UNIVERSITI MALAYA

FAKULTI PERUBATAN
Faculty of Medicine

INAUGURAL LECTURE

Professor Dr Sanjay Rampal a/l Lekhraj Rampal

Department of Social and Preventive Medicine
Faculty of medicine, Universiti Malaya

OBESITY AND PUBLIC HEALTH: CHALLENGES AND OPPORTUNITIES FOR NATIONAL PROSPERITY

UNIVERSITI MALAYA

FAKULTI PERUBATAN
Faculty of Medicine

OBESITY AND PUBLIC HEALTH: CHALLENGES AND OPPORTUNITIES FOR NATIONAL PROSPERITY

Inaugural Lecture

Professor Dr Sanjay Rampal a/l Lekhraj Rampal

Department of Social and Preventive Medicine
Faculty of medicine
Universiti Malaya
Malaysia

15 October 2024

Professor Dr Sanjay Rampal a/l Lekhraj Rampal
Department of Social and Preventive Medicine
Faculty of Medicine
Universiti Malaya
Malaysia

SYNOPSIS

Non-communicable diseases (NCDs) have escalated dramatically over the past few decades, a trend intricately linked to structural transformations within Malaysian society. Number one cause of death. These changes, characterized by rapid socio-economic development, increased urbanization, evolving dietary patterns, and an ageing population, have collectively intensified the burden of NCDs globally and in Malaysia. As our Malaysian society increasingly adopts less healthy diets and experiences a decline in physical activity, the prevalence of obesity and its associated complications, such as metabolic-associated fatty liver disease and diabetes, has surged. Notably, the early 2000s marked a significant turning point in the rising obesity prevalence. This lecture aims to summarize my research findings in this critical area.

In addition, I will use this lecture to share my professional and academic journey and offer a few critical insights gained thus far.

We require a dynamic and competent public health workforce to effectively address the challenges posed by the rising burden of NCDs. The discipline of Public Health is critical to improving our nation's health. My academic work at Universiti Malaya will continue to focus on leading efforts to cultivate our region's next generation of public health professionals, specialists, and leaders.

Biography

Dr Sanjay Rampal a/l Prof Lekhraj Rampal has been the Deputy Dean (Research) for the Faculty of Medicine, Universiti Malaya, since September 2021. He is a Professor of Epidemiology and a Public Health Medicine Consultant at the Department of Social and Preventive Medicine, Faculty of Medicine, Universiti Malaya.

Dr Rampal was medically trained in India and served in the Ministry of Health Malaysia from 1998 to 2005. The clinical experiences from his early medical career helped him realize that treating one patient at a time was insufficient and that more could be done by intervening at a population level. He improved his basic epidemiology and biostatistics knowledge by completing an MPH from Harvard University in 2004.

He joined Universiti Malaya in 2005, intending to strengthen the research skills of the Malaysian medical and public health community. He completed his PhD in Epidemiology from Johns Hopkins University in 2014. He was Certified in Public Health (CPH) by the US National Board of Public Health Examiners in 2013.

Dr Rampal's research has focused primarily on the epidemiology and prevention of cardiovascular disease. He has investigated the etiological and prognostic roles of various factors with diabetes and cardiovascular disease. These factors include gender, ethnicity, nutrition, obesity, metabolic-associated fatty liver disease, dyslipidemia, and other structural determinants of health. He has further investigated the role of these traditional cardiovascular risk factors in the development of colorectal cancer. He hopes to

leverage this information further to design and implement better prevention programs that reduce the number of new patients our healthcare system sees.

In recent years, he has applied his epidemiological expertise to communicable diseases. He investigated the roles of Obesity and Diabetes on the prognosis of Dengue Severity.

His methodological interest includes improving research methodology, biostatistics, epidemiological designs, regression models, causal inference, multiple imputations, measurement error, and propensity scoring.

During the COVID-19 pandemic, Dr Rampal improved the prevention and control of COVID-19 through active research and translation. He had actively communicated with the public through the media on COVID-19 issues. He was a member of the following committees: 1) Science and Technology Expert Panel for Disaster Risk Reduction under the Health and Emerging Threat Cluster of the Malaysia Disaster Management Agency; 2) National COVID-19 Epidemiological Analysis Task Force under the Ministry of Science, Technology, and Innovation; 3) AFC Covid-19 Advisory Expert Group; 4) UMMC COVID-19 Task Force; and 5) The Journal of Global Health Science Commission on COVID-19 Response.

Dr Rampal lectures in epidemiology, biostatistics, and research methods at Universiti Malaya. He has supervised 19 Doctoral, ten 4-year Master of Public Health, and 29 Master candidates to completion. He actively supervises 10+ postgraduate students. Since 2005, he has provided many methodological and biostatistical consultations to graduate students and clinical researchers. Dr

Rampal has published 120 peer-reviewed research papers with an h-index of 34 and 18,000+ citations on WOS and an h-index of 37 and 20,000+ citations on SCOPUS.

Dr Rampal is a Fellow of the Academy of Medicine Malaysia and was the past honorary secretary for the College of Public Health Medicine from 2006-2009 and an executive member from 2016 to 2024. He has been the Chair of the Public Health Medicine Specialty Education Subcommittee at the Malaysian Medical Council. He has also been a member of the Technical Advisory Committee for Health Technologies Economic Evaluation, Ministry of Health Malaysia since 2017. He had previously chaired the Malaysian National Conjoint Committee for Public Health Postgraduate Medical Program and the Public Health Society of the Malaysian Medical Association.

Dr Rampal heads the Western Pacific Regional Training Centre of the Special Programme for Research and Training in Tropical Diseases (TDR). He is also an advisory member of the Global Health Program of the Association of Pacific Rim Universities and an international advisory committee member of the ASEAN University Network Health Promotion Network. He is also a member of the International Epidemiology Association and a past member of the American Heart Association/American Stroke Association and the Society for Epidemiology Research.

During the COVID-19 pandemic, Dr Rampal improved the prevention and control of COVID-19 through active research and translation. He had actively communicated with the public through the media on COVID-19 issues. He was a member of the following committees: 1) Science and Technology Expert Panel for Disaster

Risk Reduction under the Health and Emerging Threat Cluster of the Malaysia Disaster Management Agency; 2) National COVID-19 Epidemiological Analysis Task Force under the Ministry of Science, Technology, and Innovation; 3) AFC Covid-19 Advisory Expert Group; 4) UMMC COVID-19 Task Force; and 5) the Journal of Global Health Science Commission on COVID-19 Response.

He has actively advocated and engaged with the community through the media on current health issues. Since 2020, he has conducted 13 TV and 23 radio interviews, had 29 articles, and given 108 interviews to the mass media.

Acknowledgment

I want to acknowledge my gratitude to the following.

To Tan Sri Dato' Dr. Amin and Dato' Dr. Sirajoon Ghani, the Dean and the Head of the Department, respectively, for offering me an opportunity to contribute to the University of Malaya.

To Prof Datuk Dr. Awang Bulgiba and Prof Dr. Maznah Dahlui, who have been excellent mentors and have continued support over the years.

To Prof Dr. April Camilla Roslani, thank you for the opportunity to lead the Faculty's research portfolio. I am grateful for the many things she taught me during her tenure.

To Prof Dato' Dr. Adeeba Kamarulzaman, thank you for the opportunity to lead the department.

To the current Faculty of Medicine Management led by Prof Dato Dr Yang Faridah Abdul Aziz, Profesor Dr. Shahrul Bahyah Kamaruzzaman, Profesor Dr. Muhammad Yazid Jalaludin, Prof. Madya Dr. Tengku Ahmad Shahrizal Tengku Omar, Profesor Dr. Azlina Amir Abbas, and Puan Sarinah Sallip, thank you for your guidance, camaraderie and support. Big thanks to Prof Dr Ong Teng Aik for his help and support.

To the many administrative officers and assistants who help facilitate my work.

To Profs Drs Noran Naqiah, Victor Hoe, Ng Chiu Wan, Moy Foong

Ming, Claire Choo Wan Yuen, Mas Ayu Said, Nirmala Bhoopathy, Rafdzah Ahmad Zaki, Wong Li Ping, and Drs Abqariah Yahya, Nithiah Thangiah, and Howie Lim Sin How, for their camaraderie and support. A special shout-out to those who covered my workload while I was away completing my PhD.

To the many staff members of the SPM Department, past and present, who have helped make my work life easier. Special shoutouts to those who have helped tremendously in administrative matters, including Ms. Nur Hashimah (Early academic career), Mrs. Jayasutha Kamrajoo (HOD tenure), Matron Norchaya Yahya, Ms. Devi Peramalah (Research Centre), Ms. Shathanapriya Ammikapathi, Noor Rasida Abdullah.

