

TRAINING FOR THE HEALTH SECTOR

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WHY CHILDREN?

Children's Health and the Environment

WHO Training Package for the Health Sector

World Health Organization

www.who.int/ceh

July 2008 version

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<<NOTE TO USER: Please add details of the date, time, place and sponsorship of the meeting for which you are using this presentation in the space indicated.>>

<<NOTE TO USER: 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. A number of slides refer to the specific issues related to indoor air pollution in developing countries, as it represents a major determinant of the burden of disease in children. Present only those slides that apply most directly to the local situation in the region.>>

Why Children?



WHO

Children represent the future of our societies
Protecting their health and environment is crucial

- ❖ **Children should reach their full potential as individuals**
- ❖ **Children should become contributing members of societies**
- ❖ **They are an intrinsic component of sustainable development**

29/07/2008

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<<READ SLIDE.>>

The term “children” refers to all age groups, from conception (embryonic and fetal stages) to the end of adolescence.

References:

- *Children in the New Millennium, Environmental impact on health.* UNEP, UNICEF, WHO, 2002.
- *Healthy Environments for Children Booklet.* Geneva, World Health Organization, 2002.

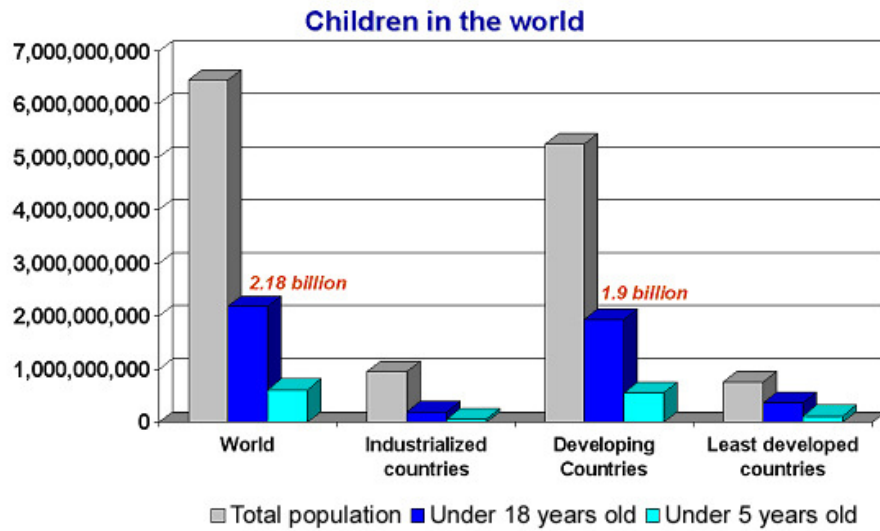
Why Children?

LEARNING OBJECTIVES

- ❖ To understand the global importance and public health impact of children's exposure to environmental threats
- ❖ To learn about the special vulnerability of children – new knowledge, new concepts
- ❖ To consider the threats to children's health in developing, in transition economies and in industrialized countries
- ❖ To consider how different stakeholders can take action

<<READ SLIDE.>>

Why Children?



www.unicef.org/sowc05/english/sowc05.pdf

There are 2.18 billion children under the age of 18 years in the world, and 1.9 billion live in developing countries (552 million are under age 5).

29/07/2008

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Ref:

•UNICEF. *The state of the World's Children 2005*. Childhood under threat (www.unicef.org/sowc05/english/sowc05.pdf)

Why Children?

CHALLENGES TO HUMAN HEALTH AND DEVELOPMENT

NEW DRIVING FORCES

Rapid globalization
New industrialization
Upsurge of urbanization
Pervasive poverty and inequity
Non-sustainable consumption
Excessive population growth
Trans-boundary chemical transport

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A number of new driving forces and global environmental changes pose challenges to human health and to the environment.

These challenges contribute to environmental degradation – and environmental degradation disproportionately affects children.

<<NOTE TO SPEAKER: The driving forces and global environmental changes mentioned are self-explanatory. However, speakers may need to expand on one or two of the points, if considered relevant.>>

Ref:

•Gracey M. *Child health implications of worldwide urbanization*. Rev Environ Health, 2003, 18:51-63.

The upsurge of urbanization, often poorly planned and uncontrolled, has caused major impacts on human societies for at least two centuries. Urban environments and urbanized lifestyles have strong influences on health and well-being, including on infant and childhood populations in developed and underdeveloped countries, as well as among societies in developmental and environmental transition around the world. Urbanization will inevitably have significant impacts on the health of future generations. Notably, the health consequences of urbanized lifestyles are not confined to residents of cities and large towns but rather are becoming manifest in rapidly changing, previously traditional societies in rural and remote areas because globalization is altering infant feeding practices and the dietary habits and lifestyle patterns of their children. In underdeveloped countries, overcrowding and environmental pollution are huge problems that are exacerbated by undernutrition and infection, particularly respiratory and diarrhoeal diseases. In developed societies, other problems such as injuries; poisonings; violence; drug abuse; exposure to chemical, biological, industrial, and atmospheric pollutants, including pesticides; sexually transmissible diseases; and 'lifestyle' diseases, including obesity and cardiovascular disease risk, are of great current and potential importance.

Why Children?

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Upsurge of urbanization
Pervasive poverty and inequity
Non-sustainable consumption
Excessive population growth
Trans-boundary chemical transport

GLOBAL ENVIRONMENTAL CHANGE

Climate change
Ozone depletion
Desertification/deforestation
Forest fires
Loss of biodiversity
Increased use of biotechnology

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6

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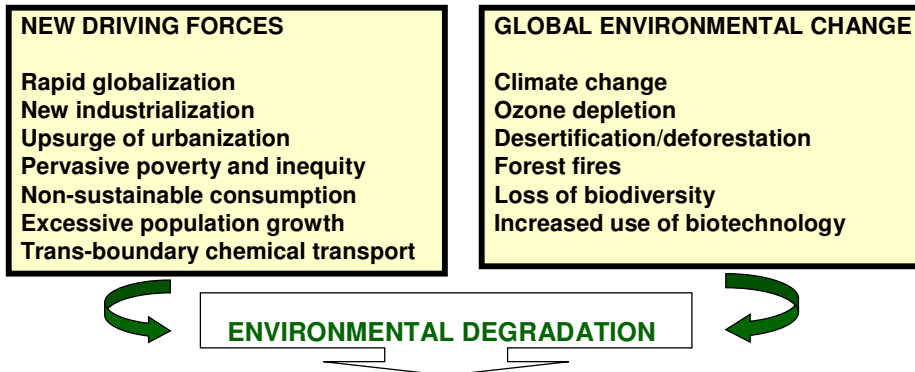
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Why Children?

CHALLENGES TO HUMAN HEALTH AND DEVELOPMENT



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Why Children?

CHALLENGES TO HUMAN HEALTH AND DEVELOPMENT

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GLOBAL ENVIRONMENTAL CHANGE

Climate change
Ozone depletion
Desertification/deforestation
Forest fires
Loss of biodiversity
Increased use of biotechnology



**Children are disproportionately vulnerable,
suffering most of the effects, now... and in the future**

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Why Children?

