**Day of General Discussion 2016. Child Rights and the Environment**

**Written contribution for Working Group 1. Children’s exposure to environmental toxicants.**

**Child Health and Environment Program (CHEP), Brisbane, Australia.**

Hazardous substances from natural sources and certain types of human activity, including uncontrolled industrial emissions, industrial accidents, mining, energy production, waste disposal, and the use of certain pesticides in agriculture, can be found in the food children eat, the water they drink and the air they breathe, as well as the consumer products they use. They are found in homes, at schools and childcare centres, in play areas, and places where children work, in both the natural and built environments. Dozens of chemicals have been measured in human cord blood, showing children can be exposed even before birth. These environmental exposures can severely impact the health of children and impact their ability to exercise their rights to life, health, education, and to safe food, water, sanitation and hygiene.

What is a child?

The Convention on the Rights of the Child defines a child as “every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier.” (1). While there are many definitions of a child, for the purpose of this submission we will be using the life-course approach adopted by the World Health Organization (WHO) in 1995, which does not just recognise a child as from conception to eighteen years, but acknowledges that there are environmental factors impacting the child even from pre-conception, and these impacts can continue into adulthood and inter-generationally (2). The life-course approach supported by WHO is being used to address exposures during early life that increase the risk of developing chronic disease in adulthood (2).

Child rights and the environment

The rights to life, health, education, food, water, sanitation and hygiene, adequate pre and postnatal care for mothers, safe rest and leisure, and protection from economic exploitation and hazardous labour enshrined in the Convention on the Rights of the Child are particularly relevant to the relationship between the environment and child health. Children are not just little adults as they are susceptible to different and unique exposures, have a dynamic physiology, exhibit behaviours that put them in contact with hazards, have a longer life expectancy, more time to live with handicaps, more time to develop disease, and are politically powerless (3).

Children are susceptible to different and unique exposures as they are subject to unique exposure pathways, namely transplacental and breastfeeding, and exhibit exploratory behaviours which can lead to exposure, most commonly hand-to-mouth and object-to-mouth behaviour (3). They spend their time in different living zones as their location is typically lower to the ground and have a high surface area to volume ratio (3). They also do not understand danger the way adults do which can place them in environments that expose them to dangerous toxicants and injuries (3).

If a child is exposed to environmental toxicants during a period of rapid growth and development, a window of developmental susceptibility, the child may be at a greater risk of developing disease. An example of this is during the third and fourth month of pregnancy when the foetus’s brain is going through rapid growth. If the mother is exposed to mercury (as in mining-related work or though high consumption of fish with elevated levels of mercury) studies have found this can affect the brain and the nervous system of the developing child (4). Mercury is a toxic metal that builds up in the body. In adults mercury will be broken down over time, but in a fetus the potential effects can result in lifelong consequences which can impact a child’s ability to participate in education (4). This highlights how vulnerable children are as exposure to different environmental toxicants at different stages in a child's development can have different impacts based on the dose, timing and route of exposure (5).

Due to the vulnerabilities of children it has been found that a number of health outcomes can be attributed to modifiable environmental factors, and subsequently a large burden of disease and death is influenced by the environment. In 2016, WHO estimated that a large proportion of deaths are attributable to modifiable environmental factors; 23% of all deaths and 22% of the total disease burden in disability adjusted life years (DALYs) (6). In children under five years, the proportion of preventable deaths attributable to the environment increases to 26%, and DALYs to 25% (6). This highlights the vulnerability of children. This publication also identified diseases that have the highest preventable environmental disease burden for children under five years old which included; 32% of all respiratory infections, which commonly result from household and ambient air pollution and second-hand tobacco smoke, 22% of diarrhoeal diseases, which can result from water, sanitation, hygiene and agricultural practices, and 15% of neonatal conditions, which can be influenced by air pollution exposure, mothers’ exposure to second-hand tobacco smoke, water and sanitation in birth settings and a lack of infrastructure in healthcare facilities (6). These diseases also account for a large proportion of environmentally attributable deaths in children under 5 years old, with 18% being attributable to lower respiratory infections and 20% to diarrheal diseases (6). This highlights the importance of protecting children from environmental exposures as they are a particularly vulnerable population.

Regulations and Enforcement

There is a heavy burden of exposure to environmental toxicants during childhood in all regions, in low-income countries, high-income countries and emerging economies. Regulations are an important measure to protect children from environmental exposures but they must been effectively enforced.

