AIxImpact Competition 2022

Healthcare Track

COSMO

A redesigned response to future pandemics

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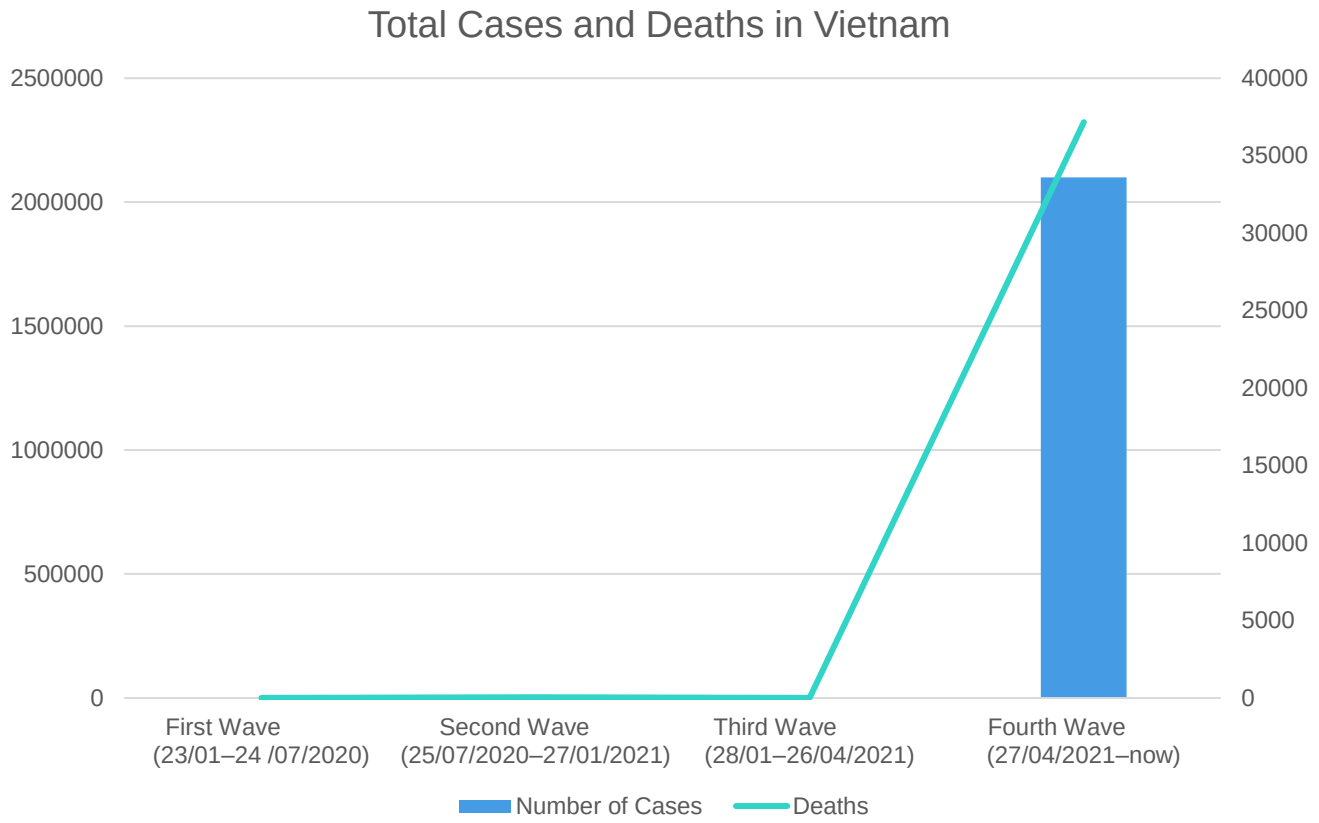
Vietnam failed to control the fourth wave of Delta variant due to late and ineffective interventions compared to previous waves.

