

Proactive steps to population health: Starting early, starting right

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The global burden of non-communicable diseases is rising, with continued projected increases in the prevalence of metabolic syndrome (MetS) in the future. This epidemic, albeit of a metabolic nature, poses broad socioeconomic and healthcare burdens worldwide. Population health improvement and optimisation of healthcare are important to address these burdens. Modelling health systems to be more health-centric—in addition to being disease-centric—is key, focusing on preventive care initiatives, which avert the development of metabolic diseases in the community at large.

Origins and clustering of risk factors for the development of MetS as an adult begin in infancy and early childhood—formative periods of life, which are susceptible to environmental influences, shaping lifelong cardiometabolic health. This forms the basis of the Developmental Origins of Health and Disease hypothesis. Epigenetics have a potential role in the mediation between an obesogenic environmental influence, and an individual's subsequent metabolic health trajectory.¹ Advances in microbiome research, especially those related to gut dysbiosis, have also demonstrated influences in metabolic health.¹ Given that early epigenetic programming may determine a person's lifelong health, it is therefore crucial that primary prevention and population health efforts begin from early childhood, with the ultimate aim of a population growing and ageing healthily.

Through birth cohort studies, risk factors that adversely impact a child's neurocognitive and metabolic health have been determined, thereby identifying components of an obesogenic environment. Caloric intake and rapidity of weight gain during infancy have been shown to directly influence body mass index throughout childhood.² In turn, childhood obesity tracks into adulthood as well, with a significant correlation with body mass index demonstrated at 50 years of age.³ Optimal weaning and introduction of a healthy balanced diet to a child are thus pivotal in determining subsequent metabolic health, with appetitive traits and taste preferences as an adult shown to be ingrained from an early age.⁴

Holistic considerations should also include the formation of healthy habits and lifestyle from a young age. Physical activity during infancy and early childhood may not be a domain frequently prioritised by caregivers and healthcare providers. However, it has been shown to have a positive impact on a child's body composition (particularly muscle mass and bone mineralisation), cardiometabolic health and neurocognitive development,⁵ with its benefits continuing into adulthood. Furthermore, with the increasing widespread use of digital devices, it is also critical to understand its adverse impact on a child's neurodevelopment. Exposure to screen time in early childhood has been shown to impair attentive and executive functions, with neuroimaging evidence of white matter changes and electroencephalographic alterations.⁶ Apart from its deleterious effects on neurodevelopment, longer screen time also correlates with poorer quality and duration of sleep, with increased odds of developing childhood obesity as well.⁷ Overall, a person's long-term metabolic health seems to be an outcome of multiple compounding effects, with an accumulation of predisposing or protective cardiometabolic factors from early childhood.

In this issue of the *Annals*, Loo et al.⁸ present recommendations on daily physical activities, lifestyle and dietary habits in children aged 0 to <7 years old. A systematic review of the literature was performed, with an amalgamation of the latest available evidence, and synthesis of consensus statements by workgroup members, comprising physicians and allied health professionals. For ease of reference, these statements were categorised into three age groups: 0 to <1 year, 1 to <3 years, and 3 to <7 years old. These recommendations fulfil the clinical purpose of improved developmental, physical and neurocognitive health in children aged <7 years old, with the aim of reducing the incidence of non-communicable diseases in their later years. The “Consensus statement on Singapore integrated 24-hour activity guide for early childhood” represents the first step in the distillation of up-to-date literature and expert opinions, which should serve as subsequent guidance for an evidence-based approach to population health

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management. The Healthier SG initiative was announced by the Ministry for Health in March 2022,⁹ with an important emphasis on community engagement and preventive care to reduce the economic and healthcare burden of non-communicable diseases among other chronic illnesses. This is a paradigm shift, with an increased focus towards efforts in health promotion in addition to management of patients and diseases.

However, future challenges remain in the implementation and translational aspects of delivering preventive medicine. With clear scientific findings, prospective data and expert opinions, the next integral step would be engaging the community and delivering this information in an accessible and sustainable manner. A key component in achieving this would be to enlist stakeholders, forming community partnerships and championing the use of digital platforms and innovation to educate the general public. Digital applications, online forums and social media are some available avenues to allow this information to be accessed by parents, children's caregivers, as well as healthcare providers.

Models of care also need to be modified and updated accordingly, with a “guided” delivery of anticipatory guidance that is less episodic, random and physician dependent. Primary care providers are well placed under the Healthier SG model, with well-baby visits for developmental screening and vaccinations, and the assignment of a regular family doctor enabling continuity of care, forming strong patient-doctor relationships and partnerships in preventive medicine. Population health is not only defined by improving health outcomes in a particular group of individuals, but also includes the distribution of these outcomes within this group.¹⁰ Therefore, it is also important to consider the social determinants of child health, and how preventive healthcare can be delivered in a robust yet accessible and active manner such that those with disadvantaged or marginalised circumstances can still receive and apply this knowledge effectively in their children's lives. It is important that recommendations from this consensus guidelines can pervade different aspects of a child's life. This includes considerations in pre-school educational systems, incorporating physical activity, outdoor exposure and play, nutritional understanding of

the diet provided in pre-school centres, and how screen viewing may sometimes be used as a tool for educational purposes.

In conclusion, given that lifelong cardiometabolic health is potentially determined by the accrual of protective or predisposing factors during infancy and early childhood, it is critical to optimise environmental factors during this vulnerable window. Adopting a life-course approach could yield dividends in population health management and address the burgeoning tide of non-communicable diseases. Following the compilation of evidence and expert opinions in the consensus guidelines, future efforts should be directed towards the application of implementation sciences to facilitate its uptake in the community, and integrating health economics to ensure its accessibility and efficacy as well.

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