets, phone apps to include environmental reminders, dropdown menus, questions, diagnostics and interventions

Note: if possible, give examples of time saving methods that have been successfully used in your context.

Photo:
- © WHO / Malika Diagana. Go.Data in use as part of the COVID-19 response at a health facility in Nouakchott, Mauritania.
The use of preprinted materials is another way for clinicians to save time. These can be:

- environmental health anticipatory guidance in the form of handouts for patients and their families and caregivers, organized by patient age, by season, by hazard, or by health condition.
- preprinted prescriptions for environmental health or handouts for environmental remediation. Once developed, these can be used effectively to explain issues, sent home with patients and their families as reminders, and can be used to refresh education within the clinic.

The images on this slide show example from the United States of America. The top image shows a prescription for preventing environmental exposures in a 0-12-month-old child and highlights the benefits of breastfeeding and avoiding mercury and second-hand smoke exposures (1). The image on the bottom is an example of a prescription to prevent exposure to lead paint in the home. This prescription is context specific and gives contact information for local health departments (2).

**Note:** if possible, give examples of pre-printed materials that have been successfully used in your context.

**References:**


**Figures:**

- **Top:** © ATSDR.
- **Bottom:** © New York State Children’s Environmental Health Centers.
The final clinic-level barrier discussed in this module addresses fighting feelings of ineffectiveness and associated frustration. This slide suggests some ways that health care workers can increase their knowledge on environmental-related health issues and fight feelings of frustration and ineffectiveness:

- **continue medical education and increase knowledge on environmental health through online and easily accessible sources**, such as:
  - textbooks and eBooks, such as the *Pediatric Environment Health* handbook (pictured top) (1);
  - specialty journals, such as Environmental Health Perspectives (open access) (2) and the Lancet Planetary Health (open access) (3);
  - World Health Organization’s (WHO) children’s health and the environment training package for the health sector (middle figure on slide shows the introductory module *Why children*) (4);
  - Pediatric environmental health toolkit developed by Pediatric Environmental Health Specialty Units (PEHSU) and Physicians for Social Responsibility (5), and training module provided by the Agency for Toxic Substances and Disease Registry (ATSDR) (6);
  - PEHSU provides a variety of information and resources for health professionals (pictured at bottom of slide), with a strong focus on Canada and the United States of America (7);
  - ATSDR’s case studies in environmental medicine (8);
  - UNICEF-WHO’s introductory course on children’s environmental health (9);
  - other sources that may provide useful training and information for health care workers may include national centres for disease control, local and national health departments and agencies, and the WHO world directory of poisons centres (10).

- **Professional meetings and conferences** run by international health organizations are increasingly exploring environmental health topics and may provide train-the-trainer sessions on environmental health topics, such as International Network on Children’s Health, Environment and Safety (INCHES) (11) and the International Pediatric Association (IPA) (12).

It is important to **cultivate health care experts** by maintaining engagement, ensuring opportunities for further education and skill development, and creating knowledge sharing platforms that will place increasing importance on children’s health and the environment.

**References:**
3. The Lancet Planetary Health [website]. Amsterdam: Elsevier; 2023


Figures:
• Top: © American Academy of Pediatrics.
• Middle: © WHO.
• Bottom: © PEHSU.
Many environmental health problems are related to large-scale environmental issues, which are outside the standard clinical approach paradigm of: diagnose and treat; research and publish sentinel cases; educate and empower patients, families, colleagues and students; and provide a good role model. This is a significant cause for feelings of inadequacy among clinicians and other health care workers. While the standard clinical approach described briefly on the slide are essential to spread awareness and knowledge, the most effective approach that health care providers can take to these large-scale environmental problems is to:

- **Advocate** for systemic change is often the most effective way to create healthy environments for children and prevent environmental-related illness and morbidity. The role of health care providers in advocating for healthy environments for children is critical and participating in advocacy groups with colleagues, parents and environmentalists can help fight frustration and increase feelings of effectiveness when addressing such large-scale environmental challenges.

For example, air pollution is a serious health hazard associated with premature death, negative birth outcomes, asthma exacerbation and increased likelihood of disease and death from lower respiratory infections (2). To tackle air pollution at the clinical level, health care providers can:

- **Conduct research and publish** to expand the knowledge base;
- **Raise awareness** among colleagues and community of the links between air quality and incidence of lower respiratory infection and asthma exacerbation;
- **Suggest methods to avoid high levels of air pollution**;
- **Suggest interventions to reduce levels of household air pollution**;
- **Model clean and sustainable personal choices, such as walking or bicycling to work and making energy efficient choices in clinical offices**.

