Children's Health Vulnerability to Climate Change

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NATIONAL WORKSHOP

"Building Capacities to Cope with Health Impacts of Climate Change"
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Lay out of the presentation

- Introduction
- Children are not little adults
- Major Risks for children due to climate change
- We must and we can act now – links to Cy-CEHAP

Climate change will affect everybody but not everybody in the same way

Populations differ in vulnerability

- The old people
- People suffering from long-term diseases
- Emergency services providers and labourers in outdoor environments
- **children are most at risk from the effects of climate change**

Why special concern for children ???

WHO: Children from 0-19 years

Children are not little Adults they have different

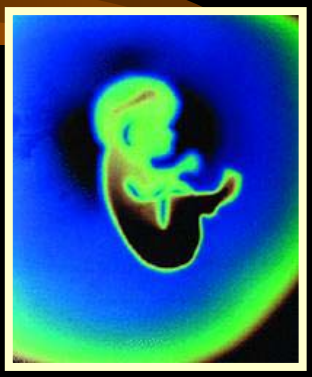
EXPOSURE and **VULNERABILITY**

Longer life expectancy-

Politically defenseless powerless

PHYSIOLOGY AND BEHAVIOUR

Xenobiotics may be handled differently by an immature body.



PHYSIOLOGY: Very rapid growth

- Breath faster, eat & drink more
- Skin may absorb more : higher area/PBW thus greater weight adjusted absorption through skin
-- Proportionally greater dose absorbed
Pb absorbed : Toddler 50% Vs 5-15% of an adult

