



# Non-communicable diseases: Opportunities to promote future health during the first 1000 day of life

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DOI: [10.35898/ghmj-731003](https://doi.org/10.35898/ghmj-731003)

Given as a keynote speech at *the 1<sup>st</sup> Cirebon International Health Symposium, Faculty of Medicine, Universitas Swadaya Gunung Jati, Indonesia, 31 August 2024.*

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## ABSTRACT

The Developmental Origins of Health and Disease (DOHaD) framework now underlies the evolution and epigenetics of many non-communicable diseases that develop in adult life. Type 2 diabetes, obesity, hypertension, heart disease and stroke in particular have links back to events during the first 1000 days of life, and as the world is witnessing an epidemic of these conditions, identifying measures able to contribute to reducing the potential for these NCDs to develop in our aging populations becomes all the more important. Parental health at conception and good maternal health and nutrition throughout pregnancy are known to be integral to normal infant development and health in later life, but more recently the central importance of infant nutrition that achieves healthy weight gain has become recognized. In this context, achieving growth patterns for infants that avoid either the onset of obesity or development of stunting during the first 1000 days of life appears to be an achievable goal with significant potential for the avoidance of many NCDs in later life. Hence the relevance of health promotion initiatives to share this knowledge among health care providers and educate parents on the benefits of optimal infant nutrition.

**Keywords:** *Developmental origins of health and disease; Exclusive breast feeding; First 1000 days of life; Obesity; Stunting.*

**Published:** 25 September 2024.

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## Editorial

The progressive advance of non-communicable diseases (NCDs) has resulted in a significant and growing global epidemic which is having devastating health and economic consequences. NCDs are chronic diseases and often of long duration; the main forms are Type 2 diabetes, cardiovascular diseases that cause high blood pressure, heart attacks and stroke, some types of cancer and respiratory diseases like chronic obstructive pulmonary disease, and asthma (World Health Organization, 2023).

While these are diseases that have an increased incidence in aging populations, many NCDs are highly preventable or modifiable, as they result from a combination of genetic, physiological, environmental and behavioral factors, with five major epidemiological risk factors being common: tobacco use, physical inactivity,

harm from alcohol consumption, poor diet and air pollution.

The epidemic of NCDs poses devastating health consequences for individuals, families and communities, and threatens to become an unmanageable burden for health systems. Worldwide NCDs affect an estimated two billion people; low and middle income countries (LMICs) bear the biggest burden, with more than three quarters of global NCD deaths occurring in LMICs.

Reducing the burden of NCDs is an important investment. In addition to providing better health, improving quality of life and reducing the incidence of premature death, the financial benefit would also be considerable. The extent of health budget expenditure on care for the increasing numbers of patients with Type 2 diabetes is an example; these costs are increasing to such an extent that in Africa the care for diabetics in the population threatens to consume the whole health care budget in some countries by 2030. Another measure of the unchecked rise in NCDs on the African continent is that it is estimated that deaths from diabetes will soon be greater than those for malaria.

The WHO has identified several cost-effective, high-impact NCD-related interventions that could save millions of lives in LMICs, but headway to improve the situation is poor worldwide, as the necessary measures are either not being implemented or their scale up is inadequate. At the same time, although NCDs remain the largest cause of premature death globally, health promotion initiatives and interventions to curb their advance only receive a small proportion of preventive care budgets.

There is now clear evidence that a range of adverse early life events can predispose an individual to increased risk of developing NCDs in later life, and also that this risk can be passed to future generations. Awareness of this form of programming underlies the concepts of the Developmental Origins of Health and Disease (DOHaD), and explains the potential for defined life events to underlie the development of many NCDs. DOHaD concepts focus particularly on the first 1000 days of life and three specific periods. 1) conception (including periconceptual health of the father as well as the mother), 2) pregnancy (particularly maternal nutrition, and vitamin and trace element provision during the first three months when fetal structures are formed) and, 3) infant nutrition up to the end of the second year of life (where the pattern of weight gain should avoid both excessive weight gain, and gradual weight loss leading to stunting of growth).

