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Viewpoint

Transforming Urbanite Health with Upstream Knowledge

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Urban environments significantly influence public health, shaping the well-being of millions of urbanites.[1,2] Health can be envisioned as a river, with upstream, midstream, and downstream components, as well as the roots of socio-economic factors (Figure 1). Historically, cities have focused on reactive health measures, addressing issues as they arise, yet as urbanite health is a complex interplay of social, environmental, and economic factors, there is an urgent need for a proactive approach that tackles root causes. Upstream health interventions—preventative measures focused on green infrastructure such as green and blue spaces—can significantly improve health outcomes by addressing problems before they manifest downstream.[3,4] This approach not only reduces overall health costs but also fosters sustainable, resilient urban environments. Evidence increasingly supports the efficacy and economic prudence of this upstream shift, highlighting its potential to transform urbanite health.[4−6]

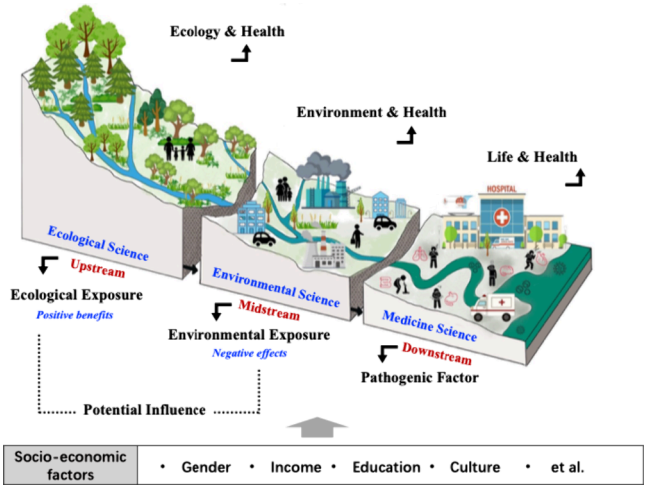

Figure 1. A novel diagram to describe the "health" with upstream, midstream, and downstream metaphors. Ecological exposure is the amount (magnitude, frequency, and duration) of an individual or population's exposure to natural ecosystems.

The Urgency of Upstream Interventions

Urbanites worldwide face a myriad of health challenges, from chronic diseases and mental health disorders to infectious diseases.[7] Traditional health strategies, which often focus on treating symptoms (downstream interventions), are insufficient to address these issues sustainably. Upstream interventions, aimed at improving green infrastructure, offer a more effective nature-based solution by targeting the root causes of health problems.[3,8] For instance, the World Health Organization (2021) reports that air pollution leads to 4.2 million premature deaths annually, predominantly affecting urbanites. Urban planning policies that reduce air pollution through enhanced green spaces and stricter environmental regulations can significantly mitigate these health risks. Moreover, access to green infrastructure has been shown to improve mental health, reduce stress, and lower the incidence of lifestyle-related conditions like obesity and diabetes.[3,9,10] Research indicates that urbanites with easy access to green infrastructure are more likely to engage in physical activity and experience lower stress levels, contributing to overall better health.[5,11]

Economic and Social Benefits

Investing in upstream health interventions also yields substantial economic and social benefits. Upstream preventative strategies can alleviate the burden on healthcare systems by reducing the prevalence of chronic diseases and the need for costly emergency care. Upstream interventions also promote social equity. Marginalized communities often bear the brunt of poor environmental conditions and lack of access to green infrastructure, exacerbating health disparities. Hence, inclusive urban policies—such as affordable green infrastructure and equitable access to "nature prescription"—can enhance social cohesion and health equity by upstream means. Further evidence-based studies are needed to clarify the impact of upstream interventions on individual health outcomes and societal costs.[3]

Challenges and Opportunities in Implementing Upstream Strategies

Despite the clear benefits, integrating upstream health knowledge into urban health planning presents several challenges. It requires a multidisciplinary approach that combines insights from public health, environmental science, urban planning, and social policy. Additionally, the long-term

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nature of upstream interventions often conflicts with the short-term focus of political cycles and budgetary constraints. Opportunities to overcome these challenges include fostering collaboration between academia, government, and the private sector. Initiatives like the Partnership for Healthy Cities, supported by Bloomberg Philanthropies, exemplify how global networks of cities can work together to implement evidence-based interventions to reduce noncommunicable diseases. A recent theoretical framework—Exposure Ecology—proposes a comprehensive understanding of the nexus between urban natural ecosystems, ecological exposure, and health, presenting an opportunity for further research and application.[3]

Big data and artificial intelligence (AI) advancements also offer significant potential. By leveraging these technologies, cities can gather actionable insights and monitor the impact of interventions in real time. For example, AI can analyze urbanite health data to identify at-risk populations and tailor interventions accordingly. Community engagement is another crucial component. Policies must be culturally sensitive and responsive to the needs of diverse populations. Engaging communities in planning ensures that nature-based upstream interventions are effective and sustainable.

A Call to Action

The shift toward upstream health knowledge in health planning is both a scientific necessity and a moral imperative. As urbanization accelerates, the health of urbanites must remain a priority. Specifically, actionable upstream knowledge includes the mechanism of upstream interventions on urbanite health (microbiome),[12] the dose−response relationship and threshold of short-term and long-term health effects of greenspace exposure,[3,10] and optimal spatial patterns and inequity of greenspace exposure for urbanites.[13] The recently proposed "3-30-300" rule for healthier and greener cities is also a good example of actionable upstream knowledge.[14] Policymakers, urban planners, and public health professionals must embrace actionable upstream strategies to create healthier, more equitable urban environments.

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Notes

The authors declare no competing financial interest.

Biography

Zhaowu Yu, an Associate Professor and doctoral supervisor in the Department of Environmental Science and Engineering at Fudan University, mainly engages in research related to Urban Ecology, Exposure Ecology, Nature-based Solutions (NbS), and Climate Change and Remote Sensing.

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