MAJOR ENVIRONMENT- RELATED KILLERS IN CHILDREN UNDER 5 YEARS OF AGE

- ❖ Diarrhoea kills 1.6 million children / year (unsafe water & poor sanitation)
- ❖ Indoor air pollution (biomass fuels) kills one million children /year (ARI)
- ❖ Malaria kills one million children under five / year, mostly in Africa.
- ❖ Unintentional physical injuries kill 300 000 children annually:
 - ❖ 60 000 are attributed to drowning
 - ❖ 40 000 to fires, 16 000 to falls
 - ❖ 16 000 to poisonings
 - ❖ 50 000 to road traffic incidents
 - ❖ and over 100 000 are due to other unintentional injuries.

Diseases strongly linked to environmental threats are present in places where children grow, live, learn and... work

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A number of public health accomplishments, such as improved sanitation, vaccinations, antibiotics, improved nutrition and medical surveillance programmes, have reduced morbidity and mortality among children, especially in the economically developed countries.

However, over 98% of deaths among children under the age of 5 years occurs in developing countries.

The five major childhood conditions which are responsible for deaths in under-fives in low- and-middle income countries are: diarrhoea, acute respiratory infections, malaria, measles and perinatal conditions. Most of these are the consequence of poverty and economic inequity, which have risen sharply in many of the least developed countries, reducing the resources available for health care.

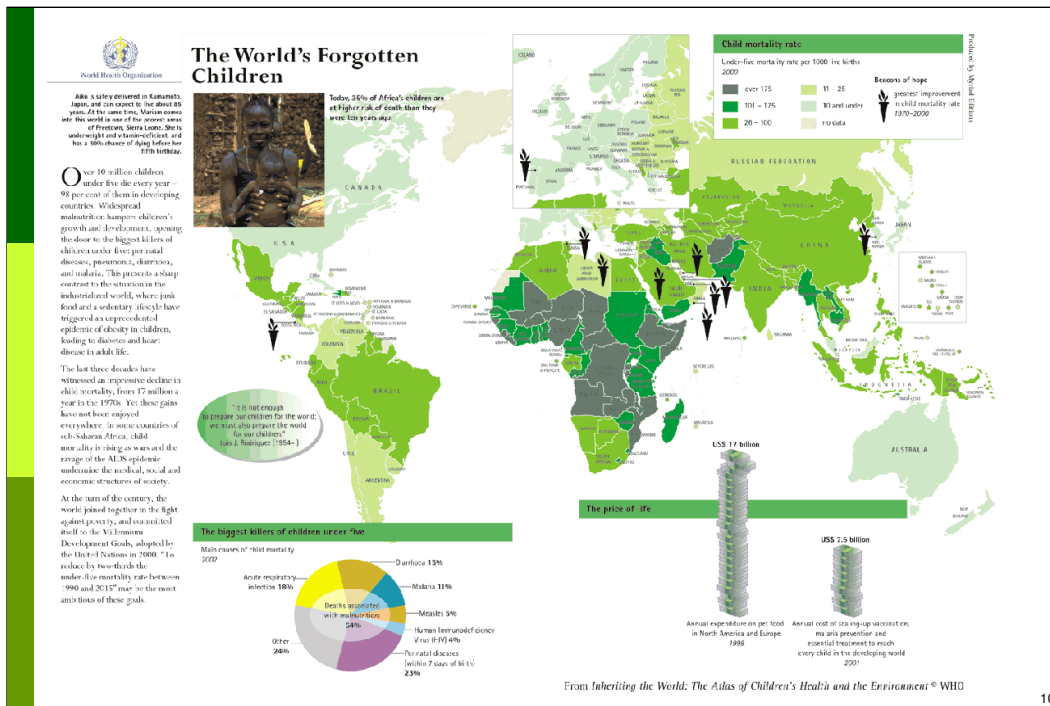
The "big killers" are diseases that have a strong environmental component: indoor air pollution from biomass fuels (causes acute respiratory infections (ARI)), unsafe water and food (cause diarrhoea) and the proliferation of vectors in the environment (cause various other diseases such as malaria).

Major environment-related killers in children under five years of age

- Diarrhoea kills an estimated 1.6 million children each year, caused mainly by unsafe water and poor sanitation.
- Indoor air pollution associated with the still-widespread use of biomass fuels kills nearly one million children annually, mostly as a result of acute respiratory infections (ARI). Mothers, in charge of cooking or resting close to the hearth after having given birth, are most at risk of developing chronic respiratory disease.
- Malaria, which may be exacerbated as a result of poor water management and storage, inadequate housing, deforestation and loss of biodiversity, kills an estimated one million children under five annually, mostly in Africa.
- Unintentional physical injuries, which may be related to household or community environmental hazards, kill nearly 300 000 children annually: 60 000 are attributed to drowning, 40 000 to fires, 16 000 to falls, 16 000 to poisonings, 50 000 to road traffic incidents and over 100 000 are due to other unintentional injuries.

Refs:

- Black RE et al. *Where and why are 10 million children dying every year?* *Lancet*, 2003, 361:2226.
- WHO. *The environment and health for children and their mothers, Fact sheet WHO/284, 2005.* (www.who.int/mediacentre/factsheets/fs284/en/index.html)



Over 10 million children aged under five years die every year – 98% of them in developing countries. Widespread malnutrition hampers children's growth and development, opening the door to the biggest killers of children in this age group, namely, perinatal diseases, pneumonia, diarrhoea and malaria. This presents a sharp contrast to the situation in the industrialized world, where junk food and a sedentary lifestyle have triggered an unprecedented epidemic of obesity in children, leading to diabetes and heart disease in adult life. The last three decades have witnessed an impressive decline in child mortality, from 17 million a year in the 1970s. Yet these gains have not been enjoyed everywhere. In some countries of sub-Saharan Africa, child mortality is rising as wars and the ravages of the AIDS epidemic are undermining the medical, social and economic structures of society. At the end of the twentieth century, the world joined together in the fight against poverty, and committed itself to the Millennium Development Goals, adopted by the United Nations in 2000: "to reduce by two-thirds the under-five mortality rate between 1990 and 2015" may be the most ambitious of these goals.

Ref:

•Gordon B et al. *Inheriting the world, the Atlas on Children's Health and the Environment*. Geneva, World Health Organization, Myriad Editions Ltd, 2004.

Why Children?

❖ **Newborns, children and adolescents represent 40% of the world's population**

❖ **Children are in a continuous process of growth and development**

- effects may be cumulative and intergenerational
- effects early in life may appear in adulthood, or in the next generation
- effects may lead to long-term consequences or disabilities

❖ **Children present “windows of susceptibility” to environmental threats**

**Safe and supportive environments are required
for the newborn to survive, for the child to grow and
for the adolescent to face the new challenges in life**

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There is growing concern about the effects of environmental threats on children's health for the following reasons.

1. Newborns, children and adolescents represent 40% of the world's population:

- children under 5 years of age represent 10% of the world's population; and
- adolescents represent 20% of the total ...and 85% live in developing countries!