An issue currently in the spotlight is the export of hazardous waste from high-income countries into lower income countries. This poses a serious risk to the rights of the child as children in these areas may work in informal waste recycling, live in homes where waste is processed, or live in an environment contaminated by toxicants from hazardous waste. Recent investigations into electronic and electrical waste (e-waste) disposal found that a large portion of e-waste is shipped to countries is West Africa, South Asia and Southeast Asia (7). Emerging economies in many regions also produce significant domestic streams of e-waste that are not processed in the formal sector. Reports have surfaced in recent years exposing the conditions that children are working in in order to scavenge wire from e-waste sites, where they are exposed to toxicants by direct contact, inhalation of toxic fumes, as well as through accumulation in soil, water and food (8). This occurs even in countries with legislation requiring companies and local governments to safely recycle e-waste, and national legislation regulating the importation of e-waste and hazardous waste. This highlights the need for a focus on the quality and enforcement of regulations.

Lead presents another clear example of the need for ongoing monitoring and enforcement. The recent exposure of children in Flint, Michigan, and other cities in the United States of America to lead contaminated water highlights that there is potential for exposure to harmful levels of environmental toxicants in areas with existing regulations. The crisis occurred when harmful levels of lead seeped from lead pipes into the cities water supply, resulting in exposure of potentially 15,000 children to high lead levels (9). Studies found that among children under 5 years old, the incidence of blood lead levels over 5µg/dL, the current level of alert in the United States, increased from 2.4% to 4.9%, and in the most affected areas up to a 6.6% increase (10). Elevated blood lead levels in children can lead to behavioural problems, a lower IQ and health issues such as changes in physical growth, blood cell development and kidney functioning (11). This incident highlights how even a small lapse in monitoring and enforcement can result in acute health issues and long-term effects on the health, education and quality of life of those affected. Not only do similar incidents impact a child’s right to safe water and sanitation, but can also impact the right to health and education.

The lead example also presents us with clear financial estimates on how primary prevention works not only at the health level but also yields economic benefits at the country level. In addition to lead being found in water, other common sources of exposure include lead-based paints and the potential inhalation of lead dust during house renovations, lead in ceramic glazing that is used for cooking pots in parts of Latin America, and kohl which is used in many parts of Asia and the Middle East as eyeliner but is particularly detrimental when used on babies. All of these sources of exposure are easily preventable but interventions are often viewed as prohibitively costly. Despite the cost of interventions it has been estimated that each dollar invested in the control of lead paint exposure would provide a return of $17-$221 (12). It has also been estimated that the cost of childhood lead exposure, through direct health costs and lost productivity, is $977 billion a year in low and middle-income countries, approximately 1.20% of global GDP (13). An additional $50.9 billion a year in the Untied States and $55 billion in Europe is lost to childhood lead exposure (14,15). In addition to the potential health outcomes of childhood lead exposure, there is an economic cost burden associated with health outcomes from exposure to environmental toxicants. There are significant cost savings from control measures that are specifically targeted to early interventions.

The precautionary principle

The precautionary principle suggests that if there is a potential risk to health or the environment, measures should be taken to reduce exposure and minimize negative effects even if the full extend of the potential harm has not yet been confirmed. Under the concept, it is the responsibility of the producer, user or importer of a substance to prove that it is not harmful. This principle is highly relevant to emerging environmental exposures, in particular chemicals. The health hazards of newly developed chemicals can take decades to confirm, during which time they can have devastating effects.

Studies have found that the period from conception to birth is a highly critical time in development, during which exposures can have long-term effects on the child. In the 19th Century case reports began proposing a link between tobacco use and cancer and in 1939 the first case-control study on the topic was published (16). Articles also began expressing concern about the effect of smoking on unborn children. The link between tobacco smoking and lung cancer was confirmed in the mid-1960s, and few years later the link between maternal smoking and low birth weight was confirmed (16). The impacts of second-hand smoke were also beginning to be confirmed. Yet it was not until the late 20th century that many countries introduced progressive tobacco control policies. It took decades to confirm the link between tobacco smoking and negative health outcomes, and during this time many children were exposed*.* Maternal smoking during pregnancy has now been linked to an increased risk of adverse birth outcomes including preterm delivery, low birth weight and fetal growth restriction, sudden infant death syndrome, altered cardiovascular responses, increased risk of asthma and wheezing, as well as behavioural abnormalities such as attention deficit disorders, lower IQ, cognitive dysfunction and impaired learning and memory (17). Exposure to tobacco smoke is an example of the value of adopting the precautionary principle as the health effects were suspected long before comprehensive rules and regulations were in place to protect children.

