

Children's Unique Vulnerability to Climate Change

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Why children?

- Across the world, 1 in 5 deaths each year occurs in a child < 5 yrs old¹

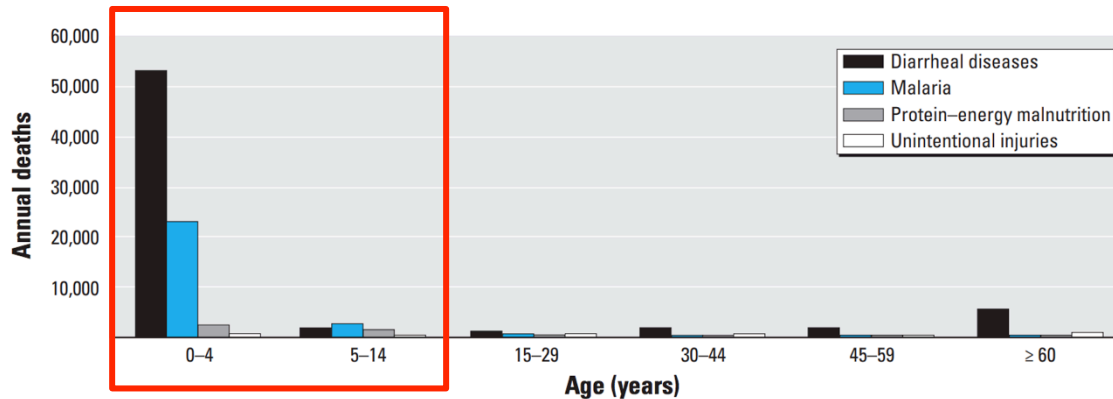


Figure 1. Deaths attributable to global climate change: 2004 annual data in total numbers divided by age categories (adapted from WHO 2008).

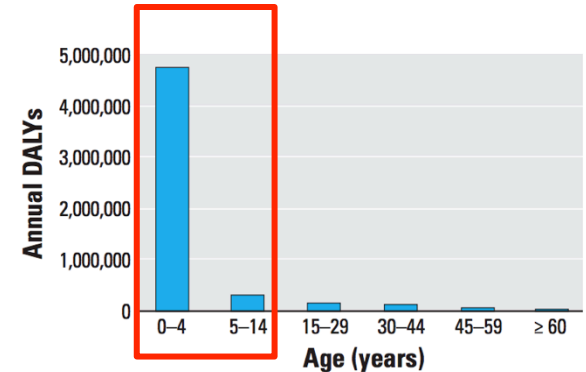


Figure 2. DALYs attributable to global climate change: annual data in total numbers divided by age categories (adapted from WHO 2002a).

¹Sheffield PE, Landrigan PJ. Global climate change and children's health: threats and strategies for prevention. *Environ Health Perspect.* 2011;119(3):291–298pmid:20947468

EXPOSURE

Exposure is contact between a person and one or more biological, psychosocial, chemical, or physical stressors, including stressors affected by climate change

SENSITIVITY

Sensitivity is the degree to which people or communities are affected, either adversely or beneficially, by climate variability or change.

ADAPTABILITY

Adaptive capacity is the ability of communities, institutions, or people to adjust to potential hazards, to take advantage of opportunities, or to respond to consequences

VULNERABILITY of Human Health to Climate Change

HEALTH IMPACTS

Injury, acute and chronic illness (including mental health and stress related illness), developmental issues, and death

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Exposure

- Higher exposure per unit body weight
 - Kids breathe more air, drink more water, eat more food per unit of body weight
 - In the first 6 months of life, children drink 7x more water per kg of body weight compared to adults¹
- Behavioral differences
 - Kids spend more time outside
 - Kids crawl around more, put their hands in their mouths more, increasing the exposure to dust, mold spores, allergens and contaminants
 - Up to 11% of toddlers may exhibit pica behavior (eating non-food items including soil and dust)²

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² Roberts, J. W., L. A. Wallace, D. E. Camann, P. Dickey, S. G. Gilbert, R. G. Lewis, and T. K. Takaro, 2009: Monitoring and reducing exposure of infants to pollutants in house dust. Reviews of Environmental Contamination and Toxicology, 201, 1-39.

