

PERSPECTIVE

# Climate change, urban health, and the promotion of health equity

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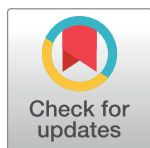
A core principle of public health practice is the obligation to empower and protect the most vulnerable populations [1]. This is closely related to the public health goal of eliminating health inequities. The Intergovernmental Panel on Climate Change (IPCC) has pointed out that climate change risks to health will be distributed unevenly, with some population groups being more likely to suffer the adverse consequences than others [2].

Urban populations, and especially socially and economically disadvantaged populations within urban areas, are likely to be especially vulnerable to the adverse effects of climate change [3]. For example, it is well known that people living in urban centers are exposed to higher extreme temperatures because of the heat island effect. Urban populations may have concurrent exposures to air pollutants and social stressors, and those with low income may be more likely to suffer from comorbid conditions that make them more sensitive to heat effects. Low-income populations are also less able to take adaptive actions, for example, because they lack and cannot afford air conditioning to avoid heat exposure [4]. Low-income, urban neighborhoods may have less green space, less energy-efficient housing, and fewer community resources necessary to escape and mitigate the impact of heat. They may also live in areas that are more subject to flooding and have fewer resources to adjust to flooding when it occurs [5]. The growth of urban populations all over the world makes a focus on the impact of climate change on health in cities especially relevant.

Public health practitioners have long acted based on a recognition that the health of the population is inextricably linked to protection of the environment and the long-term sustainability of human interactions with the environment. This interdependence of the natural and built environments is a foundational belief in public health [1]. These connections are manifested most recently in the emerging planetary health movement. Integral to planetary health is the notion that interventions intended to protect the health of ecosystems will often result in positive impacts on population health, which may be viewed as “co-benefits” [6].

The recognition of health co-benefits is critical to public health efforts to prevent health impacts of climate change and is fundamental to the public health goal of eliminating health inequities. Health co-benefits of policies to mitigate climate changes may be realized in the short term, while the environmental benefits may be apparent only after many years or decades [7]. There are many ways in which environmental interventions intended to prevent or mitigate climate change may have important health co-benefits for urban populations.

Shifts away from fossil fuel combustion toward renewable and noncarbon sources to power the transportation and electricity-generation systems, together with improvements in efficiency and other types of energy conservation, will reduce emissions of carbon dioxide and slow the rise in temperatures, as intended [2,8,9,10,11]. This shift will also result in a reduction in emissions of other air pollutants from these energy sources, positively affecting air quality



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and yielding a substantial health co-benefit [11,12,13], and much of the benefit will likely accrue to urban populations, where air pollution may be worse and large numbers of people live and work [3].

Investments in urban designs that encourage active modes of travel will not only reduce carbon dioxide emissions and improve air quality but could also result in benefits to cardiovascular health from increased physical activity and reduced obesity [9,11,14,15]. An American Heart Association statement notes that policies to promote active transport increase overall physical activity through the life span [16]. Safe, active transport design that separates cars from bicyclists and walkers could have the added health co-benefit of reducing the frequency and severity of injuries. These co-benefits could be most impactful among urban, low-income populations, who are more likely to have lower physical activity and a higher prevalence of obesity, diabetes, and cardiovascular disease [3].

Considering their total energy use, buildings account for 32% of global greenhouse gas emissions [17]. Climate mitigation investments made in neighborhoods to promote conservation and improve energy efficiency of housing, through improved insulation and air-tightness of buildings, will not only reduce energy consumption and carbon dioxide emissions but can also serve as adaptive actions by reducing vulnerability to both cold and hot extremes in temperature [9,18].

Greening of urban areas could reduce the urban heat island effect, contribute to energy conservation by reducing the need for energy for cooling, and potentially improve local air quality. Co-benefits from neighborhood greening could include health benefits from increased nature contact: enhanced well-being; reduced stress, aggression, depression, and anxiety; and increased physical activity from recreational opportunities in green spaces in urban environments [11,19]. In many urban areas, opportunities for the health benefits of greening are larger in low-income communities [20].

Although discussions of co-benefits are often framed around health co-benefits of actions to mitigate or adapt to climate change, it is useful to recognize that some public health actions that have long been promoted in urban areas may be seen as having co-benefits in the climate arena. For example, more widespread adoption of dietary changes promoted to improve cardiovascular health, such as lower consumption of meats (particularly beef), would substantially reduce greenhouse gas emissions because production systems that support diets high in meat generate much more emissions than those that support vegetarian or high fish diets [11]. Likewise, campaigns whose purpose is to promote health through increased physical activity such as biking and walking will have important environmental co-benefits through reductions in automobile-related pollutant emissions. These health policies thus have the potential for doubly benefiting the most disadvantaged, through direct health impacts and through their secondary impacts via environmental change and prevention of the most adverse effects of climate change.

The public health impacts of climate change may be the largest global health challenge in the current century. Climate change is occurring in the context of rapid urbanization. Urban areas present many challenges in terms of addressing the health consequences of climate change, but they also provide many opportunities. Urban policies that promote dense, walkable, and transit-friendly communities have multiple health and environmental co-benefits [21]. Strategies to reduce the consumption of animal products and processed foods in urban settings, through taxation, for example, will also have both types of co-benefits. These co-benefits are likely to be magnified for disadvantaged urban populations, given their greater exposure to environmental hazards and their adverse health effects.

Health, the environment, and equity are closely entwined. This close interrelation is especially critical in growing urban areas. Designing, managing, and governing urban areas so that

they are simultaneously healthier, environmentally sustainable, and more equitable is a critical need and also an opportunity for the future of population health and our planet.