Eliminating air pollution, however, is outside the control of individual health care providers and can be frustrating to try and mitigate. The voices of pediatric health care providers in advocacy work can be powerful in moving policy toward cleaner, less polluting industries and consequently reducing levels of air pollution.

**Note:** for more information on air pollution and child health please see the modules **Ambient air pollution**, **Ambient air pollution**.
Household air pollution, Indoor air pollution and Childhood respiratory diseases linked to the environment.

References:

Photos:
• Top: © WHO / Esther Ruth Mbabazi. WHO staff speak to community members in Kapelebyong District, one of the areas with the highest levels of malnutrition in Uganda.
• Bottom: © WHO / Esther Ruth Mbabazi. Hygienists take part in a training session at Mulago Ebola Isolation Center, Uganda.
This final section of this training module discusses four case studies illustrating how the paediatric environmental history (PEH) can be used. This section is designed to be interactive to encourage learner interaction and discussion. Follow the animation in each slide and discuss:

- the patient’s history and symptoms;
- possible environmental causes;
- children’s vulnerability to environmental hazards;
- how the PEH was used in the case study, or could have been beneficial to the scenario.

Three of the cases come from the clinic, include interventions that are available at the individual level and are under the control of the family once provided with appropriate advice and information. The final case study is more complex and requires broader systemic change. Systemic change require advocacy at multiple levels, and the input of health care professionals is powerful in advocacy.

**Note:** if you have any case studies or examples pertinent to your context illustrating how the PEH has been used, or could be beneficial, insert them here. Use the suggested animation to encourage learner participation and stimulate discussion.

**Photo:**
- © WHO / Ala Kheir. Dr Mohamed attends to Arsema and her mother Alem at ZOA clinic in Um Rakuba Refugee Camp, eastern Sudan. Arsema was born in the camp and Dr Mohamed and the staff at the clinic followed her pregnancy.
The details of this case study are divided into three sections as listed on the slide (1).

1. **Patient details:**
   - Baby Courtney, 1 month old
   - Lived in farming community
   - Breastfed from birth with the addition of some powdered formula supplement
   - Occasional blue colour in nails and fingertips

2. **Health care provider diagnosis:**
   - Acrocyanosis
   - Courtney was healthy and normal

3. **Consequently:**
   - Her mother noted she is not “thriving”
   - Thought it is due to breastfeeding
   - Transitioned to more powder-based formula mixed with tap water
   - Courtney developed progressive vomiting and diarrhoea at 2 months
   - Breastfeeding discontinued
   - Courtney passed away at 2 and a half months old

Reference:
Case study 1: Individual tragedy

What happened?

Courtney lived in a farming community

What were some of the main risks to Courtney’s drinking water living in a farming community?

1. The family’s drinking water was from a private well
   a. Private wells that are shallow and have permeable soils are at higher risk of chemical and microbial contamination, especially if they are located close to sources of chemical pollution or sewerage systems. Private wells may not undergo routine testing to ensure water quality (2);
2. In this case, the well water was contaminated with artificial fertilizer run-off from local farms;
   a. Upon testing, the family’s private well was found to have nitrate levels 15 times higher than the national standard;
3. Courtney died of methaemoglobinemia
4. Why was Courtney the only victim?

What happened in this case? As mentioned on the previous slide, Courtney and her family lived in a farming community. What were some of the main risks to drinking water sources for Courtney living in a farming community?

1. In this case, the family’s drinking water was from a private well. What are the potential risks of drinking water from private wells?
   a. Private wells that are shallow and have permeable soils are at higher risk of chemical and microbial contamination, especially if they are located close to sources of chemical pollution or sewerage systems. Private wells may not undergo routine testing to ensure water quality (2);
2. In this case, the well water was contaminated with artificial fertilizer run-off from local farms;
   a. Upon testing, the family’s private well was found to have nitrate levels 15 times higher than the national standard;
3. Courtney was misdiagnosed with acrocyanosis. She died from methaemoglobinaemia - a condition in which haemoglobin has decreased ability to transport oxygen to tissues;
4. Why was Courtney the only victim in her family to nitrate pollution in the drinking water? (Answers discussed in the next slide).

