

Pandemic disease prediction & management: A case of the outbreak of COVID-19 in Thailand

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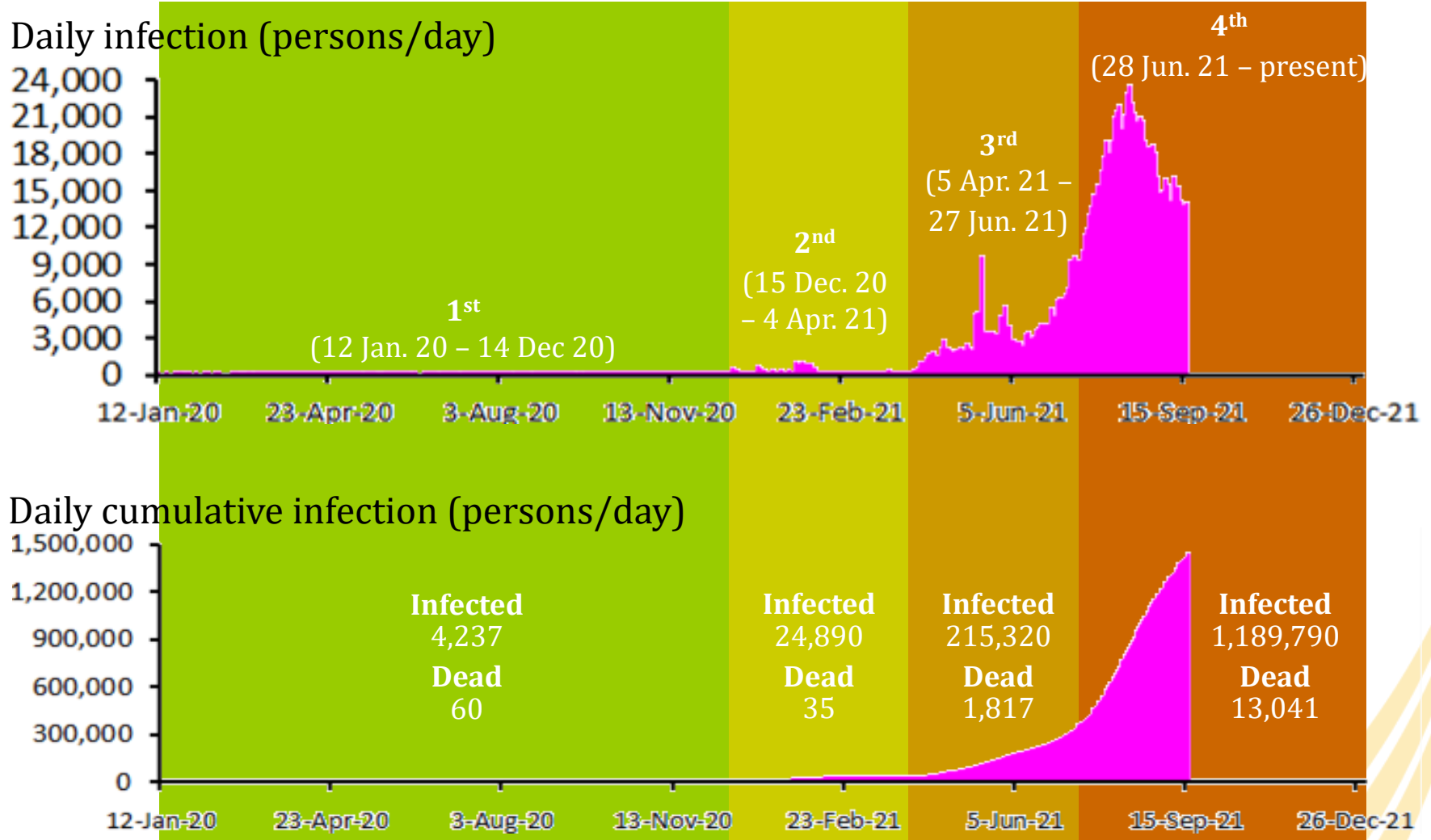


- Summary of the outbreaks
- Predictions & trend
- Pandemic disease management



Summary of the four outbreaks|

(12 Jan. 20 – present)





Summary of the 1st outbreak|

(12 Jan. 20 – 14 Dec. 20)

