<<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. Present only those slides that apply most directly to the local situation in the region.>>

<<NOTE TO USER: This presentation contains six examples of children's environmental health indicators in action for six separate health issues (slides 48 to 119). You should select one or two examples that are most relevant to your audience and present only these.>>

LEARNING OBJECTIVES

- Learn what children's environmental health indicators are, and how to use them
- Understand the importance of children's environmental health indicators
- Introduction to indicators
  - Types of indicators
  - Indicators in context
- Review examples of indicators and how they are used
- Consider why, when, where and how to monitor the environmental health of children

Children's Environmental Health Indicators

"What can be measured can be improved."

WHO

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Environmental health indicators are methods for measurement. We use indicators in health because, as this proverb says, "what can be measured can be improved." Taking measure of an environmental health issue helps us focus resources on the problems and people that need them most, and it helps us understand what is working to improve health.

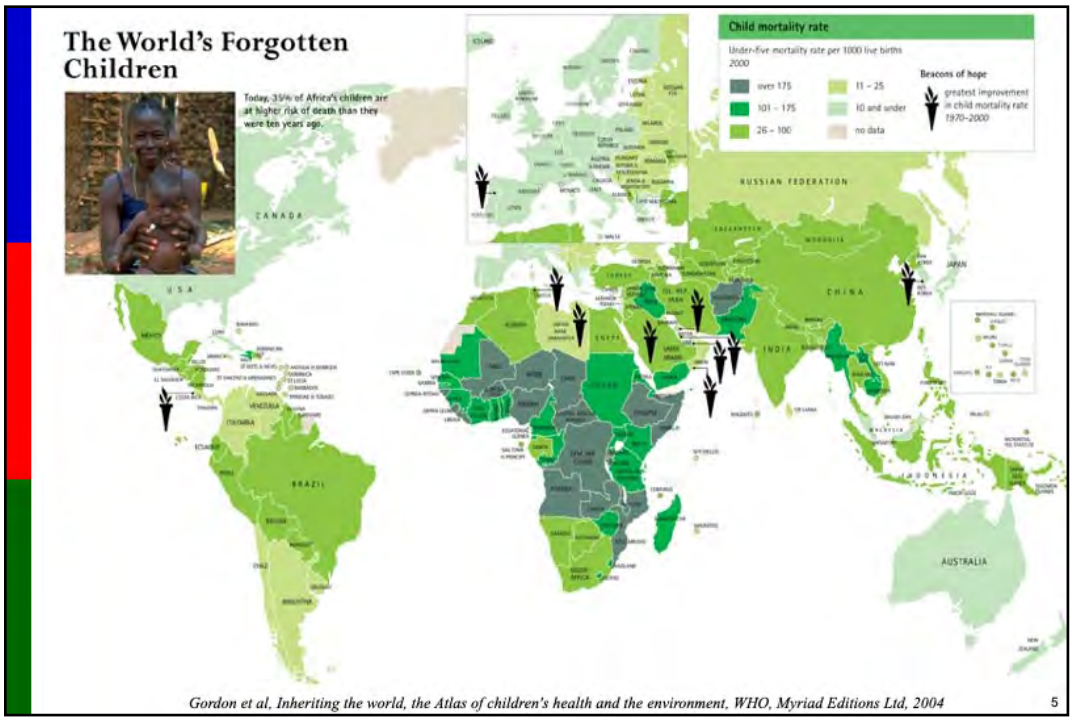
Picture: WHO

OUTLINE OF THE PRESENTATION

I. **Introduction and background**

II. **Children's Environmental Health Indicators**