The first three waves were contained primarily by **early social distancing, contact tracing**, and **lockdown.**

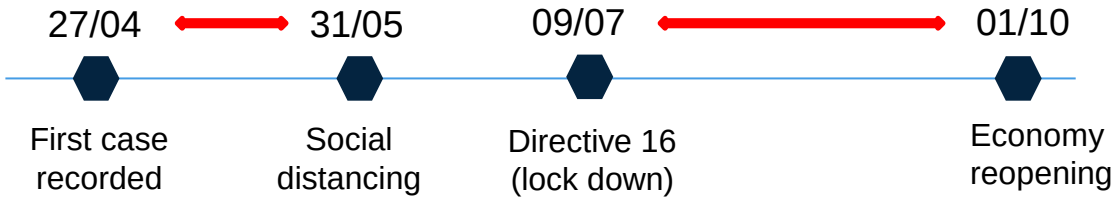


In the 4th wave alone, total cases and deaths account for the majority of all waves combined …

Cases: **97.9%**

Deaths: **99.0%**

… since Government intervened **too late** and **ineffectively over a long period of time**.



Policy failure due to existing problems of current models could be prevented by a more comprehensive simulation model informed by analytics.

Predictive analytics predicts future circumstances based on past pandemic trends…

BUT it has the **data quality problem**:

Too reliant on **limited historical data**

Less reliable **assumption-based scenarios**

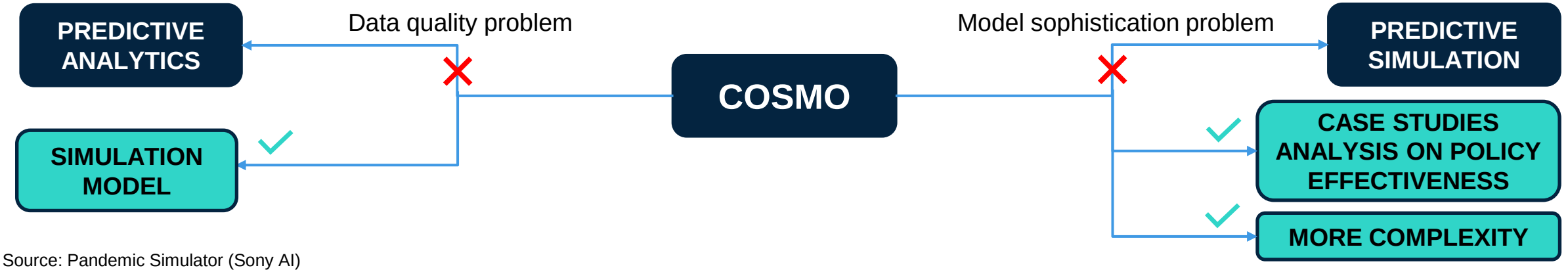
Predictive simulation gives intervention recommendations by simulating real-world interactions…

BUT it has the **model sophistication problem**:

Oversimplified policy recommendations

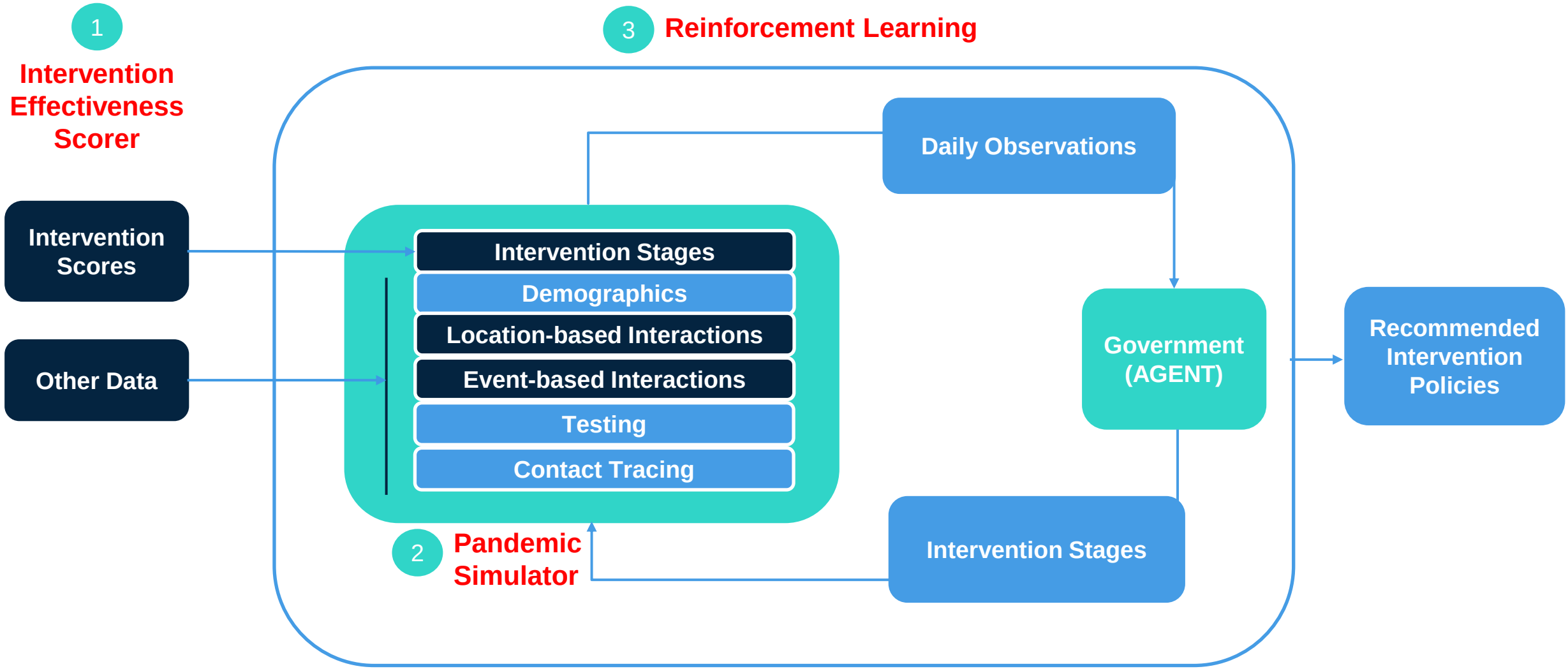
No supporting data for policy effectiveness

Our approach, COSMO, helps **solve the weaknesses of current models** by using **analytics** to support a **redesigned simulation model** to **recommend intervention stages** to policy makers.



Source: Pandemic Simulator (Sony AI)

A recommendation model powered by OxCGRT data, based on the existing Pandemic Simulator, and enhanced by Reinforcement Learning.



COSMO

Source: The Oxford Covid-19 Government Response Tracker

: New Improvements

Intervention Effectiveness Scorer scores feature importance for each intervention measure based on the country.

Main Categories of The OxCGRT Dataset

C: Containment and closure policies
E: Economic policies
H: Health system policies
V: Vaccination policies
M: Miscellaneous policies (depends on countries)

XGBoost Regressor

- Policy Stringency
- Daily Cases
- Intervention Effectiveness

Weighted Average Scores

Policy	Score
C1	0.25
C2	0.56
C4	0.95
H1	0.8
H7	0.15

Source: The Oxford Covid-19 Government Response Tracker

Projection Simulator customizes multi-level government interventions to simulate covid-19 progression in a data-efficient way.

