

Lowering COVID-19 Related Fatalities Worldwide Through Vaccine Game Theory Analyses



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INTRODUCTION

As of March third, only 13% of people in developing countries have received at least one dose of the COVID-19 vaccine (Ritchie et al., 2021). Wealthier countries often hoard vaccines, creating an effect similar to the “prisoner’s dilemma” (Papadakis, et al, 2021). The prisoner’s dilemma displays how selfish intent in groups will drive them apart and devastate communities as a total. This project uses the Prisoner’s Dilemma to find an alternate vaccine distribution.

RESEARCH METHODOLOGIES

Inquiry approach:
 Descriptive
 Measurement tools:
 Inferential statistics
 Quantitative data

Previous games were analysed to show how the current vaccination distribution is unfair to the world. It was soon found that sharing vaccines would be the most optimal distribution. With this information and R_e values, it was possible to create graphs that show the death reduction rates in Laos when Japan shared vaccines based on Laos’ population.

DATA AND FINDINGS

The data collected was based on the actions caused by wealthier countries and their tendencies to hoard vaccines. The diagram to the right is based on the current and hypothetical distributions.

PRISONER'S DILEMMA IN TERMS OF VACCINE DISTRIBUTIONS

	Cooperate / use COVAX	Defect / optimise vaccines for own country
Cooperate / use COVAX	The world has an equal amount of vaccines and is equally vaccinated.	Some developed and developing countries are fully vaccinated against COVID-19 whereas some developing countries have no protection against COVID-19.
Defect / optimise vaccines for own country	Some developed and developing countries are fully vaccinated against COVID-19 whereas some developing countries have no protection against COVID-19.	Developed countries have the necessary (if not an excess amount) supplies to vaccinate their own countries, but developing countries are left unvaccinated and will be devastated by COVID-19.

Figure 1: Vaccine distribution in terms of sharing vaccines

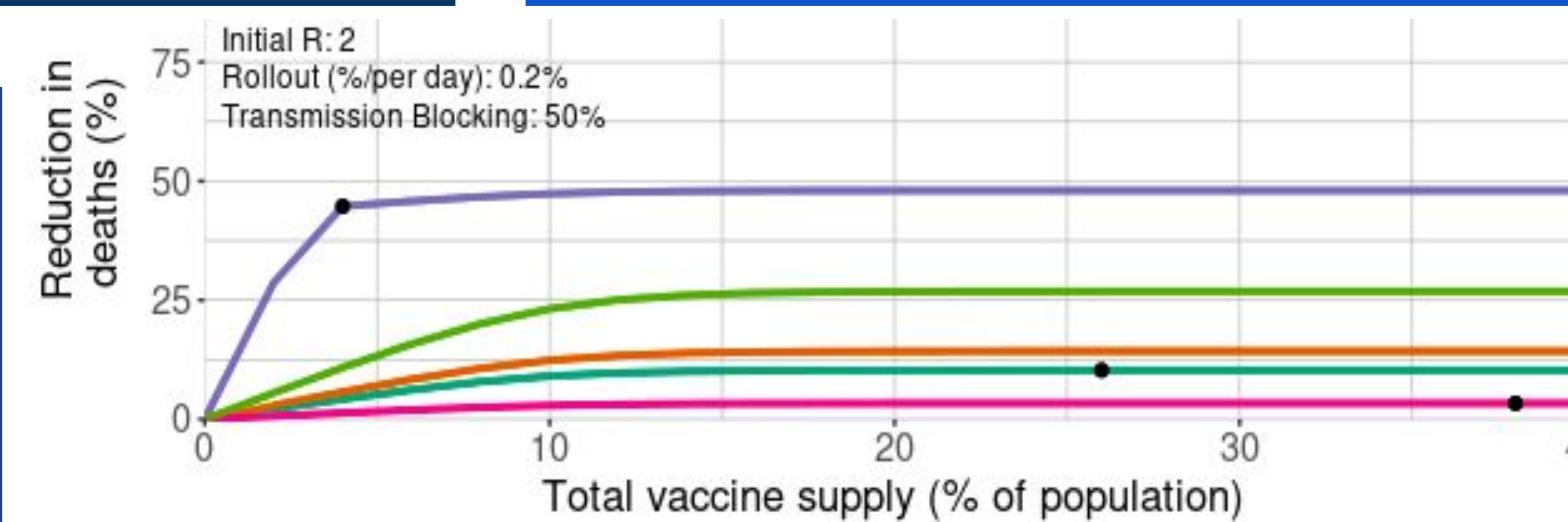


Figure 3: reduction in deaths in Laos if Japan shared 36000 vaccines per day.

