



Health Longevity Starts from the Womb

Text by Prof Lee Yung Seng

Singapore is facing the complex challenge of an ageing population. As life expectancy rises and fertility rates decline, the demographic balance will shift, placing unprecedented pressure on the healthcare system. The nation has to move beyond achieving mere longevity, towards healthy ageing and increased productive and independent healthspans with fewer years spent in ill health. With an increasing ratio of old to young people, there is a growing dependency on the younger generation to sustain the economy and support the elderly.

In light of these demographic shifts, every child born in Singapore becomes not only a symbol of hope but also a crucial asset for the nation's future prosperity. Recognising the significance of this demographic transition, Singapore must prioritise the optimisation of the health and well-being of its younger citizens and set them on a better health trajectory than the generation before them. By investing in the health of the youth, Singapore can secure a prosperous and sustainable future while mitigating the burden on the healthcare system, not only for the present but also for the future.

In the intricate tapestry of life, health is not merely a destination, but a journey that commences from the very moment of conception. Over the past two decades, groundbreaking research has illuminated the profound impact of early life experiences on long-term health outcomes. The Developmental Origins of Health and Disease (DOHaD) hypothesis

has emerged as a guiding principle, revealing that the conditions we encounter during *in utero*, infancy and early childhood can sculpt our health trajectories for years to come. From the development of chronic diseases to the attainment of our full potential, the foundations of healthy longevity are laid in the womb and early childhood, and they need to be nurtured throughout our lifespan through a life course approach. Healthy ageing begins long before we reach old age.

Applying the science of DOHaD

In the last two decades, the overwhelming evidence from studies of DOHaD has taught us the importance of a good start to life in determining the health trajectory and risk for chronic diseases later in life. The essence of the DOHaD hypothesis lies in recognising the intricate interplay between genetics, environment and epigenetics during critical periods of development. Studies have shown that exposure to factors such as maternal nutrition, stress and environmental toxins can leave indelible imprints on our physiology, influencing susceptibility to a myriad of health conditions later in life.

The concept of “metabolic programming” highlights how early life experiences can shape metabolic pathways, predisposing individuals to conditions like obesity, diabetes and cardiovascular disease. Moreover, the burgeoning field of epigenetics underscores the role of environmental factors in modifying gene expression,

further emphasising the importance of early intervention in promoting lifelong health. Brain circuitries are largely built in the early years of life while the brain is developing, and it is easier to inculcate healthy behaviours at this stage than to try to do so later in life.

Embracing early intervention

The adage “an ounce of prevention is worth a pound of cure” rings particularly true in the realm of health promotion. The early years of life represent a critical window of opportunity – a time when interventions can yield maximal impact on long-term health outcomes. By focusing on the critical window of opportunity in the first 1,000 days of life (which encompasses the nine months *in utero* and first two years of childhood), we can lay a solid foundation for health and well-being that reverberates throughout one's lifespan, setting them on a path towards optimal health. Initiatives such as those aimed at optimising maternal health before and during pregnancy, promoting breastfeeding and ensuring access to quality early childhood education can yield dividends in terms of reducing the burden of disease, maximising potential and fostering healthy ageing.

Comprehensive preventive maternal and child health service

A cornerstone of any strategy for promoting healthy longevity is the establishment of comprehensive preventive maternal and child health

services that are accessible by all. By providing early and continuous preventive care through a life course approach, and with deliberate focus on the vulnerable families which need such care most, we can mitigate their immediate and long-term healthcare and societal burdens, and the impact of health disparities and inequities. Examples of such immediate impacts include decreased referrals to child development and mental health services for behavioural, neurodevelopmental and mental health concerns; as well as emergency room visits for poorly managed conditions like asthma, attributed to lack of access to primary care (due to social factors or poor physical environments such as mould and smoke exposure). Importantly, there will be long-term benefits where we will see curtailment of incidence of chronic conditions in the future, when the children grow into adulthood. We should target health outcomes which are predicted to be the biggest future healthcare burden and would adversely impact our human capital, such as obesity, poor cardiometabolic health and poor mental well-being. Our strategy should not only promote disease prevention, but also focus on health enhancement and help each child to achieve his/her full potential, and work towards health equity.

Redesigning models of care

To truly move the needle on attaining healthy longevity, we must rethink traditional models of care, embrace a community-centric approach and remove the barriers to access. The Pareto principle, which when applied to healthcare expenditure suggests that 80% of healthcare dollars are spent on 20% of the population, underscores the need to deliberately target vulnerable groups and address the root causes of health disparities. The vulnerable populations such as low-income families are often underserved and marginalised inadvertently. They are at risk of not receiving and applying preventive health information and practices, as well as not accessing healthcare in a timely manner,

resulting in a vicious downward spiral. They are often the population strata which will demand the most healthcare resources. Breaking the cycle of inequity, allocating resources to where they are needed most, and shifting care to the community will improve healthcare access for those who need help most, and will result in more efficient and effective use of healthcare resources, now and in the future. Health equity must remain a central tenet of our approach.

Fostering collaboration, tackling social determinants

Social determinants of health account for 30% to 55% of health outcomes. Promoting healthy longevity therefore necessitates a collaborative and community-driven approach that leverages the collective resources and expertise of diverse stakeholders. Healthcare workers should recognise the social determinants of health; we cannot do this alone, and we need to embrace and partner the multiple stakeholders in the community. Collaboration with social agencies is essential to address social factors that contribute to health disparities and inequities. From healthcare providers and public health agencies to community organisations and advocacy groups, collaboration is key to addressing the multifaceted challenges of promoting lifelong health comprehensively. Community-based interventions that empower individuals, build social connections and create supportive environments can yield lasting benefits in terms of promoting health and well-being across the lifespan.

Tracking progress and driving change

As we embark on the journey towards healthy ageing, it is essential to monitor progress, evaluate the effectiveness of interventions and adapt strategies as needed. Robust data systems and surveillance mechanisms are indispensable tools for tracking trends in health outcomes, identifying areas of improvement and informing evidence-based decision-making. Moreover,

fostering a culture of continuous learning and improvement allows us to refine our approaches over time, ensuring that we make meaningful progress towards our goals of promoting lifelong health and well-being. Hence, the importance of making such data readily available to healthcare workers is crucial to provide us with valuable information and help us measure how aligned we are with our North Star.

Conclusion

Nurturing health from conception requires a multifaceted approach that addresses the complex interplay of biological, environmental and social factors. By embracing the principles of DOHaD, prioritising early intervention, and establishing comprehensive preventive and primary care maternal and child health services that are accessible by all, we can lay the groundwork for a future where all individuals have the opportunity to age healthily. With the right strategy and collective action, we can move beyond mere Brownian motion and truly move the needle, charting a course towards healthier, more vibrant communities for generations to come. ◆

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