UNIQUE EXPOSURE

- Placenta
- breastfeeding

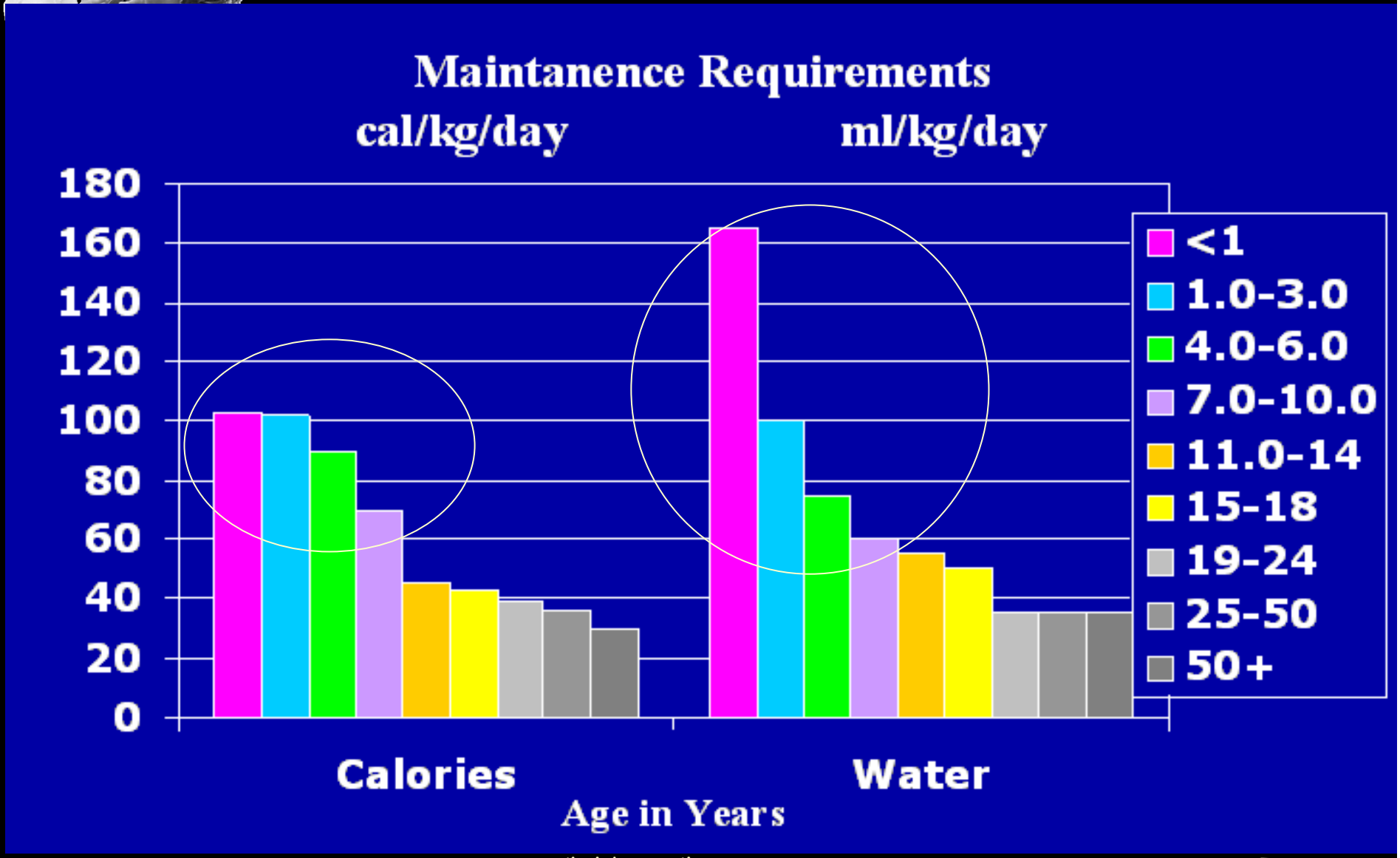
BEHAVIOUR

- More time outdoors, play and breath closer to the ground,
- "hand-to-mouth" activities
- Unawareness about risks

PHYSIOLOGY + BEHAVIOUR: Leads to enhanced exposure

- Ref. IFCS *FORUM IV 1-7/11/03 Protecting Children from Harmful Chemical Exposures Chemical Safety and Children's Health*

