

Health Executives in Asia Leaders (HEAL)
**Precision Public Health:
Transforming Health with Data**



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Introduction to the HEAL Programme

The Healthcare Executive in Asia Leaders (HEAL) Programme was a series of four webinars and four workshops hosted by the Saw Swee Hock School of Public Health at the National University of Singapore from March to August 2021. The programme was supported by Temasek Foundation, in partnership with The American Chamber of Commerce in Singapore.

The importance for managers and leaders, including those in non-health professions, to understand how health issues impact society and business and vice versa is increasingly becoming apparent, particularly in light of the COVID-19 experience. The HEAL programme aimed to equip managers and executives in leadership capacities in all sectors to effectively understand and navigate modern health challenges and to develop an ability to integrate health considerations into their decision making. It is timely to address some aspects of this complex interrelation, and each of the four webinars/workshops examined one specific topic under this lens with a focus on the experience in Southeast Asia, and Asia more broadly.

Throughout this series, and in particular through the workshops, participants discussed topics of relevance within the broad areas of precision public health, food and nutrition, healthy cities, and commercial determinants of health, and related the discussion to their own countries and professional sectors. Guest speakers also shared their expertise and provided their perspectives. One of the outcomes of the series was to build a multi-sectoral cohort of like-minded professionals who can support each other in developing their understanding of public and global health.

Precision Public Health: Transforming Health with Data

Participants were introduced to the emerging theme of precision public health (PPH) and its important implications in revolutionising the world of social, biological, and behavioural health. The event details and speakers were as follows:

Webinar

Tue, 2 March 2021
9:00-10:30am
(SGT)

Speakers

- **Prof Gareth Baynam**
Head, Western Australian Register of Developmental Anomalies
Clinical Geneticist, Genetic Services of Western Australia
Program Director, Undiagnosed Diseases Program
Western Australia
Government of Western Australia Department of Health
- **Asst Prof Nina Schwalbe**
Principal Visiting Fellow, *International Institute for Global Health, United Nations University*
Adjunct Assistant Professor, *Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University*

Moderated by

- **Assoc Prof Hsien-Hsien Lei**
Chief Executive Officer, *The American Chamber of Commerce in Singapore*
Adjunct Associate Professor, *NUS Saw Swee Hock School of Public Health*

Workshop

Thu, 3 June 2021
2:00-4:00pm (SGT)

Speaker

- **Prof Yik-Ying Teo**
Dean, *NUS Saw Swee Hock School of Public Health*

Facilitated by

- **Assoc Prof Jeremy Lin**
Director, Leadership Institute for Global Health Transformation (LIGHT), *NUS Saw Swee Hock School of Public Health*

Executive Summary

This report will highlight some of the key learnings from these discussions, which centred on three broad takeaways:

1. **Technology and stakeholder buy-in as key enablers of PPH.** PPH is made possible with advancements in technology and the way we analyse data, but it will still require gaining the trust and buy-in of key stakeholders including the public.
2. **Areas of opportunities for PPH at the global, national, and individual levels.** PPH covers global and national priority setting, policymaking, and distribution of resources, as well as nudging more healthful behaviours at the individual level.
3. **Challenges and other considerations of harnessing the potential of PPH.** While data owners and users overcome technical challenges of data sharing and minimise cybersecurity, the public sector, private sector, and civil society need to work together to manage the political and ethical concerns of PPH.

Introduction to Precision Public Health

"If precision medicine is about the individual, precision public health is about populations. It is essentially about delivering the right intervention at the right time, every time to the right population."

- Muin J Khoury (2018), Director, Office of Public Health Genomics, Centers for Disease Control and Prevention

PPH is about designing targeted policies and programmes to address health issues and needs of the identified population groups, so that high quality and cost-effective care can be delivered timely. In short, PPH is about providing the right health interventions to the right population groups at the right time and right locality. While PPH and traditional public health both rely on data for risk factor and disease surveillance, screening, interventions, and evaluation, PPH borrows from precision medicine and expands the focus from individuals to the population level to provide a holistic approach to deliver 'personalised' public health.