Spreading source	COVID-19 variant	Infected peak (cases)	Duration (days)	Measures
<p>Four groups of super spreaders</p> <ul style="list-style-type: none"> > People gathered in boxing stadiums in BKK & Nonthaburi. > Night visitors at the entertainment places in BKK. > Workers returned homes in the countryside. > People who came from countries that faced the outbreaks. 	<p>Serine (Original variant from Wuhan, China)</p>	<p>188 (22 Mar. 20)</p>	<p>338 (0-1 case/day during the last 7 days of the period)</p>	<ul style="list-style-type: none"> • The CCSA (Center for COVID-19 Situation Administration) • Emergency Decree • Curfews <ul style="list-style-type: none"> > 26 Mar. – 30 Apr. 20 (10pm – 4am) > 1 – 31 May 20 (11pm – 4am) > 1 – 14 Jun. 20 (11pm – 3am) • State & local quarantines • Social distancing

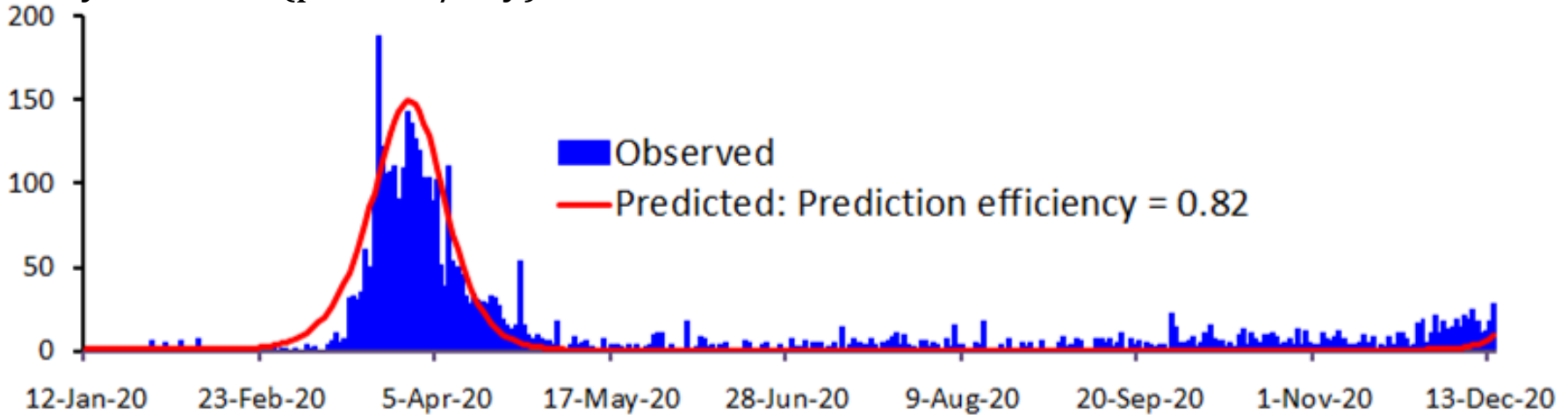


The 1st outbreak prediction

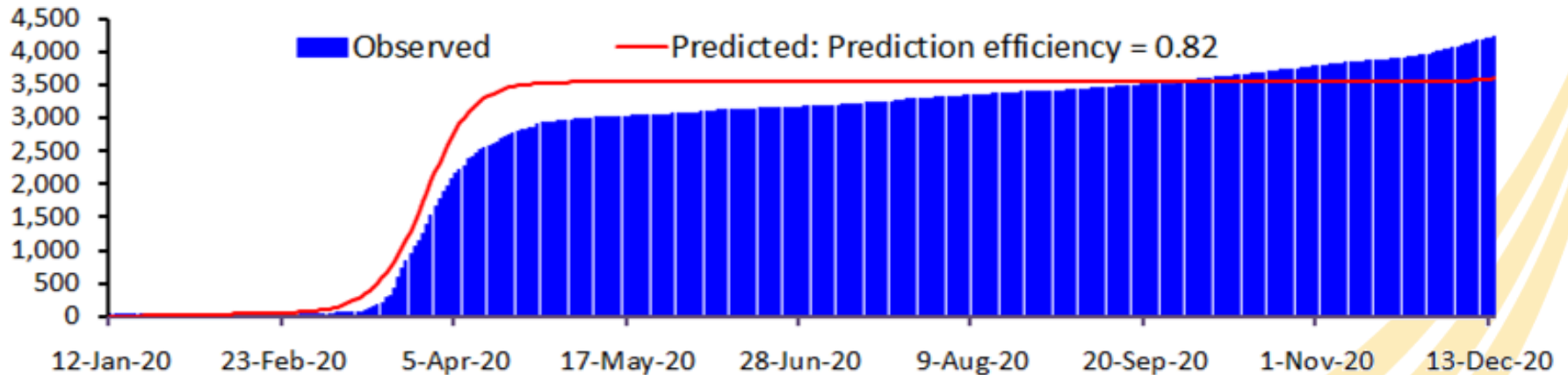
SIQR pop. model (12 Jan. 20 – 14 Dec. 20)