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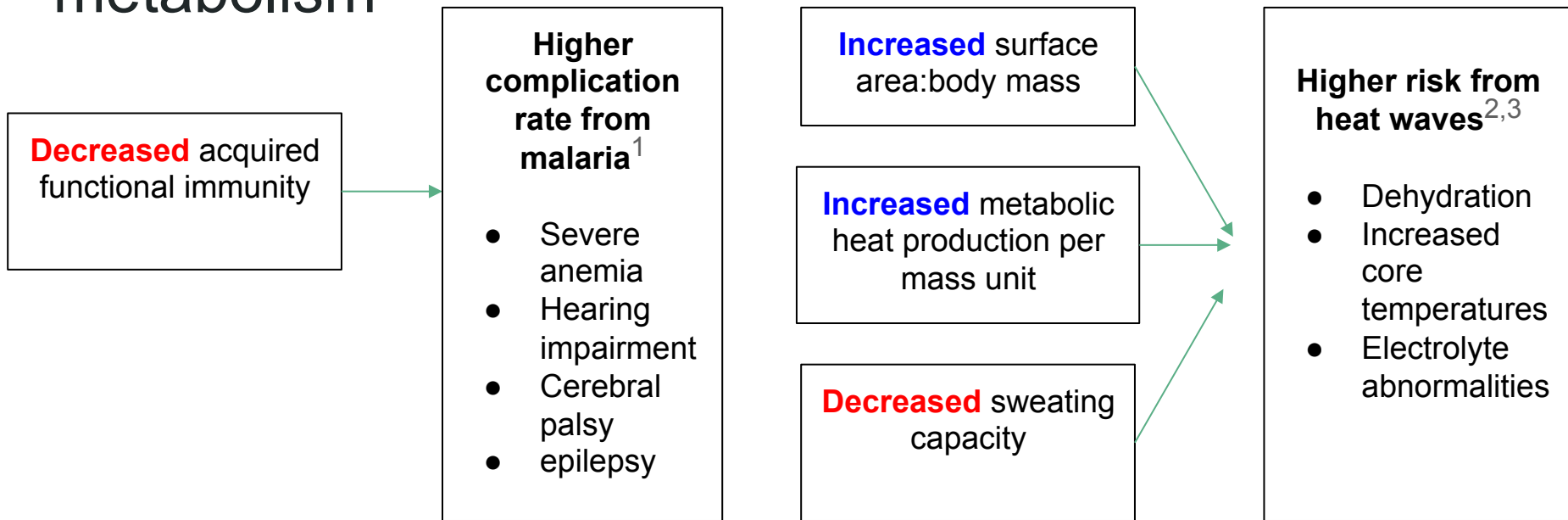
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Sensitivity: Differences in physiology and metabolism



¹ Snow, R. W., Craig, M., Deichmann, U. & Marsh, K. Estimating mortality, morbidity and disability due to malaria among Africa's non-pregnant population. Bull. World Health Org. 77, 624–640 (1999).

² American Academy of Pediatrics, Committee on Sports Medicine and Fitness. Climatic heat stress and the exercising child and adolescent. Pediatrics 2000; 106 (Pt 1): 158-9.

³ Knowlton, K., M. Rotkin-Ellman, G. King, H. G. Margolis, D. Smith, G. Solomon, R. Trent, and P. English, 2009: The 2006 California heat wave: Impacts on hospitalizations and emergency department visits. Environmental Health Perspectives, 117, 61-67.

Sensitivity: Unique windows of development

- Unique windows of development for:
 - Malnutrition
 - Can cause poor bone health, blindness, immune deficiency, wound healing, loss of brain neurons, etc.¹
 - Toxins
 - Can cause neurologic and behavior problems, cancers, early onset puberty^{2,3}
 - Air pollutants
 - Exacerbates asthma⁴
 - Can cause permanent impact on lung growth and maturation⁵

¹ Black RE, Allen LH, Bhutta ZA, et al, for the Maternal and Child Undernutrition Group. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet 2008; 371: 243–60.

² Children are not little adults. In: Children's Health and the Environment—A Global Perspective: A Resource Manual for the Health Sector (Pronczuk-Garbino J, ed). Geneva:World Health Organization, 3–16.

