A holistic perspective on children's environmental health challenges in the region

Paul Jagals

Professor and Specialist Practitioner of Environmental Health

- Children’s Environmental Health Programme, University of Queensland
  p.jagals@uq.edu.au
- Director of Environment4health
  p.jagals@environment4health.org
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Realizing the rights of **every child**, especially the most disadvantaged

**GOAL AREA 1**
Every child survives and thrives

**GOAL AREA 2**
Every child learns

**GOAL AREA 3**
Every child is protected from violence and exploitation

**GOAL AREA 4**
Every child lives in a safe and clean environment

**GOAL AREA 5**
Every child has an equitable chance in life

**RESULT AREAS**

**HOW: Change strategies**

**ENABLERS: help to deliver the WHAT and HOW**
Let us understand.....

- Our world
- Environmental Health
- The World of a Child
  - Environment
  - Health
- Children’s Environmental Health: Challenges and Opportunities
Living with our environment

<table>
<thead>
<tr>
<th>Oceans and Atmosphere</th>
<th>Land and Water</th>
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<tbody>
<tr>
<td>Anthropogenic Settings</td>
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<tr>
<td>Biters and Vectors</td>
<td>Living with Animals</td>
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<tr>
<td>Infectious Disease</td>
<td>Natural Allergens and Toxins</td>
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Living with Animals

Natural Allergens and Toxins

Infectious Disease

Biters and Vectors

Living with our environment
Oceans and Atmosphere

Land and Water

Anthropogenic Settings

Energy

Water

Goods

Food

Living with our environment
First let us define *Environmental Health*

- **Public Health discipline**
  - Measure, understand and manage exposures to environmental hazards
  - Healthy environments for healthy people

- **Academic discipline**
  - Research and teach how exposures to environmental hazards affect our health

- **Practice**
  - Ensure hazardous environments are prevented / mitigated
  - And healthy environments are promoted and sustained
The ultimate goal of Children's Environmental Health

• Protect Children’s Health
• (to sustain support for them achieving their highest potential)
  • Reducing bad exposures to unhealthy environments
  • Protecting and promoting healthy environments
  • Where they live, play, learn and work
  • During foetal stage, childhood as well as across the entire human life span
The World of a Child

- Complex Matrix of Environments
- Unique and Different Exposures
- Dynamic Developmental Physiology
- Live longer- express diseases over longer latency period
- Politically powerless
- Their health more definitively linked to their environments
  - And their interaction with these environments

Sources:
- Hubal et al 2014: Identifying important life stages for monitoring and assessing risks from exposures to environmental contaminants: Results of a World Health Organization review
- www.who.int/features/factfiles/children_environmental_health/en/
For a child we must consider ‘Environment’ very comprehensively

- Children's environments are complex - many layers
- Environments themselves change over time
- Many interactions with multiple environments at different life stages
- Influences of the human genome and epi-genome
- Interactions between their environmental health, poverty, and social injustice
Unique and Different Exposures

- Unique exposure pathways
- Exploratory behaviours (leading to exposures)
- Stature and living zones, microenvironments
- Children do not understand danger
**Unique exposure pathways**
- Many chemicals cross the placenta and breastfeeding
  - Lead, mercury, polychlorinated biphenyls (PCBs)...
  - Substances of abuse: alcohol, methadone
- Some physical factors may affect the fetus directly
  - Ionizing radiation, heat

**Exploratory behaviours (leading to exposures)**
- Hand-to-mouth, object-to-mouth
- Non-nutritive ingestion

**Stature and living zones, microenvironments**
- Location – lower to the ground
- High body-mass to volume / surface ratio

**Children do not understand danger**
- Pre-ambulatory children cannot avoid danger
- Pre-adolescents / adolescents have cognitive immaturity and thus "risk-taking" behaviours
Environments

• More than one environment actually
• Spaces / places where children live, develop, learn, play and work
• Contains the settings and agents that are hazardous
• Carriers that transmit hazard through exposure pathways
Children’s Environments (Settings)

- Intra-uterine
- Home
- Home-away-from-home (Day care)
- School
- Workplace

![Sectoral distribution of children in child labour, 5-17 years age group, 2012](image)
Children’s Environments (Settings)

- Play place
  ![Play place](image)

- Hangouts
  ![Hangouts](image)

- Recreation
  ![Recreation](image)

- Nature
  ![Nature](image)
Environmental risk factors

• Settings:
  • Lack of physical activity
  • The built environment
  • Local and global environments – climate change, disasters, conflicts

• Environmental health risks such as:
  • Air pollution
  • Lack of water and inadequate sanitation
  • Malnutrition
  • Disease vectors
  • Chemical and electronic hazardous waste
  • Injuries
  • Radiation
  • Endocrine Disrupting Chemicals in everyday use
Safe as houses: Risks to children of inadequate housing

Healthy houses for children should be safe and free of environmental and health threats.