To the core administrative team for the research office: Mrs Haslinda Lahuddin, Quratu'aini Nadrah, Wan Nur Syazana, Izaidah Binti Jamaludin, Nor Faizah, Tengku Maimunah, Siti Halimahton Ayob, and Mr Mohd Zamriee.

To all who have contributed to the RO to increase our UM's research impact, thank you, your hard work is reflected in the faculty's performance. It takes a village to raise a baby.

I want to acknowledge the essential contributions of the Research Units and Research laboratories teams. A million thanks to Assoc Prof Dr. Tan Ai Huey, Prof Dr. Vairavan Narayanan, Dr. Lee Yew Kong, Assoc Prof Dr. Puah Suat Moi, Dr. Krishnamurithy a/l Genasan, Professor Dr. Puteri Shafinaz, Dr. Thamil Selvee, Mrs. Thibashini Nair Sathasivan, Assoc Prof Dr. Leo Bey Fen, Assoc Prof Dr. Anwar Norazit, Dr. Jaime Jacqueline Jayapalan, Dr Goh Siew Li and Prof. Dr. Hany Binti Mohd Ariffin.

To the VICOM unit for their support and help.

I graciously acknowledge my indebtedness to my family for their continuing support and love. My father, Professor Datuk Dr. Lekhraj Rampal, has played an immense role in my life and has always provided me with excellent advice, guidance, and support. He has always encouraged me to specialize in a clinical medical specialty; however, his training in Epidemiology and long-standing career with the Ministry of Health may have eventually been the beacon that drew me to Public Health. I would also like to acknowledge the tremendous support from my mother, Surinder Kaur, my brothers, Sanjiv, Rajiv, and Rajesh Rampal, and their families.

I am here because of the unreserved love, support, and understanding from my wife, Lalita Sharma, and my four wonderful daughters, Tanisha Rampal, Tanushri Rampal, Breenda Rampal, and Ritisha Rampal.

Last and most importantly, I thank God for his many blessings and for guiding me to what is true in this life.

Om asato maa sad gamaya,
Tamaso ma jyotir gamaya,
Mrityor ma mritam gamaya,
Om shaantih shaantih shaantih.

O Supreme Being, lead us from untruth to truth,
Lead us from darkness to light,
Lead us from death to immortality.
Om, peace, peace, peace.

Brhadaranyaka Upanishad — I.iii.28

Hare Om

Chapter 1: Research

My first involvement with the research enterprise was as a research assistant for six months in an Occupational Health Research project on "Noise Pollution in Palm Oil Factories" conducted by Professor Dr Krishna Gopal Rampal at the Department of Community Health, National University of Malaysia.

I first had the opportunity to contribute as a research investigator at Clinical Research Centre Hospital Kuala Lumpur. Dr Lim Teck Onn, the principal investigator, invited me to contribute as a clinical investigator. This culminated in a paper in the International Journal of Impotence Research (Lim et al., 2003). The project resulted in a cross-culturally adapted and translated Bahasa Malaysia version of the International Index of Erectile Function.

On returning to Malaysia with my MPH, I joined a research team led by Professor Mulia Datuk Dr. Lekhraj Rampal. On a personal note, he is my father, but we have established a good and long-lasting professional working relationship. I contributed to the team by providing advanced epidemiological input and biostatistical analyses. This included using complex survey analysis and, later on, multiple imputations. Both these concepts were not mainstream then, and there needed to be more software support.

Early evidence for an epidemic of obesity

One of the first significant papers I analyzed and co-authored estimated the prevalence of Obesity in Malaysia in 2004 (L. Rampal et al., 2007).

We estimated that 11.7% (95% Confidence Interval, CI = 11.1 - 12.4%) of the overall national prevalence of obesity among Malaysians aged 15 years and above was 11.7% (95% CI = 11.1 - 12.4%). Obesity prevalence was significantly higher in females (13.8%) compared to males (9.6%) ($p < 0.0001$). The highest prevalence of obesity was found among Malays (13.6%) and Indians (13.5%), followed by Sarawak Bumiputra (10.8%) and Chinese (8.5%). The Sabah Bumiputra had the lowest prevalence at 7.3%. The prevalent odds of Obesity were significantly associated with age, gender, ethnicity, urban/rural status, and smoking status.

This study utilized a population-based cross-sectional design and was conducted across all states in Malaysia. A stratified two-stage cluster sampling design with proportional allocation was used to select participants. The analysis included Malaysians aged 15 years and above. Trained interviewers used a standardized protocol to obtain weight and height measurements and other relevant information. Obesity was defined as a body mass index (BMI) ≥ 30 kg/m^2.

This paper was the first to show evidence of a sharp inflection period in the obesity trajectory in Malaysia. The dramatic 280% increase in obesity prevalence between 1996 and 2004 underscored the urgency of addressing this public health issue. The findings raised awareness about the escalating obesity problem in Malaysia, and the authors emphasized the need for a comprehensive, integrated, population-based intervention program to address the growing problem of obesity in Malaysia.

This national study provided crucial insights into the prevalence and distribution of obesity in Malaysia, serving as a foundation for future research, policy-making, and public health interventions to address this significant health concern. It has been widely cited in subsequent research on obesity in Malaysia, 100 times in SCOPUS and 66 times in WOS, contributing to the body of knowledge on this topic and informing further studies
A few years later, I revisited this dataset and investigated ethnic differences in the prevalence of metabolic syndrome. I then utilized multiple imputations to address the dataset's missingness and conducted further dose-response analysis. My co-authors included Sanjiv Mahadeva, Eliseo Guallar, Awang Bulgiba, Rosmawati Mohamed, Ramlee Rahmat, Mohamad Taha Arif, and Lekhraj Rampal.

Figure 1 describes that the prevalence of metabolic syndrome increases but then plateaus after 60 years old. It also highlights that the association between the prevalence of Metabolic Syndrome and age differs between the different ethnic groups.

Figure 2 describes that the prevalence of central obesity metabolic syndrome increases but then plateaus after 50 years old. It also highlights that the association between the prevalence of Metabolic Syndrome and age differs between the different ethnic groups.
The associations between the Malays and Indigenous Sarawak also suggest a possible birth cohort that will eventually be explored in a future study.

Trends in the prevalence of obesity across the life course and birth cohorts in Malaysia

From one of my earliest papers, I now transition to a more recent research project with a doctoral student, Dr. Teh Chien Huey. I have been interested in examining the trajectories of NCD risk factors for some time but have not found the right time to operationalize them. Working with Teh CH allowed me to explore age-period cohort analysis of various NCD risk factors.

We used Hierarchical Age-Period-Cohort (HAPC) analysis to explore the trajectories of BMI and waist circumference across the life course and birth cohorts by sex and ethnicity (Teh et al., 2023). The study used data from four population-based National Health and Morbidity Surveys conducted in Malaysia in 1996, 2006, 2010, and 2015.

The prevalence of both general and abdominal obesity increased from 1996 to 2015 across all demographics in Malaysia. Figure 3 describes a steep increase in BMI from ages 18 to 60 and then plateaued for both sexes. Females had higher BMI and waist circumference than males across the life course and birth cohorts.

Waist circumference increased monotonically across the life course for both sexes. Malays and Indians had higher BMI and waist circumference trajectories compared to Chinese across all birth cohorts. Notably, more recent birth cohorts showed higher BMI and waist circumference trajectories than earlier cohorts.