³ Bellinger D, Leviton A, Waternaux C, Needleman H, Rabinowitz M. Longitudinal analysis of prenatal and postnatal lead exposure and early cognitive development. New England journal of medicine, 1987, 316:1037–43.

⁴ CDC. "Asthma-related missed school days among children aged 5-17 years." Accessed 6 May 2020.

⁵ Gauderman, W. J., and others, 2004: The effect of air pollution on lung development from 10 to 18 years of age. New England Journal of Medicine, 351, 1057-1067.

Psychological Impacts and ACEs

- Psychological impact
 - Inability to regulate emotion, undermined cognitive development and academic performance, PTSD, anxiety, depression, phobia, panic¹
- **Adverse Childhood Events (ACEs)** - those events to which intense, frequent, and/or sustained exposure without the buffer of a caring and able adult, can lead to “toxic stress”²
 - **Toxic stress** - the result of dysregulated endocrine and immunologic systems, which do not allow the body to return to homeostasis
 - Toxic stress can lead to: problems with dental health, lifetime asthma, ADHD, autism, obesity, learning difficulties, violent behaviors
 - Climate change creates trauma that contribute to toxic stress and feedback loops that aggravate ACEs



¹ Brokamp C, Strawn JR, Beck AF, Ryan P. Pediatric Psychiatric Emergency Department Utilization and Fine Particulate Matter: A Case-Crossover Study. Environ Health Perspect. 2019;127(9):97006. doi:10.1289/EHP4815

² Bucci, M., Marques, S.S., Oh, D. and Harris, N.B., 2016. Toxic stress in children and adolescents. Advances in Pediatrics, 63(1), pp.403-428.

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Adaptability

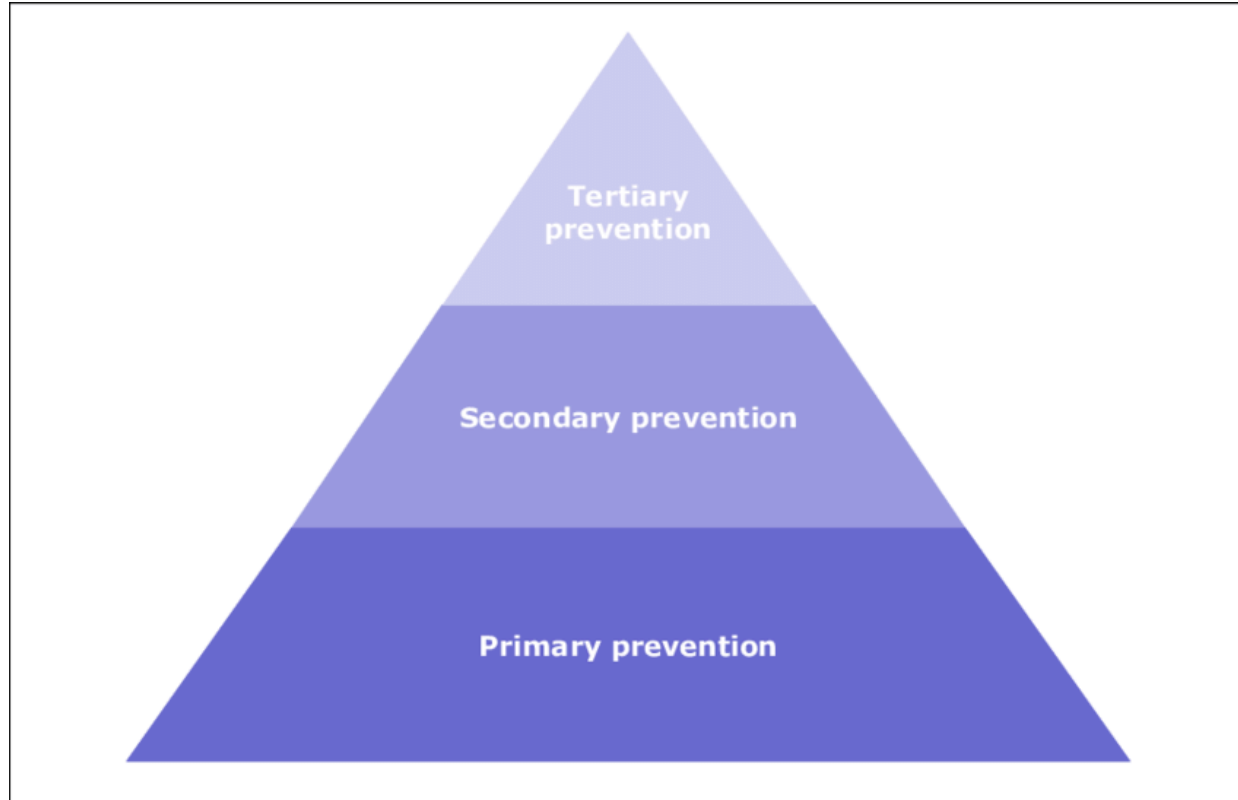
- Reduced ability to understand what is happening
- Dependence on caregivers
- Context in which they live
 - Geographic location
 - Poverty
 - Environmental injustice - inequitable and disproportionately heavy exposure of poor, minority, and disenfranchised populations to toxic chemicals and other environmental hazards ^{1, 2}