- Indoor temperature
- Noise pollution
- Ambient air pollution
- Household air pollution
- Reduced brain development
- Overcrowding
- Home appliances and household products
- Lack of access to water and sanitation
- Lack of access to cycling lanes/walking paths
- Lack of green spaces
- Injuries
- Cardiovascular disease
- Structurally unsound or unsafe
Examples of hazardous chemicals that can be found in everyday items:

- **Toys**: Lead, arsenic, mercury
- **Computers**: Flame retardants: polybrominated diphenyl ethers (PBDEs), chromium, cadmium, mercury, lead
- **Cosmetics**: Lead, mercury
- **Clothing**: PBDEs, hazardous dye ingredients e.g. chromium VI
- **Food**: Organic solvents, disinfectants
- **Carpet/furniture**: PBDEs, formaldehyde, fungicides
- **Cleaning products**: Plasticisers: phthalates, alkylphenols, formaldehyde, chlorinated phenols, fungicides
- **PVC shoes, raincoat**: Plasticisers: phthalates, alkylphenols, formaldehyde, chlorinated phenols, fungicides
What is a ‘Healthy Environment’ for a child?

‘..A geographical space / a condition / a state of mind where the interactions between children and all their environments do not cause disease, injury and / or disability’
Dynamic Developmental Physiology

- Children have growing bodies
- Xenobiotics handled differently by an immature body
• Critical windows of development - very vulnerable
  • Their vital organs are still forming and rapidly developing
  • When?
    • During pregnancy
    • In early childhood

• Use more calories, water and oxygen per kg of body weight
• Absorption of substances into the body much greater
• Their bodily detoxification processes not yet developed
• Elimination of wastes from their bodies slower – especially at a very young age
Not only do the organs grow, but their function also matures and modifies at different life stages, until the end of adolescence.
Children’s Environmental Health

Challenges and Solutions
It's the ideal measure of how we are doing environmentally.
Environmental fraction of global burden of disease (in DALYs), by age and disease group, 2012

Main diseases contributing to the environmental burden of disease for children under five years, 2012

Diseases with the largest environmental contribution in children under five years of age include lower respiratory infections, diarrhoea, neonatal conditions, malaria and protein-energy malnutrition, as well as injuries.
Complex environments of Children and adolescents

HAZARDS
- Physical
- Chemical
- Biological

SUSCEPTIBILITIES
- Critical windows / timing
- Age
- Nutritional status
- Poverty

MEDIA AND CARRIERS
- Water
- Air
- Food
- Soil
- Objects

ACTIVITIES
- Learning, Working
- Eating, Drinking
- Sleeping, Breathing
- Smoking
- Doing sports, Playing
- "Testing"
- Scavenging

SETTINGS
- Rural / urban
- Home
- School
- Play ground
- Sports place
- Field / Street
- Public places
- Workplace

OUTCOME-EFFECTS
- good or bad?
- Organs
- Systems
- Functions
- Development
- Survival

Photo credit US NIEHS CERHR logo
Stressors

- Biological
- Chemical
- Physical
- Technology
- Psychosocial
- Socioeconomic

Operational objectives

- Prevent
- Mitigate
- Adapt

Natural environment

- Air
- Food
- Land
- Water
- Goods
- Hands
- Radiation

Our homes

- Public places
- Transport
- Institutes
- Rehab
- Leisure and Recreation

Vectors

Climate Change

- Anti-Microbial Drug Resistance
- Bio-diversity loss
- Chemicals and Waste
- Sustainable consumption and production

Institutes

Production (Work)

- Rehabilitation

Transport

Public places

Leisure and Recreation

Operational objectives
Environmental interventions for improving child health

The main areas of environmental intervention for improving child health include ensuring clean air inside and outside households, adequate water, sanitation and hygiene (including in birth settings), protection of pregnant women from second-hand tobacco smoke, and safe built environments (at household and community levels).