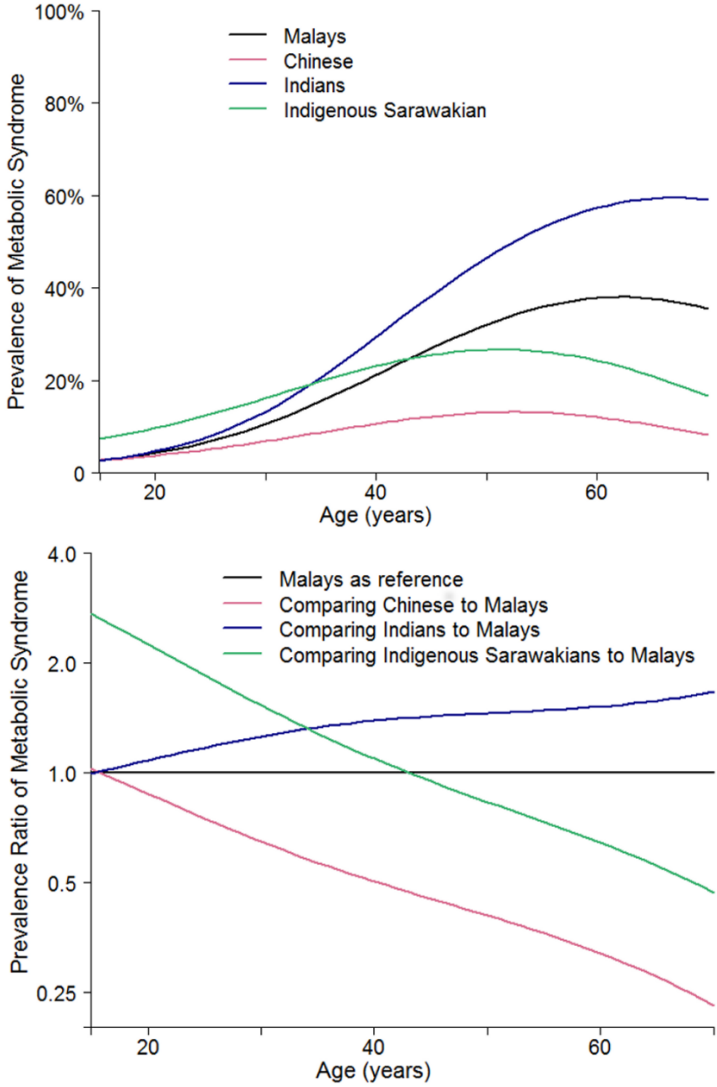

Figure 1. Age-variation in prevalence of metabolic syndrome by ethnicity in Malaysia, 2004.

Reproduced from source: "Rampal, S., Mahadeva, S., Guallar, E., Bulgiba, A., Mohamed, R., Rahmat, R., Arif, M. T., & Rampal, L. (2012). Ethnic Differences in the Prevalence of Metabolic Syndrome: Results from a Multi-Ethnic Population-Based Survey in Malaysia". PLOS ONE, 7(9), e46365.

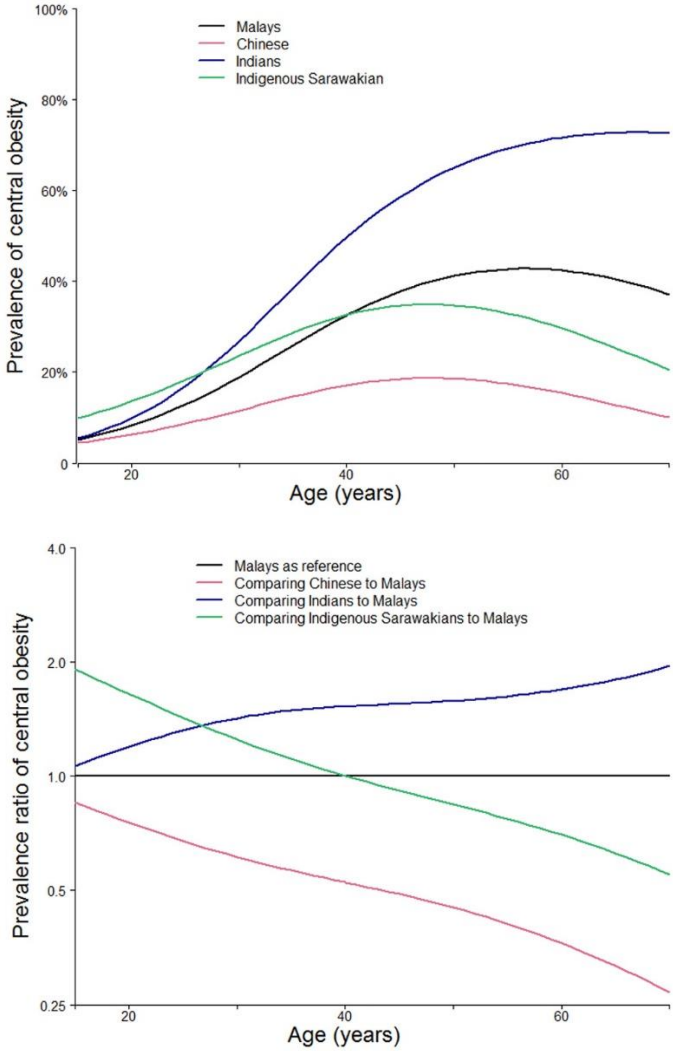

Figure 2. Age-variation in the prevalence of central obesity by ethnicity in Malaysia, 2004.

Reproduced from source: "Rampal, S., Mahadeva, S., Guallar, E., Bulgiba, A., Mohamed, R., Rahmat, R., Arif, M. T., & Rampal, L. (2012). Ethnic Differences in the Prevalence of Metabolic Syndrome: Results from a Multi-Ethnic Population-Based Survey in Malaysia". PLOS ONE, 7(9), e46365.

This comprehensive examination of obesity trends in Malaysia over nearly two decades offers insights into the dynamics of weight gain. It provides valuable insights into the complex dynamics of obesity trends in Malaysia, highlighting important sex and ethnic differences that can inform targeted public health interventions.

The findings highlight the need for targeted interventions for women, who showed more significant increases in both BMI and waist circumference. It also revealed important ethnic differences in obesity trajectories, suggesting the need for culturally tailored prevention and intervention strategies. The results can inform public health policies and strategies aimed at curbing the rising obesity rates in Malaysia, focusing on addressing disparities among different demographic groups.

This study adds to the limited body of evidence on obesity trajectories in Southeast Asian populations, filling a gap in the literature

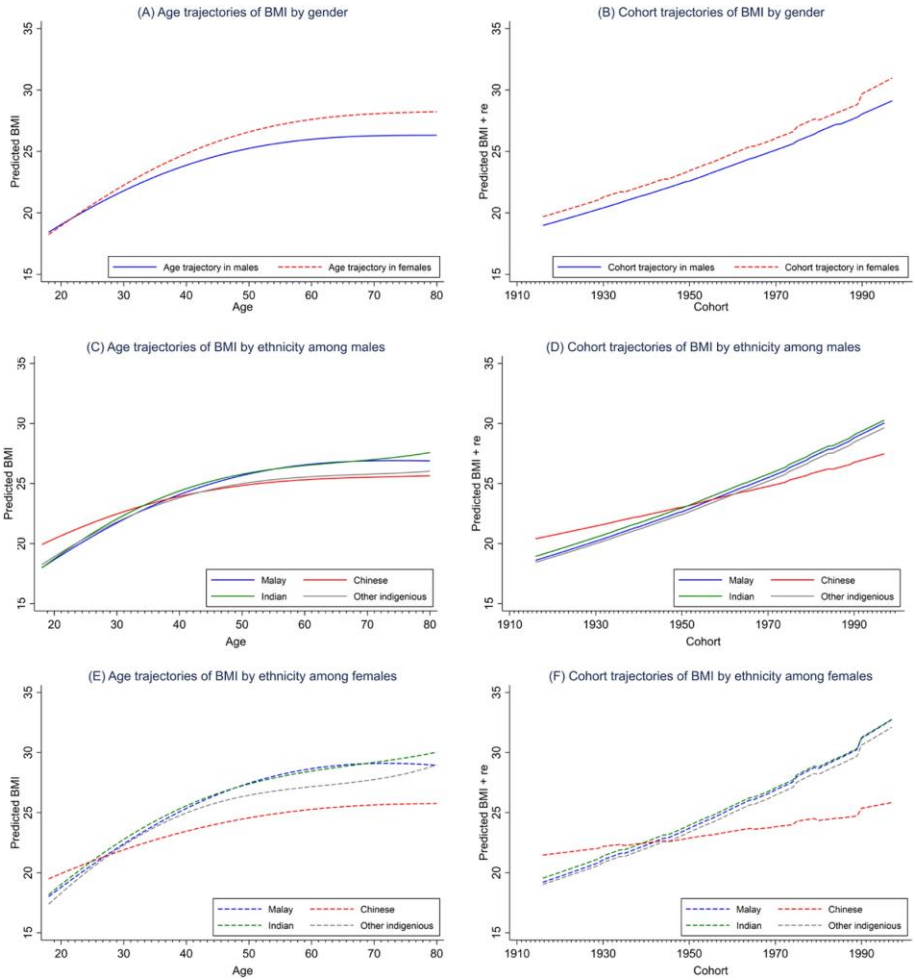

Figure 3: BMI trajectories across age and cohort, by sex and ethnicity in Malaysia

Reproduced from source: "Teh C.H., Rampal S., Kee C.K., Azahadi O., Tahir A. Body mass index and waist circumference trajectories across the life course and birth cohorts, 1996-2015 Malaysia: sex and ethnicity matter. (2023) Int J Obes (Lond),47(12),1302-1308.