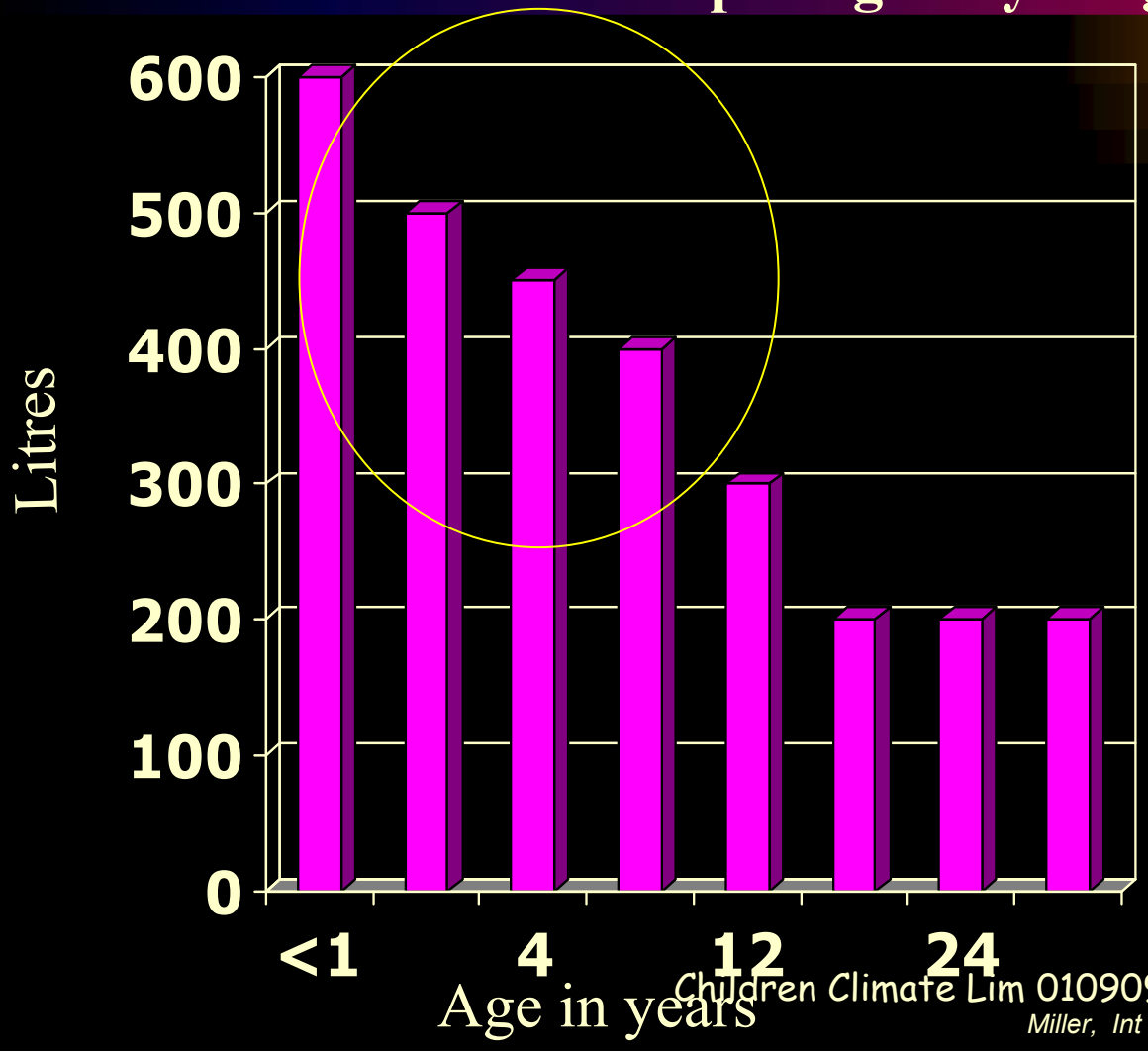
Greater Food and water intake/bw



2. DYNAMIC DEVELOPMENTAL PHYSIOLOGY

OXYGEN DEMAND

Minute ventilation per kg body weight/day



An infant has triple the minute ventilation of an adult and a 6 year old has double.

Miller, Int J Toxicology (2002) 21(5);403

VULNERABILITY

Because of physiology and Biology

- Fast cell division and multiplication
- Immature , organs, constantly developing
- Metabolism and age related Toxicokinetics Toxicodynamics
  - increased Absorption and Distribution,
  - reduced Bio transformation, and Elimination,
  - less ability to Detoxify & Excrete
  - Immune system under development