References:
Courtney’s case illustrates three ways that children are uniquely vulnerable to environmental exposures. The well water her mother was using to make formula had levels of nitrates 15 times higher than the national safety standard. Although the rest of her family were also drinking the same water, Courtney was the only one who became ill. Many differences between infants and older children and adults contributed to this infant’s special vulnerability and ultimate death. In order to prevent similar circumstances, it’s important to understand how nitrates are converted to nitrites in the body causing methaemoglobinemia.

1. **Courtney had a unique exposure - a single food source (1).** Progressively, as her mother shifted from nursing to exclusive bottle feedings, Courtney had only a single food source, the formula, and concurrently a single source of water. Her siblings and parents drank juices, sodas, bottled water, as well as water at work and outside the home. Combined with higher fluid intake per body weight typical of infants, and the result is a much higher exposure to the nitrates in the private well at home than the rest of her family.

2. **Courtney had unique vulnerabilities - in the gastrointestinal tract, nitrate is converted to nitrite by bacterial flora (1,2).** In infants, there is a relative overgrowth of this flora related to a higher gastric pH. This results in more efficient conversion of nitrate to nitrite, which is then absorbed and causes methaemoglobinaemia. Infants have a substantial proportion of fetal haemoglobin, which was more readily oxidized to methaemoglobin with reduced oxygen carrying capacity. An infant’s ability to convert methaemoglobin back to normal haemoglobin is reduced as infants have only about half the methaemoglobin reductase of adults and older children, which completes this conversion. Courtney also developed diarrhoea and vomiting and consequently dehydration, which exacerbated methaemoglobinaemia. Together, these factors cause unique vulnerability to nitrate in drinking water in infants less than four months old.

3. **Courtney was dependent upon the adults in her life to keep her safe.** In this case, Courtney’s paediatrician misdiagnosed her condition as acrocyanosis, which led to her not receiving the life saving medical care and treatment that she needed. Additionally, her mother, with all good intentions and thinking her condition was related to it, decided to stop breastfeeding and switch exclusively to formula feeding, which she also thought would provide her with additional calories.

**References:**


Photo:
By understanding the affects that the environment can have on children's health and taking a paediatric environmental history, the paediatrician in this case study could have changed this scenario and prevented Courtney’s death. Some methods of changing the scenario to prevent adverse health outcomes include (1):

**Primary prevention** methods may include conducting prenatal counselling to:
- know your community and the local environmental hazards;
- identify drinking water sources;
- advise regular private well testing, where relevant;
- prevent exposure to identified environmental risks by:
  - educate expecting parents on the potential risks of contaminated water;
  - advising the use of bottled water if relevant;
  - suggesting a change in drinking water source if necessary;
- encourage exclusive breastfeeding for at least the first 6 months of life.
Primary prevention methods may also include incorporating key environmental hazards as part of of vital signs, in this case study by asking about drinking water sources.

**Secondary prevention** methods may include:
- being curious and listening. Is the mother’s concern disproportionate? Are there any red flags?
- taking an environmental history and do no settle for "idiopathic" lightly.

**Reference:**
Baby Grace was a 7 pound (lbs) 14 ounce (oz), term infant with no history of problems during pregnancy, labour, or delivery. Her APGAR scores was 9/10. She had mild transient neonatal jaundice with a peak bilirubin of 12.6. She had no family history of hereditary illness or neurologic disease. At a well baby exam at 12-weeks old she was found to be hypertonic by her primary care physician and referred for evaluation to a paediatric neurologist. The paediatric neurologist noted she had upper and lower extremity hypertonicity, and ankle clonus. The diagnosis of cerebral palsy was made by the neurologist at 16-weeks old, and physical therapy was started (1,2).

Note: APGAR stands for appearance, pulse, grimace, activity, respiration. It is used to evaluate the health of a newborn at 1-, 5- and 10-minutes after birth and determine whether additional care is required (3).

References:
Case study 2: Correcting misdiagnosis

What happened next?

At 6 months old, parents reported having had their house sprayed for insects the day before they brought Grace home from hospital:

1. Grace’s metabolite levels were elevated, equal to that of an applicator after an 8-hour shift
2. Diazinon pesticide residues in the home six times expected after normal application
3. Family left the house
4. 6 weeks later Grace’s condition was cured
5. Why were Grace’s parents unaffected?