## References

1. Public Health Leadership Society. Principles of Ethical Practice of Public Health, Version 2.2. Public Health Leadership Society; 2002. Available from: [https://www.apha.org/~media/files/pdf/membergroups/ethics\\_brochure.ashx](https://www.apha.org/~media/files/pdf/membergroups/ethics_brochure.ashx) Cited 21 June 2018.
2. IPCC. Summary for Policymakers. In: Field CB, Barros VR, Dokken DJ, Mach KJ, Mastrandrea MD, Bilir TE, et al., editors. Climate Change 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge (United Kingdom) and New York: Cambridge University Press; 2014.
3. Gamble J, Balbus J, Berger M, Bouye K, Campbell V, Chief K, et al. Chapter 9: Populations of concern. In: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Washington DC: U.S. Global Climate Change Research Program; 2016, pp. 247–286.
4. Kovats RS, Hajat S. Heat stress and public health: A critical review. *Annu Rev Public Health* 2008; 29:41–55. <https://doi.org/10.1146/annurev.publhealth.29.020907.090843> PMID: 18031221
5. Lane K, Charles-Guzman K, Wheeler K, Abid Z, Graber N, Matte T. Health effects of coastal storms and flooding in urban areas: a review and vulnerability assessment. *J Environ Public Health* 2013; 2013:913064. doi: <https://doi.org/10.1155/2013/913064> PMID: 23818911
6. Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, de Souza Dias BF, et al. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation—Lancet Commission on planetary health. *Lancet* 2015; 386:1973–2028. [https://doi.org/10.1016/S0140-6736\(15\)60901-1](https://doi.org/10.1016/S0140-6736(15)60901-1) PMID: 26188744
7. Haines A. Health co-benefits of climate action. *Lancet Planet Health* 2017; 1:e4–e5. [https://doi.org/10.1016/S2542-5196\(17\)30003-7](https://doi.org/10.1016/S2542-5196(17)30003-7) PMID: 29851591
8. IPCC WG I. Summary for Policymakers. In: Stocker TF, Qin D, Plattner G-K, Tignor M, Allen SK, Boschung J, et al., editors. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge (United Kingdom) and New York: Cambridge University Press; 2013.
9. Watts N, Adger WN, Agnolucci P, Blackstock J, Byass P, Cai W, et al. Health and climate change: policy responses to protect public health. *Lancet* 2015; 386:1861–1914. [https://doi.org/10.1016/S0140-6736\(15\)60854-6](https://doi.org/10.1016/S0140-6736(15)60854-6) PMID: 26111439
10. Frumkin H, Hess J, Luber G. Chapter 11: Public Health Policies and Actions. In: Levy B, Patz J, editors. Climate Change and Public Health, New York: Oxford University Press; 2015.
11. Patz JA, Frumkin H, Holloway T, Vimont DJ, Haines A. Climate change: challenges and opportunities for health. *JAMA* 2014; 312:1565–1580. <https://doi.org/10.1001/jama.2014.13186> PMID: 25244362
12. Orru H, Ebi KL, Forsberg B. The interplay of climate change and air pollution on health. *Curr Envir Health Rpt* 2017; 4:504–513.
13. West JJ, Smith SJ, Silva RA, Naik V, Zhang Y, Adelman Z, et al. Co-benefits of global greenhouse gas mitigation for future air quality and human health. *Nature Clim Change* 2013; 3:885–889.
14. Woodcock J, Edwards P, Tonne C, Armstrong BG, Ashiru O, Banister D, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *Lancet* 2009; 374:1930–1943. [https://doi.org/10.1016/S0140-6736\(09\)61714-1](https://doi.org/10.1016/S0140-6736(09)61714-1) PMID: 19942277
15. Grabow ML, Spak SN, Holloway T, Stone B Jr, Mednick AC, Patz JA. Air quality and exercise-related health benefits from reduced car travel in the midwestern United States. *Environ Health Perspect* 2012; 120:68–76. <https://doi.org/10.1289/ehp.1103440> PMID: 22049372
16. American Heart Association Active Transportation Policy Statement. July 2017. Available from: [http://www.heart.org/idc/groups/heart-public/@wcm/@global/documents/downloadable/ucm\\_495249.pdf](http://www.heart.org/idc/groups/heart-public/@wcm/@global/documents/downloadable/ucm_495249.pdf) Cited 21 June 2018.
17. Lucon O, Ürge-Vorsatz D, Zain Ahmed A, Akbari H, Bertoldi P, Cabeza LF, et al. Buildings. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer O, Pichs-Madruga R, Sokona Y, Farahani E, Kadner S, Seyboth K, et al., editors]. Cambridge and New York: Cambridge University Press; 2014.
18. Wilkinson P, Smith KR, Davies M, Adair H, Armstrong BG, Barrett M, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: household energy. *Lancet* 2009; 374:1917–1929. [https://doi.org/10.1016/S0140-6736\(09\)61713-X](https://doi.org/10.1016/S0140-6736(09)61713-X) PMID: 19942273

19. Frumkin H, Bratman GN, Breslow SJ, Cochran B, Kahn PH Jr, Lawler JJ, et al. Nature contact and human health: A research agenda. *Environ Health Perspect* 2017; 125: <https://doi.org/10.1289/EHP1663> PMID: 28796634
20. Kondo MC, South EC, Branas CC. Nature-based strategies for improving urban health and safety. *J Urban Health* 2015; 92:800–814. <https://doi.org/10.1007/s11524-015-9983-y> PMID: 26275455
21. Woodcock J, Givoni M, Morgan AS. Health impact modelling of active travel visions for England and Wales using an integrated transport and health impact modelling tool (ITHIM). *PLoS ONE* 2013; 8: e51462. <https://doi.org/10.1371/journal.pone.0051462> PMID: 23326315