

MEDIA RELEASE

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For Immediate Publication

NEW STUDY SHOWS UNHEALTHY LIFESTYLES IN TODDLERS PERSIST IN CHILDHOOD, POOR HABITS LINKED TO HIGHER HEALTH RISKS

Children in the consistently unhealthy group had close to three times higher risks of poor health markers at the age of eight

SINGAPORE — When parents and caregivers are up to their neck in work and daily chores, they may not think twice about giving in to children, by allowing more screen time or fast food.

But a new study has shown that children's lifestyle patterns developed from a young age and continued over time have a bearing on their risks of developing undesirable outcomes in later childhood.

The children studied were those enrolled since birth in the Growing Up in Singapore Towards healthy Outcomes (GUSTO) cohort study, a collaboration between A*STAR's Singapore Institute for Clinical Sciences (SICS), KK Women's and Children's Hospital, National University Health System and National University of Singapore.

The study, led by Associate Professor Mary Chong and Senior Research Fellow, Dr Chia Airu, from the National University of Singapore's Saw Swee Hock School of Public Health, was published in the International Journal of Behavioural Nutrition and Physical Activity in January 2024. A/Prof Mary Chong is also an Adjunct Principal Investigator at the A*STAR's SICS.

In this new study, 546 children were tracked across three time points – at ages two, five and eight, when their caregivers reported on their screen time, physical activity and dietary intake, among others.

The researchers identified three distinct lifestyle pattern trajectories: 11 per cent of the children had a consistently healthy pattern, while 18 per cent had a consistently unhealthy pattern. The majority, at 71 per cent, had a mixed pattern of both healthy and unhealthy behaviours.

Children in the consistently unhealthy group were less active, had higher screen time and poorer diets, characterised by low intakes of fruits and vegetables and high intakes of discretionary foods such as ultra-processed foods, snacks and sugary drinks.

They tended to be breastfed for shorter periods, had parents with lower educational attainment and lower household income, and had mothers who exhibited sub-optimal

lifestyle during pregnancy (i.e., poor diet, physically inactive, poor sleep quality, higher television viewing time and higher tobacco exposure).

At eight years old, these children had close to three times higher risk of pre-hypertension and higher levels of diastolic blood pressure, fasting insulin and triglycerides than the mixed pattern group. This was despite having similar body mass index (BMI) as the rest of the children.

Dr Chia said: “What is surprising is that only 11 per cent of children maintained a healthy pattern during the study period. These children exhibited healthy habits at the age of two and continue to adhere to these healthy patterns as they grew older, emphasising the importance of promoting and reinforcing healthy behaviours from a young age to mitigate future health risks.”

A/Prof Chong pointed out that with a large majority of children in the mixed pattern group, this “suggests that while many follow at least one healthy behaviour, this does not necessarily result in them adhering to an overall healthy lifestyle pattern”.

She added: “This finding highlights that greater health promotion efforts need to be done to encourage more children and their parents to cultivate various healthy behaviours from young.”

Dr Cai Shirong, Principal Investigator, A*STAR's SICS and Adjunct Assistant Professor, Human Potential Translational Research Program, National University of Singapore's Yong Loo Lin School of Medicine, added: “One of the biggest strengths of our study is the inclusion of a comprehensive list of lifestyle factors, gathered consistently throughout early and middle childhood, which is a critical developmental period. As the lifestyle factors are modifiable, we can potentially target them in early childhood, especially in the groups that we have identified to be more likely to have unhealthy lifestyle habits.”

Professor Chong Yap Seng, Lead Principal Investigator for the GUSTO study, who is also Senior Consultant, Division of Maternal Fetal Medicine, Department of Obstetrics and Gynaecology, National University Hospital, said: “Targeting positive behaviour change during pregnancy, which often continues after childbirth and integrated into family routines, may be effective in promoting healthier lifestyles for children.”

Prof Chong, who is also Dean of the National University of Singapore's Yong Loo Lin School of Medicine and Chief Clinical Officer at A*STAR's SICS, added: “Children with unhealthy lifestyles may not always gain weight and be obese. This study underscores the importance of measuring various cardiometabolic risk markers – predictive of future cardiovascular diseases – alongside BMI, to detect early signs of poor health in children.”

For more information, please refer to the [published study](#) in the International Journal of Behavioural Nutrition and Physical Activity.

Chinese Glossary

National University Health System (NUHS)	国立大学医学组织 (国大医学组织)
National University of Singapore Saw Swee Hock School of Public Health (NUS SSHSPH)	新加坡国立大学苏瑞福公共卫生学院 (国大苏瑞福公共卫生学院)
National University Hospital (NUH)	国立大学医院 (国大医院)
National University of Singapore Yong Loo Lin School of Medicine (NUS Medicine)	新加坡国立大学杨潞龄医学院 (国大杨潞龄医学院)
Agency for Science, Technology and Research (A*STAR)	新加坡科技研究局
Singapore Institute for Clinical Sciences (SICS)	新加坡临床科学研究院
Growing Up in Singapore Towards healthy Outcomes (GUSTO)	新加坡健康成长追踪研究
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About the National University Health System (NUHS)

The National University Health System (NUHS) aims to transform how illness is prevented and managed by discovering causes of disease, development of more effective treatments through collaborative multidisciplinary research and clinical trials, and creation of better technologies and care delivery systems in partnership with others who share the same values and vision.