Recent technological advances in computing, sensor technology, and connectivity are key enablers of PPH that have facilitated the collection, analysis, and use of individual- and population-level data in real-time. This results in a paradigm shift and allows for public health to be more precise. When additional data about people, place, and time are taken into consideration, PPH can give us a deeper understanding of complex health and causal systems. This improved understanding makes it possible to develop effective interventions that address social determinants of health as well as biological and behavioural factors for better health outcomes and the reduction of health inequities. PPH benefits high-income countries by enabling more targeted and effective health promotion methods, but also offers opportunities for low- and low-middle income economies to make more informed, data-driven decisions, especially in priority-setting and allocation of scarce resources.

While PPH promises immense benefits, many real challenges remain in the way of fully leveraging these opportunities. Issues such as ethics, sustainability, data privacy and confidentiality, as well as cybersecurity will still need to be carefully considered as we move forward with PPH.

Acronyms and Abbreviations

PPH	Precision Public Health
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

1. Key enablers of PPH

Technology

PPH is made possible with recent advances in technology, which fall under three main categories:

1. *Connectivity* – improvements in connectivity with each other
2. *Computing* – increased connectivity with systems and computing power
3. *Compression* – the miniaturisation of devices with large computing power

Together with the data revolution that has improved how data is produced, analysed and used, these offer incredible opportunity for public health through the following ways:

- The collection and analysis of data at subnational or district levels, rather than national levels, allow policymakers to allocate resources to higher risks areas.
- The digitalisation of work processes, such as the use of electronic health records and health information systems, allows data to be pooled and shared across agencies.
- The triangulation of data from traditional and non-traditional public health sources, such as geospatial mapping, facial recognition and genomics, provide us with new insights on public health.

Stakeholder Trust and Buy-in

However, the adoption of PPH will not be possible without the buy-in of the target population. These conversations will take time and deliberate crafting of cultural-specific messaging, and should take into consideration principles that promote equity such as the FAIR and CARE Principles for Indigenous Data Governance¹.

One key challenge to gaining stakeholder buy-in is that research funding is often provided only for a short period of time, which may create unwanted dynamics when researchers try to develop relationship and trust of the community. One way to overcome this is to allocate sufficient funding to support the community that co-creates and implements the project, as they are crucial to the project's success.

¹ FAIR, Findable, Accessible, Interoperable, and Reusable. CARE, Collective benefit, Authority to control, Responsibility, and Ethics.

2. Areas of Opportunities for PPH

PPH uses data from traditional and emerging sources to target interventions for populations by person, place, and time, with a specific focus on informing decision-making to reduce health disparities. PPH may be employed to improve public health at three different levels:

1. At the **global** level, the intelligence of health trends provides insights on health outcomes, in both chronic diseases and non-chronic diseases. With PPH, public health practitioners may better understand national and global risk factors to set international guidelines and laws. It may also guide the distribution of resources and assistance from high- and upper middle-income countries to low- and lower middle-income countries.
2. At a **national** level, availability of local evidence will guide policymakers to make more informed decisions and prioritise policies that matter. For example, risk stratification may enable relevant authorities to identify subpopulations at risk and implement target strategies to mitigate these risks. These allow for better management of scarce resources, including time and effort.
3. At the **individual** level, PPH is about what individuals can do to measure their environmental and inherent risks. For example, using genetic information to predict the risks of side effects or treatment efficacy, monitoring adherence to healthful behaviours with wearables, or even nudging health-seeking behaviour with smartphones and smartwatches.

Some examples of the use of PPH were discussed during the webinar:

1. **Disease outbreak surveillance.** Overlaying geospatial information and public health data provides new insights for more targeted and cost-effective programmes. For example, 90% of the disease burden can be addressed by focusing on just 14% of the total area in which the mosquito *Aedes aegypti* transmits chikungunya, dengue, yellow fever, and Zika. With more data on climate patterns, biodiversity loss, and urbanisation, we may also be able to better predict when or where future outbreaks could occur.