A pesticide expert was consulted. Based on the history, tests for urine metabolites for organophosphates were ordered and consequently:

1. Grace’s metabolite levels were elevated and equal to that of an applicator after an 8-hour shift;
2. six months after the application, diazinon pesticide residues in the home measured six times what would be expected immediately after normal application;
3. the family left the house;
4. 6 weeks later Grace’s muscle tone was normal. Her “cerebral palsy” was cured.
5. Why were Grace’s parents unaffected by pesticide residues? (Answers discussed in the next slide).

References:

Case study 2: Correcting misdiagnosis

Children are not little adults

- **Unique exposures:**
  - Large surface area/volume
  - Different breathing zone
  - Limited mobility

- **Unique vulnerabilities:**
  - High minute ventilation

- ** Longer life expectancy:**
  - Risk of long-term neurotoxicity

- **Depend upon adults:**
  - Initial medical professionals’ misdiagnosis
  - Inadequate controls/education for pesticide applicators
  - Lack of public awareness/education

Grace’s case illustrates four ways that children are uniquely vulnerable to environmental exposures (1,2):

1. **Grace had unique exposures** to the pesticide. Her exposure was different because infants have a larger surface area to volume ratio making dermal exposure a greater threat. Infants reside in a lower breathing zone than adults and have limited mobility so are more likely to be exposed to off-gassing fumes from floors and surfaces;

2. **Grace had unique vulnerabilities** to the pesticide. As a rapidly growing and developing infant, her high minute ventilation resulted in a greater internal dose of pesticide contamination from the air which her body was unable to metabolize quickly enough.

3. **Grace had a longer life expectancy** in which to develop associated disease. Her longer lifetime meant that even though her acute symptoms resolved by 1 year of age, her developing systems may have been damaged by the pesticide exposure making it possible that illness or harm related to high exposure in the first 6 months of life could manifest later.

4. **Grace was dependent upon the adults** in her life to protect her from harmful pesticide exposure. The adults in her life initially failed to appropriately protect her when they did not identify the pesticide exposure. Thanks to thoughtful parents and a responsive paediatrician, they eventually asked the correct questions and were able to change the situation and correct the misdiagnosis. Additionally, systemic failures in this case study created a situation in which hazardous pesticides were used inside the home – also a result of adults failing to protect vulnerable children.

**Reference:**


**Photo:**

By understanding the affects that the environment can have on children’s health and taking a paediatric environmental history, the paediatrician or the neurologist in this case study could have changed this scenario earlier in Grace’s life and reduced her acute exposure to a hazardous pesticide during important periods of development (1,2). Some methods of changing the scenario to prevent adverse health outcomes are discussed on the slide.

Due to the medium and long-term consequences of toxic pesticide exposure, the greatest good is achieved through primary prevention. Prenatal counselling with the parents about the risks of home pesticide use to the health of their child could have specifically prevented its use in the home. The precautional principle – the assumption that a chemical exposure could be harmful unless scientifically proven to be safe – could have led the parents to choose alternative solutions to any active insect problem (3). Public education on how to create and maintain a healthy home to avoid toxic exposures can include:

- non-chemical integrated pest management choices;
- tighter regulation and enforcement on pesticide use and approved applicators when unavoidable.

In this case study, secondary prevention was key to Grace’s original misdiagnosis. Some changes to secondary prevention in this case could have identified Grace’s symptoms earlier, for example:

- the paediatrician and the paediatric neurologist could have asked about the home environment, potential exposures and completed an environmental history. If either were curious to ask, they could have made the diagnosis when Grace was 12 weeks old when the hypertonicity was first noted;
- a lack of risk factors for cerebral palsy should have led to either the paediatrician or the specialist to probe more deeply for potential extrinsic causes to a lifelong diagnosis.

Tertiary prevention was also relevant in this case study. This would involve knowledge of potential medium and long-term sequelae to early pesticide exposure and assuring that the child and family receive all possible assistance and support to minimize any ongoing harm.

Note: for more information, please see Children and neurodevelopmental behavioural intellectual disorders (NDBID), Developmental and environmental origins of adult disease and Pesticides.

References:

A mother who is two months pregnant brings her 8-year-old son, John, to the pediatrician. He has been complaining of headache, weakness, and less interest in school this autumn. His symptoms have continued for several weeks. He feels nauseous, but has no vomiting, diarrhoea, abdominal pain, or fever. The headache is present in the morning when he wakes up. His teacher says he appears sleepy and does not seem to be paying attention in class, although he does begin to perk up somewhat in the afternoon.