Key environmental intervention areas for main childhood diseases and injuries

<table>
<thead>
<tr>
<th>Diseases and injuries</th>
<th>Main environmental intervention areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory infections</td>
<td>• Household and ambient air pollution, second-hand tobacco smoke</td>
</tr>
<tr>
<td></td>
<td>• Housing</td>
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<tr>
<td>Diarrhoeal diseases</td>
<td>• Water, sanitation and hygiene</td>
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<tr>
<td></td>
<td>• Climate change</td>
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<tr>
<td>Parasitic and vector diseases</td>
<td>• Environmental management and modification</td>
</tr>
<tr>
<td></td>
<td>• Water, sanitation and hygiene</td>
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<tr>
<td></td>
<td>• Housing</td>
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<tr>
<td>Neonatal and nutritional conditions</td>
<td>• Household air pollution</td>
</tr>
<tr>
<td></td>
<td>• Maternal exposure to second-hand tobacco smoke</td>
</tr>
<tr>
<td></td>
<td>• Water, sanitation and hygiene (including in birth settings)</td>
</tr>
<tr>
<td>Injuries (drowning, road traffic accidents, poisonings, burns)</td>
<td>• Road design, land-use planning</td>
</tr>
<tr>
<td></td>
<td>• Safe handling, labelling and storage of chemicals</td>
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<tr>
<td></td>
<td>• Safety of cooking, lighting and heating equipment, use of flammable materials in the home</td>
</tr>
<tr>
<td></td>
<td>• Safety of water environments, public awareness, regulations</td>
</tr>
<tr>
<td>Cancers</td>
<td>• Household air pollution, exposure to second-hand tobacco smoke, ionizing and UV radiation, chemicals</td>
</tr>
<tr>
<td>Asthma</td>
<td>• Air pollution, second-hand tobacco smoke, indoor pollution from dampness and mould</td>
</tr>
<tr>
<td>Congenital anomalies</td>
<td>• Exposure of pregnant women to second-hand tobacco smoke, certain chemicals</td>
</tr>
</tbody>
</table>

Source: Adapted from Prüss-Ustün et al. 2016.
Local Solutions?

Children’s Environmental Health: Challenges and Opportunities

- **Policy-Makers**: Monitor health outcomes, tobacco control, regulate harmful chemicals.
- **Industry**: Manage hazardous waste, reduce the use of harmful chemicals.
- **Housing**: Clean fuel for heating and cooking, no mold or pests, remove unsafe building materials, no lead paint.
- **Schools**: Safe sanitation and hygiene, free of noise pollution, promote good nutrition.
- **Health-Care Facilities**: Safe water, sanitation and hygiene, reliable electricity.
- **Transport**: Reduce emissions, increase public transport.
- **Urban Planning**: Green spaces, safe walking and cycling paths.
- **Agriculture**: Reduce the use of hazardous pesticides, no child labor.
Child Injury – the specialisation that gives us a good matrix for practice

<table>
<thead>
<tr>
<th>Key approaches</th>
<th>Traffic</th>
<th>Drowning</th>
<th>Burns</th>
<th>Falls</th>
<th>Poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislation, regulations and enforcement</td>
<td>Speed limits; comprehensive drink-driving laws; child restraints</td>
<td>Four-sided pool fencing</td>
<td>Hot water tap temperature legislation; smoke alarms</td>
<td>Playground equipment standards</td>
<td>Labelling and packaging requirements; restrictions on sales of hazardous products to consumers</td>
</tr>
<tr>
<td>Product modification</td>
<td>Vehicle-front modification; child restraint systems</td>
<td>Personal flotation devices</td>
<td>Non-tip lanterns and candle holders</td>
<td>Baby walker modification; safety glass</td>
<td>Medication packaging; child resistant closures</td>
</tr>
<tr>
<td>Environmental modification</td>
<td>Child-friendly infrastructure; safer routes to school; safer play spaces</td>
<td>Barriers, such as well coverings and fencing</td>
<td>Separation of cooking from living area</td>
<td>Window guards on tall buildings; roof railings, non-climbable banisters</td>
<td>Safe storage of potentially harmful substances</td>
</tr>
<tr>
<td>Education and skills development</td>
<td>Helmet wearing; using child restraints</td>
<td>Swimming training and supervision</td>
<td>First aid – “cool the burn”</td>
<td>Supportive home visitation to identify fall hazards</td>
<td>Immediate first aid</td>
</tr>
<tr>
<td>Emergency medical care</td>
<td>Child-sized equipment; child-friendly environment</td>
<td>Immediate resuscitation</td>
<td>Burns centres</td>
<td>Appropriate paediatric acute care</td>
<td>Poisons centres</td>
</tr>
</tbody>
</table>
Don’t pollute my future