The optimal way to avoid excessive weight gain and stunting is exclusive breastfeeding (EBF) for the first six months of life (Yan et al., 2014; Horta et al., 2015). EBF is defined as giving infants breast milk only with no additional food or drink, except for the addition of medications, oral rehydration salts and vitamins as needed, and has multiple other well-known benefits for both mother and infant. The adequacy of an infant's nutritional status is best monitored by plotting weight at regular intervals on a WHO growth chart. The infant's weight at birth places her/him on a centile curve and from then on weight gain should follow the curve of that same centile. Small babies should not be overfed with the intention of making them grow more quickly, and large babies should not be limited in their calorie intake. Excessive weight gain with weight moving upwards across the weight centile predisposes an infant to obesity and an increased risk of being overweight and developing Type 2 diabetes in later life. Inadequate weight gain and a downward fall across the centiles lead to stunting of growth which predisposes the infant to cardio metabolic effects in adult life, which increase the risk of obesity, diabetes, coronary artery disease, hypertension and stroke.

However, it must be recognized, that not every mother who wants to breast feed can do so, and, even for those who can, that a full 6 months of EBF may not be possible. The need to supplement breastfeeding with formula and situations where just formula is fed are also a reality, so, in parallel with promoting EBF and encouraging breastfeeding the need to monitor weight gain in every infant needs to be understood. Regardless of how they are fed, it is important to monitor weight gain in all infants so as to avoid any of them becoming either overweight or stunted.

Importantly, the next generation of parents needs to be the target group for interventions aimed at optimizing health during the first 1000 days of life; hence adolescence is a critical opportunity for health promotion related to prevention of NCDs (Tohi et al., 2022). While antenatal care, postnatal maternal support and monitoring each infant's weight gain remain important, focusing health promotion on these phases risks missing important

opportunities during the DOHaD relevant time periods of preconception and the first three months of fetal growth when a mother may not realize that she is pregnant. So it is important for health care providers, parents and educators to engage with adolescents to promote the future health of their children in anticipation of future conception.

School-based programs offer an opportunity to promote health; lifestyles and behaviors likely to break the cycle of NCDs, and WHO has estimated that over a billion children worldwide have the potential to benefit from effective health promotion programs in schools (Macnab. 2019). But finding creative ways to educate is necessary because school programs based on facts and approaches that may be clear and obvious to adults will probably be of little interest, or seem to have no obvious relevance, to high school pupils. In a study in Africa it was found that facts about the burden of diabetes in adult life or the problem of cost to the health care system were meaningless to teenagers, but, in contrast, there was definite interest in learning DOHaD-related facts that increased the chances of their future child being healthy (Macnab & Mukisa, 2018). This was because the prime motivator for future parents wanting to learn more was coming to understand that when they have a healthy child she/he will earn more in their lifetime than someone who is unhealthy.

Because they are the next generation of parents, adolescents must be considered a priority group for advancing knowledge based on DOHaD science, and in particular for promoting the benefits of exclusive breast feeding as a way to avoid overweight or stunting in infancy. But, ideally, because of the urgency of the NCD epidemic, a whole community approach will occur where there is a special focus on engaging with adolescents, as this offers most hope for breaking the NCD disease cycle.

There is no doubt that the current NCD epidemic is jeopardizing the health, wellbeing and survival of millions of people globally, and in addition, threatens to overwhelm the ability of some countries to provide essential health care for the whole population. Consequently, it is now a priority for all of us to seek ways to raise awareness of about NCDs, the potential for DOHaD-related approaches to contribute to breaking the cycle, and work to contribute to local community and national strategies to prevent and control NCDs in the future.

You can learn more about NCDs and initiatives to prevent them or modify their consequences, DOHaD concepts, the benefits of breastfeeding and school-based programs to promote health through online updates from the WHO.

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### Cite this article as:

Macnab, A.J. (2024). Non-communicable diseases: Opportunities to promote future health during the first 1000 day of life. *GHMJ (Global Health Management Journal)*, 7(3). 109–111. <https://doi.org/10.35898/ghmj-731003>