<<NOTE TO USER: State the percentage of the different age groups in your country.>>

2. Because of children's dynamic and continuous process of growth and development, the effects of environmental threats may be cumulative (e.g. in some instances children may be exposed repeatedly to toxicants or radiations and their effects continue to accumulate). Childhood exposure may affect health in adulthood, or the health of the next generations (i.e. effects are intergenerational, as is the case with children born to mothers who were exposed to lead in their childhood). Exposure may have long-term consequences and produce permanent disability.

Ref: Hernandez-Avila, 2002 (see below).

3. Children have “windows of susceptibility” to environmental threats. These are specific periods in their development when the effect of a chemical, physical or biological agent is major and may result in adverse health outcomes.

Everybody requires a safe, clean and healthy environment. However, children are special and they require both a protected and protective environment to enable:

- the newborn to survive (the highest mortality rate is in children aged under 5 years in developing countries!);
- the child to grow, be able to go to school and learn; and
- the adolescent to mature under good conditions and face the challenges of adulthood.

Ref:

•Hernandez-Avila M et al. Effect of maternal bone lead on length and head circumference of newborns and 1-month-old infants. *Arch Environ Health*, 2002, 57:482.

The authors evaluated the effects that maternal bone lead stores have in anthropometry at birth in 223 mother–infant pairs. The participants were recruited between April and November 1994. Anthropometric data were collected within the first 12 hrs following delivery. Maternal information was obtained 1 month after delivery occurred. Bone lead burden was determined with in-vivo K-X-ray fluorescence of the tibia (cortical bone) and the patella (trabecular bone). The authors transformed anthropometric measurements to an ordinal 5-category scale, and the association of measurements with other factors was evaluated with ordinal logistic-regression models. Mean bone lead levels were 9.8 microgram/gm bone mineral and 14.4 microgram/gm bone mineral for the tibia and patella, respectively. Birth length of newborns decreased as tibia lead levels increased. Compared with women in the lower quintiles of the distribution of tibia lead, those in the upper quintile had a 79% increase in risk of having a lower birth length newborn (odds ratio = 1.79; 95% confidence interval = 1.10, 3.22). The authors adjusted by birth weight, and the effect was attenuated – but nonetheless significant. Patella lead was positively and significantly related to the risk of a low head circumference score; this score remained unaffected by inclusion of birth weight. The authors estimated the increased risk to be 1.02 per microgram lead/gm bone mineral (95% confidence interval = 1.01–1.04 per microgram lead/gm bone mineral). Odds ratios did not vary substantially after the authors adjusted for birth weight and other important determinants of head circumference.

Why Children?

There is new recognition of:

- ❖ special vulnerability of children and developing fetuses to toxicants and physical agents
- ❖ effects depend upon: toxicity, dose, timing and amount of exposure
- ❖ effects are exacerbated by:
 - poverty
 - malnutrition
 - urbanization
 - degraded environments
 - stressful circumstances



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WHO 12

Although the special susceptibility of children has been recognized for decades (especially by paediatricians), it is only in the last decade that this vulnerability has been NEWLY recognized.

There is new, more detailed information about the specific effects of some chemicals on the developing fetus.

There is new, more sophisticated knowledge about toxicokinetics and toxicodynamics.

The importance of the TIMING of exposure is now recognized (see next slide). Dose refers to the quantity of a chemical, whereas type/amount refers to frequency of exposure (e.g. is it repetitive?).

In the poorer regions, the adverse effects are further exacerbated or magnified by poverty, malnutrition and stress (such as is experienced in refugee camps, or areas affected by drought, tornadoes or floods,...or in areas of war or conflict).

<<NOTE TO USER: Emphasize that the "environment" is the sum of a large variety of factors.>>

Why Children?

DIFFERENT SETTINGS: RURAL AND URBAN

URBAN

- ❖ Non-communicable diseases:
 - Better immunization coverage
 - Better access to health services
- ❖ Violence
- ❖ Air pollution
- ❖ Traffic (pollution, injury, stress, noise)
- ❖ Social and affluence problems
- ❖ Lifestyle diseases (cancer, heart problems)
- ❖ Mental ill-health (stress, anxiety, depression)

RURAL

- ❖ Communicable diseases
- ❖ Poor access to health care
- ❖ Poor access to schools
- ❖ Environmental problems linked to:
 - agricultural products and processes
 - moldy hay, pollens

**However, poverty
brings out the worst of
both worlds...**

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Worldwide, epidemiological and demographic information suggests that health, health services and survival rates are better in cities than in rural areas. The epidemiological transition (the shift from a predominance of communicable disease to a predominance of non-communicable disease) took place fastest in countries with high levels of urbanization, and the transition generally occurred first in urban areas. However, some old and new communicable diseases, such as HIV, predominate in urban areas, while research on intraurban differentials indicates that low income urban populations suffer the 'worst of both worlds' in terms of communicable and non-communicable diseases.

Public health measures and socio-economic change led to declines in urban infant mortality rates (IMR) and around 1905, rural and urban IMRs were similar. Later, the urban IMR curve decreased more sharply than the rural one. Recent analysis of urban data from 43 developing countries, however, suggests much slower declines in IMRs among city residents since the 1970s compared to smaller towns and villages. But in sub-Saharan Africa, IMRs had actually substantially risen in small and medium-size cities. In addition, the current global HIV/AIDS epidemic may be contributing to the sub-Saharan African urban penalty, with substantial evidence of higher HIV prevalence in larger cities.

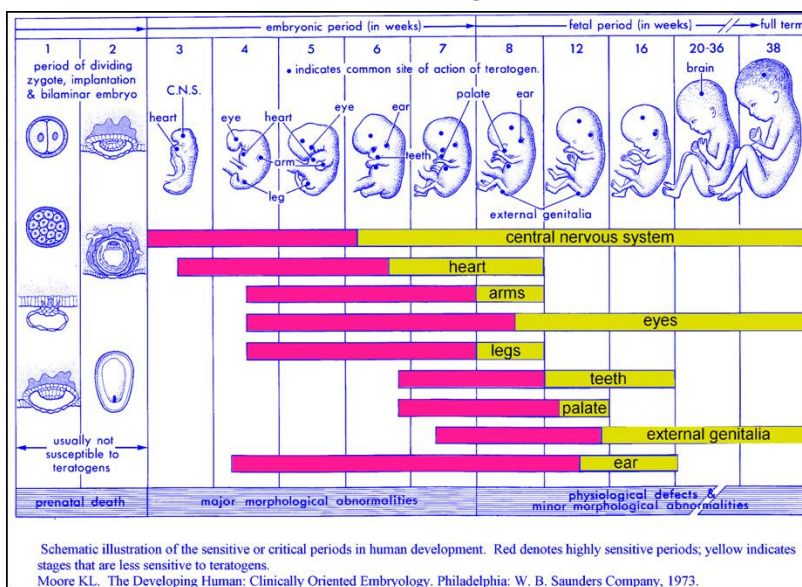
Many studies imply that the urban poor suffer the worst of both worlds: a double burden of both old and new epidemiological profiles. An analysis of Demographic and Health Survey (DHS) data demonstrates that the ratio of stunting prevalence of poorer versus wealthier quintiles was greater within urban than rural areas, and that intraurban differences between socio-economic groups were greater than the urban-rural differentials. Data on migrants in urban areas reveal that poor housing conditions in urban areas of the developing world are highly correlated with childhood diseases and injuries. Findings of DHS studies in Brazil, Egypt, Ghana and Thailand show that the health of urban children is influenced by the wider social and physical environment in which the household is located, and that it is not determined solely by disposable household income.