(S = Susceptible, I = Infectious, Q = Quarantined, R = Recovered)

Daily infection (persons/day)



Daily cumulative infection (persons/day)





Summary of the 2nd outbreak

(15 Dec. 20 – 4 Apr. 21)

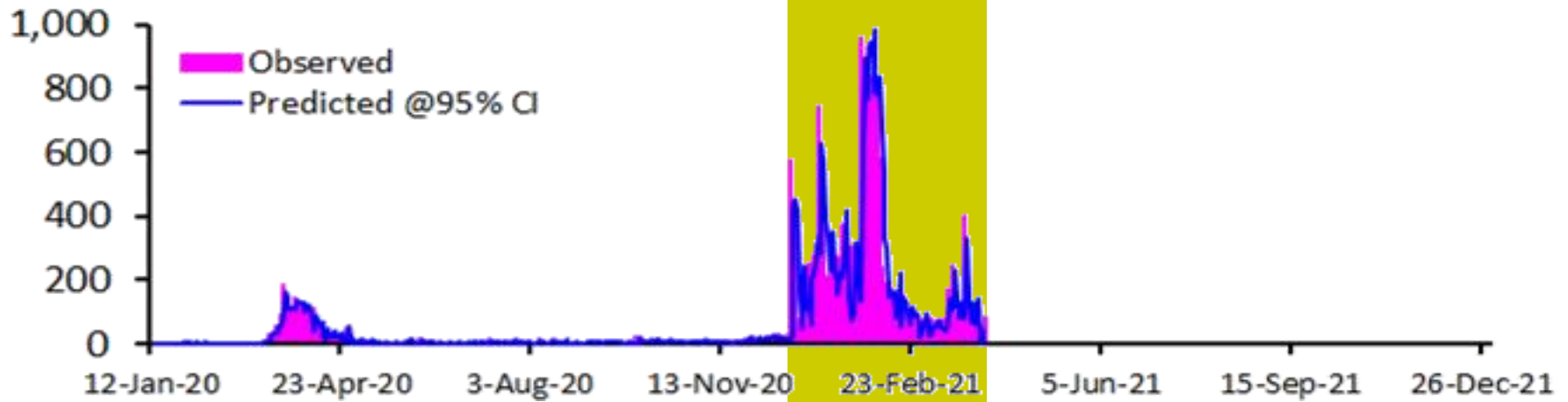
Spreading source	COVID-19 variant	Infected peak (cases)	Duration (days)	Measures
<ul style="list-style-type: none"> • Fishery workers at the shrimp raft & the Central Shrimp Market, Samut Sakhon Province • Networked fresh markets • People who came from Tachilek, Myanmar. • Gambling place in Rayong Province 	<ul style="list-style-type: none"> • GH (mainly) • Beta (a few, Jan. 21) 	<p>959 (26 Jan. 21)</p>	<p>111 (26 – 96 cases/day during the last 7 days of the period)</p>	<ul style="list-style-type: none"> • The CCSA (Center for COVID-19 Situation Administration) • Emergency Decree • Temporarily lockdown of the Central Shrimp Market • Curfew in Samut Sakhon (10pm – 5am) • Bubble & seal • Field hospitals • State & local quarantines • Social distancing • Vaccination (started on 28 Feb. 21)