Weak defence mechanisms

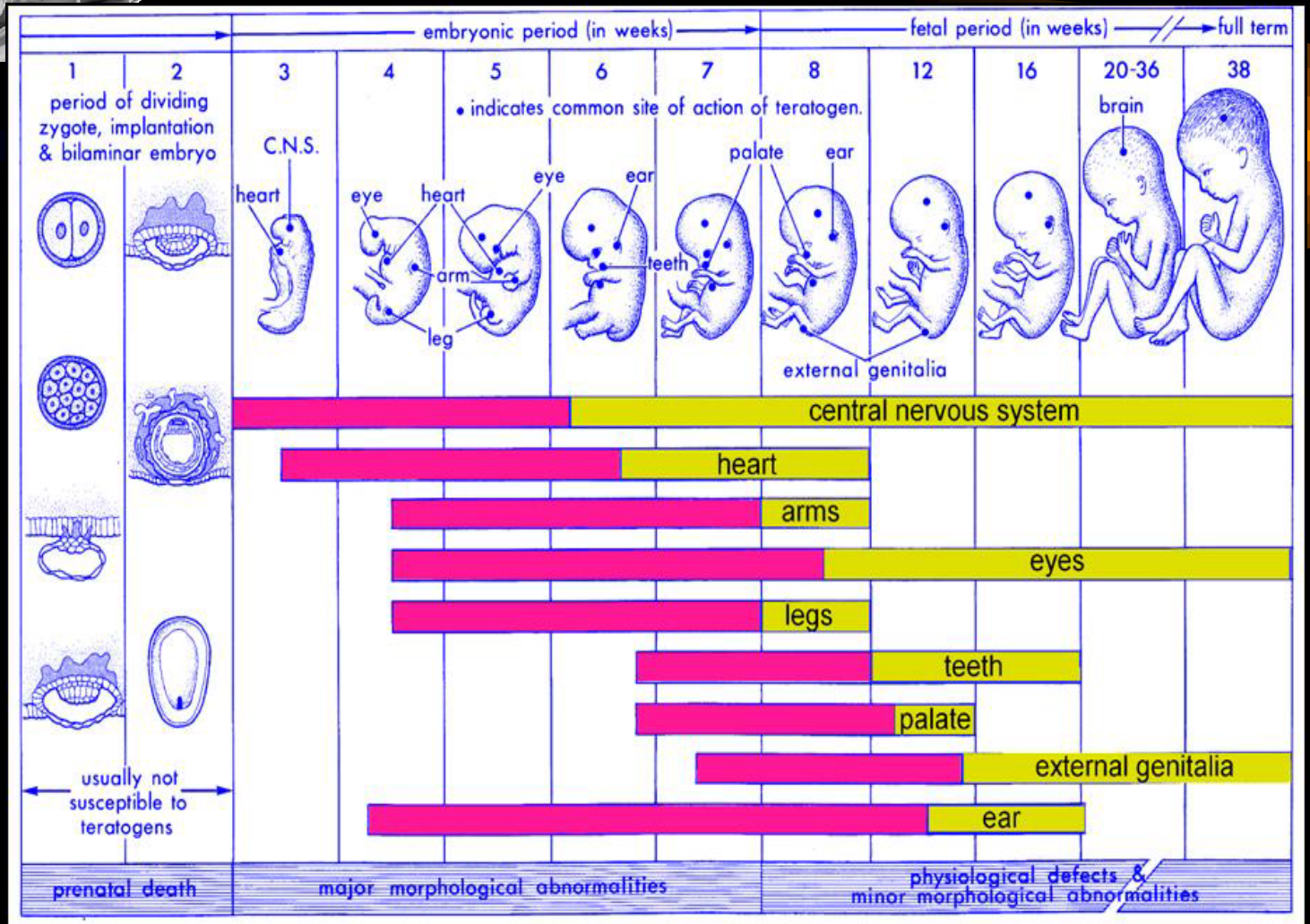
Critical Developmental Windows

The developmental component of a child's physiology is

- ✓ changing, maturing, differentiating and growing in phases known as developmental windows.
- ✓ These critical windows of vulnerability have no parallel in adult physiology and

create unique risks for children exposed to hazards which can alter normal function and structure.

Windows of development



Schematic illustration of the sensitive or critical periods in human development. Red denotes highly sensitive periods; yellow indicates stages that are less sensitive to teratogens.
Moore KL. The Developing Human: Clinically Oriented Embryology. Philadelphia: W. B. Saunders Company, 1973.

Moore, Elsevier Inc, 1973

The growth process

- the growth does not stop at birth, but continues through adolescence.
- Not just **physical growth, but the maturation and continued differentiation of physiologic functions**.
- The organs and their function grow, matures and modifies as well at different life stages, until the end of adolescence.

The Timing of exposure is a determinant factor

- If the process **disrupted during critical periods,** damage may be severe and life long.

Environmental hazards may operate to harm a developmentally dynamic child by mechanisms that do not operate in the adult.

Major Risks for children

Due to climate change

HEATWAVES+ AIR pollution

HEAT WAVES AND STRESS

AIR POLLUTION

AIR Quality is affected

Air quality is threatened via at least three mechanisms:

- heat-driven increases **in ground-level ozone,**
- energy production-driven increases in **particulates**
- other fossil fuel-related air pollutants,
- changes **in aeroallergens**.
- Production of **pollutants from FIRES**

Health hazards PM

PM increases the risk of respiratory death in infants under 1 year,

- affects the rate of lung function development,
- aggravates asthma and causes other respiratory symptoms such as cough and bronchitis in children;

Ref The systematic data assessment completed in 2004 by the WHO European Centre for Environment and Health, Bonn, indicates that

CHILDREN'S UNIQUE VULNERABILITY

- **Greater exposures** because they spend more time outside
- **Inhale more pollutants** per kilogram of body weight than do adults
- Because airways are narrower, irritation can result in proportionately greater airway obstruction

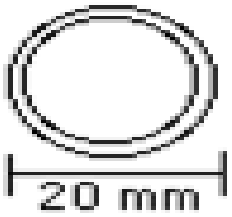
Smaller airways -more vulnerable

www.vh.org/pediatric/provider/pediatrics/ElectricAirway/Diagrams/AirwayDIaneterEdema.jpg

Diagram of the Effect of Edema on the Cross-Sectional Airway Diameter

(R = radius)

Adult Airway

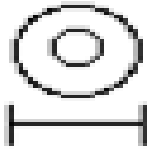


Area = $\pi R^2 = \pi\ 10^2 = 100\ \pi$ mm^2 (Normal)

If have 1 mm Edema Area = $\pi\ 9^2 = 81\ \pi$ mm^2

or 81% of normal

Full Term Newborn



Area = $\pi R^2 = \pi\ 3^2 = 9\ \pi$ mm^2 (Normal)

If have 1 mm Edema Area = $\pi\ 2^2 = 4\ \pi$ mm^2

or 44% of normal

Increased air pollution including ozone

Additional Risks
Child and pregnant women

- ✓ decreased lung growth
- ✓ permanent decrements in pulmonary function
- ✓ increases in respiratory infection, asthma, infant mortality and all age mortality,
- ✓ miscarriages,
- ✓ preterm delivery
- ✓ low birth weight
- ✓ Allergies