Weighted Average Scores

Policy	Score
C1	0.25
C2	0.56
C4	0.95
H1	0.8
H7	0.15

Formulated Intervention Stages Based On Selected Policies

- Stage 1: C1, H7
- Stage 3: C1, C2, C4, H1, H7

Population Demographics Parameters:

- Demographics
- Personal routine
- Location-based interactions(supermarket, gym, public transport, etc)
- Event-based interactions(public holidays)

Testing
Contact Tracing
Vaccination

Pandemic Simulator

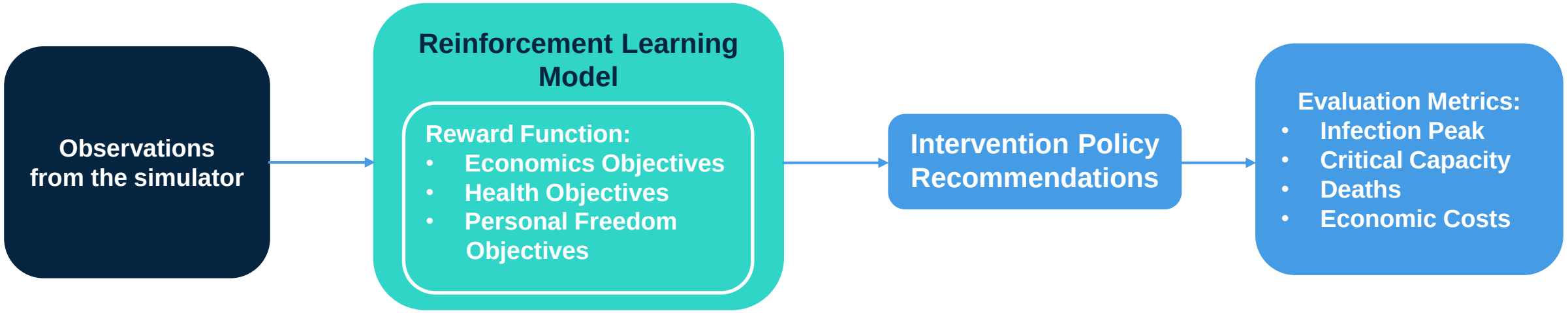
- Persons
- 24 hourly steps
- SEIR Infection Model

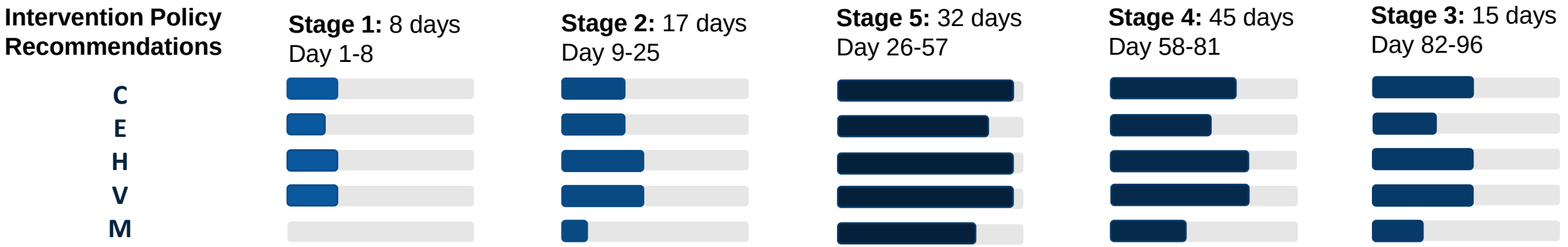
Daily Observations:

- Infection summary
- Testing summary
- Economic openness

Source: Pandemic Simulator (Sony AI)

Reinforcement Learning learns from simulated observations and recommends interventions that are timely, effective and balance competing objectives.





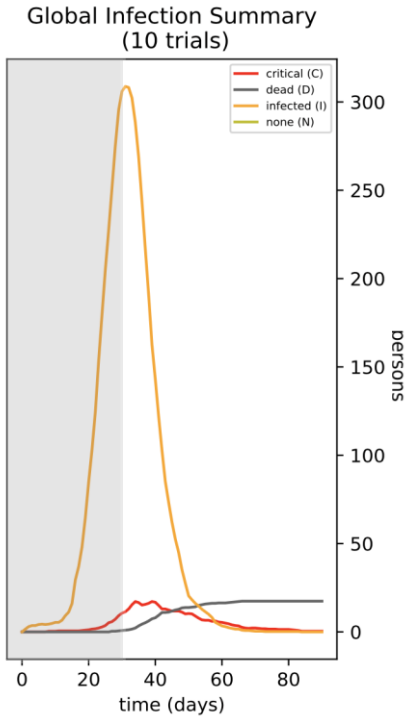
Meaningful recommendations shorten decision-making time lag, enable prompt intervention and reduce the number of infected cases and deaths.