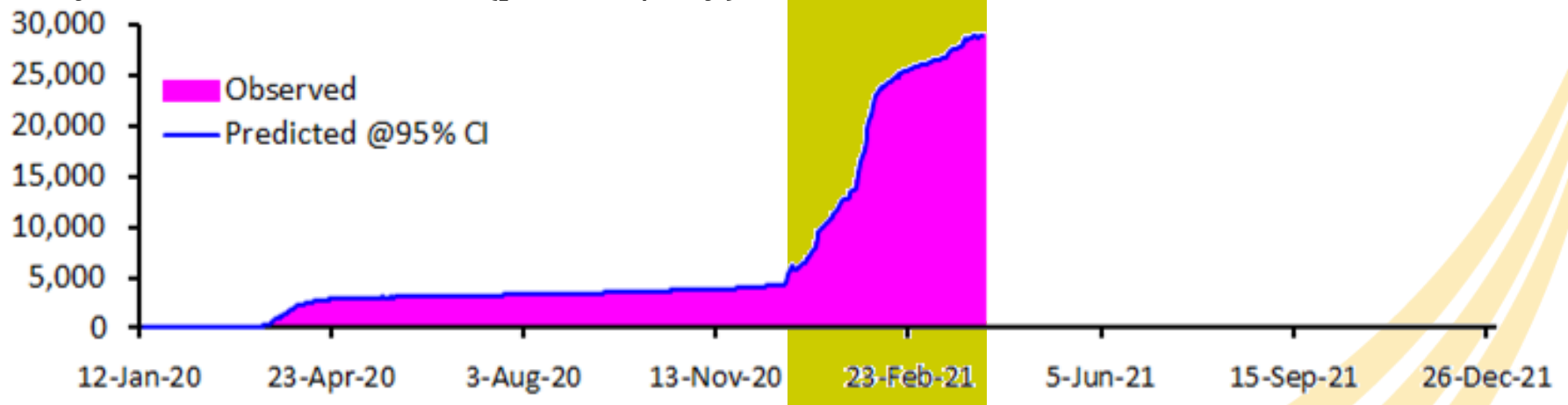
The 2nd outbreak prediction

Mixed models (15 Dec. 20 – 4 Apr. 21)

Daily infection (persons/day)



Daily cumulative infection (persons/day)





Summary of the 3rd outbreak

(5 Apr. 21 – 27 Jun. 21)

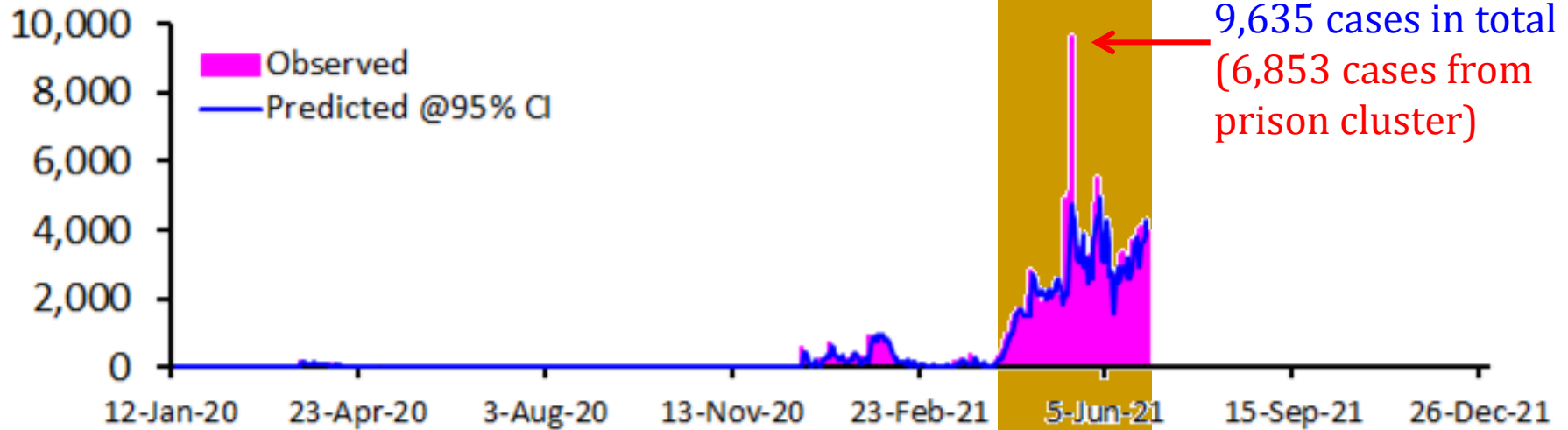
Spreading source	COVID-19 variant	Infected peak (cases)	Duration (days)	Measures
<ul style="list-style-type: none">• Prisons• Night entertainment places in BKK• Local transmission, particularly visiting hometowns of people during the Songkran festival.	<ul style="list-style-type: none">• Alpha (dominant)• Delta (some, May 21)	9,635 (17 May. 21)	84 (3,174 – 4,161 cases/day during the last 7 days of the period)	<ul style="list-style-type: none">• The CCSA (Center for COVID-19 Situation Administration)• Emergency Decree• Bubble & seal• Field hospitals• State & local quarantines• Social distancing• Vaccination