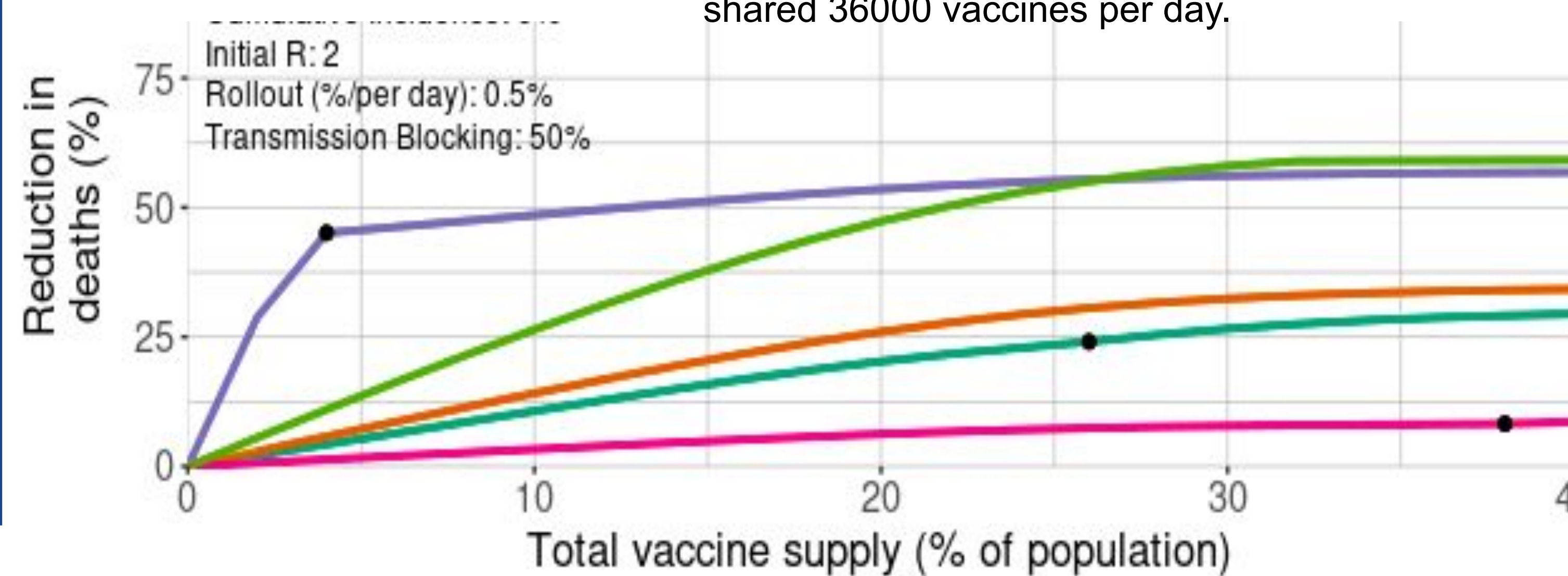


Figure 4: reduction in deaths in Laos if Japan shared 36000 vaccines per day.

Legend

- Under 20
- Adults 20-40
- Adults 20+
- Adults 60+
- All Ages

CONCLUSIONS AND ANALYSIS

A few key findings were found: Without any changes, there would still be 660 COVID-19 related deaths in Laos, (the number is continuing to grow). If Japan shared vaccines for 0.2% of Laos’ population per day, Laos’ deaths would optimally decrease to 572 deaths. On the other hand, if Japan shared shots for 0.5% of Laos’ population per day, it would further decrease to 429 deaths. These changes in the distribution may cause Japan to have a higher value of deaths, but will lower the net world wide deaths. If the same experiment was executed on other countries, similar results are expected.

IMPLICATIONS AND NEXT STEPS

Cooperation between developed countries and developing was key to lowering the COVID-19 related fatalities worldwide. It will not be possible to lower the amounts of COVID-19 deaths if one does not get vaccinated as soon as possible. Developed countries should immediately start sharing vaccines with developing countries in order to avoid further devastation.

ACKNOWLEDGEMENTS / REFERENCES

Papadakis, M., & Spernovasilis, N. (2021). Vaccines in the coronavirus disease 2019 (COVID-19) era: Game theory applications. *Infection Control & Hospital Epidemiology*, 1-2. doi:10.1017/ice.2021.125
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