Earlier Intervention:
20 days

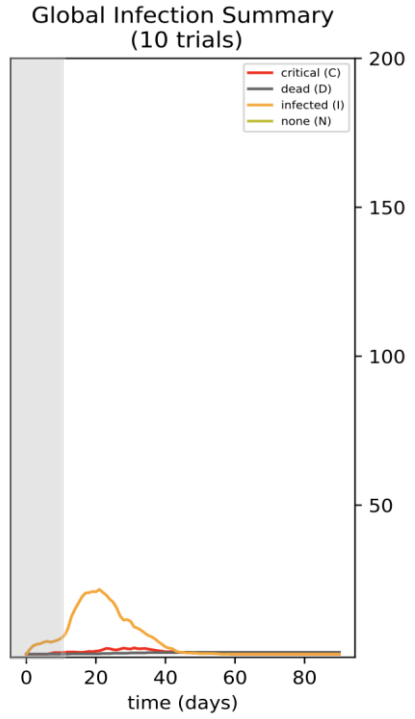
Reduced Cases:
250++

Reduced Deaths:
15++

Infected Cases

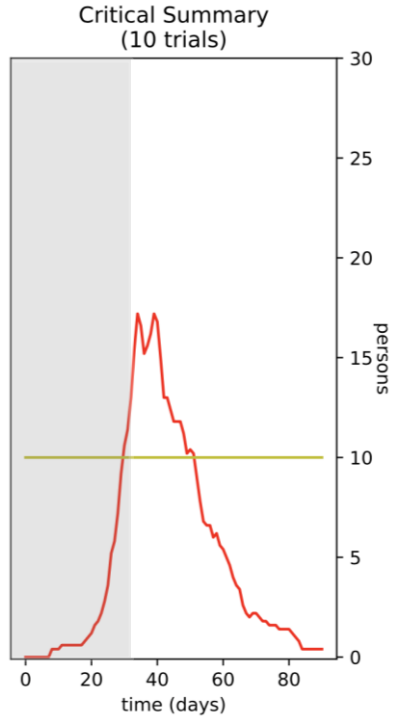


Late Intervention

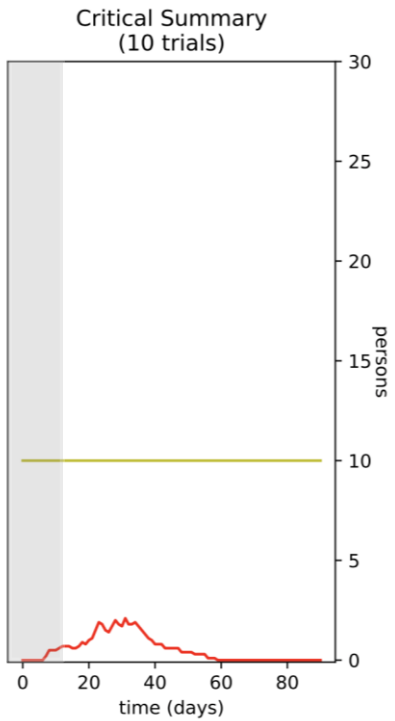


Timely Intervention

Hospitalized Cases



Late Intervention



Timely Intervention

(*) Population size: 1000

: Intervention Delay (Days)

We are a diverse team of computer, data science, economics and business backgrounds, who are passionate about creating meaningful human-centric innovations.

Duong Pham
(Computer Science)
NUS

Hao Lam
(Business)
FUV

Dung Nguyen
(Economics)
FUV

Hung Nham
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Thank You!

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Discussion

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