



Climate changes impacting children's health globally and in Europe

Klimatske promjene koje utječu na zdravlje djece u svijetu i Europi

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SUMMARY. The natural, economic and public health crises that have periodically struck the world over the past two decades have often revealed a low degree of self-sufficiency and a high degree of unpreparedness on the part of European and non-European countries. It is generally the most vulnerable who suffer the consequences, and adverse events have shown their effects and direct negative impact mainly on the population aged 0–18 years, with major implications for families and communities. Climate change and environmental pollution are certainly prominent among the natural disasters impacting children's health. This brief commentary is aimed at raising the attention of general pediatricians on the serious insult caused by climate change to children's health, emphasizing that climate change will affect the health of children born today throughout their lives

Introduction

Climate change can have detrimental effects, either directly or indirectly, on the health and well-being of individuals, especially the most vulnerable namely the elderly and children. Present generations of children are already facing, and future generations will face, a large number of pathological conditions that are an effect of climate change. The current impacts and future risks of changes caused by human activities far exceed those of any other force that has transformed the earth's environment in recent history¹.

From industrialization to the present there has been a gradual rise in temperatures. Projections suggest an increase of 2°C or more in global average temperature by the end of this century, leading to crucial changes in the Earth's geosphere, biosphere, cryosphere, hydrosphere, and atmosphere, with serious implications for human and planetary health. This brief commentary is aimed at raising the attention of general pediatricians on the serious insult caused by climate change to children's health, emphasizing that climate change will affect the health of children born today throughout their lives^{1,2}.

A crisis announced. Preliminary global data

Initially sounding the alarm about the dangers of climate change to children's health was UNICEF through the report "The climate crisis is a child rights crisis"³. This report analyzed in different countries children's levels of exposure to climate and environmental shocks (from cyclones to heat waves) as well as their vulnerability to these extreme weather events. The preliminary data described by the UNICEF "Children's climate risk

index"⁴ reflect the current situation and were obtained by overlaying and comparing indicators of climate risk with indicators of children's vulnerability, including health and nutrition, education, poverty, and access to clean water. An initial assessment of these data shows that they are seriously compromising the health of the child and are likely to worsen as the impacts of climate change accelerate across local settings.

'Preliminary' data from the literature show that about one billion children are exposed to excessively high levels of air pollution while for 920 million their daily lives are marked by a lack of clean water^{1,2,5,6}. This is a global situation. However, it will be increasingly serious in Europe as well due to the increased frequency and duration of drought periods and the unpredictability of rainfall, which is increasingly sudden, short and of significant amounts. Thus, exposing often unprepared populations to very serious risks. Four hundred million children live in areas at high risk of being hit by violent cyclones, and 330 million live in areas at high risk of flooding. In contrast, about 820 million children are exposed to sub-entrant heat waves, and the situation is likely to worsen as average global temperatures rise. Rising temperatures and changes in the rainfall cycle (which are increasingly erratic or scarce) will cause droughts and increasing difficulties in accessing clean water in several areas of the world. This, for children translates not only into less available drinking water and food (with direct consequences on growth and physical

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development related to malnutrition) but also to the risk of contracting diseases carried by contaminated water, such as diarrhea.

There are also 815 million children exposed to different types of pollution that can occur through different pathways: water, food, skin, air. To this regard, the issue of air quality is of great importance to children's health. Worldwide, almost all children (about 2 billion) live in areas where the concentration of fine particulate matter (PM 2.5) exceeds 10 micrograms per cubic meter, which is the threshold set by the World Health Organization guidelines⁶. While one billion children live in areas where the concentration of fine particulate matter exceeds 35 micrograms per cubic meter, with a 15 percent increase in the chance of dying from a respiratory disease. The different types of pollution affecting children, lead pollution and chemical contaminants are particularly serious. For example, the various environmental chemical contaminants with which children come into contact through the atmosphere and food, are the cause of major endocrine disruptions with short-, medium-, and long-term effects on a child's health⁷. In addition, the humid climate that has been characterizing Europe for about the past two decades, is causing the spread of mosquitoes and other insects that transmit like diseases of various kinds, including unexpectedly malaria and dengue, as shown by the recent cases observed in the north of Italy⁸. Today there are about 600 million (one in four globally) children who are at high risk of contracting these diseases, and their numbers are likely to grow as the areas where disease-carrying insects find suitable climates to live, and breed expand.

The impact of global change on children's health in Europe.

A recent study published by the Vrije Universiteit Brussel, titled "Born into the Climate Crisis," shows that on average under the initial reduction commitments of the Paris Agreement, children born in 2020 will face nearly seven times as many scorching heat waves as the previous two generations, as well as twice as many devastating wildfires as their grandparents experienced during the recent decades. In Adriatic Countries such as Italy, Slovenia and Croatia, the likelihood of extreme events related to the climate crisis has been calculated to have increased by 9 percent in 20 years. Last summer, people in France, Spain and Portugal faced extreme heat waves and wildfires that forced tens of thousands of people out of their homes. More than 360 people have already died from the heat in Spain where temperatures have reached 47 degrees last summer. In the United Kingdom, for the first time in history, the Met Office issued a "red" warning for exceptional heat as parts of the country recorded tem-