III. **Examples of indicators in action**



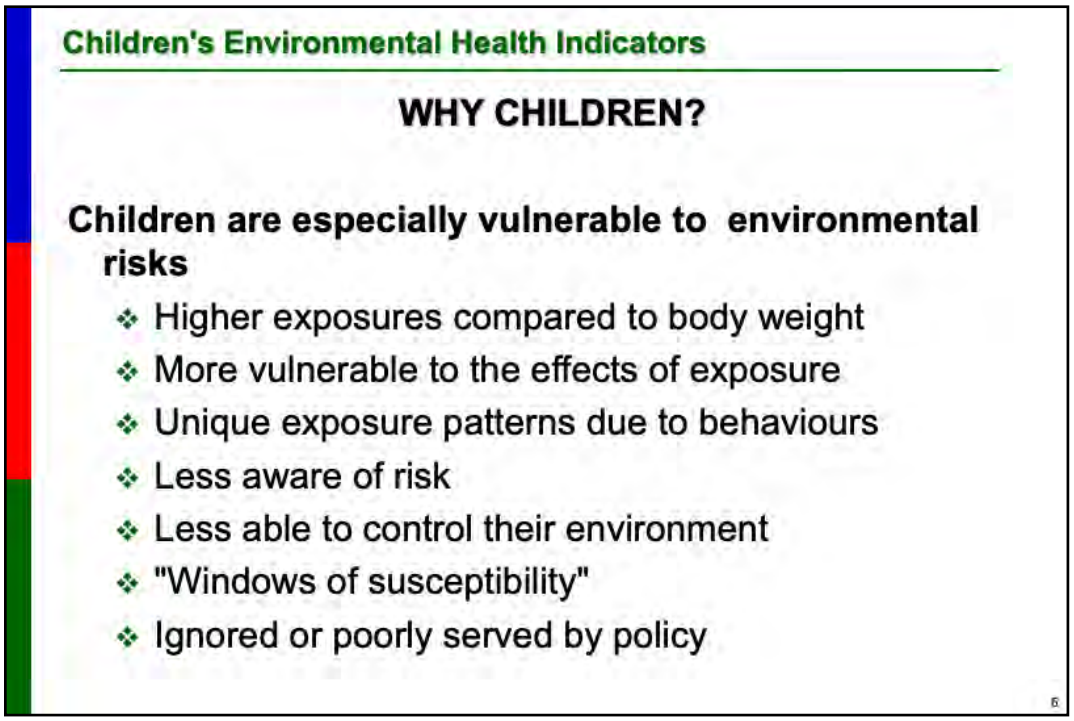
Nearly 10 million children aged under five years die every year – 98% of them in developing countries. Widespread malnutrition hampers children's growth and development, opening the door to the biggest killers of children in this age group. This presents a sharp contrast to the situation in the industrialized 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.

This slide shows that in country **<<NOTE TO USER: Please specify the country you wish to highlight>>**, X number of children under five died in the year 2000.

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.

Reference:

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



Compared to adults, children suffer disproportionately from a wide range of environmental diseases. Children are even more vulnerable than adults to environmental risks because:

•Compared to adults, children breath more air, eat more food and drink more water relative to their body weight, so they are exposed to higher doses of environmental risk.

•Children's' immune systems are still developing, so they are less able to deal with exposures.

•Childhood behaviours such as crawling on the ground, putting objects in mouths and playtime activities may pose risks that do not exist for adults.

•Children are less aware of risk, less able to communicate exposure to hazards, and less able to mitigate risk in their environment because they are usually powerless.