¹ Vasquez VB, Minkler M, Shepard P. Promoting environmental health policy through community based participatory research: a case study from Harlem, New York. J Urban Health. 2006;83:101–110.

² Landrigan PJ, Rauh VA, Galvez MP. 2010. Environmental justice and the health of children. Mt Sinai J Med 77:178–187.

Opportunities for Action



Opportunities for Action

- **Primary prevention** - slowing or stopping development of climate change
 - Personal choices:
 - Shrink your own carbon footprint! Power your home with renewable energy, invest in energy-efficient appliances, decrease food waste, take public transportation
 - Systemic changes:
 - Support regulatory standards to ensure clean soil, water, air
 - Support urban planning strategies that make it easier to reduce your own carbon footprint - better public transportation, mixed residential/commercial housing, bike lanes



Opportunities for Action


- **Secondary prevention** - reduce the impact of disease or injury from climate change, once it has occurred
 - Heat waves ¹
 - Reduce high-intensity activities on hot and/or humid days
 - Stay well hydrated - periodic drinking of cold water or flavored salted beverage: 5 oz for a child, 9 oz for a teen, every 20 min
 - Wear light colored, lightweight clothing
 - Vector borne illness
 - Use mosquito repellents, wear long-sleeved clothes, use bed nets
 - Check kids for ticks after they've been outdoors, especially in wooded or grassy areas, in warm months
 - Air pollution
 - Check air quality index and pollen counts on your local weather report - consider limiting outdoor time if levels are high

¹ American Academy of Pediatrics, Committee on Sports Medicine and Fitness. Climatic heat stress and the exercising child and adolescent. Pediatrics 2000; 106 (Pt 1): 158-9.

Opportunities for Action

- **Tertiary prevention** - soften the impact of ongoing climate related illness and disease that has lasting effects
 - Education and medications for management of asthma and other chronic diseases
 - Support for communities most and already affected by climate change
 - Counseling, psychological help ¹






ASTHMA ACTION PLAN  Asthma and Allergy Foundation of America
aafa.org

The colors of a traffic light will help you use your asthma medicines.

GREEN means Go Zone! Use preventive medicine.
YELLOW means Caution Zone! Add quick-relief medicine.
RED means Danger Zone! Get help from a doctor.

Name: _____ Date: _____
 Doctor: _____ Medical Record #: _____
 Doctor's Phone #: Day _____ Night/Weekend _____
 Emergency Contact: _____
 Doctor's Signature: _____