Notes taken from:

- www.unchcs.org/Istanbul+5/54.pdf
- www.unchcs.org/Istanbul+5/brochure.pdf

Why Children?

Windows of development



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Moore, Elsevier Inc, 1973

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Physiological differences between children and adults are not only manifest in immature metabolic pathways. Because important systems are still differentiating and growing, children have unique susceptibilities not seen in adults — and critical time windows for those susceptibilities. The critical times are as follows:

- preconception
- gestation (susceptibility to: thalidomide, DES, ionizing radiation, methylmercury, lead)
- postnatal (susceptibility to: SHTS (second-hand tobacco smoke), lead).

There has been an explosion of knowledge about child development in past decade or so, and it is hard to remember that it was only about 50 years ago that the discovery was made that the fetus is vulnerable to exposures. The phocomelia epidemic resulting from use of thalidomide by pregnant women was an early and dramatic example of the ability of chemicals to traverse the placenta and damage the fetus. Additionally, thalidomide administered during a small, 4-day window between gestational days 20 and 24, may increase the risk of autism (Stromland, 1994). More than one system can be susceptible and different pathology may occur depending upon the dose and timing of exposure.

Now we know that other exposures during gestation, some of which are listed here, can harm the systems of the developing child. We also know that preconception exposure of parents, as well as postnatal exposure of both parents, can harm children.

<<NOTES TO USER: It is important to point out the different responses to insults shown on the bottom bar of the figure. Significant insult during the embryonic phase will result in pregnancy loss (first 2 weeks) or major organ malformation. During the fetal stage, damage is more subtle and related to system dysfunction.>>

Ref:

•Stromland K et al. Autism in thalidomide embryopathy: a population study. *Developmental Medicine & Child Neurology*, 1994, 36:351.

Of a population of 100 Swedish thalidomide embryopathy cases, at least four met full criteria for DSM-III-R autistic disorder and ICD-10 childhood autism. Thalidomide embryopathy of the kind encountered in these cases affects fetal development early in pregnancy, probably on days 20 to 24 after conception. It is argued that the possible association of thalidomide embryopathy with autism may shed some light on the issue of which neural circuitries may be involved in autism pathogenesis.

Figure: Reprinted from Moore KL. *The developing human*. Elsevier Inc., 1973. Used with copyright permission (2004) from Elsevier.

Why Children?

New recognition and in some instances, new knowledge about their special susceptibility:

The significance of TIMING OF EXPOSURE

- Exposure to DES *in utero* → cancer later in life (girls)
- Exposure to Hg or Pb *in utero* → neurological/learning disabilities

Mechanisms of action:

- interference with genetic expression
- disturbance of the endocrine system
- alteration of cell development
- other...

Needs:

- more research
- risk assessment to consider the characteristics of fetus/child

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The importance of the TIMING of exposure should be stressed. The precise moment when exposure occurs may correspond with a critical developmental period when rapidly changing organs or physiological functions may be affected by chemical or physical agents. These are called "windows of vulnerability".

Two examples of exposure *in utero* and its significant effects later in the life of the child are given to illustrate this concept.

1. Exposure to diethylstilbestrol (DES) administered to pregnant women (to prevent abortion) produced vaginal cancer in the daughters (during adolescence and early adulthood) and malformations in the sons.

Some cancers are believed to be due to or triggered by exposures early in life, that may have no immediate effects.

Many chemicals are well known to be carcinogenic in animal experiments, but it may take decades to prove their effects in humans. However, an animal carcinogen, vinyl chloride, causes cancer even after SHORT exposures early in life (Soffritti, 2002).

2. Exposure to heavy metals *in utero* – for example, to lead and mercury – may have no apparent effect on the newborn, but a few months or years later, as the child grows, the neurological and learning disabilities become evident.

The mechanisms of action of these early effects may be:

- interference in genetic expression;
- endocrine effects (e.g. on the thyroid – which has a great influence during growth and development);
- alteration of cell development; and
- effects on neurone migration.

There is a clear need for more research on mechanisms, that will help to explain how and when the adverse effects occur.

It is important to stress that risk assessments should consider explicitly the unique exposure and biological characteristics of the fetus, the child and the adolescent.

Ref:

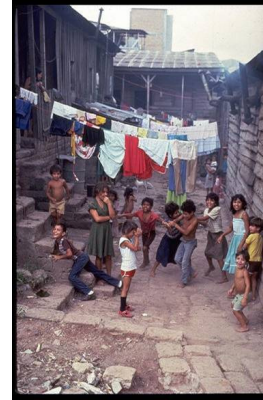
•Soffritti M et al. Ramazzini Foundation cancer program: history and major projects, life-span carcinogenicity bioassay design, chemicals studied, and results. *Ann N Y Acad Sci*, 2002, 982:26.

The Ramazzini Foundation research programme on experimental carcinogenicity bioassays for the identification of exogenous carcinogens (environmental and industrial above all) began in 1966. This project has included 398 experimental bioassays on 200 compounds/agents using some 148 000 animals monitored until their spontaneous death. Among the studies already concluded, 47 agents have shown "clear evidence" of carcinogenicity. The results have demonstrated for the first time that (1) vinyl chloride can cause liver angiosarcoma as well as other tumours; (2) benzene is carcinogenic in experimental animals for various tissues and organs; (3) formaldehyde may produce lymphomas and leukaemias; and (4) methyl-tert-butyl ether (MTBE), the most common oxygenated additive used in gasolines [petrol], can cause lymphomas/leukaemias. Many of the results achieved have led to the introduction of norms and measures of primary prevention.

Why Children?

MAIN GLOBAL ENVIRONMENTAL HEALTH RISKS

- ❖ Poor hygiene and sanitation
- ❖ Air pollution – indoor and outdoor
- ❖ Household water insecurity
- ❖ Disease vectors
- ❖ Chemical hazards
- ❖ Injuries and accidents
- ❖ ... EMERGING ISSUES!



WHO

Over 5 000 000 children under 14 yrs die every year from diseases that relate to environmental conditions, mainly in the developing world.

www.who.int/world-health-day/2003

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According to WHO, there are six main GLOBAL environmental risk factors for children.

<<NOTE TO USER: The six risk factors will be described in more detail in the following slides.>>

- *Household water insecurity*. This is one of the main causes of diarrhoea. Safe drinking-water, as defined by the WHO Guidelines, does not represent any significant risk to health over a lifetime of consumption, including different sensitivities that may occur at different life stages.
- *Poor hygiene and sanitation*. This leads to inadequate washing and cleaning practices, and therefore to disease.
- *Air pollution, both indoor and outdoor*. This triggers or aggravates respiratory diseases.
- *Disease vectors*. These cause one million deaths a year in children, due to malaria, dengue fever, leishmaniasis, Japanese encephalitis and others.
- *Chemical hazards*.
- *Injuries and accidents*. Injuries including road accidents, drowning, burns and poisoning cause 400 000 deaths per year.
- *EMERGING ISSUES!* These include global change (climate and others), ozone depletion, electromagnetic radiation, contamination by persistent organic pollutants...