Endocrine disruptors are chemicals that can interfere with the body’s endocrine system and produce adverse developmental, reproductive, neurological and immune effects (18). Many chemicals are suspected or confirmed endocrine disruptors, including polychlorinated biphenyls (PCBs), pesticides, some pharmaceuticals, dioxin and dioxin-like compounds, and plasticizers such as bisphenol A. Plastic bottles and containers, metal food cans, detergents, clothes, food, toys, cosmetics, and pesticides may contain these chemicals (18). Children, particularly during gestation and in early childhood, are sensitive to endocrine disruptors as their bodies are smaller and immature and therefore are unable to as effectively break down the toxicants as adults. As a result the effects can be more severe. Despite much of our knowledge of endocrine disrupting chemicals coming from animal studies, and the full effects of these chemicals in humans not yet being confirmed, application of the precautionary principle has been used by some countries mitigate risks. Some countries have introduced legislation to remove certain endocrine disrupting chemicals from products used by children. Although endocrine disrupting chemicals have been used for decades and there is evidence they are associated with harmful health effects in humans, they are often still classified as emerging chemicals and often unregulated.

The use of the precautionary principle is particularly relevant to the issue of emerging chemicals as there are close to 800 chemicals that are known or suspected to be endocrine disrupting, many of which have not been adequately tested for their effects on children (18). The European Commission’s announcement in 2000 that it would be adopting the precautionary principle when developing chemicals legislation and introduction of the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation in 2006 were positive steps (19). As exemplified above, the use of the precautionary principle in developing legislation provides the opportunity to protect children against potentially harmful toxicants in the future.

Vulnerable Populations

All children are vulnerable to environmental exposures but some are particularly vulnerable. Vulnerabilities most critical to child rights are sex, culture, socio-economic background, urban or rural location, the different age-stages and disability. Each of these vulnerabilities influences the environments in which children spend their time and their risk of contact with environmental toxicants. Being aware of and sensitive to these specific vulnerabilities is essential if children’s exposure to environmental toxicants is to be reduced, as no one strategy will work for all children.

Drafted by Paige Preston and Fiona Goldizen, Children’s Health and Environment Program (CHEP), The University of Queensland, WHO Collaborating Centre for Children’s Health and Environment. The technical assistance of Marie Noel Bruné from the World Health Organization Department of Public Health, Environment and Social Determinants of Health is gratefully acknowledged.

Annex 1. Recommendations

1. The precautionary principle should be the standard when developing legislation to prevent environmental exposures, in particular in the cases of emerging chemicals, climate change and other emerging risks. As has been introduced by some states, authorities should move towards the requirement for a new chemical entity to be shown to be safe for children before it is introduced.
2. Special attention should be paid to enforcement and monitoring of regulations designed to protect children from environmental exposures, in all countries and territories. Although legislation is a very positive step in protecting children’s rights, it must be effectively monitored and enforced.
3. Multisectoral action and the involvement health professionals, the education sector, communities, families, the transport sector, the energy sector, the agricultural sector, and the manufacturing sector, among others, is necessary to prevent exposure to harmful environmental toxicants. We can only achieve Sustainable Development Goal (SDG) 3, ensure healthy lives and promote well-being for all at all ages, if we ensure all other SDGs are met.
4. Policy makers should view the environment not only as a risk to children’s health but also as an opportunity to protect children. Environmental management and low-cost interventions have the potential to prevent negative health effects and save significant government resources. Many environmental exposures are preventable.
5. Actors at all levels should invest in preventing early life environmental exposures, before birth, during early childhood and during adolescence. Because of the high long-term costs of some early life environmental exposures, including direct medical costs, education costs and lost productivity, this is often more cost-effective.