Institutions in the NUHS Group include the National University Hospital, Ng Teng Fong General Hospital, Jurong Community Hospital and Alexandra Hospital; three National Specialty Centres – National University Cancer Institute, Singapore (NCIS), National University Heart Centre, Singapore (NUHCS) and National University Centre for Oral Health, Singapore (NUCOHS); the National University Polyclinics (NUP); Jurong Medical Centre; and three NUS health sciences schools – NUS Yong Loo Lin School of Medicine (including the Alice Lee Centre for Nursing Studies), NUS Faculty of Dentistry and NUS Saw Swee Hock School of Public Health.

With member institutions under a common governance structure, NUHS creates synergies for the advancement of health by integrating patient care, health science education and biomedical research.

As a Regional Health System, NUHS works closely with health and social care partners across Singapore to develop and implement programmes that contribute to a healthy and engaged population in the Western part of Singapore.

For more information, please visit www.nuhs.edu.sg.

About NUS Saw Swee Hock School of Public Health (SSHSPH)

Building upon decades of experience in research, training and practice in epidemiology and public health, the Saw Swee Hock School of Public Health (SSHSPH), under the National University of Singapore, was established in October 2011 as Singapore's national school of public health. The School is also a member of the National University Health System (NUHS).

The School aims to continually foster healthier communities in Singapore and the region, and impact public health programmes and policies through its robust educational programmes and translational cross-disciplinary research work on cohort studies and life course epidemiology, infectious disease research, health technology assessments, health promotion, workplace safety and health, health systems evaluation and health services research. An interdisciplinary approach, augmented by rigorous training, applicable research and regional partnerships, places SSHSPH at the forefront of public health knowledge discovery and practice in Asia.

The School actively collaborates with many partners including the London School of Hygiene & Tropical Medicine, Karolinska Institutet, Harvard School of Public Health and University of Michigan School of Public Health. Its flagship programme, the Master of Public Health degree, attracts students from a wide range of disciplines from within Singapore and throughout the region.

For more information, please visit <https://sph.nus.edu.sg/>

About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector R&D agency. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit the economy and society. As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by improving societal outcomes in healthcare, urban living, and sustainability. A*STAR plays a key role in nurturing scientific talent and leaders for the wider research community and industry. A*STAR's R&D activities span biomedical sciences to physical sciences and engineering, with research entities primarily located in Biopolis and Fusionopolis. For ongoing news, visit www.a-star.edu.sg.

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About A*STAR's Singapore Institute for Clinical Sciences (SICS)

Founded in 2007, the Singapore Institute for Clinical Sciences' (SICS) mission is to promote health and human capacity in Singapore, Asia and globally. The first institute within the Agency for Science, Technology and Research (A*STAR) to focus on clinical sciences and translational research, SICS posits that health has its origins in good beginnings and continued interactions between our physiological makeup and environment. To fulfil our vision of building gateways and an evidence base for positive health, our institute strongly promotes clinical research that supports the understanding of metabolism, neuroscience and how they impact human development. To take our research into the real world, we launched seminal nationwide birth cohort studies such as Growing Up in Singapore Towards healthy Outcomes (GUSTO) and Singapore PREconception Study of long-Term maternal and child Outcomes (S-PRESTO). By paving the way for scientific research to make a difference to the social and economic fabric of our communities, we are committed to 'Changing Tomorrow's Health, Today'.

For more information, visit www.a-star.edu.sg/sics.

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About GUSTO

Set up in 2009, GUSTO (Growing Up in Singapore Towards healthy Outcomes) is a nationwide birth cohort study involving collaborators from KK Women's and Children's Hospital (KKH), National University Health System (NUHS), National University of Singapore (NUS), and Singapore Institute for Clinical Sciences (SICS). It is a longitudinal study of Singaporean mothers and their offspring. Since its inception, the study has recruited 1,247 Singaporean pregnant women as volunteers. These volunteers are studied extensively during their pregnancy, and their offspring are closely followed up as they grow up. GUSTO aims to understand how conditions during

pregnancy and early childhood may affect the mothers' and children's health, growth and development, as well as metabolic, neurodevelopmental and other conditions – all of which are of major public health and economic importance in Asia and around the globe. The research spans across four themes, where the results from monitoring both mother and child help in developing public health policies; clinically-valuable, testable interventions; reduce the burden of childhood obesity and non-communicable diseases, e.g. diabetes; and improve neurodevelopmental outcomes in children. The study is supported by the National Research Foundation (NRF) under the Open Fund-Large Collaborative Grant (OF-LCG) administered by the Singapore Ministry of Health's National Medical Research Council (NMRC), and the Agency for Science, Technology and Research (A*STAR). In RIE2025, GUSTO is supported by funding from the NRF's Human Health and Potential (HHP) Domain, under the Human Potential Programme. <https://www.gusto.sg/>