Refs:

- *Healthy environments for children and a healthier planet. Booklet*. Geneva, WHO, 2002.
- *WHO Guidelines for drinking-water quality, 3rd ed*. Geneva, World Health Organization, 2004 (www.who.int/water_sanitation_health/dwq/gdwq3/en/).

Why Children?



WHO

WATER AND SANITATION

**Access to safe water and sanitation:
universal need and basic human right**

- ❖ Global population increase: 21% (5.3 to 6.4 billion) 1990–2004
- ❖ Access to water supply: 77% in 1990
83% in 2004
- ❖ Access to sanitation: 2.5 billion in 2004 without improved sanitation
1.2 billion without any sanitation facilities



Impact on public health and education

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The importance of access to clean drinking water and sanitation is paramount.

The consequences of inadequate water and sanitation have a very heavy toll, especially for children:

-A high number of deaths in children under 5 years, every year.

-Disease and malnutrition!

-High costs for the public health system.

-Children's education is affected, as they often lose days of schooling. In some countries, girls are affected even more than boys as they do not go to school if there are no toilets – especially after menarche.

-Self-esteem and dignity are very low when the child is ill all the time, cannot go to school and becomes a burden to the family and the community.

Ref:

•WHO/UNICEF. *Progress on drinking water and sanitation*. 2008.

Why Children?



WHO

AIR POLLUTION

The homes of poor children in developing countries may be unhealthy places

- 1 000 000 ARI deaths in < 5 yrs
- Rising trends of “wheezing”

- ❖ **Coal and biomass fuel: a major source of indoor air pollution**
- ❖ **Suspended particulate matter ↑ the risk of acute respiratory infections (ARI)**
- ❖ **CO and other toxic gases may impair development and health**
- ❖ **Second-hand smoke is a major concern**

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More than two billion people worldwide continue to depend on solid fuels, including biomass fuels (wood, dung, agricultural residues) and coal, for their energy needs.

Cooking and heating with solid fuels on open fires or traditional stoves results in high levels of indoor air pollution. Indoor smoke contains a range of health-damaging pollutants, such as small particles and carbon monoxide (CO), and levels of particulate pollutants may be many times higher than accepted guideline values.

Ref:

•WHO, *World Health Report 2002* (according to which indoor air pollution is responsible for 2.7% of the global burden of disease).

There is consistent evidence that exposure to indoor air pollution can lead to acute lower respiratory infections in children under 5 years old, and chronic obstructive pulmonary disease and lung cancer (where coal is used) in adults.

Acute respiratory infections, in particular pneumonia, continue to be the biggest killers of young children and cause about 2 million deaths annually. This is almost exclusively a problem of children in developing countries.

Some countries are reporting a rising trend of “wheezing”.

•The heavy use of coal and biomass fuels (the most polluting fuels) is linked to respiratory (and other) effects on children.

•Suspended pollutants may carry infectious agents into the lungs and also predispose to infection: other particles may carry chemicals that predispose to lesions and infection.

•Not only particles are noxious, but also carbon monoxide and other toxic gases released as products of combustion (the complete explanation is given in the Respiratory Diseases Module).

• Second-hand tobacco smoke is a major concern.

Ref:

•WHO. *The environment and health for children and their mothers, Fact sheet WHO/284, 2005.*

Picture: WHO, C. Gaggero. Child housework, Costa Rica

Why Children?

Major demographic, environmental and societal changes in the last decade have contributed to the re-emergence of vector-borne diseases (VBDs)



29/07/2008

WHO

VECTOR-BORNE DISEASES

- ❖ Malaria
- ❖ Schistosomiasis
- ❖ Japanese encephalitis
- ❖ Dengue
- ❖ Trypanosomiasis
- ❖ Other

<<NOTE TO USER: VBD: vector-borne diseases; refer to those prevalent in the country.>>

Major global demographic, environmental and societal changes occurring in the last decade have contributed to the re-emergence of vector-borne and other diseases, many of which have an important impact on children's health and development. A considerable proportion of the disease burden for four key vector-borne diseases: malaria, schistosomiasis, Japanese encephalitis and dengue haemorrhagic fever falls on children under five years of age.

• **Malaria** is caused by a protozoan (plasmodium) and transmitted by the bite of an infected female mosquito (*Anopheles*). It affects over 100 countries but 90% of the disease burden is in Africa. Malaria causes 800 000 deaths per year, mostly in children under 5 years.

• **Schistosomiasis or "Bilharzia"** is caused by flukes (Trematodes) released by snails in fresh water, and which penetrate the skin of children. The disease is endemic in 74 countries, but 80% of infected people are in sub-Saharan Africa. Children are exposed through swimming and lack of personal hygiene. High infection rates and individual worm loads account for a debilitating infection. Liver and bladder damage may result in premature death.

• **Japanese encephalitis** is caused by a *Flavivirus* transmitted by mosquitoes (*Culex*), that breed particularly in flooded rice fields. Outbreaks occur only in Asia and south-east Asia. About 400 000 cases occur per year, 90% of them in children, and the case-fatality rate is 20%.

• **Dengue** is an acute eruptive and febrile disease caused by four different dengue viruses transmitted by infected female mosquitoes (*Aedes*). It occurs mainly in urban areas. In children it may develop into dengue haemorrhagic fever or shock, which have high mortality rates. There are 13 000 deaths annually, more than 80% of them in children.

• **Trypanosomiasis** is a vector-borne parasitic disease. *Trypanosoma*, the parasites concerned, are protozoa transmitted to humans by tsetse flies in the case of Human African Trypanosomiasis. Tsetse flies live in Africa, and they are found in vegetation by rivers and lakes, gallery-forests and vast stretches of wooded savannah. Another human form of trypanosomiasis (Human American Trypanosomiasis) occurs in the Americas and is known as Chagas disease.

• **Lyme disease** is an infectious disease caused by a spirochete (*Borrelia burgdorferi*), which is transmitted chiefly by ticks (*Ixodidae*). It is a disease with early and late cutaneous manifestations plus involvement of the nervous system, heart, eye, and joints in variable combinations.

Ref:

• *Initiating an alliance for action*. Geneva, World Health Organization, 2002 (Document prepared for WSSD, September 2002)

• www.who.int/mediacentre/factsheets/fs259/en/

Picture: WHO, S. Lindsay. Bouts of malaria prevent children going to school, and interrupt their education, Gambia

Why Children?



WHO

Children learning how to install an insecticide-treated net (ITN) to prevent the spread of malaria

Africa Malaria Day, 25 April 2001

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•Malaria affects over 100 countries but 90% of the disease burden is in Africa. It causes 800 000 deaths per year, mostly in children under 5 years.

One of the major breakthroughs of recent years has been the realization that mosquito nets treated with an insecticide (e.g. pyrethroids) give a high degree of protection against malaria. As well as stopping the bites, the net is a chemical-trap for the mosquitoes drawn to the bait of the sleeping person. It therefore protects others living in the same house and even in the same village. Properly used, insecticide-treated nets (ITNs) can cut malaria transmission by at least 60% and child deaths by a fifth.

