



For decades, the role of genetics in health outcomes has been a subject of debate. However, a new study published in ***Nature Medicine*** reveals that the exposome - the sum of all environmental exposures across a person's lifetime - plays a far more significant role in determining healthspan and disease risk. According to the study, led by Tina Woods of New Medicine Partners, exposomic factors influence mortality risk nearly ten times more than genetic predisposition, drawing renewed attention to how external conditions shape human ageing and longevity.

The exposome includes everything from air quality and diet to social interactions and chemical contaminants, all of which interact with internal biological mechanisms to determine health trajectories. The emerging field of functional exposomics aims to systematically track and analyse these interactions using high-throughput biomarkers, artificial intelligence (AI), and real-world testbeds in cities, clinics, and communities. Organisations like the Biomarkers of Ageing Consortium and the European Human Exposome Network are now working to standardise exposome measurement methods, providing actionable insights for precision medicine and public health policies.

While genetics can predispose individuals to certain conditions, this study highlights that environmental exposures - such as air pollution, socioeconomic status, and chronic stress - can significantly amplify or mitigate these risks. The findings strengthen the call for a *Human Exposome Project*, modelled after the **Human Genome Project**, to systematically map environmental influences on health and ageing.

The Implications for Healthcare and Public Policy

The impact of this research extends beyond academic circles, challenging traditional healthcare models that focus on treating disease rather than preventing it. If the exposome is indeed the dominant driver of longevity and disease risk, healthcare strategies must shift towards proactive interventions, public health initiatives, and systemic reforms to mitigate

harmful exposures. Governments and policymakers may need to rethink urban planning, environmental regulations, and food safety standards to create healthier living environments. Such changes could also reshape economic policies, insurance models, and global health initiatives.

The upcoming ***Exposome Moonshot Forum***, scheduled for May in Washington, D.C., aims to accelerate global efforts to map environmental exposures and integrate them into healthcare frameworks. The initiative will bring together researchers, policymakers, and industry leaders to establish the necessary methodologies, policies, and collaborations to advance exposome research on a large scale. Experts hope this will lead to the standardisation of tracking environmental influences on health and facilitate the development of personalised medicine approaches based on an individual's exposomic profile.

Leaders in the Field Speak Out

Tina Woods, a steering committee member of the *Exposome Moonshot Forum*, CEO of Collider Health, and Executive Director of the International Institute of Longevity, emphasised the urgency of this research. "The time for the *Human Exposome Project* has come, and I am excited to participate in the *Exposome Moonshot Forum* to turn this concept into reality," she stated. "We need to measure the exposome to demonstrate the return on investment in health and incentivise prevention."



Tina Woods, steering committee member of the Exposome Moonshot Forum, NMP Expert, CEO of Collider Health and executive director of the International Institute of Longevity.



Professor David Furman, from the Buck Institute for Research on Aging and Stanford 1000 Immunomes Project.

Professor David Furman of the Buck Institute for Research on Ageing and the Stanford 1000 Immunomes Project echoed this sentiment, highlighting the technological advancements that make exposome research more feasible than ever. “At a time of increasing environmental threats to human health - such as air pollution and microplastics - we now have AI and advanced biomarker analysis to help us unravel the complex interactions between environment, immunity, and health. These insights can provide a more accurate picture of population health trends.”

Global Efforts to Study the Exposome

Several cities worldwide have already begun applying exposomic research in real-world settings:

- **Rotterdam’s Exposome-NL Programme** integrates environmental sensors with health records to study the effects of urban design on public health.
- **Utrecht’s Exposome-City Programme** is pioneering bicycle-based mobile monitoring to assess child-specific exposures and air quality variations.
- **Barcelona’s Exposome Research Hub** utilises geospatial data and environmental sensors to link pollution, green spaces, and urban conditions to respiratory and cardiovascular disease risk.

These initiatives provide critical insights into how policymakers can mitigate harmful exposures and create healthier urban environments. Early findings have already influenced air quality and green space regulations in select districts.

Shaping the Future of Healthcare and Longevity Science

By systematically studying the exposome, researchers can guide national health policies and industry regulations to reduce the prevalence of chronic disease and extend healthspan. Scientists are particularly interested in how different exposures interact—for instance, how air pollution compounds the negative effects of poor diet or chronic stress. This deeper understanding could lead to more targeted public health interventions.

Beyond environmental pollutants, emerging research suggests that psychosocial factors - such as chronic stress, social isolation, and early childhood adversity—may have long-term biological consequences. Integrating exposomic data with genomics and metabolomics could enable a more comprehensive understanding of how lifestyle and environmental exposures accelerate ageing and disease processes.



A Call to Action

As exposome research continues to uncover the specific pathways through which environmental factors shape health, there is an opportunity to embed prevention into the foundation of healthcare. Expanding beyond clinical diagnostics to include real-time monitoring of environmental influences - using wearable technology and AI-driven analytics - could allow for more personalised and proactive healthcare strategies.

With growing recognition that environmental and behavioural factors outweigh genetic predisposition in determining health outcomes, exposomics has emerged as a vital new frontier in ageing research. The challenge now is translating these findings into concrete policy changes that prioritise longevity, resilience, and quality of life on a societal scale.

The **Exposome Moonshot Forum** represents an important step in that direction, laying the groundwork for a global exposome strategy that integrates science, policy, and technology to promote healthier, longer lives.