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One brain, one mind, one health, one planet—a call from Switzerland for a systemic approach in brain health research, policy and practice

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The global burden of brain disorders is significant and rising, with at least one in three individuals affected worldwide.[1,2] Brain—neurological and psychiatric—disorders impose immense societal costs, with Europe's economic burden estimated to exceed 1 trillion US dollars in 2020, more than heart disease, cancer, and diabetes combined according to Economist Impact study (https://impact.economist.com/). In Switzerland, in 2008, 1.74 million citizens were affected by at least one brain disorder with significant economic costs. More recent data show psychiatric disorders *alone* to cost Switzerland up to 19.6 billion dollars annually with 17% of the workforce (45–54 years old) on sick leave for mental health reasons.[3] Neurological disorders such as migraine, dementia and stroke also impact a significant portion of the Swiss population.

The burden of brain conditions is driven by an aging population, environmental pressures, and fragmented healthcare systems. Brain health—*the state of brain functioning across cognitive, sensory, social-emotional, behavioral, and motor domains, [...], irrespective of the presence or absence of disorders* according to the World Health Organization—is influenced by a complex interplay of environmental, genetic, emotional, and social factors. Yet traditional silos between 'mind' and 'brain' disciplines, fail to address these interconnected determinants as two sides of the same coin. Such an intricate connection between the brain and mind is exemplified by their mutual influence on health and disease outcomes. For instance, depression increases dementia risk and stress accelerates neurodegeneration.[4] Psychosocial factors like lower socioeconomic status or early-life trauma amplify neurological vulnerability, while conditions such as sleep disorders are both comorbid with psychiatric disorders[5] and independent risk factors for stroke and dementia.[6] Failure to recognize the intricate connection between brain and mind, has resulted in a fragmented approach across psychiatry, neurology, and related disciplines hindering the development of comprehensive strategies to address brain health in its entirety for improved prevention and treatment outcomes.

Emerging frameworks now emphasize the interconnectedness of human health with the environment and other living systems. One such framework is Planetary Health,[7] which connects the molecular and planetary scales, emphasizing the ties between human well-being and environmental systems. Climate stability, biodiversity, and pollution profoundly shape brain health—extreme heat correlates with rising suicide rates,[8] air pollutants contribute to cognitive decline,[9] and eco-anxiety driven by environmental changes is increasingly common among youth. Both internal and external exposome—the cumulative environmental exposures across a lifetime—are central to understanding and intervening on brain health (Fig. 1). While internal exposome factors like genetics, sleep, and metabolism are comparatively well-studied with relation to brain health, external factors such as pollutants, social connection and nature exposure remain underexplored despite their critical impact. Addressing these interconnected determinants calls for comprehensive strategies. The One Health framework builds on this by underscoring the interdependence of human, animal, and environmental health.[10] While zoonotic diseases highlight the dangers of disrupted ecosystems, human-animal bonds—a concept referred to as 'zooeyia'—have been shown to benefit human health and have potential for treatment. Integrating One Health principles into brain health research fosters collaboration across disciplines, opening perspectives for strategies that promote mental and physical well-being across diverse systems.

In Switzerland, these ideas converge within the Swiss Brain Health Plan (SBHP),[4] which exemplifies a comprehensive and systemic approach to brain health. Bringing together over 50 experts across neuropsychiatric disciplines and public health, the SBHP aligns with