But in 2003, fewer than 5% of Africa's children were sleeping under ITNs. And fewer than 15% were sleeping under any net at all. The principal problem is the gap between what nets cost and what families can and will pay for them. Demand must be driven up by health information and social marketing. And prices must be driven down by increasing competition, cutting taxes and tariffs and targeting subsidies to the poorest and most vulnerable.

Ref:

•Adamson. *Malaria is alive and well and killing 3000 African children every day*. WHO, UNICEF.

Picture: WHO. Africa Malaria Day, Nigeria, April 25th 2001. Children installing a malaria bednet.

Why Children?

CHEMICALS



WHO

**Unintentional poisonings and chronic low-level exposure to chemicals:
A heavy toll on children's health**

- **Unintentional poisonings: 35 000 deaths/year in children 0–14 yrs**
- **Rising trends of adverse effects linked to "chemicals"**
- **"Unexplained" paediatric diseases**

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The picture shows a boy in south-east Asia (India) being exposed to pesticides while helping adults working in the fields.

Ref. (for the mortality due to poisonings)

World Health Report, 2002, reducing risks, promoting healthy life, Annex 2. Geneva, World Health Organization, 2002, p.186

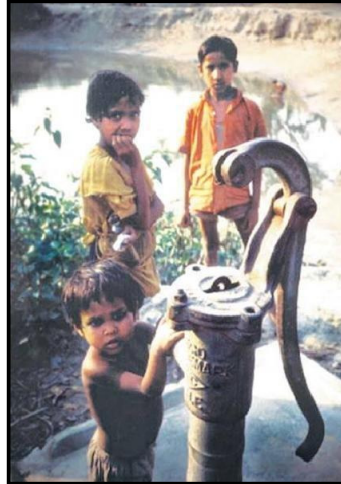
- WHO estimates that 35 000 children aged 0–14 years die every year as a result of unintentional poisoning (note that the term "accidental" is not being used).
- Some adverse effects on health and development of unknown etiology are being attributed to chemicals – for example to some "new" pollutants, or poorly-tested chemicals.
- There are rising trends of adverse effects linked to "chemicals" (see module: "Children and chemicals"). For example, chemicals with endocrine-disrupting properties are a cause of global concern.
- There are also "unexplained" paediatric diseases that may be linked to chemicals. For example, sudden infant death is related to tobacco use by the mother or in the home of the newborn.

<<NOTE TO USER: List the main chemicals of concern (and why there is concern) in your country.>>

Why Children?

CHEMICALS OF CONCERN

- ❖ Lead and mercury
- ❖ Pesticides
- ❖ POPs
- ❖ Nitrates
- ❖ Fluorides
- ❖ Arsenic
- ❖ Mycotoxins
- ❖ Other chemicals



WHO

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<<NOTE TO USER: List the main chemicals of concern (and why there is concern) in your country. For more information see the corresponding modules on the chemicals mentioned.>>

Some examples are listed below:

- lead: a major development toxicant, worldwide;
- mercury: distribution ubiquitous, may affect the fetus and child;
- pesticides: their unsafe use creates important public health and environmental problems;
- POPs: persistent organic pollutants: are they linked to reproductive dysfunction? Cancer? (Pesticides include aldrin, dieldrin, chlordane, DDT, endrin, heptachlor, mirex, toxaphene. Industrial chemicals include PCBs and HCB. Unintended by-products include dibenzodioxins, dibenzofurans. For more information, see presentation on "POPs");
- nitrates: risk of methaemoglobinaemia in newborns;
- fluorides: risk of dental and/or osteoskeletal fluorosis in some countries;
- arsenic: serious problem of contamination of drinking-water in Bangladesh, India, and a few other countries – (intervention illustrated in the slide);
- mycotoxins: an endemic problem in some African countries; and
- other chemicals.

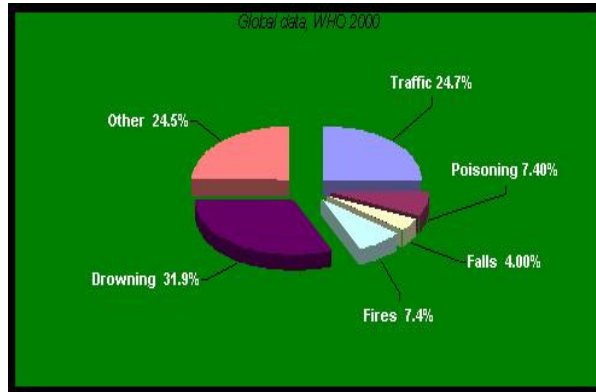
Picture: WHO. Children near a tube-well disconnected due to contamination of water with arsenic.

Why Children?

INJURIES AND "ACCIDENTS"

**Unintentional injuries:
400 000 deaths/year
globally – the
majority in children**

**Survivors may
suffer lifelong
disability**



Non-intentional injuries in children under 15 years
WHO, 2001

29/07/2008

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Unintentional injuries account for over 400 000 deaths every year worldwide – the majority in children and adolescents.

Those who survive may suffer life-long disability.

In Europe, 3 out of 10 deaths in the 0–4-year age group are a consequence of injury.

Injuries are usually classified on the basis of "intentionality" – i.e. as intentional or non-intentional.

The word "accident" should not be used, as it carries the notion of inevitability – whereas, in effect, accidents are 100% preventable...

The next slide goes into more detail.

<<NOTE TO USER: Include local data and priority issues.>>

Ref:

• *Initiating an alliance for action*. Geneva, World Health Organization, 2002 (Document prepared for WSSD, September 2002).

Figure: WHO, Global burden of disease database, Version 1, Geneva, World Health Organization, 2001.

Why Children?

INJURIES AND "ACCIDENTS"

UNINTENTIONAL INJURIES

- ❖ Road traffic injuries
- ❖ Poisoning
- ❖ Falls
- ❖ Fire and burn injuries
- ❖ Drowning

INTENTIONAL INJURIES

- ❖ Homicides
- ❖ Sexual assaults
- ❖ Neglect and abandonment
- ❖ Maltreatment
- ❖ Suicides
- ❖ Collective violence (war)

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Injuries are usually classified on the basis of "intentionality".

- Road traffic injuries, poisoning, falls, fire and burn injuries, and drowning are unintentional in children (in most cases).

- Homicides, sexual assault, neglect and abandonment, and maltreatment are intentional, as are suicide and collective violence (war).

- Evidence suggests that small children are more vulnerable to injuries such as poisoning, drowning, burns and maltreatment by caregivers
- ...and adolescents to road traffic injuries, interpersonal violence and sports injuries.

- Injuries tend to be more prevalent in boys. The general rates of injuries due to burns and car accidents tend to be higher in boys. There are some exceptions such as injuries related to horse-riding in Australia and the United Kingdom and in girls working as cooks and cleaners (Ian Scott, VIP/WHO, personal communication).

- Poor children live in the most unsafe and unhealthy environments – and are particularly vulnerable as they have fewer chances of overcoming the risks and fewer advantages, such as access to education and health services.

- Rates and patterns of injury vary from country to country.

