

90% of chronic disease is linked to our environment – the ‘Human Exposome Project’ will explore exactly how

Submitted by: Collider Health

Wednesday, 12 March 2025

12 March 2025, London, UK. Recent research confirms the relatively minor role that genetics plays in our health, with the ‘exposome’, defined as the totality of exposures individuals experience over their lives affecting their health, responsible for 10 times more variation in mortality risk than genetic predisposition[1].

A paper published in Nature Medicine today, ‘Cities, communities and clinics can be testbeds for human exposome and aging research’[2], sets out ways to start measuring how humans are affected by the exposome and furnish long-overdue evidence to design environments that enhance healthy life expectancy while reducing health and wellbeing inequalities.

The publication of the paper coincides with a tipping point for an international movement behind the ‘Human Exposome Project’, a generation on from the Human Genome Project, to understand how external exposures (including social, behavioural and geo-physical factors) and their interaction with internal factors (such as genetics and physiology), affect an individual’s health and overall resilience.

The Exposome Moonshot Forum is meeting for the first time in Washington DC 12-15 May 2025 to launch an unprecedented international scientific endeavour to map the combined impact of environmental factors that impact human health from conception to death.

Specific environmental factors can activate pathological pathways that contribute to disease and accelerate aging. The ability to capture, analyse and link individual data outside the medical record can show how external exposures affect a person’s health across their lifetime. These interactions can now be much better understood at an individual level and traced with unprecedented precision using artificial intelligence, representing a significant leap forward in determining the impact of the exposome at an aggregated, population health level.

This work is crucial to define new ways to address the chronic disease epidemic and ageing demographic now creating an economic drag in many nations around the world. The evidence will shape more effective public health interventions urgently needed to shift investment and policy away from an unsustainable healthcare model to one more rooted in prevention.

Tina Woods, steering committee member, Exposome Moonshot Forum; CEO, Collider Health; executive director of the International Institute of Longevity, and corresponding author says: ‘The time for the Human Exposome Project has come and I am excited to be participate in the Exposome Moonshot Forum to move it from concept to reality. We need to measure the exposome to demonstrate the return on investing in health and incentivising prevention.’

Professor David Furman, Buck Institute for Research on Aging, director of the Stanford 1000 Immunomes Project, steering committee member, Exposome Moonshot Forum, and corresponding author says: ‘At a time of increasing environmental threats to human health such as air pollution and microplastics, we have the technologies like applied artificial intelligence to help us to unravel the complex interactions between

environment, immunity and health at an individual level that can be aggregated up to get a true picture of the relative impact drivers of population health’.

Professor Nic Palmarini, director of the National Innovation Centre for Ageing, and author, says: ‘We have the technologies and tools to understand the human exposome with clinics, communities and cities acting as ideal real-world testbeds to understand what solutions will promote healthier behaviours and ultimately, outcomes.’

Note for editors

This paper follows a recent study published by Nature Medicine, Integrating the environmental and genetic architectures of aging and mortality, which showed that while genetics certainly play a role, modifiable environmental factors explain far more of the variation in premature mortality than genes do. The study used UK Biobank data from nearly 500,000 people, then mapped all of the environmental exposures (the “exposome”) influencing mortality and biological aging and then compared the influence of the exposome vs. genetics in explaining aging and disease. The study showed that the exposome explains nearly 10x more variation in mortality risk than genetic predisposition, and that smoking, socioeconomic factors, living conditions, physical activity, sleep, early life factors, and psychological well-being were among the strongest associations with mortality risk and biological aging.

Buck Institute

The mission of the Buck Institute is to end the threat of age-related disease for this and future generations. It is the first biomedical research institution devoted solely to research on ageing revolving around our commitment to helping people live better longer.

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National Innovation Centre for Ageing

The UK’s National Innovation Centre for Ageing is a world-leading organisation to help co-develop and bring to market products and services which create a world in which we people live better, for longer.

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International Institute for Longevity

The International Institute of Longevity (IIOL) is focused on driving global excellence, industry standards and best practice in the real-world application of longevity science into ‘longevity clinics’ as well as scientific and medical innovation to extend human healthspan, resilience and flourishing in the wider context of corporate and urban health and wellness.

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Exposome Moonshot Forum

The Exposome Moonshot Forum on 12-15 May in Washington DC is intended to define and accelerate the future of the Human Exposome Project (HEP). The central aim of the Forum is to identify the resources, policies, and collaboration necessary to drive the successful implementation of the HEP, ensuring longevity and impact. Outcomes will centre around:

- Defining clear, actionable steps toward the scalable implementation of the HEP.
- Building consensus on the essential policy changes needed to support and expand research.
- Establishing long-term collaborative partnerships that will bring together diverse sectors, including academia, industry, government agencies, and non-profit organizations, and divert critical funds toward this project and toward successful integration of active working groups

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[1] Argentieri, M.A., Amin, N., Nevado-Holgado, A.J. et al. Integrating the environmental and genetic architectures of aging and mortality. *Nat Med* (2025). <https://doi.org/10.1038/s41591-024-03483-9>

[2] Woods, T., Furman D., Palmarini N. et al. Cities, communities and clinics can be testbeds for human exposome and aging research. *Nat Med* (2025). <https://doi.org/10.1038/s41591-025-03519-8>