At first, his mother thought John’s symptoms were related to a viral syndrome or were a reaction to her pregnancy, since she has been more fatigued and irritable and consequently short with him. She herself also complains of considerable “morning sickness” that she describes as headache and vomiting in the morning. John’s father is currently not at home and is working out of town.

On medical examination, John’s vital signs are normal, and growth is in 50\textsuperscript{th} percentile (which is normal for him). The only findings are mild nasal congestion and some sleepiness. His past medical history is entirely benign. The pediatrician notes that the symptoms are present in the mornings at home but improve at school as the day progresses. The paediatrician wonders if there is something in the home that could be responsible for the symptoms (1).

Note: discuss with the learners the possible environmental causes of John and his mother’s symptoms that could be found in the home.

Reference:
As noted on the previous slide, the pediatrician was concerned that as John’s symptoms were present in the morning at home, but improve at school as the day progresses, there may be something in the home responsible for the symptoms.

The paediatric decided to take an environmental history and found:

1. The environmental history finds:
   - Heating source forced hot air from gas furnace
   - Installed in 1960
   - Ductwork repair and redesign few months prior
   - No carbon monoxide detector

2. Consequently:
   - Consult with specialist
   - COHb tests
   - John’s COHb = 15%
     (normal 1-3%)
   - His mother’s COHb = 10%
   - Family vacated home

This represented a medical emergency, and the family vacated the house immediately. The utility company identified the source of carbon monoxide as incomplete combustion of gas in the furnace exacerbated by the newly redesigned duct work. The problem was fixed, and the family were able to return safely to the house (1).

Reference:
This case illustrate the special vulnerabilities of both the fetus and the child, as well as illustrating an example of symptoms presenting differently in an adult (1).

1. **The unique exposures** in this case study were relevant to the pregnant mother and the developing fetus. She was breathing air polluted with carbon monoxide which can cross the placenta and enter the fetal blood stream. Fetal hemoglobin (FHb) has a much higher affinity to carbon monoxide than adult hemoglobin (AHb), which results in more anoxia than in an adult. This is particularly hazardous to the health of the fetus as critical systems, including the nervous system, are rapidly developing. Carbon monoxide exposure during pregnancy may result in lifelong harm. Protecting pregnant women throughout gestation is a critical way to promote children’s environmental health.

2. John had **unique vulnerabilities to carbon monoxide exposure**. John is in the anabolic phase of growth, so his metabolic rate and minute ventilation are higher than adults. Thus, he internalized more carbon monoxide than an adult which was reflected in the higher percentage of carboxyhemoglobin in his blood compared to his mother’s.

3. **Longer life expectancy is most likely to affect the developing fetus.** Depending on the duration and timing of the carbon monoxide exposure, structural and/or functional changes may have resulted. John is less likely to have long term consequences due to his age at exposure, less rapidly developing systems and recovery time at school away from the source of exposure. Both John and his unborn sibling, however, should be closely monitored.

4. **Dependency upon adults and effective action taken by the adults** in John’s life is evident in this case. While the family did not have a carbon monoxide detector in the house, John’s concerned mother took him for an evaluation with his paediatrician due to his behaviour change. His paediatrician noted where and when his symptoms were at their most severe, asked the right questions and sought specialist advice that led to the correct diagnosis and appropriate intervention.

**Reference:**
While this case study has a positive outcome, **primary prevention methods** could have avoided the situation (1).

**Primary prevention** methods in this case may have included:
- regular maintenance of heating, ventilation and cooling systems;
- installation of carbon monoxide detectors;
- anticipatory guidance scheduled just before “heating season.”

**Secondary prevention** methods could have included the identification and elimination of the exposure and remediation of heating, ventilation and cooling systems. In this case study, the secondary prevention measures were successful with action from the paediatrician and the family.

Finally, **tertiary prevention** may also be necessary in this case. Both children should be closely monitored for any changes. Monitoring the health of the remainder of the pregnancy, and the baby’s growth and development after birth, for any long-term sequelae from the carbon monoxide exposure in utero is particularly important. Interventions should be initiated as early as possible should any health issues arise.