<<NOTE TO USER: Include local data and priority issues.>>

Ref:

- *Initiating an alliance for action*. Geneva, World Health Organization, 2002 (Document prepared for WSSD, September 2002).

Why Children?

EMERGING ISSUES

New or "re-emerging" potential threats to children's health and development

- ❖ Global climate change
- ❖ Ozone depletion
- ❖ Some radiations
- ❖ Persistent organic pollutants
- ❖ Endocrine disruption
- ❖ Obesity
- ❖ Others...



WHO



WHO

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Emerging issues are new or "re-emerging" potential threats to children's health and development.

For some of the following, the effects have not been fully demonstrated, but there is growing evidence about potential effects on children.

• **Global climate change** – global warming and its effects on vectors and on vector-borne diseases, which are a major "killer" of children. The pictures illustrate two examples of major climate events, such as hurricanes and floods (young girl in flooded area in Luanda).

Ref:

Githeko AK et al. *Climate change and vector-borne diseases: a regional analysis, Bulletin of WHO (2000) 78 (9): 1136*

- **Ozone depletion** – and overexposure to ultraviolet radiation, to which children are very susceptible.
- **Some radiations** – give cause for great concern and are currently the subject of studies.
- **Contamination by persistent organic pollutants (POPs)** – effects have been demonstrated in wildlife; acute toxic effects have been observed in humans; effects of low-level exposure are currently under study.
- **Endocrine disruption** – due to anthropogenic and natural compounds with endocrine effects which have been demonstrated in animals, and are suspected in humans.
- **Obesity** – related to environments that predispose to sedentarism and unhealthy diets in children.
- **Others...**

Pictures: WHO.

Why Children?

COMBINATION OF ENVIRONMENTAL RISK FACTORS

A number of paediatric illnesses are linked to:

Heavy traffic

+

Toxic waste sites

+

Industrial effluents

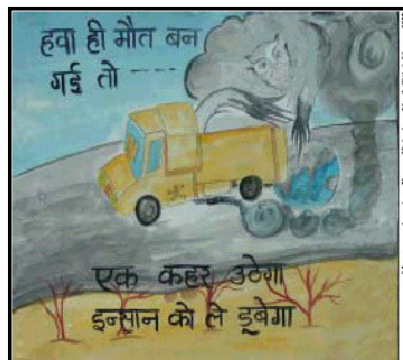
+

Contaminants

(in water, food, objects ...)

+

Pollutants where children live, grow, play,...work



WHO

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A review of the GLOBAL environmental threats to children's health, one by one, helps to provide an understanding of why many paediatric illnesses are linked to pollutants in the environment, which may cause, trigger or exacerbate diseases.

Let us consider some examples that illustrate the fact that environmental risks do build up, do not come "alone", but rather combine in different settings and under various circumstances.

Preliminary estimates suggest that up to 1/3 of the GLOBAL burden of disease can be attributed to environmental factors.

Over 40% of this burden falls on children under 5 years of age, who make up about 10% of the world population.

Ref:

•Smith KR et al. How much global ill health is attributable to environmental factors?
Epidemiology, 1999, 10:573.

Many paediatric diseases are linked in one way or another to circumstances where several threats are combined:

- heavy traffic (as illustrated by the drawing by an Indian child) where exposure to noise, heat, particulate materials and the risk of injury coexist;
- toxic waste sites – where children are exposed to toxic products; discarded contaminated food; vectors of disease; dioxins and toxic fumes, where waste is burned; plus a social environment that may predispose to injury and violence;
- industrial effluents;
- contaminants in water, food and objects; and
- pollutants where children live, grow, play,...work.

It is important to stress that all the effects and diseases resulting from chemical, physical and biological threats have high social and economic costs (see next slide).

Why Children?

**Environmentally-related
paediatric illnesses have
high social and
economic costs**

- **Increased medical expenses**
- **Sickness, disability and death**
- **Sick days away from school**
- **Productivity lost by parents away from work**
- **Personal agony of families and communities**
- **Reduced long-term productivity of the country**



WHO

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It is important to stress that all the effects and diseases resulting from chemical, physical and biological threats have high social and economic costs.

Picture: WHO. Child hospitalized due to cholera, in Peru.

Why Children?

ENVIRONMENTAL RISK FACTORS AND CHILD LABOUR



SEARO, HRIDAY Educational Company

Over 171 million of the 352 million children aged 5 to 17 who work mainly in poor regions of the world are exposed to hazardous conditions, including chemical exposure and poisoning

ILO/IPEC

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<<NOTE TO USER: Mention child labour only if relevant; include relevant local data, if available; state whether the country has ratified the ILO/IPEC conventions.>>

IPEC: International Programme for the Eradication of Child Labour.

Some of the worst forms of environmental exposure in children occur in the context of child labour.

The drawing was done by a schoolchild from Delhi, India, in connection with a WHO educational event, after being told about environmental threats and the risks of exposure (March 2002, photo from HRIDAY, provided by WHO Regional Office for South-East Asia).

Ref:

•ILO website (International Programme for the Eradication of Child labour – IPEC):
www.ilo.org/public/english/standards/ipecc

Why Children?

ARE ENVIRONMENTAL THREATS SIMILAR AROUND THE WORLD?

KEY GLOBAL RISK FACTORS (WHO)

- Household water insecurity
- Poor hygiene and sanitation
- Air pollution
- Disease vectors
- Chemical hazards
- Injuries and accidents
- **EMERGING ISSUES!**

SPECIFIC ENVIRONMENTAL HEALTH CONCERNS IN INDUSTRIALIZED REGIONS

- Childhood cancer
- Respiratory disease & air quality
- Built environment
- Neurological impairments
- Birth defects
- Autism
- Foetal origin of adult disease
- Obesity/nutrition/diabetes
- Endocrine disruption

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This slide compares the main "global" concerns with those reported in industrialized countries.

Children in ALL countries are exposed to environmental risks factors.

However, the risks vary from country to country and even within the country, and in different communities (e.g. urban and rural).

It is useful to compare the concerns of developing and industrialized countries:

- key global risk factors – as determined by WHO – that have already been described, the very "basic" risk factors that result in high morbidity and mortality; and

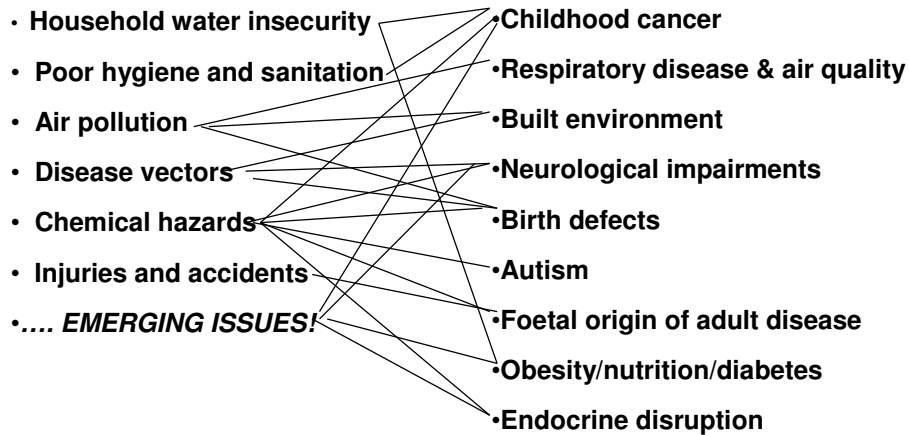
- specific concerns of both the scientific community and the public in the more industrialized countries – that refer more to outcomes that may be attributable to environmental risk factors. This is a list of diseases and developmental effects observed in children that are linked to environmental causes – even if in many instances there is no scientific proof of the links.