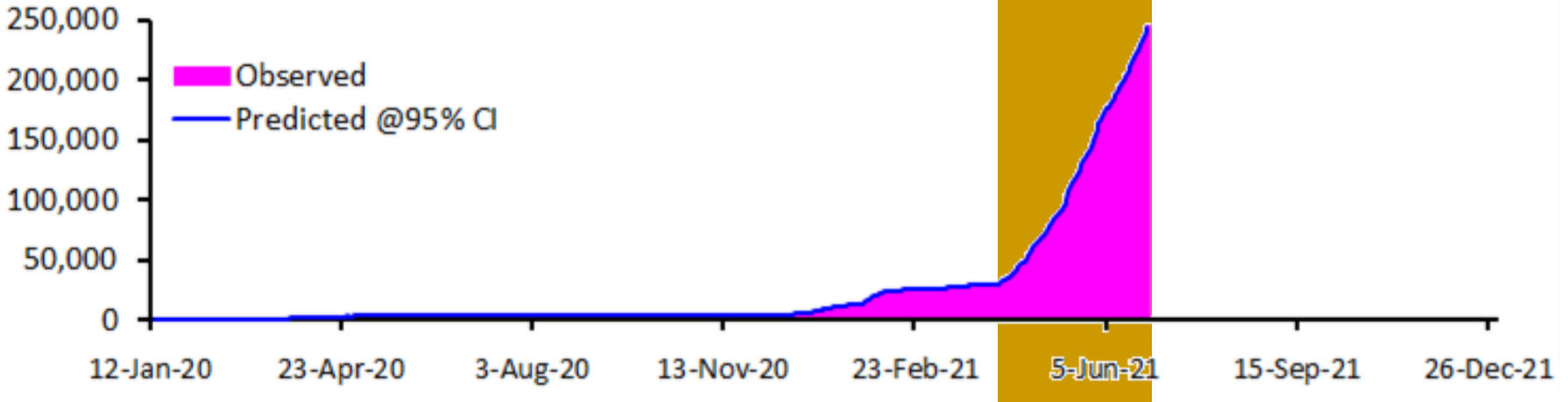
The 3rd outbreak prediction |

Mixed models (5 Apr. 21 – 27 Jun. 21)

Daily infection (persons/day)



Daily cumulative infection (persons/day)





Summary of the 4th outbreak|

(28 Jun. 21 – present)

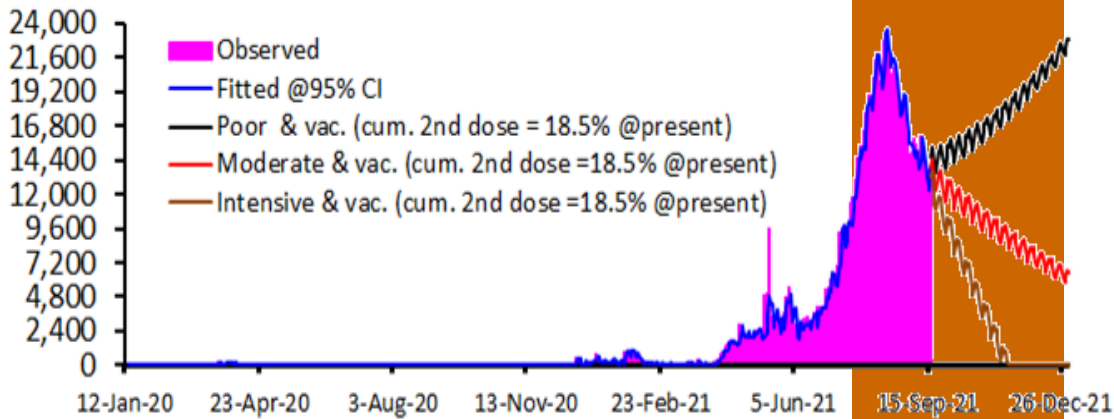
Spreading source	COVID-19 variant	Infected peak (cases)	Duration (days)	Measures
<ul style="list-style-type: none"> • Households/communities • Worker camps/construction sites • Factories/Industrial Estates • Prisons 	<ul style="list-style-type: none"> • Delta (dominant) • Alpha (fewer) 	<p>23,418 (13 Aug. 21)</p>	<p>28 Jun. 21 – present</p>	<ul style="list-style-type: none"> • The CCSA (Center for COVID-19 Situation Administration) • Emergency Decree • Curfew in the highest control areas (1 Aug. 21 – present, 9pm – 4am) • Hospitals, home/community isolations • Field hospitals • State & local quarantines • Social distancing • Vaccination