References

1. Convention on the Rights of the Child. 1989. (<http://www.ohchr.org/EN/ProfessionalInterest/Pages/CRC.aspx>, accessed 2 June 2016)
2. WHO, International Longevity Centre-UK. A Life Course Approach to health. Geneva: World Health Organisation; 2000. (<http://www.who.int/ageing/publications/lifecourse/alc_lifecourse_training_en.pdf>, accessed 30 June 2016).
3. WHO. Children’s Health and the Environment: A global perspective, a resource manual for the health sector. World Health Organisation; 2005. (<http://www.who.int/ceh/publications/handbook/en/>, accessed 30 June 2016).
4. WHO. Mercury and health [website]. Factsheet. Geneva: World Health Organization; 2016. (<http://www.who.int/mediacentre/factsheets/fs361/en/> accessed 28 July 2016).
5. Cameron N, Demerath EW. Critical periods in human growth and their relationship to diseases of aging. American Journal of Physical Anthropology, 2002; 35:159-84.
6. Prüss-Ustün A, Wolf J, Corvalán C, Bos R, Neira M. Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks. Geneva: World Health Organization. 2016. (<http://apps.who.int/iris/bitstream/10665/204585/1/9789241565196_eng.pdf?ua=1>, accessed 30 June 2016).
7. Rucevska I, Nellemann C, Isarin N, Yang W, Liu N, Yu K et al. Waste crime – waste risks: gaps in meeting the global waste challenge**.** A UNEP Rapid Response Assessment*.* Nairobi and Arendal: United Nations Environment Programme and GRID-Arendal; 2015. (<http://www.unep.org/delc/Portals/119/publications/rra-wastecrime.pdf>, accessed 30 June 2016).
8. WHO. Electronic waste, Children’s Environmental Health [website]. World Health Organisation. 2016 (<http://www.who.int/ceh/risks/ewaste/en/>, accessed 30 June 2016).
9. The White House. Fact sheet: Federal Support for the Flint Water Crisis Response and Recovery. Washington D.C.: The White House; 2016. (<https://www.whitehouse.gov/the-press-office/2016/05/03/fact-sheet-federal-support-flint-water-crisis-response-and-recovery> accessed 30 June 2016).
10. Hanna-Attisha M, LaChance, J, Sadler RC, Champney Schnepp A. Elevated Blood Lead Levels in Children Associated With the Flint Drinking Water Crisis: A Spatial Analysis of Risk and Public Health Response. American Journal of Public Health, 2016; 106(2): 283-290. Doi: 10.2105/AJPH.2015.303003
11. Lanphear BP, Hornung R, Khoury J, Yolton K, Baghurst P, Bellinger DC et al. Low-level Environmental lead exposure and children's intellectual function: an international pooled analysis. Environmental Health Perspectives, 2005; 113(7), 894-899.
12. Gould, E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. Environmental Health Perspectives. 2009; 117(7), 1162-1167. Doi: 10.1289/ehp.0800408
13. Attina TM, Trasande L. Economic Costs of Childhood Lead Exposure in Low- and Middle-Income Countries. Environ Health Perspect, 2013; 121(9). Doi: 10.1289/ehp.1206424.
14. Bartlett ES, Trasande L. Economic impacts of environmentally attributable childhood health outcomes in the European Union. The European Journal of Public Health, 2013; 24(1):21-26. Doi: 10.1093/eurpub/ckt063.
15. Trasande L, Liu Y. Reducing the staggering costs of environmental disease in children, estimated at $76.6 billion in 2008. Health Aff (Millwood), 2011; 30(5): 863-70. Doi: 10.1377/hlthaff.2010.1239.
16. Doll B. Uncovering the effects of smoking: historical perspective. Statistical Methods in Medical Research, 1998; 7: 87-117.
17. Banderali G, A. Martelli, M. Landi, F. Moretti, F. Betti, G. Radaelli, et al. Short and long term health effects of parental tobacco smoking during pregnancy and lactation: a descriptive review. J Transl Med 2015; 13: 327. Doi: 10.1186/s12967-015-0690-y.
18. UNEP, WHO. Bergman A, Heindel JJ, Jobling S, Kidd KA, Zoeller RT, editors. State of the science of endocrine disrupting chemicals – 2012. Geneva: United Nations Environment Programme and World Health Organization. 2013. (<http://www.who.int/ceh/publications/endocrine/en/>, accessed 10 July 2016).
19. European Commission. Commission adopts Communication on Precautionary Principle [website]. European Commission; 2000. (<http://europa.eu/rapid/press-release_IP-00-96_en.htm>, accessed 10 July 2016).