2. **Personalised population health and breast cancer screening.** While existing breast cancer screening guidelines are based on one's age, appropriate screening regimes could be further customised for women based on their personal medical history, family history, and genetic testing. This may lead to more efficient screening programmes and large savings in time and resources.
3. **Population mental health surveillance.** PPH also allows for passive, at scale and inexpensive population mental health surveillance through digital phenotyping, using data from personal digital devices to give a sense of the individual's state of mind.
4. **Management of COVID-19 in New York City.** Data in New York City showed that the death risk from COVID-19 is elevated in older age groups and racial minority groups, which could inform vaccine distribution strategies.
5. **Improving healthcare accessibility in remote or indigenous communities.** Professor Baynam shared two initiatives that increase accessibility to health services using PPH. [Lyfe Languages](#), an Indigenous Medical Translator currently available in Australia and Ghana, utilises technology to overcome language and cultural barriers for medical professionals to deliver better health services to indigenous communities. [Mappa](#) (Mapping Health Services Closer to Home) increases the physical accessibility of remote communities to health services, by mapping out location of services, identifying local referral options, and improving travel planning.
6. **Analysis of COVID-19 vaccination hesitancy through social media.** Social media tracking provides policymakers with a good understanding of the evolving concerns of vaccine hesitancy. This data can be used in tandem with other data sources for resource and logistics planning including vaccine supplies and the capacity of vaccination centers.

7. **Personalised health promotion.** The [LumiHealth](#) Initiative, a partnership between Singapore's Health Promotion Board and Apple that started in 2020, is a personalised programme that aims to encourage healthy activity and behaviours by delivering 'nudges' at real-time at scale through the Apple Watch. It gamifies healthful behaviours, allowing users to participate in social challenges and earn points and rewards. The data from this programme will inform public health experts about the populations who are receptive to these real-time 'nudges'.

3. Challenges of harnessing the potential of PPH

While PPH promises immense benefits, many real challenges remain in the way of fully leveraging these opportunities. Several challenges and future directions were discussed during the webinar and workshop.

1. **Sustainability**

PPH programmes must, first and foremost, be effective in achieving better and sustained health outcomes. After establishing this, health systems must then determine the cost-effectiveness and downstream implications of a programme. For example, sufficient resources must be available for downstream surveillance or disease management. The context of the country is also an important consideration in decision making. PPH initiatives that require external support may not be sustainable if local capacity is not built, especially as long-term support schemes may be withdrawn as LMICs become wealthier.

2. **Cybersecurity, Data Ownership and Sharing**

To further the potential of PPH, anonymised data should ideally be made available to researchers. In the past, we have not been able to share data well, especially across borders, due to technical challenges (e.g., data interoperability) and political challenges (e.g., who shares data). Private-public partnerships is one way to improve this. For example, [Facebook Data For Good](#) is working with universities to provide public datasets such as population density maps, movement range maps, and survey results to academics, researchers, and policymakers to inform public health policies for COVID-19. While data risks cannot be eliminated, safeguards in the form of technology or data governance and regulations must be in place to minimise risks.

3. **Ethical Concerns and Social Acceptance**

Many ethical concerns also surround the data collection, ownership, and usage. Society may be concerned about their data privacy, at least in the short term. One example raised is whether health or genetic data can be accessed by insurance companies. To address these concerns, public health professionals need to involve social scientists and economists in PPH, as well as learn from the experience and best practices from other countries' case studies.

4. **Existing Regulations and Political Will**

Ground-up initiatives will encounter a lot of resistance against existing laws or perceptions of the law, as institutions are averse to bearing the responsibilities of these risks. Therefore, top-down approaches may see more success in the short run, such as the move towards sequencing all *Mycobacterium tuberculosis* to trace and manage outbreaks. However, there still needs to be proper change management to align the expectations of leaders and managers on the ground. In the past, healthcare leaders have the political will and are enthusiastic about effecting change, but existing regulations have hindered the implementation of these changes. For example, it was challenging for artificial intelligence experts to access mammogram data to train machine learning algorithms, due to existing laws that protect individual data very well. This may improve once relevant government ministries or agencies decide that the adoption of precision techniques is the way to delivering healthcare.