Global burden and trends in the prevalence of obesity

We then contributed to the NCD Risk Factor Collaboration group, which resulted in several publications focusing on obesity.

The study by Stevens *et al.* analyzed global trends in adult overweight and obesity from 1980 to 2008 (Stevens et al., 2012). It noted a global increase in its prevalence. The age-standardized prevalence of obesity nearly doubled from 6.4% in 1980 to 12.0% in 2008. Women had higher obesity rates than men throughout the study period. The highest obesity rates were observed in North America, while the lowest were in South Asia. The fastest increases in obesity prevalence were seen in Oceania.

The NCD Risk Factor Collaboration extended the analysis to include children and adolescents, and further covered the period from 1975 to 2016 (NCD-RisC, 2017).

They estimated that the global prevalence of obesity in children and adolescents between 1975 an 2016 had increased from 0.7% to 5.6% in girls and from 0.9% to 7.8% in boys. In addition, the prevalence of underweight decreased but remained high in some low-income countries, particularly in South Asia. They concluded that while the rising trends in children's and adolescents' BMI had leveled off in many high-income countries at high levels, it remained on an upward trajectory in many other countries.

The NCD Risk Factor Collaboration then focused on the rural-urban divide in obesity trends from 1985 to 2017 ((NCD-RisC, 2019)). The study found that over half of the global rise in mean BMI and more than 80% of the increase in obesity was due to increases in

rural populations. In low- and middle-income countries, rural areas experienced a faster increase in obesity rates compared to urban areas. The rise in rural BMI was higher among women except in Sub-Saharan Africa. The largest increases in rural BMI were observed in Central Latin America, South Asia, and Oceania.

The findings from a subsequent analysis in 2021 suggested that interventions targeting the entire BMI distribution, rather than just the upper tail, might be more effective in addressing both obesity and underweight ((NCD-RisC, 2021)). This was due to a persistence in the lower tail of the BMI distributions. The following figure differentiates the possible shifts in population distribution of BMI.

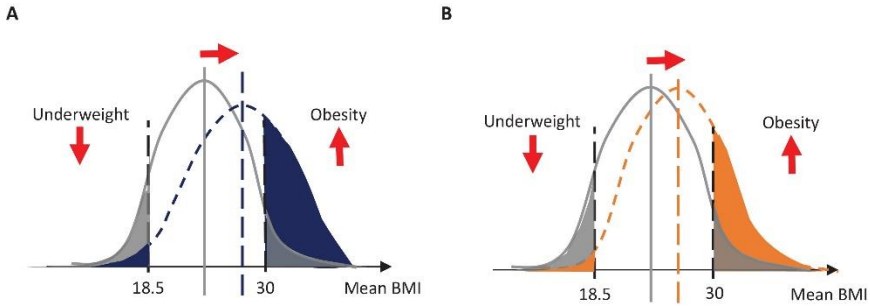

Figure 4: Schematic diagram of the contribution of change in mean body mass index (BMI) to the total prevalence of underweight or obesity.
(A) Change in the prevalence of underweight and obesity if the distribution shifts, represented by a change in its mean and shape (standard deviation). In this example, the change (shown as the difference between blue and gray) results in a smaller decrease of underweight and a larger increase in obesity.
(B) Change in the prevalence of underweight and obesity when only mean BMI changes (shown as the difference between orange and gray); there is a change in the mean without a change in the shape (standard deviation) of the distribution.
Reproduced from source: "Heterogeneous contributions of change in population distribution of body mass index to change in obesity and underweight," by NCD Risk Factor Collaboration (NCD-RisC),2021, Elife;10:e60060

The most recent NCD Risk Factor Collaboration analysis publication provides a comprehensive analysis of global trends in underweight and obesity from 1990 to 2022 (NCD-RisC, 2024). By 2022, over 1 billion people worldwide were living with obesity, including 880 million adults and 159 million children and adolescents. Adult obesity rates nearly tripled for women (6.6% to 18.5%) and quadrupled for men (3% to 14%) between 1975 and 2022. Obesity rates in children aged 5-19 increased tenfold from 1975 to 2022. This was consistent with the previous analysis.
The combined prevalence of underweight and obesity increased in most countries, driven primarily by increases in obesity. The highest combined prevalence of underweight and obesity was found in island nations in the Caribbean, Polynesia, and Micronesia, as well as countries in the Middle East and North Africa. Despite overall declines, underweight remained prevalent in certain South Asian and African countries.

In conclusion, these NCD Risk Factor Collaboration studies collectively demonstrate a consistent global trend of increasing obesity rates across all age groups, with a particularly alarming rise in childhood obesity. While underweight prevalence has generally decreased, it remains a significant issue in certain regions. The research highlights the complex nature of the "double burden" of malnutrition, emphasizing the need for comprehensive, population-wide interventions to address both ends of the BMI spectrum.

Association between dietary patterns and the prevalence of diabetes, metabolic syndrome, and subclinical atherosclerosis.

Under the guidance of Eliseo Guallar and Juhee Cho, I collaborated with a group of clinical researchers from Kangbuk Samsung Hospital, including Seungho Ryu, Yoosoo Chang, and Yuni Choi. I worked with Eliseo, Yiyi Zhang, and Di Zhao for several years, managing the Kangbuk Samsung Health Study datasets.

As part of my doctoral dissertation, I investigated the associations between dietary patterns and the prevalence of diabetes and metabolic syndrome, and subclinical atherosclerosis.

Dietary patterns were derived from the study participants and labeled as Traditional Korean, Modern Korean, and Western Korean among the 269,266 adult men and women who underwent a screening examination. Compared to Traditional Korean diets, higher adherence to modern Korean diets were associated with higher odds of diabetes and metabolic syndrome.

We further analyzed prevalent subclinical atherosclerosis in 27,028 participants with coronary artery calcium scores. However, we found no significant associations between adherence to the three dietary patterns and coronary artery calcium scores.

Metabolically healthy obesity

Metabolically healthy obese individuals had a significantly higher risk of developing non-alcoholic fatty liver disease (NAFLD) compared to metabolically healthy normal-weight individuals (Chang, Jung, et al., 2016). The risk increased with BMI, even

among those considered metabolically healthy.

Metabolically healthy obese individuals had a higher risk of developing chronic kidney disease compared to metabolically healthy normal-weight individuals (Chang, Ryu, et al., 2016). The risk increased with BMI, suggesting that obesity itself, regardless of metabolic health, is a risk factor for chronic kidney disease.

Metabolically healthy obese individuals had a higher prevalence of coronary artery calcification compared to metabolically healthy normal-weight individuals(Chang et al., 2014). This suggests that obesity may increase cardiovascular risk even without metabolic abnormalities.

Multiple studies highlight that being metabolically healthy does not fully protect against the adverse effects of obesity. Even metabolically healthy obese individuals have increased risks for various health conditions compared to their normal-weight counterparts.

The research collectively illustrates that metabolic disorders are complex and interconnected, involving multiple organ systems (liver, kidneys, cardiovascular system) and influenced by various factors (obesity, viral infections, metabolic health status).

The studies suggest that even in seemingly healthy individuals (e.g., metabolically healthy obese), there are increased risks for future health problems, highlighting the importance of early intervention and prevention strategies.

The complex interplay between obesity and other diseases.

I have been interested in traditional cardiovascular risk factors' role in other diseases. The shared pathophysiological mechanisms of these upstream risk factors have led me to complete a number of research analyses that analyzed the role of the risk factor in colorectal adenoma and other communicable diseases, such as Dengue.

Association between Adiposity markers and colorectal adenomas

Through the guidance of Eliseo Guallar and Juhee Cho, I was fortunate to collaborate with a group of clinical researchers from Samsung Medical Center, Sungkyunkwan University School of Medicine. We worked on a health screening dataset and investigated the association between various cardiovascular risk factors and the prevalence of colorectal adenomas in 19,361 consecutive South Koreans who underwent a screening colonoscopy.
Higher levels of BMI, waist circumference, and body fat percentage were significantly associated with the prevalence of colorectal adenomas.
The research project also found that the prevalence of colorectal adenomas was significantly associated with markers of glucose metabolism, markers of dyslipidemia, and coronary artery calcium scores (S. Rampal et al., 2014; Yang et al., 2013; Yun et al., 2018)
Higher fasting glucose, fasting insulin, and HOMA-IR (insulin resistance) were associated with an increased risk of colorectal adenoma. The association was stronger for advanced adenomas. This highlights that insulin resistance and hyperinsulinemia may play a role in colorectal carcinogenesis.