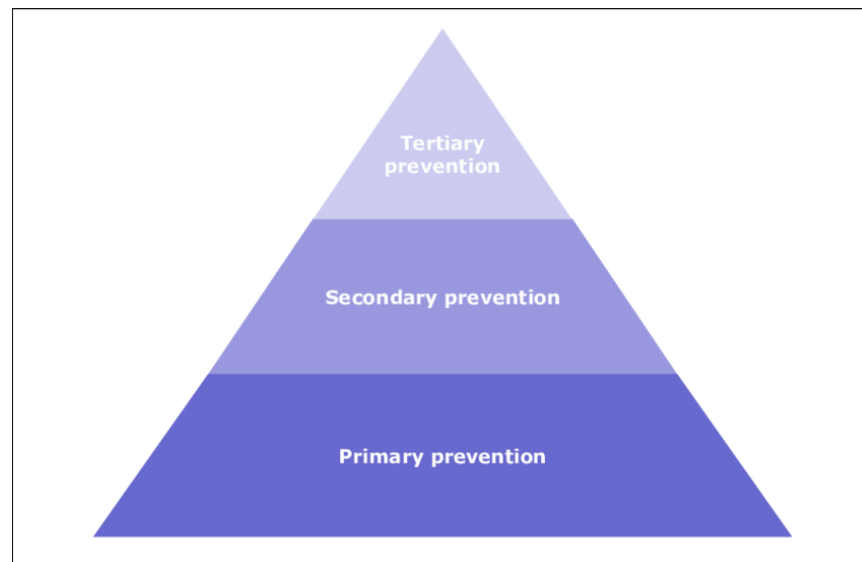
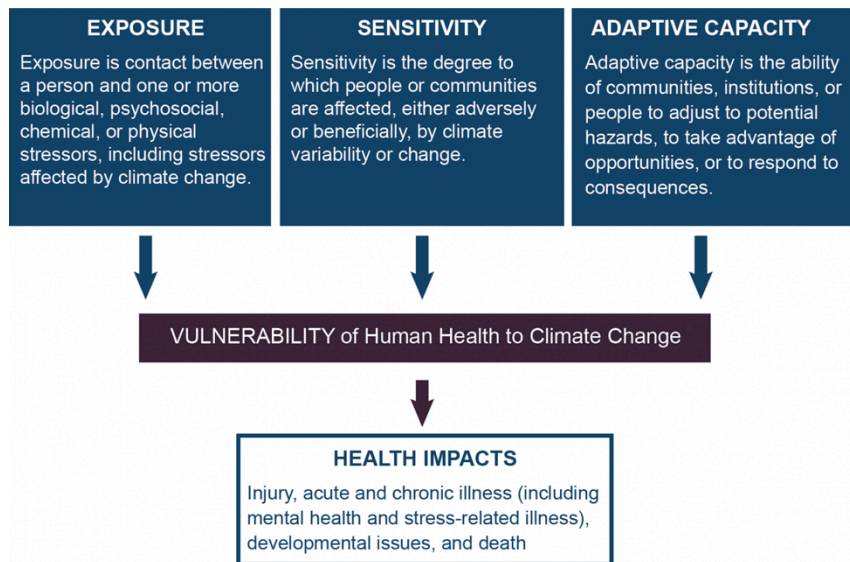
Personal Best Peak Flow: _____

GO	Use these daily controller medicines:		
	MEDICINE	HOW MUCH	HOW OFTEN/WHEN
You have all of these: • Breathing is good • No cough or wheeze • Sleep through the night • Can work & play Peak flow:  from _____ to _____ For asthma with exercise, take: _____			
CAUTION	Continue with green zone medicine and add:		
	MEDICINE	HOW MUCH	HOW OFTEN/ WHEN
You have any of these: • First signs of a cold • Exposure to known trigger • Cough • Mild wheeze • Tight chest • Coughing at night Peak flow:  from _____ to _____ CALL YOUR ASTHMA CARE PROVIDER			
DANGER	Take these medicines and call your doctor now.		
	MEDICINE	HOW MUCH	HOW OFTEN/WHEN
Your asthma is getting worse fast: • Medicine is not helping • Breathing is hard & fast • Nose opens wide • Trouble speaking • Ribcage shows (in children) Peak flow:  reading below _____			

GET HELP FROM A DOCTOR NOW! Your doctor will want to see you right away. It's important! If you cannot contact your doctor, go directly to the emergency room. **DO NOT WAIT.** Make an appointment with your asthma care provider within two days of an ER visit or hospitalization.

¹ CDC. "Your Child Is At Risk for Mental Health Issues After a Disaster." Accessed 6 May 2020. Available at <https://www.cdc.gov/childrenindisasters/features/disasters-mental-health.html>

Summary



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