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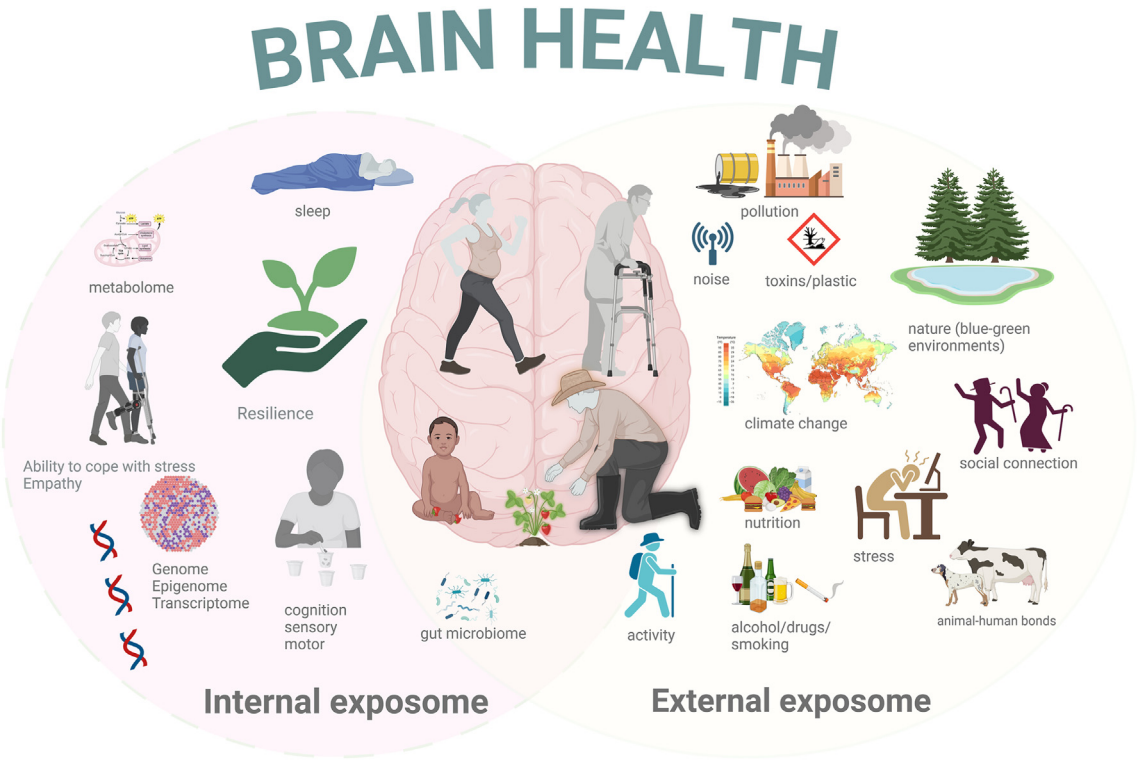

Fig. 1: **A schematic non-exhaustive view of brain health, illustrating some of the internal exposome and external exposome effects on brain health.**

WHO and European strategies, emphasizing prevention, research, training, and patient empowerment. Core themes of the SBHP focus on raising brain health literacy, fostering interdisciplinary training, and advancing research to deepen understanding of brain health.

In particular, research within the SBHP roadmap prioritizes the development of innovative indicators that combine biomonitoring, neurotechnology, and environmental data to better understand the factors influencing brain health. Tools such as wearable biomonitoring technologies, high-resolution environmental data, and causal insights from brain circuit modulation using non-invasive stimulation, combined with advanced clinical trial designs in integrated neurological and psychiatric cohorts, could offer valuable insights into the long-term effects of exposome factors on brain health. Simultaneously, regulatory frameworks must ensure ethical standards, equitable access, and the broad applicability of emerging technologies, ensuring that advancements in brain health benefit all populations to leave no one behind.

Frameworks like the SBHP represent a scalable model that could drive the integration of neuroscience, psychiatry, neurology, public health, and environmental sciences. However, sustaining these initiatives requires policy and systemic funding frameworks to evolve. Long-term, flexible investments are essential to support interdisciplinary training beyond funding silos, foster international collaboration, and ensure inclusive research and policy frameworks. Additionally, global agreements and data-sharing initiatives will be critical to maximize efficiency and accelerate discoveries. By integrating insights from One Health and Planetary Health, the SBHP provides a blueprint for addressing the interconnected challenges of brain health to bridge disciplinary gaps, advance innovation, and inform evidence-based policies, setting new standards for brain health globally.

Contributors

All authors contributed intellectually to the conceptualization and preparation of the manuscript. I.B: Conceptualization of the manuscript; drafting and revising the manuscript; integration of neuroscience, mental health, and brain health perspectives; coordination of author contributions. A.F.: Provided expertise in public health and systems thinking; contributed to the framing of One Health and Planetary Health integration; critical review and revision of the manuscript. I.Bo: Focused on the One Health framework, particularly the interconnectedness of human, animal, and environmental health; provided input on policy implications; reviewed and edited the manuscript. R.R.d.C.: Contributed to the ecological health and planetary health dimensions; reviewed the scientific framing of exposome and ecosystem health interactions; revised the manuscript. A.M.V.C: Provided expertise on environmental health and climate change impacts on brain health; contributed critical analysis related to planetary health; reviewed and revised the manuscript. C.L.A.B: Provided strategic input and high-level

guidance; integrated neurological perspectives and insights from the Swiss Brain Health Plan; critically reviewed and revised the manuscript.

Declaration of interests

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