Adapted from Katherine M. Shea MD, MPH and Sophie J. Balk MD

Wildfires

- Air pollution
  - ✓ Particulate matter
  - ✓ PAHS
  - ✓ etc
- Concentration of toxic pollutants, in water and food

Additional Child Specific Risks

- injury and death
- Growth retardation,
- developmental delay
- Increased risk for cancer, asthma, respiratory and neurological diseases

Adapted from Katherine M. Shea MD, MPH and Sophie J. Balk MD

Warm spills and heat waves

- **Children more vulnerable because they do not have fully developed temperature regulation mechanisms and**
- are unable to change their environments without help from adults.
  - ✓ Very young at higher risk of death
  - ✓ older children will have more heat stress due to time spent in exercise
  - ✓ more diarrhea and more hospitalizations for dehydration.

Infants and small children are at higher risk for complications and hospitalizations from infections.

Adapted from Katherine M. Shea MD, MPH and Sophie J. Balk MD

- There is a NEED FOR ACTION

EFFECTIVE Interrelated National PLANS

Flexibility

Adaptive capacity

Expand partnership

Foster Coordination

Cyprus Action Plan on Environment and Children's Health (Cy-CEHAP),2007-2010

The Cyprus Political Will and Commitment to protect children's Health from Environmental Risks, based on the principles of

Precaution, Prevention and Integration

Cy –CEHAP: VISION

OUR VISION

- Our children, from conception to adolescent, will enjoy a healthy and safe environment with the minimum possible exposure to environmental risk factors. An environment which will allow them to reach their full physical, mental and psychological development and enjoy a healthy life.

OUR GOAL

- To minimize the burden of avoidable environmentally linked diseases and disabilities, through the reduction of children's exposure to chemicals and other hazardous factors.

Added Value and Synergy

(Cy-CEHAP),2007-2010

Indicative common activities

- Heatwave Plans
- Reducing exposure to air pollutants
- Awareness raising & Advocate to minimize GHGs and use chemicals
  - invest on children, parents, health professionals, teachers
  - greening activities
- Sun awareness campaign: skin cancer
- insure water quality in small communities

EFFECTIVE Interrelated National PLANS

Flexibility

Adaptive capacity

Expand partnership

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CLIMATE CHANGE STRATEGIC PLAN FOR CYPUS

Action Plan for health impacts Climate Change

Action plan Cy-CEHAP

Taking **effective** steps towards minimization of exposure and risks for our children

The Regulatory System is Guided by EU Legislation

but

We DO participate and we can influence its development

But at National Level

Awareness Communication Intervention

Involvement of all stakeholders

- **Educate parents, teachers, communities- *and the children* - about types & routes of exposure, how to recognize and avoid risks**

Raise the awareness and foster commitment of decision-makers to encourage policies that take into account the special vulnerability of children

- **TRAIN Professionals**
- **Target oriented research and surveillance**

Children represent the future of our planet and are intrinsic component of sustainable development