Higher levels of total cholesterol, LDL cholesterol, and triglycerides were associated with an increased risk of colorectal adenomas. Lower HDL cholesterol levels were associated with an increased risk of colorectal adenomas. These associations were stronger for high-risk or advanced adenomas.

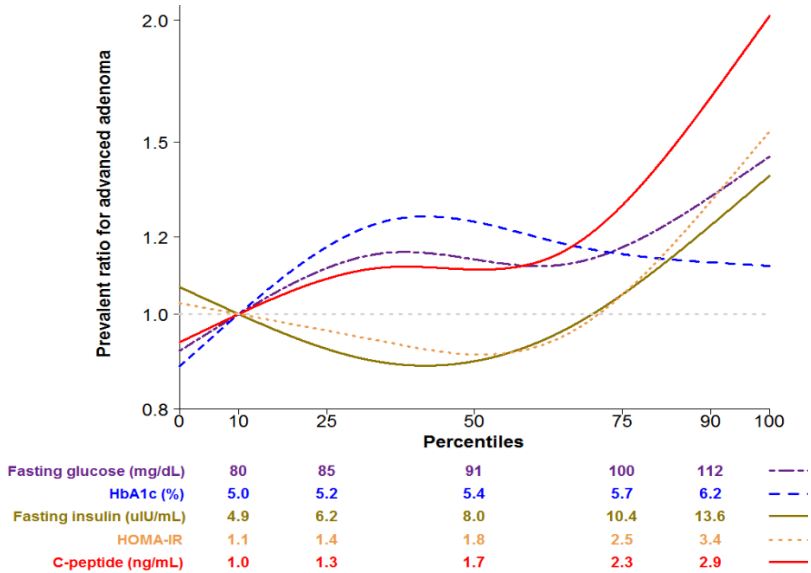

Figure 5. Association between advanced colorectal adenomas and markers of glucose metabolism

Figures 5 have been submitted for the following publications: "Rampal, S., Yang, M. H., Sung, J., Son, H. J., Choi, Y.-H., Lee, J. H., Kim, Y.-H., Chang, D. K., Rhee, P.-L., Rhee, J. C., Guallar, E., & Cho, J. (2014). Association between markers of glucose metabolism and risk of colorectal adenoma." Gastroenterology, 147(1), 78-87.

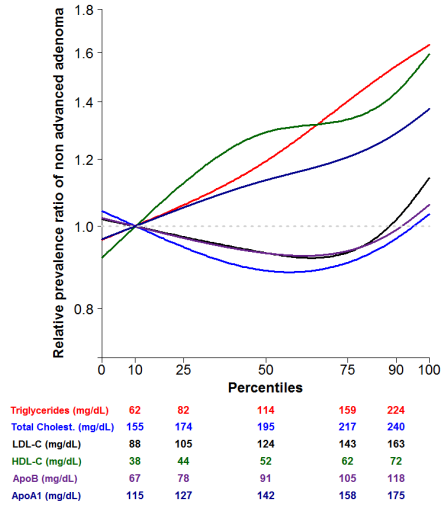

Figure 6. Association between colorectal adenomas and markers of dyslipidemia.

Figures 6 have been submitted for the following publication: "Yang, M. H., Rampal, S., Sung, J., Choi, Y.-H., Son, H. J., Lee, J. H., Kim, Y. H., Chang, D. K., Rhee, P.-L., Kim, J. J., Rhee, J. C., Chun, H.-K., Guallar, E., & Cho, J. (2013). The association of serum lipids with colorectal adenomas." The American Journal of Gastroenterology, 108(5), 833–841.

Association between obesity and severity of dengue infection

Working with Dr. Mohd Syis bin Zulkipli, we investigated the associations of Obesity, Diabetes Mellitus, and Hypertension with Dengue Severity (Zulkipli et al., 2018, 2021).

We conducted a cohort study among 173 laboratory-confirmed dengue patients aged >18 years in the central region of Peninsular Malaysia from May 2016 to November 2017. Dengue severity was defined as either dengue with warning signs or severe dengue. Participants underwent daily follow-up, during which vital signs, warning signs, and full blood count results were recorded. The study used mixed-effects logistic regression to model the incidence of

Dengue severity and mixed-effects linear regression for changes in platelet count and hematocrit.

Higher BMI levels was significantly associated with higher odds of developing more severe dengue. A higher BMI was also associated with higher hematocrit levels. The dose-response analysis revealed that as BMI increased, the odds of DS, hematocrit levels, and platelet levels increased during the first phase of dengue fever.

The study provided novel findings that suggest risk-stratifying dengue patients based on obesity for closer monitoring and prevention of severe dengue complications. Given the increasing prevalence of obesity in areas with high risk of dengue infection, these findings suggest that obesity may increase the burden and mortality related to dengue infection.

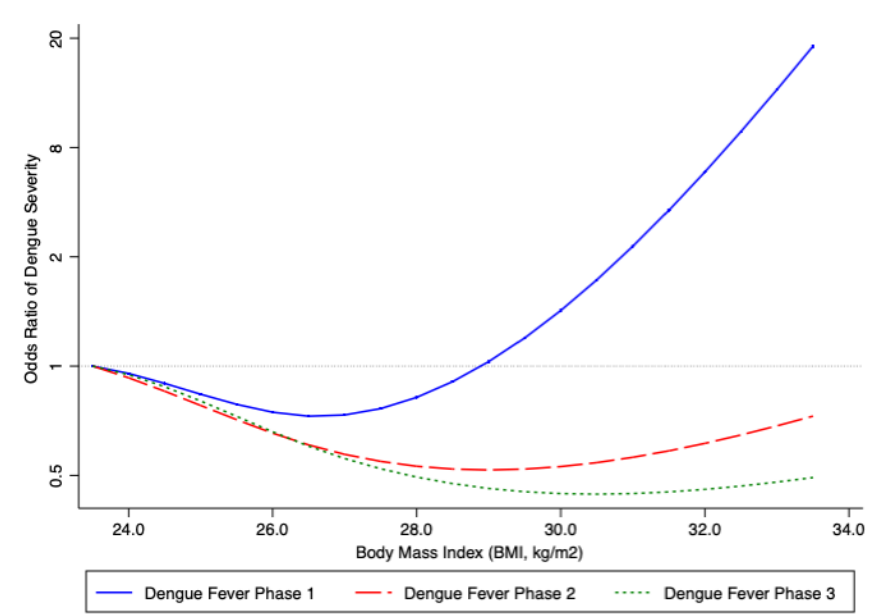

Figure 7: Dose-response relationship between BMI and dengue severity by dengue fever phase

Figures 7 have been submitted for the following publication: "Zulkipli, M. S., Rampal, S., Bulgiba, A., Peramalah, D., Jamil, N., See, L. L. C., Zaki, R. A., Omar, S. F. S., & Dahlui, M. (2021). Is there any association between body mass index and severity of dengue infection?" Transactions of the Royal Society of Tropical Medicine and Hygiene, 115(7), 764–771.

Chapter 2: Career

"If I have seen further, it is by standing on the shoulders of giants,"
Isaac Newton

"we see more and farther than our predecessors, not because we have keener vision or greater height, but because we are lifted up and borne aloft on their gigantic stature."
Bernard of Chartres

Early Career

I have often reflected on my life's journey, which has brought me here today. My educational and professional path has been anything but linear, winding through various paths and trajectories. I am grateful and acknowledge the grace of the almighty for guiding me to where I am today.

I initially attended La Salle Klang before moving on in Form 3 to St Johns Institution, where I completed my SPM. Toward the end of my secondary education, I had a chance to discuss his experience as an exchange student in the United States with my uncle, Prof Dr. Krishna Gopal. I applied and was accepted for the one-year American Field Scholarship (AFS) Intercultural Program in Australia. I stayed with a host family and had frequent immersive experiences with fellow international students and local Australian communities.

As an exchange student embedded in a completely new culture, I gained many valuable life skills that have helped me along the way. One such lesson was that when dealing with different cultures, acceptance of others is critical. When interacting with international friends and communities, there is no right and wrong culture;

cultures are just different, and acknowledging the differences helps us build bridges across communities. This nontraditional learning made me appreciate the educational opportunities beyond the classroom. This experience expanded my worldview tremendously and improved my ability to make friends. It also made me realize that our modern society was rapidly moving toward becoming a Global Village and that I needed to become a global citizen to navigate it better.

Following my transformative year in Australia, I returned home with a renewed sense of purpose and explored various opportunities to pursue a medical degree. I also worked as a research assistant for several months to better understand medical research. I then enrolled in a medical program at MS Ramaiah Medical College in Bangalore, India. I am very grateful to my parents for the financial support that allowed me to complete my medical degree without financial burdens.