The 4th outbreak prediction & trend

Mixed models (28 Jun. 21 – present)

Daily infection (persons/day)

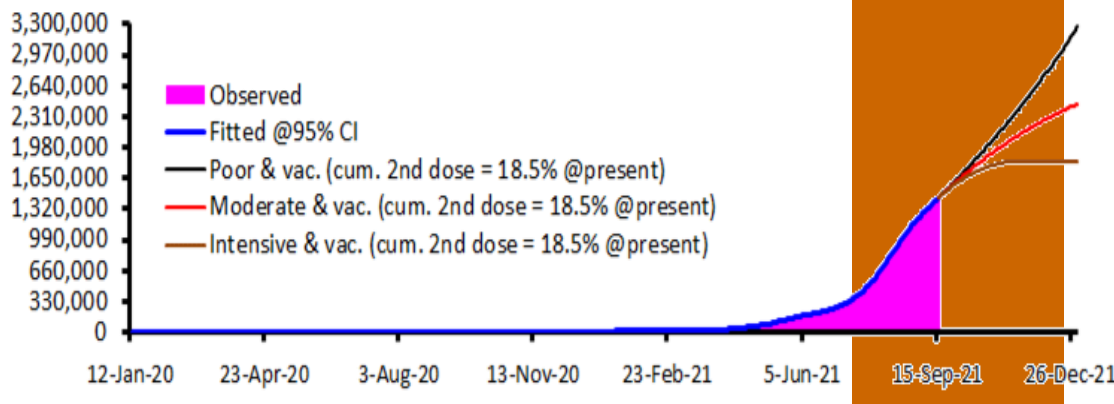


Poor & vac: ↑ 22,937 cases/day @the end of 2021

Moderate & vac: ↓ 6,485-7,745 cases a day after 6 Dec. 2021 (We are here!)

Intensive & vac: ↓ <3,000 cases/day after the end of Oct. 2021

Daily cumulative infection (persons/day)