peratures of 40 degrees. In southern Europe and the Balkans, the repercussions of the climate and environmental crisis were also strongly felt. Particularly in several municipalities with low resilience to such phenomena, and urbanized areas will suffer severe negative impacts from climate change, especially with reference to extreme phenomena such as heat waves or heavy rainfall. Already, urban centers in southern Europe and the Balkans experience temperatures as much as 5-10°C higher than the surrounding rural areas. This is an important finding considering that urban centers occupy more than 2 percent of the earth's surface and about 90 percent of the world's produced resources are consumed in cities. According to a Lancet study¹⁰, the more children are exposed to extreme heat, the greater the risk of respiratory and kidney disease, fever and electrolyte imbalance that can alter a range of critical functions. These will include cardiac and neurological functions, and cause severe dehydration, exhaustion and heat stroke, which if left untreated, can rapidly damage the brain, heart, kidneys and muscles, resulting in some cases fatal. By taking urgent measures to limit warming temperatures to 1.5 degrees above pre-industrial levels, we can reduce children's additional exposure to heat waves by 45 percent and fires by 10 percent. We must also consider the plight of children with special needs and those affected by inequality and discrimination, such as those from low-income families or refugee communities. They are, of course, more at risk because they are more likely to lack access to quality health care, suffer from often unrecognized underlying conditions, and be subject to malnutrition.

Conclusion

As the world warms and there are no signs of sufficient action to limit warming, it is children, with their whole lives ahead of them, who bear the greatest burden. The climate crisis also disproportionately affects children in low- and middle-income countries and disadvantaged communities. There is, however, hope: the world has the resources and tools to ensure the well-being of every child on a healthy planet for generations to come. The assessment of data regarding climate change must therefore be a reminder to world leaders to act urgently on the climate crisis, and protect future generations. For instance, we need leaders to do everything in their power to limit warming temperatures to 1.5 degrees above pre-industrial levels and to devise appropriate plans to help communities adapt to our new normal. However, currently the impact of overheating and environmental pollution caused by European countries is somehow modest, as it does not exceed 8 percent globally¹¹. The EU emits yearly around 3.1 gigatonnes (Gt) of CO₂, less than 8%

of the worldwide CO₂ emissions and its consumption is responsible for 3.4 Gt of CO₂ emissions, representing about 8 percent of global CO₂ emissions¹¹. Therefore, it will be important to urge an involvement of leaders at the global level, to make sure that the efforts of European countries do not turn out in practice to be only an unnecessary and harmful self-sacrifice and become in reality just irrelevant to solving what is not a local problem but a problem of all populations globally. The realization that fundamental changes are needed to address both growing inequality and climate chaos will have to be a globally shared concept, otherwise, we would be failing our children.

CONFLICT OF INTEREST

The author declares no conflict of interests.

REFERENCES

1. Wilson L, Hamwi S, Zanni F, Lomazzi M. Global public health policies: gathering public health associations' perspectives. *Glob Health Action*. 2023 Dec 31;16(1):2183596. doi: 10.1080/16549716.2023.2183596. PMID: 36856722; PMCID: PMC9979982.
2. Atwoli L, Erhabor GE, Gbakima AA, Haileamlak A, Ntumba JK, Kigera J, et al. COP27 Climate Change Conference: Urgent action needed for Africa and the world. *Natl Med J India*. 2023 Sep-Oct;35(5):257-260. doi: 10.25259/NMJI_810_2022. PMID: 37167502.
3. UNICEF. The Climate Crisis is a Child Rights Crisis. Report 2021. <https://www.unicef.org/reports/climate-crisis-child-rights-crisis> (Accessed 15 May 2023)
4. UNICEF. The climate crisis is a child rights crisis: Introducing the Children's Climate Risk Index. 2021. <https://data.unicef.org/resources/childrens-climate-risk-index-report/> (Accessed 15 May 2023)
5. Odo DB, Yang IA, Dey S, Hammer MS, van Donkelaar A, Martin RV, Dong GH, Yang BY, Hystad P, Knibbs LD. A cross-sectional analysis of ambient fine particulate matter (PM_{2.5}) exposure and haemoglobin levels in children aged under 5 years living in 36 countries. *Environ Res*. 2023 Jun 15;227:115734. doi: 10.1016/j.envres.2023.115734. Epub 2023 Mar 23. PMID: 36963710.
6. Kline O, Prunicki M. Climate change impacts on children's respiratory health. *Curr Opin Pediatr*. 2023 Jun 1;35(3):350-355. doi: 10.1097/MOP.0000000000001253. Epub 2023 Apr 14. PMID: 37057656.
7. Chevalier N, Fénichel P. Endocrine disruptors: new players in the pathophysiology of type 2 diabetes? *Diabetes Metab*. 41 (2015), pp. 107-115
8. Riccò M, Peruzzi S, Balzarini F, Zaniboni A, Ranzieri S. Dengue Fever in Italy: The "Eternal Return" of an Emerging Arboviral Disease. *Trop Med Infect Dis*. 2022 Jan 13;7(1):10. doi: 10.3390/tropicalmed7010010. PMID: 35051126; PMCID: PMC8782038.
9. Imperial College. London, UK. Children will face huge increases in extreme climate events in their lifetimes. <https://www.imperial.ac.uk/news/230618/children-will-face-huge-increases-extreme/> (Accessed 15 May 2023)
10. Helldén D, Andersson C, Nilsson M, Ebi KL, Friberg P, Alfvén T. Climate change and child health: a scoping review and an expanded conceptual framework. *Lancet Planet Health*. 2021 Mar;5(3):e164-e175. doi: 10.1016/S2542-5196(20)30274-6. PMID: 33713617.
11. European Union. EUROSTAT. EU's CO₂ footprint continues to decrease. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220524-1#:~:text=In%202019%2C%20the%20EU%20emitted,of%20global%20CO%20emissions.> (Accessed 15 May 2023)