During medical school, I learned I was more attracted to the medical disciplines than the surgical ones. After graduating, I returned to serve and joined the Ministry of Health Malaysia. I gained valuable clinical experience as a medical intern at Hospital Tuanku Ampuan Rahimah Klang, Selangor, Malaysia.

The Klang General Hospital was well known (and still may be) to have a very high bed occupancy rate. I still remember the medical ward that typically overflowed with patients. The regular beds and additional bed cots were almost always in use. However, despite the high workload, the Medical Officers, specialists, and consultants were all very professional and cordial. They helped me improve my medical knowledge and become a more competent medical officer.

I remember my first day of work, meeting the Hospital Director and then going to start work at the Medical Ward. The two medical officers in charge of the ward were instrumental in guiding me and showing empathy towards my development as a fresh medical officer. One of those medical officers I met that first day was Professor Dr Chee Kok Han. I also had good working relationships subsequently in the Department of Surgery and Obstetrics and Gynecology. I also learned a lot from my fellow intern colleagues. Good relationships between interns are essential to building resilience that collectively helps navigate our early medical careers.

I was then posted as a Medical Officer in the Department of Pediatrics, Hospital Selayang, in 1999. I spent most of my time in the Neonatal Intensive Care Unit. I learned much from my head consultant, Dato Dr. Lim Nyok Ling, and specialists. We nurtured fragile lives as a team, and I learned about building resilience in adversity. I rapidly improved my competency in the pediatric field. The queue for the pediatric specialist training made me look for opportunities in other fields. I was then posted to the Emergency Department under Dr Sabariah in 2001 and provided services in the Green, Yellow, and Red Triage areas.

I enjoyed working in both Departments. Though we worked long hours, I liked the working environment, which fostered personal growth. This highlighted the importance of having leaders who foster supportive cultures in healthcare teams. My early career has shaped me into the passionate and dedicated medical professional I am today.

My work nature drastically shifted from a very hands-on clinician role to one where I was bridging science and practice. I joined the

first Ministry of Health Clinical Research Centre in 2002. My roles in the Clinical Research Centre's Clinical Trial Unit included being a Medical Officer (Research), Clinical Research Associate, Research Methods and Biostatics Trainer, and Good Clinical Practice trainer. I was involved in clinical trial operations for industry-sponsored, investigator-initiated, and government-funded studies.

I enjoyed working under the guidance of Dato Dr. Zaki Morad, Dr. Lim Teck Onn, Dr. Ding Lay Ming, Dr. Rugayah Bakri, and Dr. Jamaiyah Haniff. They encouraged me to pursue a degree in epidemiology and biostatistics. My father encouraged me to apply for the Master of Public Health program at the Harvard School of Public Health. In retrospect, the decision to only apply to one university was interesting. Due to work commitments, I only had one or two nights to prepare for the required Graduate Research Entrance (GRE) Examinations. I was very fortunate to be accepted into the program for the 2002 intake but differed it by a year to explore scholarship opportunities.

I pursued my MPH from 2003 to 2004 at the Harvard School of Public Health, concentrating in Quantitative Methods. This degree has been invaluable in shaping my career trajectory and introduced me to the fascinating world of Public Health. The MPH program challenged me to think critically and use rigorous analytical approaches. Looking back, the educational experience equipped me with strong fundamental knowledge and drastically changed my career trajectory. I had wanted to continue with a PhD but was on a government scholarship and was obliged to come back home and serve.

After returning to Malaysia in 2004, I transitioned to becoming a Clinical Epidemiologist at the Clinical Research Centre. I worked closely with the National Cancer Registry (Dr. Gerard Lim Chin Chye and Dato Dr. Halimah Yahaya), the National Cataract Registry (Dato' Dr. Goh Pik Pin), and the National Neonatal Registry (Dato Dr. Lim Nyok Ling). My work with the National Cancer Registry culminated with my contribution as a co-editor of the book "Cancer Incidence in Peninsular Malaysia, 2003-2005". However, I soon realized I wanted to significantly impact the Ministry of Health's workforce rather than just supporting it through research. This led me to join Universiti Malaya in 2005.

In my early career years, I built good working relationships with my support staff, peers, seniors, and bosses. I still maintain excellent professional relationships with many of them.

Early academic career: Driving Excellence in Biostatistics, Research, and Epidemiology

The midpoint of one's professional journey presents unique challenges and opportunities for self-discovery and growth. As we take on more senior roles, we must also manage the complex interplay of personal and professional responsibilities. During these early years in UM, working until late at night was common, even pulling all-nighters occasionally. My research work used to start after 5 pm due to other work commitments during the day. As new academics, we must navigate the delicate balance of research, teaching, and service demands. I was fortunate to have good work colleagues.

I joined the Department of Social & Preventive Medicine in 2005 to have a more direct and influential role in shaping our future Public Health Leaders. I still remember my interview with Tan Sri Professor Dr. Mohd Amin Bin Jalaludin and Associate Professor Dato' Dr Sirajoon Noor Ghani. I replied that I wanted to join Universiti Malaya to improve the quality of research at the University and the Ministry of Health, especially in biostatistics and epidemiology. Over the past 20 years, I have been fortunate to have excellent work colleagues and mentors who have helped me navigate the complexities of academia and hone my skills as a researcher, educator, and leader.

I initially joined the department's Medical Statistics Unit. I eventually took over the unit's responsibilities from Professor Dr. Atiya Ab Sallam and Associate Professor Dr. Quek Kia Fatt. I developed the module on Survival Analysis and helped revamp the content for Logistic Regression Analysis. Between 2005 and 2009, I also co-supervised many Public Health Medicine trainees with colleagues from the Family Health unit and Health Policy and Management unit (Associate Professor Dato' Dr Sirajoon Noor Ghani, Professor Saimy@Saman Ismail, Professor Hematram Yadav).

I can summarize my contribution in the department then in the following areas:

1) Research Methodology, Biostatistics, and Epidemiology: I developed and delivered modules at both undergraduate and postgraduate levels. I actively engage my students in learning core concepts and practical skills.

2) Research Mentoring and Collaboration: I have had the privilege of mentoring and collaborating with many junior researchers and Clinical Master's students.

3) Guiding future Public Health Leaders: I supervised 16 MPH students and 10 Public Health Medicine Specialist Trainees during this period. I helped cultivate their interest and inspire them to further their careers in Public Health.

4) Fostering interdisciplinary collaboration: Initially in the Medical Statistics Unit, my passion led my work to transcend both the Units of Epidemiology and Biostatistics. I fostered innovation in teaching material and interdisciplinary collaboration.

5) Building national capacity: Beyond academia, I helped train the workforce of the Ministry of Health, the Malaysian Armed Forces Health Services, and the industry. I conducted training tailored to improve research and evidence-based medicine competency. I organized or presented at 40+ events.

6) Consultations: Between 2006 and 2009, I provided over 100 research methods and biostatistics consultations to UM students and staff.

I am so fortunate to have worked with and been supported by so many wonderful people through those years. Looking back, I positively impacted building capacity in health and medical research, epidemiology, and biostatistics.

Ensuring high-quality clinical research at University of Malaya Medical Centre

From 2006 to 2009, I managed the Clinical Investigative Centre under Professor Rosmawati Binti Mohamed, the Director of the Clinical Investigation Centre (CIC) at the University of Malaya Medical Centre (UMMC). Our Trial physicians were conducting at least 50 trials actively at any one time, and approximately 20-30 study coordinators were assisting them. I collaborated closely with our industry and specialists on site selection and investigator recruitment procedures. I oversaw our local site's study conduct, regulatory compliance, budget negotiation, and agreement review. I provided and facilitated GCP training, equipping our investigators with the tools to conduct rigorous, ethical research. Together, we aimed to conduct high-quality clinical research at University of Malaya Medical Centre.

PhD at Johns Hopkins University: Navigating doctoral studies in multicultural and multinational research teams

My decision to pursue a PhD was a result of a discussion with the Head of the SPM department, Professor Datuk Dr. Awang Bulgiba bin Awang Mahmud, in the 4th quarter of 2008. His encouragement, along with the support and advice from my father, led me to apply to several doctoral programs in the United States of America. This time, I was better prepared with my GRE examination applications, and I was fortunate to receive several PhD offers. After careful consideration and discussions with Prof Awang, I enrolled at the prestigious Johns Hopkins School of Public Health in Baltimore, Maryland.

From 2009 to 2014, I had a transformative experience at Johns Hopkins University. The immersive experiences helped me learn better practices, develop new cultural competencies, and improve my ability to establish beneficial multinational research partnerships. I deepened my scholarship in Public Health and completed my PhD at the Department of Epidemiology, focusing on the intersection between cardiovascular diseases, traditional and novel risk factors, and nutrition. I also completed advanced Biostatistics modules to sharpen my analytical acumen.

