Project Title

Covid-19 Virtual Disease health System Outcomes model for Singapore (CoViD-SOS)

Project Lead and Members

Project lead: Prof Marcus Ong Eng Hock

Project members: Assoc Prof Sean Lam, Assoc Prof Hairil Rizal Abdullah, Prof David Bruce Matchar, Prof Nicholas Graves

Organisation(s) Involved

SingHealth, Health Services Research Centre

Healthcare Family Group Involved in this Project

Healthcare Administration, Medical

Applicable Specialty or Discipline

Health Services Research Centre

Aims

To minimize effects of the COVID-19 disease outbreak on Singapore's health systems outcomes through understanding system-wide effects using existing data and computer simulation techniques that leaded to informed policy decisions.

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lessons Learnt

See poster appended/ below

Conclusion

See poster appended/ below

Project Category

Technology

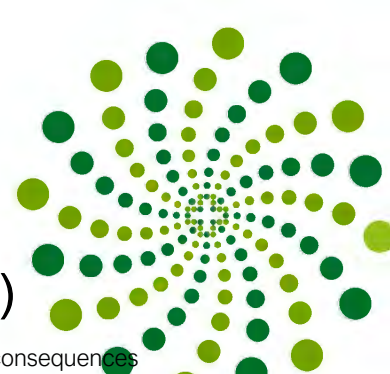Digital Health, Data Analytics, Artificial Intelligence

Keywords

COVID-19, Disease Outbreak, Computer Simulation

Name and Email of Project Contact Person(s)

Name: Ms Eileen Aw / Ms Ginny Chen

Email: Eileen.aw.k.c@singhealth.com.sg / chen.zhen.zhi@singhealth.com.sg

Covid-19 Virtual Disease health System Outcomes model for Singapore (CoViD-SOS)

COVID-19 outbreak unfolded it leaded to health system-wide consequences. These directly consequences experienced by COVID-19 patients; and indirect ones faced by non-COVID-19 patients due to decisions like cancelling non-emergency surgeries. Our project's overall aim was to minimize effects of the COVID-19 disease outbreak on Singapore's health systems outcomes through understanding system-wide effects using existing data and computer simulation techniques that leaded to informed policy decisions. We built upon local data to evaluate impact of policies on health systems estimating overall deaths and admission, complications and length of stay in healthcare facilities; understand infectious disease effects on various high risk population sub-groups. Actual health services utilization due to COVID-19 and non-COVID-19 conditions were evaluated through the analysis of electronic records. Detailed interviews of patients and other stakeholders will enrich our understanding. Costs of care will also be assessed capitalizing on routine data sources.
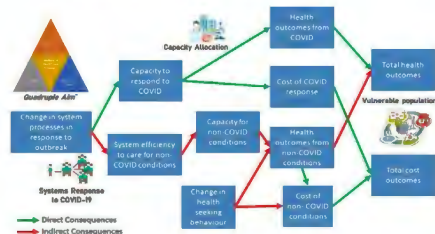
COVID-19 Virtual Disease health System Outbreak model for Singapore (CoViD-SOS)

Principal Investigator, Co-Investigators, Collaborators from MOH, NUS, NTU, SingHealth, Duke-NUS

Work stream 1 : The Effectiveness of Public Health Interventions against COVID-19: Lessons from Singapore Experience
Prof David MATCHAR, Asst Prof John ANSAH

Work stream 2 : Healthcare Resource Planning Model for COVID-19
Asst Prof Sean LAM, Dr Hairil RIZAL, Dr Ahmad Reza POURGHADERI

Work stream 3 : Impact of COVID-19 Outbreak on the Workflow of Emergency Department and Patient Outcomes
Prof Marcus ONG, Assoc Prof LIU Nan, Asst Prof Fahad SIDDIQUI

Work stream 4 : Understanding the Impact of COVID-19 Pandemic on Healthcare Utilization, Health Outcomes and Unmet Needs in Medically Vulnerable patients: A Mixed-Methods Study
Asst Prof Sungwon YOON, Assoc Prof Angelique CHAN, Asst Prof Rahul MALHOTRA

Works stream 5 : Economic Impact of COVID-19 on Tertiary Singapore Hospital
Prof Nicholas GRAVES, Asst Prof Elaine LUM