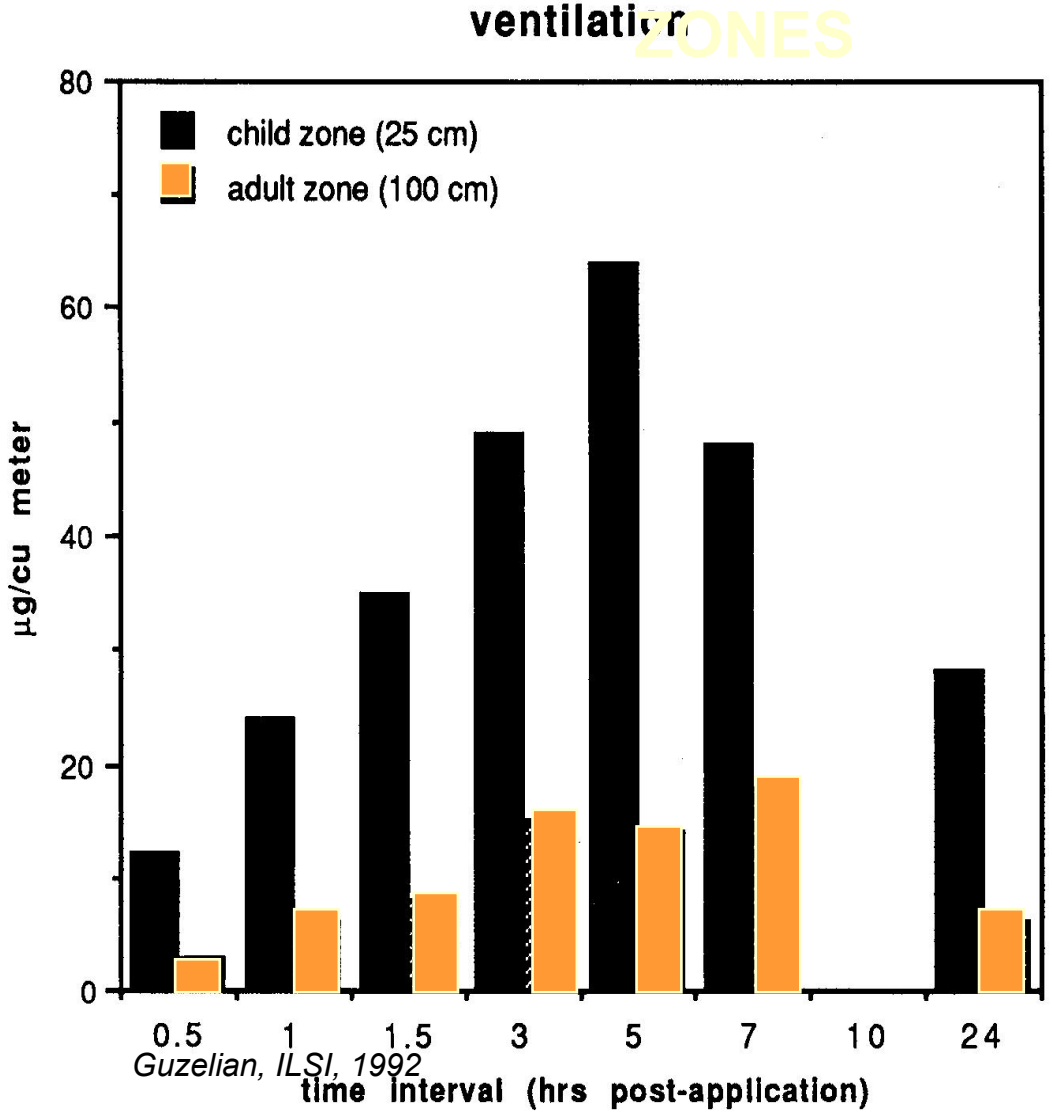
We must and can protect them and prevent health impacts.

Let's contribute to mitigating Climate Changes, minimize children exposure to toxic chemicals and other factors and take all necessary measures at all levels to protect them.

THANKS FOR YOUR ATTENTION

Different breathing zones

STATURE AND BREATHING ZONES



Guzelian, ILSI, 1992

- ✓ different exposures in different breathing zones.
- ✓ Measurements inside homes following pesticide applications find that concentrations are always highest closest to the floor

Υδατοφράκτης Γερμασόγειας Αύγουστος 2008 - Φωτογραφία: Φραγκίνος Θεοδώρου

Drought

Human Health Impact

- Increased risk of food and water shortage,
- water quality deterioration
- malnutrition and infection,

Additional Child Specific Risks

- injury and death
- More sensitive to water borne diseases

Adapted from Katherine M. Shea MD, MPH and Sophie J. Balk MD

Changes in distribution and potency of allergens

Human Health Impact

- ✓ Mycotoxins
- ✓ More severe and more prevalent allergies

Additional Child Specific Risks

- birth defects

Adapted from Katherine M. Shea MD, MPH and Sophie J. Balk MD

CY-CEHAP The Objectives:

- **To raise awareness**
- To integrate **prevention and precaution** into health, environmental and sustainable development policies.
- **To reinforce mechanisms for prompt responses to emerging threats and uncertain risks**.
- **To strengthen technical infrastructure, capabilities and knowledge** for diagnosing and curing environmentally induced diseases and disabilities through the training of professionals.
- **To promote surveillance and research**

Health hazards PM

PM increases the risk of respiratory death in infants under 1 year,

- affects the rate of lung function development,
- aggravates asthma and causes other respiratory symptoms such as cough and bronchitis in children;

- PM2.5 seriously affects health,
  - increasing deaths from cardiovascular and respiratory diseases and lung cancer.
  - Increased PM2.5 concentrations increase the risk of emergency hospital admissions for cardiovascular and respiratory causes;
- PM10 affects respiratory morbidity, as indicated by hospital admissions for respiratory illness

Ref The systematic data assessment completed in 2004 by the WHO European Centre for Environment and Health, Bonn, indicates that