At the Welch Center for Prevention, Epidemiology, and Clinical Research, I developed productive and dynamic collaborations with research teams from various countries. During this period, my active research partnerships across boundaries and continents resulted in 36 impactful publications from our collective efforts.

Professors Dr. Eliseo Guallar, Dr. Moyses Szklo, Dr. Carlos Castillo-Salgido, and Dr. Juhee Cho jointly supervised my doctoral studies. Eliseo was my primary dissertation advisor and supervised my dissertation. My supervisors and research teams were from various countries, including the USA, Mexico, South Korea, Spain, and China, and this diversity supported my cross-cultural development.

The PhD program was a mixed-mode program. I had full-time classes for the first year that then decreased with time. The first year was intensive as I took 69 credit hours of classes. I passed the comprehensive exams at the end of the first year. It was a challenging but fulfilling examination. It was an opportunity to apply what I had learned through that year. It was a 2-day open book examination that started in the morning until you finished the day's

paper. The second year's curriculum included a year-long series of Doctoral Seminars that improved my scientific reasoning and critical thinking. I was mostly immersed in research work from Years three to five. A part of that work culminated in my PhD dissertation titled "Korean Dietary Patterns and The Prevalence Of Diabetes, Metabolic Syndrome, And Subclinical Atherosclerosis".

The interdisciplinary and multinational nature of my doctoral studies helped me improve my cultural competence, research agility, and ability to establish fruitful research partnerships.

I worked outside Eliseo's office for three years during my PhD. In addition to various research meetings, we met once a week for an hour to discuss progress and challenges. I valued his friendship, mentorship, and guidance in shaping my doctoral journey.

I frequently tell my students that the doctoral journey includes theoretical and experiential learning. While theoretical learning may be standardized by having relatively similar curriculums, experiential learning opportunities distinguish one university from another. However, it is up to the student to engage and harness opportunities from the learning environment. The student has to use appropriate strategies to engage with faculty. Students should personalize their communication strategy with their faculty members. Each faculty member is unique and may communicate in different ways. The diversity, experiences, and expertise of Johns Hopkins University's students and faculty enriched my doctoral experience.

I deliberately returned to Malaysia after my PhD to improve the region's health by producing the next generation of public health

leaders. The School's motto, "Protecting Health, Saving Lives, Millions at a Time," still guides me.

Leading a research center

I was away from the Department of Social & Preventive Medicine on a study leave between 2009 and 2014. I rejoined the department in 2014 and worked in the Epidemiology and Biostatistics Unit. I started teaching more advanced epidemiological and biostatistical modules. I supervised both Master's and Doctoral students.
I led the Julius Centre University of Malaya-Center for Clinical Epidemiology and Evidence-Based Medicine from 2014 to 2017. During this period, we reviewed and revised our objectives, improved our engagement with our members and stakeholders, and increased the number of research projects. A total of 57 manuscripts were published, and 17 training sessions had been offered in 2016.

Leading a Department

As head of the Department of Social and Preventive Medicine, I ensured that our department enjoyed transformative growth during my tenure from 2016 to 2021. In February 2021, I managed a team of 28 professionals, six support staff, and 241 actively enrolled Postgraduate students. I remained committed even during my administrative Sabbatical to co-lead the Public Health Response at both the faculty and hospital levels and influenced policy at the national level.

Standing on the shoulders of giants. Building upon the legacy of my predecessors, the Department pursued Universiti Malaya's vision of becoming a global university impacting the world. We strengthened

our governance by updating our strategic plans, re-aligning our vision and mission, updating the department organization, improving engagement with the Ministry of Health and other stakeholders, and ensuring inclusivity and fairness. As a team, we also strengthened our processes to enhance the students' experience and help academicians reach their full potential.

Under my leadership, the Department progressed as a leading regional provider of Public Health Education focused on improving society's health. Our students have embarked on their journey to becoming future leaders, while our academics have progressed towards achieving world-class thought leadership.

During this period, I also developed collaborations with various international associations and universities, including the Association of Pacific Rim Universities (APRU) Global Health Program, ASEAN University Network, Asia-Pacific Academic Consortium for Public Health, Kyoto University, National Taiwan University, Mahidol University, and National University of Singapore.

Leading the Faculty's research portfolio

Since assuming the Deputy Dean (Research) role, I am focused on driving research excellence among the Faculty's 476 academicians. My core research office team comprises three officers, three support staff, and 41 academics. We aim to elevate the research impact of our academic members through strategic initiatives. I lead this team in implementing current plans and supporting our academicians through our research management, research training, and research communication units. I also oversee and work with various lab managers to provide central lab facilities. We also periodically

review our performance against the expected University Key Performance Index and develop new strategies to help the University achieve its mission. We are dedicated to helping nurture the next generation of research leaders as a team.

Together with the Internationalization Unit, we aim to increase the Faculty's international research collaborations, academic exchange, and mobility

Leading the Regional Training Centre for the Western Pacific

The Western Pacific Region's Tropical Diseases Research (TDR) Regional Training Centre (RTC) was established by the Malaysia Global Health Consortium, comprising members from Universiti Malaya, the Institute of Health Systems Research, and the United Nations University International Institute for Global Health (UNU-IIGH). The RTC initially focused on Implementation Research. I now lead this RTC, and we are harmonizing our initiatives with the new TDR strategy of building local research solutions to improve global health. The RTC is re-focusing its initiatives on TDR's major global health challenges, including epidemics and outbreaks, control and elimination of diseases of poverty, climate change's impact on health, and resistance to treatment and control agents.

Chapter 3: Obesity And Public Health

The prevalence of obesity has increased in Malaysia over the past 20-30 years, from 4.4% in 1996 to 11.7% in 2004 and to 21.8% in 2023 (Malaysia, 2024; L. Rampal et al., 2007). This steady rise in Obesity, if left unchecked, will lead to a health crisis caused by non-communicable diseases.

This trend is intricately linked to structural transformations within our society, which are characterized by socio-economic development, urbanization, and an aging population. Additionally, globalization and technological advances have influenced lifestyle changes, including adopting unhealthy diets and physical inactivity. These transformations have impacted the Malaysian lifestyle and led to the emergence of many chronic illnesses.
Malaysians living in urban areas increased from 27% in 1960 to 77% in 2023 (Urbanization, 2018). Urban environments often promote sedentary behaviors and access to calorie-dense, nutrient-poor foods, leading to positive energy balance and weight gain. Furthermore, the availability and accessibility of processed foods have risen in urban areas, often displacing traditional, healthier diets.

As Malaysia's economy has progressed towards upper-middle income status, the burden of obesity is shifting towards the poorer segments of the population. This trend is observed globally, where in low-income countries, obesity is more prevalent among the affluent, while in high-income countries, it is inversely associated with socioeconomic status. In Malaysia, structural inequities and disparities in access to healthy foods and physical activity resources

may also be exacerbating the obesity epidemic, disproportionately affecting lower socioeconomic communities.

Malaysia has experienced a diet transition in the past decades from a primarily plant-based diet to one characterized by increased consumption of meat and processed foods, leading to a surge in overweight and obesity rates. Unplanned urbanization and prevalent marketing of unhealthy products may have expediated this transition. This shift in dietary patterns is not limited to Malaysia, as similar transitions have occurred in countries worldwide where diets have moved towards higher intakes of meat and processed foods, salt, sugar, and saturated fats. As our society increasingly adopts unhealthy diets and physical inactivity, the prevalence of obesity and its downstream complications, such as metabolic-associated fatty liver disease and diabetes, has surged.

Obesity has been associated with over 50 various health issues and comorbidities, and individuals are being treated for obesity-related health problems at increasingly younger ages. The relationship between obesity and non-communicable diseases is complex, with obesity being the primary driver of conditions like hypertension, type 2 diabetes, dyslipidemia, nonalcoholic fatty liver disease, and cardiovascular disease. These rapid changes have collectively intensified the burden of non-communicable diseases in Malaysia and globally.

Faced with the multifaceted challenge of the obesity crisis and its associated health and economic consequences, Malaysia must empower a competent public health workforce to address this pressing concern effectively. Public health professionals play a crucial role in understanding the complex drivers of obesity,

designing and implementing evidence-based interventions, and evaluating their impact on population health. Strengthening the public health workforce will be critical to improving the nation's health and economy.

Chapter 4: A few lessons of life

First, the importance of fostering and sustaining collaborations. Synergistic, long-term partnerships can exponentially enhance an academic's influence on science and society.