Dr Sutowo WONG
Dr WEE Hwee Lin
Prof Alex COOK
Dr BEE Yong Mong
Dr Jenny LOW
Dr Mariko KOH
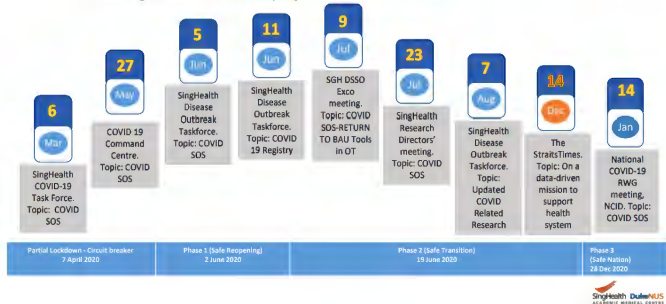A/Prof TAN Ngiap Chuan
Dr Andrew FANG
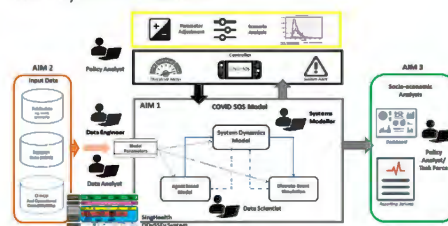Prof CAI Wenzong
Dr Abhijit VISARIA

COVID SOS Steering Committee (SC)

Outputs: Develop simulation models, help policy planning and decision making, research publications etc.

COVID-SOS – Conceptual model

— Direct Consequences
— Indirect Consequences

Impact on SingHealth

List of meetings where results of project have been shared at:

6 Mar — SingHealth COVID-19 Task Force. Topic: COVID SOS

27 May — COVID 19 Command Centre. Topic: COVID SOS

5 Jun — SingHealth Disease Outbreak Taskforce. Topic: COVID SOS

11 Jun — SingHealth Disease Outbreak Taskforce. Topic: COVID SOS

9 Jul — SGH DSSO Exco meeting. Topic: COVID SOS-RETURN TO BAU Tools in OT

23 Jul — SingHealth Disease Outbreak Directors' meeting. Topic: COVID SOS

7 Aug — SingHealth Disease Outbreak Taskforce. Topic: Updated COVID Related Research

14 Dec — The StraitsTimes. Topic: On a data-driven mission to support health system

14 Jan — National COVID-19 RWG meeting, NCID. Topic: COVID SOS

Partial Lockdown - Circuit breaker 7 April 2020
Phase 1 (Safe Reopening) 2 June 2020
Phase 2 (Safe Transition) 19 June 2020
Phase 3 (Safe Nation) 28 Dec 2020

COVID-SOS – Systems Model

AIM 1 System Architecture

Research Outputs

Article Published
N Liu, ML Chee, CL Niu, PP Pek, FJ Siddiqui, JP Ansah, DB Matchar, SSW Lam, HR Abdullah, A Chan, R Malhotra, N Graves, MSY Koh, SW Yoon, AFW Ho, DSW Ting, JGH Low, MEH Ong. Coronavirus Disease 2019 (COVID-19): an evidence map of medical literature. BMC Medical Research Methodology. (2020) 20:177. Open. Access.http://doi.org/10.1186/s12874-020-01059y

Articles Accepted
FJ Siddiqui, A Pourghaderi, R Malhotra, JP Ansah, DB Matchar, SSW Lam, JG Low, MEH Ong. How long will the Corona Virus Disease (COVID-19) pandemic last: Commentary from Singapore's perspective. Accepted by Journal of EMS Medicine

GD Nadarajan, Eunizar Omar, B Abella, PS Hoe, DS Sang, MHM Ma, MEH Ong. A Conceptual Framework for Emergency Department Design in a Pandemic. Accepted by Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine.

Articles submitted
JP Ansah, DB Matchar, SSW Lam, JGH Low, AR Pourghaderi, FJ Siddiqui, TSM Lui, AWY Chia, MEH Ong. The effectiveness of Public Health Interventions Against COVID-19. Lessons from the Singapore Experience.

SSW Lam, HRB Abdullah, AR Pourghaderi, NHL Nguyen, JT Wu, S Mohan, SK Low, JK Lee, BR Tan, S Han, ZYB Chong, FJ Siddiqui, JP Ansah, JGH Low, DB Matchar, MEH Ong. Towards Health System Resiliency: An Agile Systems Modelling Framework for Bed Resource Planning During COVID-19.

Hairil Rizal, SSW Lam, BY Ang, AR Pourghaderi, NHL Nguyen, BR Tan, SH Han, ZYB Chong, DB Matchar, MEH Ong. Resuming Elective Surgery After COVID-19: The Utility of a Machine Learning based Simulation Model in Guiding Phased Opening of Operating Rooms.

Chee ML, Ong MEH, Siddiqui FJ, Zhang Z, Lim SL, Ho AFW, Liu N. Artificial intelligence applications for COVID-19 in intensive care and emergency settings: a systematic review.

SW Yoon, H Goh, GD Nadarajan, S Sung, I Teo, JLee, MEH Ong, N Graves, TL Teo. Perceptions of mHealth applications and features to support psychosocial wellbeing among frontline healthcare workers involved in the COVID-19 pandemic response

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THE STRAITS TIMES
SINGAPORE
On a data-driven mission to support health system