References

Khoury, M. J. (2018). Precision Public Health: What Is It?. *US Centers for Disease Control and Prevention*, May, 15.

Other Resources

Watch the HEAL webinar on "Precision Public Health: Transforming Health with Data" here:

https://www.youtube.com/watch?v=QhggFMNebXY&ab_channel=SawSweeHockSchoolofPublicHealth

Precision Public Health Asia Society (P-PHAS)

<https://pphasia.com/>

Precision Public Health Asia 2021 Conference

https://www.youtube.com/watch?v=wLQ9J2NjZ20&list=PLYT_ksvMiztTGUV5daJVHcS2y7t52YHAW&ab_channel=SawSweeHockSchoolofPublicHealth

The link directs you to a playlist of videos and webinars from the Precision Public Health Asia 2021 Conference (7 – 9 April 2021) organised by NUS Saw Swee Hock School of Public Health

How Are We Going To Use Our Health Data For Public Good?

<https://www.forbes.com/sites/enriquedans/2019/11/18/how-are-we-going-to-use-our-health-data-for-publicgood/>

Big data: A new dawn for public health?

<https://www.oecd-ilibrary.org/sites/f24cb567-en/index.html?itemId=/content/component/f24cb567-en>

Speakers



Webinar Speaker

Prof Gareth Baynam

Head, Western Australian Register of Developmental Anomalies
Clinical Geneticist, Genetic Services of Western Australia
Program Director, Undiagnosed Diseases Program Western Australia
Government of Western Australia Department of Health

Prof Baynam is a practicing clinical geneticist, genomic policy advisor, clinician scientist and intrapreneur. He equitably translates innovations for public health, including through public-private and multi-stakeholder partnerships and with a line of sight to patient need. He has led the clinical implementation of genomic and phenomic (objective phenotyping) digital health technologies and omics-associated policy.

Prof Baynam led the creation of the Rare and Undiagnosed Diseases Diagnostic Service at Genetic Services of Western Australia (GSWA); directs the Undiagnosed Diseases Program (UDP)-WA and is a founding member of the International Board of Directors of the Undiagnosed Diseases Network International. He is the Chair of the Diagnostics Scientific Committee of the International Rare Diseases Research Consortium, and Chair of the "Standards of Practice Workstream" of the Global Commission to End the Diagnostic Odyssey for Children with Rare Diseases. He heads the Western Australian Register of Developmental Anomalies, is a Clinical Prof at UWA and Notre Dame and A/Prof at Murdoch and Curtin Universities, and the University of Melbourne. He led the clinical implementation of the first Aboriginal genomics reference range and leads clinical and research Aboriginal genetic health care initiatives at GSWA. He is a Director of the Academy of Child and Adolescent Health. He leads clinical diagnostic initiatives for cerebral palsy (Cerebral Palsy GUARDIANS), including Project Y, Pilbara Faces and Lyfe Languages that combine text mining, whole genome analysis and 3D facial analysis. He is a member of the Governance Council of the International Cerebral Palsy Genomics Consortium. Prof Baynam is also a Member of the Western Australian Ministerial for Precision Health. He is the Founder of interwoven initiatives to improve the lives of children living with rare diseases.



Webinar Speaker

Asst Prof Nina Schwalbe

Principal Visiting Fellow, *International Institute for Global Health, United Nations University*

Adjunct Assistant Professor, *Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University*

Nina is currently the principal at Spark Street Advisors which supports governmental and non-governmental organizations, private foundations, private sector and international institutions with public health analysis and policy and strategy development. She has held numerous leadership positions including as Managing Director for Policy and Performance at Gavi, the vaccine alliance, where she led Gavi's work in strategic planning, policy development, market-shaping, performance management, and monitoring and evaluation. She also served as the principal advisor and acting chief of health at UNICEF, overseeing their health programs in over 150 countries.