Poor & vac: → >3.2 million @the end of 2021

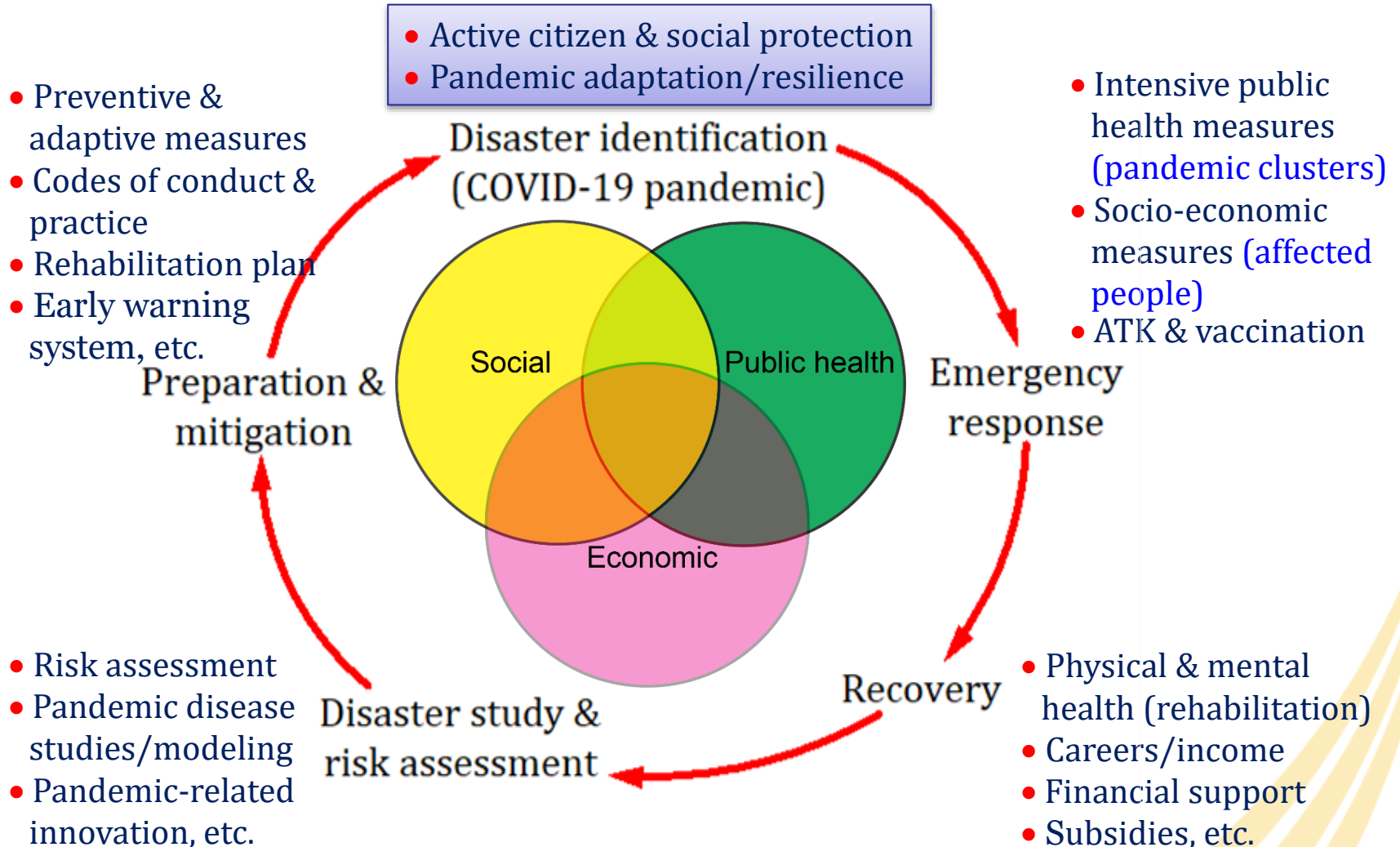
Moderate & vac: → >2.4 million @the end of 2021

Intensive & vac: → >1.8 million @the end of 2021



Pandemic disease management

COVID-19 = Public health, social, & economic disaster (Shmueli et al. 2021)





Pandemic disease management |

Examples of the effective COVID-19 management (Panneer et al. 2021)

Country/ Territory	Method	Pandemic management	Management entity (Stakeholders)	Source
Singapore (116) Cases >Infected: 73,938 >Dead: 58	Collaboration of science & social science	<ul style="list-style-type: none"> • Large scale coordination • Institutional timely response • Community resilience • National level response • Effective contact tracing 	<ul style="list-style-type: none"> • Government agencies • Industry • Banks & financial • Institutions 	<ul style="list-style-type: none"> • Liu et al. (2020) • Pan et al. (2020) • Kuguyo et al. (2020) • Woo (2020) • Yan et al. (2020)
Taiwan (152) Cases >Infected: 16,103 >Dead: 839	<ul style="list-style-type: none"> • Networking • Proactive testing • Border control • Transparency 	<ul style="list-style-type: none"> • Frequent health checks • Public education • Relief to business • Use of information technology 	<ul style="list-style-type: none"> • Multi-layer governance • Private organizations • Insurance companies • Citizens 	<ul style="list-style-type: none"> • Wang et al. (2020) • Cheng et al. (2020) • Huang (2020) • Lin et al. (2020) • Summers et al. (2020)
New Zealand (186) Cases >Infected: 3,999 >Dead: 27 https://www.worldometers.info/coronavirus/	Lockdown	<ul style="list-style-type: none"> • Lockdown measures • Travel restrictions • Social distancing • Rapid and science-based risk assessment • Rapid testing and contact tracing • Community transmission control measures, etc. 	<ul style="list-style-type: none"> • Government agencies • Public & private hospitals • Medical professionals • Virologists • Public health experts • Laboratories • Communities • Self-discipline • Citizens 	<ul style="list-style-type: none"> • Baker et al. (2020a) • Baker et al. (2020b) • Baker et al. (2020c) • Cousins (2020) • Jefferies et al. (2020)