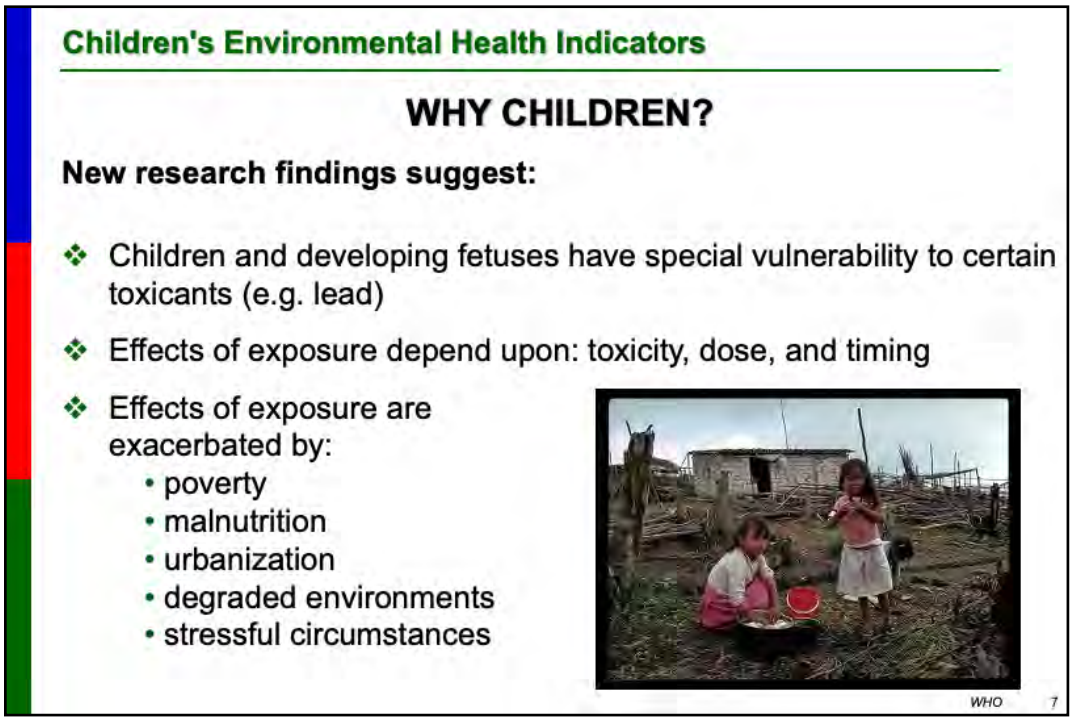
•Children have “windows of susceptibility” to environmental threats. These are specific periods in their development when the effect of a chemical, physical or biological agent is major and may result in adverse health outcomes.

•Finally, they are often disregarded or poorly served by policy. Children are essentially seen as little adults living in a big adults’ world.

References:

•Briggs D. Making a Difference: Indicators to Improve Children's Environmental Health. *Geneva, World Health Organization*, 2003.

•WHO. A Call to Action: Using Indicators to Measure Progress on Children's Environmental Health. *Geneva, World Health Organization*, 2002.



Although the special susceptibility of children has been recognized for decades (especially by paediatricians), it is only recently that science has discovered new, more sophisticated knowledge about the effects of toxins in children. For example, we now have detailed information about the specific effects of thalidomide on the developing fetus, and that of lead on the developing nervous system in young children.

The importance of toxicity, dose and timing of exposure are now recognized. Toxicity is the level at which a substance becomes toxic in the body; this may be different for children than for adults. Dose refers to the quantity and frequency of an exposure (for example, in the case of a repetitive exposure), whereas timing refers to specific vulnerabilities that come during certain developmental phases, which we call "windows of susceptibility."

For many children, the adverse effects of exposure 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).

References:

•Briggs D. Making a Difference: Indicators to Improve Children's Environmental Health. *Geneva, World Health Organization*, 2003.

•Hernandez-Avila. 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.

•Hill LM, Kleinberg F. Effects of drugs and chemicals on the fetus and newborn. *Mayo Clin Proc.* 1984, 59(10):707-16. Review.

The authors review known effects of drugs on the developing fetus. Drug teratogenicity has been demonstrated experimentally for more than 30 years. A complex set of circumstances must prevail for a specific teratogenic effect to result. Not only the drug or environmental pollutant in question but also its dose, timing, and frequency of administration as well as the genetic and individual susceptibility of the embryo are important factors.

•Knobloch J, et al. Thalidomide induces limb deformities by perturbing the Bmp/Dkk1/Wnt signaling pathway. *FASEB J.* 2007, 21(7):1410-21. Epub 2007 Feb 5.

Thalidomide, a sedative originally used to treat morning sickness and now used to treat leprosy and multiple myeloma, is also a teratogen that induces birth defects in humans such as limb truncations and microphthalmia. However, the teratogenic mechanism of action of this drug remains obscure. The authors perform a study of teratogenic effects of thalidomide in chicken embryos. They conclude that perturbing of the proteins Bmp/Dkk1/Wnt signaling is central to the teratogenic effects of thalidomide.

Picture: WHO