



MEDIA FACTSHEET

Keeping cool and safe in a hotter and more humid Singapore

NUS Medicine's Human Potential Translational Research Programme embarks on new multi-disciplinary, public health-focused project to study and identify solutions to manage heat stress in tropical climates.

Singapore's climate is becoming warmer with the average ambient temperature rising each year, and this is not only observed in Singapore, but in many countries around the world – a phenomenon attributed to global warming and the urban heat island effect.

Our equatorial location means that people are chronically exposed to hot conditions (WBGT¹ > 25°C) all year round. This makes people who work outdoors particularly vulnerable to environmental heat due to their added internal heat production from physical exertion, which can be detrimental to health, well-being and work productivity. If workers cannot or do not take rest in relation to heat stress, accidents and serious health effects such as heat stroke death can occur.

Singapore has already begun tackling some of the issues caused by heat with mitigation and adaptation to extreme heat associated with climate change through research focused on engineering solutions and urban design (e.g. Climate Change Research Centre; Cooling Singapore; Coolest Singapore).

However, heat-health is a complex socio-environmental problem that cuts across institutional, sectoral and disciplinary boundaries of public and occupational health and the domains of workplace, public space and the home. As such, there is a need to complement existing efforts by focusing on occupational exposures and their knock-on effects to support the overall effectiveness of Singapore's investments in heat-health risk management.

Project Heat-Safe

Multi-disciplinary approach to evidencing heat impacts and management for exposed occupations in and beyond the workplace

In a new multi-disciplinary project titled *Heat-Safe*, Lead Principal Investigator (PI) Associate Professor Jason Lee, Deputy Director of the Human Potential Translational Research Programme at the NUS Yong Loo Lin School of Medicine (NUS Medicine); co-lead Professor Gerhard Schmitt, Director of the Singapore-ETH Centre (SEN); and their team of researchers seek to understand the complex threat that heat exposure pose to human health, well-being and work productivity in Singapore and other tropical countries; and to identify sustainable preventive policies and actions that can reduce these impacts.

¹ The Wet-Bulb Global Temperature (WBGT) is a measure of heat stress which takes into account temperature, humidity, wind speed, sun angle and cloud cover.

Through the unique scope and scale of this multi-disciplinary project, the team will not only study the direct occupational heat exposures and impacts on health and productivity, but also gather and expand on existing literature and evidence concerning the broader health and well-being implications that have yet to be comprehensively addressed in chronically heat-exposed countries such as Singapore, Vietnam and Cambodia.

There is currently limited evidence available concerning occupational heat exposure, and the impact of age, physical fitness, and gender on these effects; or their broader effects, such as prolonged discomfort, mental stress, familial relationships and special health concerns, such as pregnancy and fertility. Improved knowledge is essential for the development of effective prevention programmes beyond the workplace.

Methodologically, this project combines disciplinary approaches that are utilised discretely and in multi-disciplinary ways to generate rich data and analyse the complex ways in which heat impacts on health and performance. This involves the spatial, temporal and other interactions of physical and social systems, including local environmental conditions, climate, thermal physiology, health and perceived health impacts, economic impacts analysis, and social practices.

The project includes research partners from across various disciplines and will be done in nine different stages across three years to achieve their respective objectives:

1. Coordination and co-design of project
2. Scientific review
3. Environmental monitoring of workplaces
 - Includes survey of hourly heat levels in selected workplaces across Singapore, Vietnam and Cambodia
4. Survey of heat impacts (in Singapore, Hanoi and Phnom Penh)
 - To identify the incidence and impacts of occupational heat, particularly in relation to impacts on health and productivity for workers, knock-on impacts on operations/profitability and well-being, and to identify measures already in place to manage heat-health at work and home
5. Physiological case studies
 - To measure and evaluate heat-induced psychological strain
6. Ethnographic case studies
 - To understand workers' activities and individual practices and how they are exposed to and manage heat and heat stress
7. Pregnancy and fertility review and case studies
 - To understand if environmental temperature fluctuations or heat stress have an impact on fertility and pregnancy outcomes in Singapore
8. Economic analysis
 - To analyse the country-level economic and well-being impact of work productivity loss due to heat, and compare it with the costs of heat prevention policies and measures
9. Testing and communication of proposed interventions

Associate Professor Jason Lee said, "Given our strategic location in the region, governmental will and technical expertise, Singapore is uniquely positioned to become a world leader in the development and deployment of heat-health management approaches, and comprehensive and coordinated approaches to the complex problems of extreme heat."

This research is supported by the National Research Foundation, Prime Minister's Office, Singapore under its Campus for Research Excellence and Technological Enterprise (CREATE) programme.

Delivering research aligned to national priorities

The Human Potential Translational Research Programme (TRP) is one of nine new TRPs at NUS Medicine aimed at creating a strong and coherent scientific base to deliver impactful and meaningful research outcomes for the School and Singapore's health system. Besides Human Potential, the other areas are Cancer, Cardiovascular Disease, Digital Medicine, Healthy Longevity, Immunology, Infectious Diseases, Precision Medicine and Synthetic Biology. These nine key multi-disciplinary, health and disease-based focus areas will create greater synergies and collaboration between basic scientists and clinician scientists, strengthen programmatic research and deliver research outcomes to address clinically relevant issues and applications that are aligned to national priorities.

About the National University of Singapore (NUS)

The National University of Singapore (NUS) is Singapore's flagship university, which offers a global approach to education, research and entrepreneurship, with a focus on Asian perspectives and expertise. We have 17 faculties across three campuses in Singapore, with more than 40,000 students from 100 countries enriching our vibrant and diverse campus community. We have also established our NUS Overseas Colleges programme in more than 15 cities around the world.

Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 31 university-level research institutes, research centres of excellence and corporate labs focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

For more information on NUS, please visit www.nus.edu.sg

About the NUS Yong Loo Lin School of Medicine (NUS Medicine)

The NUS Yong Loo Lin School of Medicine is Singapore's first and largest medical school. Our enduring mission centres on nurturing highly competent, values-driven and inspired healthcare professionals to transform the practice of medicine and improve health around the world.

Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus on innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University of Singapore and a founding institutional member of the National University Health System. It is Asia's leading medical school and ranks among the best in the world (Times Higher Education World University Rankings 2019 by subject and the Quacquarelli Symonds (QS) World University Rankings by Subject 2019).

For more information about NUS Medicine, please visit <https://medicine.nus.edu.sg/>

About the Campus for Research Excellence and Technological Enterprise (CREATE) programme

CREATE is an international collaboratory housing research centres set up by top universities. At CREATE, researchers from diverse disciplines and backgrounds work closely together to perform cutting-edge research in strategic areas of interest, for translation into practical applications leading to positive economic and societal outcomes for Singapore. The interdisciplinary research centres at CREATE focus on four areas of interdisciplinary thematic areas of research, namely human systems, energy systems, environmental systems and urban systems.

More information on the CREATE programme can be obtained from www.create.edu.sg.