**Reference:**

**Figure:**
- © WHO.
This case study discusses a collaborative pilot project in the Plurinational State of Bolivia on children, environment and health. The pilot project was developed and implemented by the Pan American Health Organization (PAHO) and the Bolivian government in 2017. **Four separate instruments** were developed for this pilot project, inspired by WHO’s abbreviated version of the paediatric environmental history, the Green Page. The purpose of the pilot project was to use these complementary tools to form a potential Green Page file for individual children at the clinical level and use the results as a roadmap for preventative action and intervention.

1. **The individual environmental history instrument** centred on the child and was administered by medical personnel in the clinic, for example a doctor or nurse;
2. **The household/family and surrounding areas instrument** explored elements within the home, among the family and surrounding areas and was completed by health care providers during home visits;
3. **The institutional instrument** assessed the institutions where the child spent time, for example schools, day care, health care facilities, industrial/businesses, and any other relevant places. This was completed by an environmental health technician or the health authority at the local level.
4. **The final instrument assessed the general community** and was completed by an environmental health technician at the local level.

Key environmental risks covered in all four instruments included:
- water and sanitation;
- fuels and technologies for cooking, heating and lighting;
- storage of chemicals;
- recycling activities of electronic appliances, car batteries and cables;
- lead exposure;
- solid waste management;
- hygiene;
- nearby industries, for example slaughterhouses in communities;
- noise.

The level of risk to each of these environmental hazards was classified in the instruments by colour as either low (green), moderate (yellow) or high (red).

Data from the individual and household level questionnaires conducted in one participating community found the most significant environmental hazards were the use of chemicals, solid waste in surrounding areas, recycling of electronics and metallic materials and unsafe water and sanitation. In the same community, the institutional and
community questionnaires found that the major environmental concerns were solid waste management, mercury in health facilities, poor sanitation conditions and infrastructure in schools (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).

**Note:** this pilot project was funded by the Government of Canada and was part of the 2017 PAHO project on Integrated Health Systems in Latin America and the Caribbean.
This slide shows the individual and household/family and surrounding areas environmental health instruments discussed in the previous slide.

The **individual instrument** was a short questionnaire with 10 questions that could be quickly completed in a busy, clinic environment. The individual instrument included simple questions on the source of drinking water and second-hand smoke in the home, among other environmental risks. There was also a section for the health care worker to grade the risk and make any comments.

On the other hand, the **instrument for household/family and surrounding areas** was significantly more detailed. It had 10 sections, including the presence of animals within the home, hygiene facilities and chemical exposure, each with an individualized, detailed grading system to assess the level of risk (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).

**Note**: these instruments are only available in Spanish.
Case study 4: Childhood, environment and primary health in Bolivia: pilot project

Customized primary health care instruments

This slide shows the institutional and community environmental health instruments. The institutional instrument as spread across three pages and addresses issues such as control of vectors of disease, biological risks and waste management. It used a grading system based on the number of “yes” or “no” answers to each question.

The community instrument required information at the population level, for example the number of children in the community under 1 year of age. It had dedicated space to include information on local industry and occurrence of climate or environmental events, such as floods. Spread across four pages, it included detailed information from any local sources of industrial pollution, risk of radiation and commercial activities that may contaminate the environment (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).

Note: these instruments are only available in Spanish.
Slides 56 and 57 show four instruments used to assess the environmental risk factors of an individual child. By integrating the information from all four instruments, a comprehensive picture of overlapping environmental risks can be identified. This can assist parents and health care providers to design appropriate interventions aimed at improving an individual child’s environmental health. This summarized data builds a risk profile that may be part of the standard paper or electronic paediatric clinical history and can promote preventive interventions and follow-up (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).

Note: these instruments are only available in Spanish.
The example shown on this slide was a child who lived and attended day care near a slaughterhouse. The child also lacked adequate sanitation in the home and was exposed to other neighbourhood contamination. The use of multiple streams of information from the four instruments (also shown on the previous slide) identified an environmental risk profile for the child, which was more complete than if a single instrument was used to make this assessment (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).

Note: these instruments are only available in Spanish.
In a municipality of the Andean region in Plurinational State of Bolivia, primary health clinics performed a pilot exercise within the populations they cared for using the four environmental health instruments. The outcomes were listed according major environmental risk categories. The data was tabulated in a graphic representation of environmental risks within the community. This data allowed the health sector to anticipate environmental risk and related health outcomes, guide medical advice, and was useful to prioritize high risk areas and inform the design and implementation of interventions (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).