Second, the importance of lifelong learning; we must adopt a growth mindset and remain humble regarding our current understanding of the universe. As Karl Popper aptly stated, with increasing knowledge comes a better articulation of our ignorance, raising awareness of what we still do not know.

Third, the importance of fulfilling our responsibilities to the best of our abilities while emotionally detaching from its' outcomes. This perspective allows us to avoid becoming overly attached to results.

Fourth, the importance of being kind to your fellow staff, students, and the community. Be kind, be compassionate, and communicate well with your colleagues, the university is a closed environment, and you will have to live with them.

Five, the importance of failing early. Failure is not the end. Follow up a failure with a root cause or situational analysis to avoid repeating past failures. "What's past is prologue," attributed to William Shakespeare, comes to mind.

Lastly, the importance of achieving a harmonious balance between work and life is crucial. While some individuals may find that their passions align with their professional recognition and financial rewards, many face a complex interplay among various pursuits—finding equilibrium is essential for overall well-being.

References

Chang, Y., Jung, H.-S., Cho, J., Zhang, Y., Yun, K. E., Lazo, M., Pastor-Barriuso, R., Ahn, J., Kim, C.-W., Rampal, S., Cainzos-Achirica, M., Zhao, D., Chung, E. C., Shin, H., Guallar, E., & Ryu, S. (2016). Metabolically Healthy Obesity and the Development of Nonalcoholic Fatty Liver Disease. *The American Journal of Gastroenterology*, *111*(8), 1133–1140. https://doi.org/10.1038/ajg.2016.178

Chang, Y., Kim, B.-K., Yun, K. E., Cho, J., Zhang, Y., Rampal, S., Zhao, D., Jung, H.-S., Choi, Y., Ahn, J., Lima, J. A. C., Shin, H., Guallar, E., & Ryu, S. (2014). Metabolically-healthy obesity and coronary artery calcification. *Journal of the American College of Cardiology*, *63*(24), 2679–2686. https://doi.org/10.1016/j.jacc.2014.03.042

Chang, Y., Ryu, S., Choi, Y., Zhang, Y., Cho, J., Kwon, M.-J., Hyun, Y. Y., Lee, K.-B., Kim, H., Jung, H.-S., Yun, K. E., Ahn, J., Rampal, S., Zhao, D., Suh, B.-S., Chung, E. C., Shin, H., Pastor-Barriuso, R., & Guallar, E. (2016). Metabolically Healthy Obesity and Development of Chronic Kidney Disease: A Cohort Study. *Annals of Internal Medicine*, *164*(5), 305–312. https://doi.org/10.7326/M15-1323

Lim, T. O., Das, A., Rampal, S., Zaki, M., Sahabudin, R. M., Rohan, M. J., & Isaacs, S. (2003). Cross-cultural adaptation and validation of the English version of the International Index of Erectile Function (IIEF) for use in Malaysia. *International Journal of Impotence Research*, *15*(5), 329–336. https://doi.org/10.1038/sj.ijir.3901009

Malaysia, M. of H. (2024). *Fact Sheet National Health and Morbidity Survey (NHMS) 2023*. Ministry of Health Malaysia. https://iku.gov.my/nhms-2023

NCD-RisC, N. R. F. C. (2017). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128·9 million

children, adolescents, and adults. *Lancet (London, England)*, *390*(10113), 2627–2642. https://doi.org/10.1016/S0140-6736(17)32129-3

NCD-RisC, N. R. F. C. (2019). Rising rural body-mass index is the main driver of the global obesity epidemic in adults. *Nature*, *569*(7755), 260–264. https://doi.org/10.1038/s41586-019-1171-x

NCD-RisC, N. R. F. C. (2021). Heterogeneous contributions of change in population distribution of body mass index to change in obesity and underweight. *ELife*, *10*. https://doi.org/10.7554/eLife.60060

NCD-RisC, N. R. F. C. (2024). Worldwide trends in underweight and obesity from 1990 to 2022: A pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. *Lancet (London, England)*, *403*(10431), 1027–1050. https://doi.org/10.1016/S0140-6736(23)02750-2

Rampal, L., Rampal, S., Khor, G. L., Zain, A. M., Ooyub, S. B., Rahmat, R. B., Ghani, S. N., & Krishnan, J. (2007). A national study on the prevalence of obesity among 16,127 Malaysians. *Asia Pacific Journal of Clinical Nutrition*, *16*(3), 561–566.

Rampal, S., Yang, M. H., Sung, J., Son, H. J., Choi, Y.-H., Lee, J. H., Kim, Y.-H., Chang, D. K., Rhee, P.-L., Rhee, J. C., Guallar, E., & Cho, J. (2014). Association between markers of glucose metabolism and risk of colorectal adenoma. *Gastroenterology*, *147*(1), 78-87.e3. https://doi.org/10.1053/j.gastro.2014.03.006

Stevens, G. A., Singh, G. M., Lu, Y., Danaei, G., Lin, J. K., Finucane, M. M., Bahalim, A. N., McIntire, R. K., Gutierrez, H. R., Cowan, M., Paciorek, C. J., Farzadfar, F., Riley, L., & Ezzati, M. (2012). National, regional, and global trends in adult overweight and obesity prevalences. *Population Health Metrics*, *10*(1), 22. https://doi.org/10.1186/1478-7954-10-22

Teh, C. H., Rampal, S., Kee, C. C., Azahadi, O., & Tahir, A. (2023). Body mass index and waist circumference trajectories across the life course and birth cohorts, 1996-2015 Malaysia: Sex and ethnicity matter. *International Journal of Obesity (2005)*, *47*(12), 1302–1308. https://doi.org/10.1038/s41366-023-01391-5

Yang, M. H., Rampal, S., Sung, J., Choi, Y.-H., Son, H. J., Lee, J. H., Kim, Y. H., Chang, D. K., Rhee, P.-L., Kim, J. J., Rhee, J. C., Chun, H.-K., Guallar, E., & Cho, J. (2013). The association of serum lipids with colorectal adenomas. *The American Journal of Gastroenterology*, *108*(5), 833–841. https://doi.org/10.1038/ajg.2013.64

Yun, K. E., Chang, Y., Rampal, S., Zhang, Y., Cho, J., Jung, H.-S., Kim, C.-W., Jeong, C., Cainzos-Achirica, M., Zhao, D., Pastor-Barriuso, R., Shin, H., Guallar, E., & Ryu, S. (2018). Coexistence of Colorectal Adenomas and Coronary Calcification in Asymptomatic Men and Women. *Journal of Clinical Gastroenterology*, *52*(6), 508–514. https://doi.org/10.1097/MCG.0000000000000824

Zulkipli, M. S., Dahlui, M., Jamil, N., Peramalah, D., Wai, H. V. C., Bulgiba, A., & Rampal, S. (2018). The association between obesity and dengue severity among pediatric patients: A systematic review and meta-analysis. *PLoS Neglected Tropical Diseases*, *12*(2), e0006263. https://doi.org/10.1371/journal.pntd.0006263

Zulkipli, M. S., Rampal, S., Bulgiba, A., Peramalah, D., Jamil, N., See, L. L. C., Zaki, R. A., Omar, S. F. S., & Dahlui, M. (2021). Is there any association between body mass index and severity of dengue infection? *Transactions of the Royal Society of Tropical Medicine and Hygiene*, *115*(7), 764–771. https://doi.org/10.1093/trstmh/trab021

UNIVERSITI MALAYA

FAKULTI PERUBATAN
Faculty of Medicine

OBESITY AND PUBLIC HEALTH: CHALLENGES AND OPPORTUNITIES FOR NATIONAL PROSPERITY

Non-communicable diseases (NCDs) have escalated dramatically over the past few decades, a trend intricately linked to structural transformations within Malaysian society. Number one cause of death. These changes, characterized by rapid socio-economic development, increased urbanization, evolving dietary patterns, and an ageing population, have collectively intensified the burden of NCDs globally and in Malaysia. As our Malaysian society increasingly adopts less healthy diets and experiences a decline in physical activity, the prevalence of obesity and its associated complications, such as metabolic-associated fatty liver disease and diabetes, has surged. Notably, the early 2000s marked a significant turning point in the rising obesity prevalence. This lecture aims to summarize my research findings in this critical area.

In addition, I will use this lecture to share my professional and academic journey and offer a few critical insights gained thus far.

We require a dynamic and competent public health workforce to effectively address the challenges posed by the rising burden of NCDs. The discipline of Public Health is critical to improving our nation's health. My academic work at Universiti Malaya will continue to focus on leading efforts to cultivate our region's next generation of public health professionals, specialists, and leaders.