Nina led the Policy team at Global Alliance for Tuberculosis Drug Development, where she focused on market access, product introduction and advocacy. She directed the global public health program for the Open Society Foundation and has worked for the Population Council and AVSC International (now Engender Health). She holds degrees from Harvard and Columbia Universities and is on the faculty at Columbia University's Mailman School of Public Health. Nina is a lifetime member of the Council on Foreign Relations and currently serves as a Principal Visiting Fellow at the United Nations International Institute for Global Health. She also chairs Gavi's Evaluation Advisory Committee and co-leads WHO's Research Network on COVID in Educational institutions.



Webinar Moderator

Assoc Prof Hsien-Hsien Lei

Chief Executive Officer, *The American Chamber of Commerce in Singapore*
Adjunct Associate Professor, *NUS Saw Swee Hock School of Public Health*

Hsien-Hsien Lei, PhD, is CEO of The American Chamber of Commerce (AmCham) in Singapore — the largest and the most active international business association in Singapore and Southeast Asia, with over 6,000 members representing over 550 companies. Lei is also an Adjunct Associate Professor at the National University of Singapore Saw Swee Hock School of Public Health, member of the Johns Hopkins Bloomberg School of Public Health's Advisory Board, member of the Singapore Institute of Directors MNC Committee, co-lead of the WorkWell Leaders SME Action Sub-Group, and on the organizing committee of the Precision Public Health Asia Conference.

Prior to AmCham, Lei was Vice President, Medical and Scientific Affairs, Medtronic Asia Pacific, where she was responsible for the Medtronic Innovation Centers in Japan and Korea, training and education, and the company's health systems transformation strategy in the region. She also has extensive experience in corporate communications, advertising and promotion, and government affairs.

Lei has lived and worked in the US, Taiwan, Japan, Vietnam, UK, and is now based in Singapore. She holds a PhD in Epidemiology from The Johns Hopkins University Bloomberg School of Public Health where she was the recipient of a US National Institutes of Health Cardiovascular Disease Epidemiology Training Grant. Her doctoral thesis explored the genetic epidemiology of end-stage renal disease and type 2 diabetes. She completed her post-doctoral fellowship at National Taiwan University Hospital in the Department of Internal Medicine. Lei also holds a BA (with honours) in Human Biology from Stanford University.



Workshop Speaker

Prof Yik-Ying Teo

Dean, NUS Saw Swee Hock School of Public Health

Professor Yik-Ying Teo, or commonly known as YY, is the second Dean of NUS School of Public Health. Trained as a mathematician at Imperial College and having completed his MSc and DPhil at Oxford in statistical genetics, YY returned to Singapore in 2010 after working for four years as a Lecturer in Oxford and concurrently as a researcher at the Wellcome Trust Centre for Human Genetics. Prior to his Deanship, he was the Founding Director for the Centre for Health Services and Policy Research, and the Director for the Center for Infectious Disease Epidemiology and Research. He is presently a member on the Council of Scientists for the International Human Frontier Science Program, as well as a governing board member of the Regional Centre for Tropical Medicine and Public Health Network for Southeast Asia.



Course Facilitator

Assoc Prof Jeremy Lim

*Director, Leadership Institute for Global Health Transformation (LIGHT),
NUS Saw Swee Hock School of Public Health*

Associate Professor Jeremy Lim is the Director of LIGHT, a global health initiative in the NUS School of Public Health, where he leads projects primarily in health systems strengthening and universal health coverage. He brings diverse and unique perspectives having spent substantial time in public and private healthcare across Asia as well as in policy formulation with Singapore's Ministry of Health.

Outside academia, Jeremy serves on the boards of various for-profit and not-for-profit organisations in different aspects of healthcare including migrant worker health, end of life care and digital health interventions. He is trained in surgery and public health, attaining post-graduate qualifications from both the United Kingdom and the United States.

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