Why Children?

ARE ENVIRONMENTAL THREATS SIMILAR AROUND THE WORLD?

KEY GLOBAL RISK FACTORS (WHO)

SPECIFIC ENVIRONMENTAL HEALTH CONCERNS IN INDUSTRIALIZED REGIONS



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This slide compares the main "global" concerns with those reported in industrialized countries.

Children in ALL countries are exposed to environmental risks factors.

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Why Children?

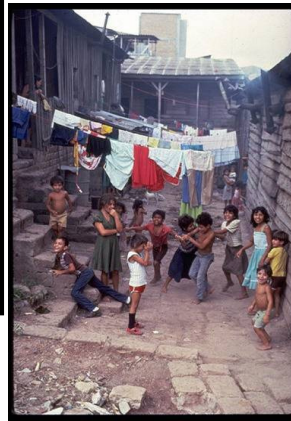
CHALLENGES TO CHILDREN'S HEALTH & DEVELOPMENT

The double – or triple – burden of disease

PERSISTENT PROBLEMS "THE UNFINISHED AGENDA"

Infectious diseases
in low-income
countries:

ARI
Malaria
Measles
Diarrhoea
HIV/AIDS...



EMERGING EPIDEMICS OF NON-COMMUNICABLE DISEASES: "NEW" THREATS

Asthma, Injuries,
Traffic effects,
Neurodevelopmental,
learning and
behavioural disorders,
Cancer,
Endocrine disruption

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WHO

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However, developing countries are currently facing both the GLOBAL risk factors (persistent problems) and the new epidemics, or emerging issues identified in the more industrialized countries.

Hence, developing countries are facing a DOUBLE burden of disease: on top of the "unfinished agenda" (infectious diseases that have not yet been conquered), they are **also** being affected by emerging epidemics of noncommunicable diseases that are characteristic of the more industrialized countries.

Children are affected by both types of challenges, as signified by the arrows.

This burden is TRIPLE if we add malnutrition or poverty as another burden...

Why Children?

INTERNATIONAL DECLARATIONS AND RECOMMENDATIONS ON CHILDREN AND THE ENVIRONMENT

- 1989 **UN Convention on the Rights of the Child (1989):** www.unhchr.ch/html/menu3/b/k2crc.htm
- 1990 **World Declaration on the Survival, Protection and Development of Children (World Summit for Children):** www.unicef.org/wsc/declare.htm
- 1992 **Agenda 21, Chapter 25 (United Nations Conference on Environment and Development):** www.un.org/esa/sustdev/documents/agenda21/index.htm
- 1997 **Declaration of the Environment Leaders of the Eight on Children's Environmental Health:** yosemite.epa.gov/ochp/ochpweb.nsf/content/declara.htm
- 1999 **Declaration of the Third European Ministerial Conference on Environment and Health:** www.who.dk/AboutWHO/Policy/20010825_2
- 2001 **UN Millennium Development Goals:** www.who.int/mdg
- 2002 **United Nations General Assembly Special Session on Children:** www.unicef.org/specialsession/
- 2002 **The Bangkok Statement (WHO International Conference):** www.who.int/ceh
- 2002 **Organization for Economic Cooperation and Development Programme (OECD):** www.oecd.org
- 2002 **World Summit on Sustainable Development :** www.johannesburgsummit.org/
Announcement of the Healthy Environments for Children Alliance and Indicators Initiative
- 2003 **IFCS Forum IV Recommendations on Children and Chemicals:** www.ifcs.ch
- 2004 **The future for our children, Fourth Ministerial Conference on Environment and Health (CEHAPE, Children's environment and health action plan for Europe) Budapest:** www.euro.who.int/childhealthenv/Policy/20030625_1
- 2005 **Healthy Environments, Healthy Children: Commitment For Action, Buenos Aires** www.who.int/ceh/news/pastevents/buenosairesdecleng/en/index.html
- 2006 **Strategic Approach to International Chemicals Management – Global Plan of Action** www.chem.unep.ch/saicm/

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Over the past 15 years, the importance of protecting children's health and their environments has been recognized internationally.

This is a long list, with the international agreements and recommendations that refer to the need to protect children from environmental threats.

Are these being put into effect in the different countries?

<<NOTE TO USER: Select and mention only the more relevant international agreements/declarations. Consult the relevant web sites if you wish to expand on any of the declarations/conventions.>>

Why Children?

CHILDREN REPRESENT THE FUTURE OF OUR SOCIETIES

Need to prevent harmful exposures and protect children's health

- ❖ **Governments and stakeholders –**
 - to recognize the issues**
 - to develop and implement policies**
 - to take and support actions**

- ❖ **Health care providers –**
 - to learn about environmental threats**
 - to diagnose, prevent and treat**
 - to investigate**
 - to inform the parents and the children**
 - to advocate**

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As children represent the future of our societies and have the right to healthier, cleaner and safer environments, different sectors are called to join their efforts and work towards the protection of children.

<<NOTE TO USER: Key message: Avoid being overwhelmed by the problems and "paralyzed" by their magnitude. >>

<<NOTE TO USER: Describe the roles that the different sectors are called to play.>>

Why Children?



WHO

***Creating healthier, cleaner and safer environments for children
will contribute to a more secure future for the world***

"Shaping the future of life"

World Health Day, April 2003

29/07/2008

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To reach these objectives, WHO is undertaking a number of technical activities, in partnership with different organizations, such as IPA (International Pediatric Association), INCHES (The International Network for Children's Health, Environment and Safety), ISDE (International Society of Doctors for the Environment) and PSR (Physicians for Social Responsibility).

One of the key activities is the preparation of training materials for health care providers, which is being undertaken in close partnership with about 15 professionals from different countries and representatives of scientific and nongovernmental organizations.

The Training Package for the Health Sector is a tool to build the capacity of the health sector to deal with the adverse effects of environmental factors.

<<NOTE TO USER: Mention the organizations involved in the event, sponsors and partners.>>

<<NOTE TO USER: End with the motto of World Health Day: "Shaping the future of life" or any other positive phrase.>>

Why Children?

"We are guilty of many errors and faults; but our worst crime is abandoning the children, neglecting the fountain of life.

Many of the things we need can wait. The child cannot.

Right now is the time his bones are being formed, his blood is being made, and his senses are being developed.

To him, we cannot answer 'Tomorrow'. His name is 'Today'."

Gabriela Mistral (1889–1957)
Nobel Prize-winning poet from Chile

Why Children?

POINTS FOR DISCUSSION

<<NOTE TO USER: Add points for discussion according to the needs of your audience.>>

Why Children?

ACKNOWLEDGEMENTS

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Why Children?

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