### Case study 4: Childhood, environment and primary health in Bolivia: pilot project

**Major environmental risk within a community in the Andean Region**

<table>
<thead>
<tr>
<th>Environmental Risks</th>
<th>Low</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Basic Services (Water, Sanitation)</td>
<td>18%</td>
<td>65%</td>
<td>18%</td>
</tr>
<tr>
<td>Risk of Poor Infrastructure</td>
<td>24%</td>
<td>47%</td>
<td>24%</td>
</tr>
<tr>
<td>Lack of Hygiene</td>
<td>29%</td>
<td>12%</td>
<td>35%</td>
</tr>
<tr>
<td>Lack of First Aid</td>
<td>18%</td>
<td>29%</td>
<td>47%</td>
</tr>
</tbody>
</table>

In a municipality of the Andean region in Plurinational State of Bolivia, primary health clinics performed a pilot exercise within the populations they cared for using the four environmental health instruments. The outcomes were listed according major environmental risk categories. The data was tabulated in a graphic representation of environmental risks within the community. This data allowed the health sector to anticipate environmental risk and related health outcomes, guide medical advice, and was useful to prioritize high risk areas and inform the design and implementation of interventions (A. Soares and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022).
Case study 4: Childhood, environment and primary health in Bolivia: pilot project

Lessons learnt

1. Instruments make visible a wide range of environmental risks
2. Interest was high
3. Environmental health must be a collaborative effort to find solutions. So, involve those who identify the risks and those involved in the response from the very beginning.
4. Involvement of the affected population or community is key
5. Health services – it is key to involve all health care workers (not only doctors), including nurses, nurse aids, students, staff responsible for clinical records, and any other health care workers;
6. Community “hungry” for more information on environmental health;
7. When the affected community is concerned about pollution, they will want the involvement of the health sector for support and validation;
8. Environmental health creates the need for more involvement of the health sector in efforts to improve conditions in communities, schools, homes or other settings where children and their families spend their time.

At the finalization of the pilot project in the Plurinational State of Bolivia, several important lessons were learned by participants and great interest was expressed by communities involved. Eight key lessons learnt through the pilot project are summarized here (A. Soares, A Laborde and B.B. Riveros, Pan American Health Organization, personal communication, 10 November 2022):

1. the use of the four environmental health instruments helped to make visible a wide range of environmental risks;
2. interest was high in these areas;
3. environmental health must be a collaborative effort to find solutions. So, involve those who identify the risks and those involved in the response from the very beginning.
4. involvement of the affected population or community is key – they can give a “reality check”;
5. health services – it is key to involve all health care workers (not only doctors), including nurses, nurse aids, students, staff responsible for clinical records, and any other health care workers;
6. community “hungry” for more information on environmental health;
7. when the affected community is concerned about pollution, they will want the involvement of the health sector for support and validation;
8. environmental health creates the need for more involvement of the health sector in efforts to improve conditions in communities, schools, homes or other settings where children and their families spend their time.
More information and recommended reading

For more information on children’s health and the environment:  
- Air pollution package  
- Children and chemicals  
- Children are not little adults  
- Pesticides  
- Sanitation and hygiene  
- Water  
- Why children

Recommended reading on the paediatric environmental history:  
- The paediatric environmental history: green page  
- Inheriting a sustainable world? Atlas on children’s health and the environment  
- Children’s health and the environment: a global perspective

For more information on children’s health and the environment see the World Health Organization (WHO) training package on children’s environmental health for the health care sector (1). The following modules may be of particular interest:

- Air pollution package – this includes Ambient air pollution, Childhood respiratory diseases linked to the environment, Household air pollution, Indoor air pollution and Second-hand smoke
- Children and chemicals
- Children are not little adults
- Pesticides
- Sanitation and hygiene
- Water
- Why children

To learn more about taking a paediatric environmental history see the below references:

- The paediatric environmental history: green page (2) and instructions (3)
- Inheriting a sustainable world? Atlas on children’s health and the environment (4)

References:
The paediatric environmental history is a useful tool that allows health care providers to take descriptions of environmental conditions, behaviours and risk factors relevant to a child’s health. This information allows health professionals to educate families on, and promote prevention of, environmental-related diseases in children. It can also help providers identify, assess and follow-up children exposed to environmental hazards and respond with effective measures. It should remain an integral part of every medical encounter throughout a child’s growth and development.

Photo:
• © WHO / Jawad Jalali. Afghan children show their fingers marked after they received drops of polio and finger mark by vaccinator in Asadabad, Afghanistan.
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