

OPTIMIZATION OF THE ROUTE FORMATION PROCESS USING THE GRASP ALGORITHM

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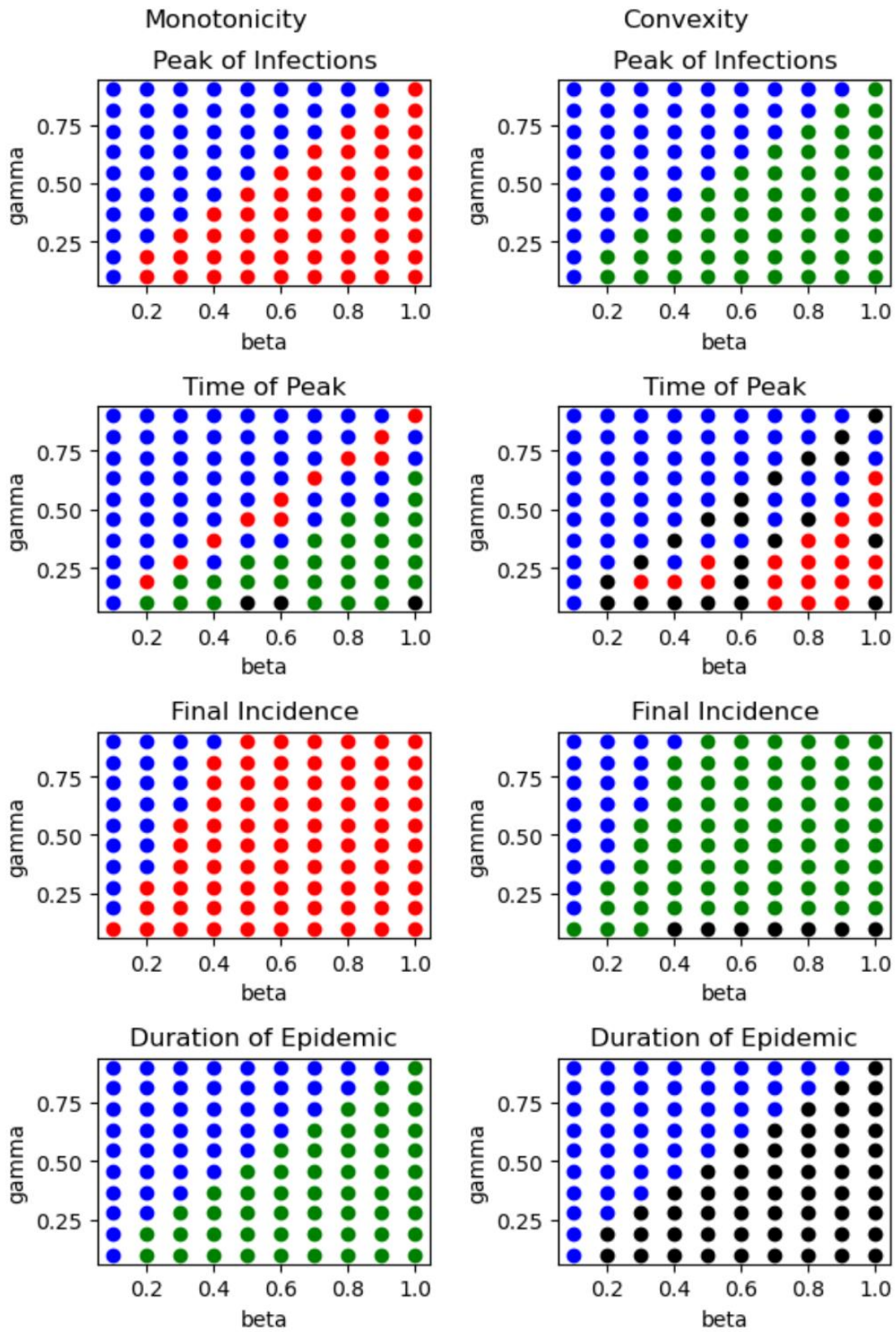
We investigate the relationship between bias about infectious disease and well-being. First, we empirically establish the existence and the causes of bias, specifically during the COVID-19 pandemic. After that we investigate theoretically the effects of bias on well-being.

For that purpose, we derive an a behavioral-epidemiological differential equation model derived from an agent-based model that combines rational choice behavior with infectious disease dynamics.

$$\begin{aligned}a(I) &= \min\left\{\frac{\tilde{\theta}\beta}{2}I, 1\right\} \\ \frac{dS}{dt} &= -\beta(1 - a(I))IS \\ \frac{dI}{dt} &= \beta(1 - a(I))IS - \gamma I \\ \frac{dR}{dt} &= \gamma I \\ \frac{dW}{dt} &= (-a(I)^2 - \bar{\theta}\beta(1 - a(I))I)S\end{aligned}$$

The last equation represents the value judgement of an axiomatically characterized model of an ethical, impartial, eudaimonistic and individualist observer.

The figures on the left and on the right below depict the signs of the first and second differences for various epidemiological parameters (red – negative sign throughout; blue – (near) equality throughout; green – positive sign throughout; black – mixed signs).



The table below can be interpreted as the volumes of the monotonicity and convexity regions with of the final welfare dependent on bias.

	> 0	= 0	< 0	other
ΔW_∞	30.3%	0.0%	21.5%	48.2%
$\Delta^2 W_\infty$	21.5%	30.3%	0.0%	48.2%

Our result is that while increased fear improves purely epidemiological outcomes, the social welfare outcome shows mixed results; which shows that it is not enough to take only epidemiological measures into account when generating policy recommendations.

Conclusion: We conclude that successful psychological control of the population, i.e. the control of its psychological variables, needs to find a balance between the prevention of disease and the costs for preventing it; which in turn requires corresponding data, on perceived and real threat levels, as well as costs; supposing that the controlling agency aims to increase the well-being of the population.

However psychological control by the state raises some fundamental issues (as argued in detail in the paper), which point beyond the present modelling, namely a loss of democratic legitimacy, polarization and risks of mal-government. These speak for the establishment of basic protective rights against psychological control by the state.

The modelling framework chosen very flexible and can be extended in various directions, as can be seen from the vastness of economic literature building on the concepts of rational choice (in an instrumental sense) and social welfare.

For detailed references see the Pre-Print

1. Pestow, 2024, The Impact on Well-Being of Cognitive Bias about Infectious Diseases, <https://www.medrxiv.org/content/10.1101/2024.02.25.24303338v1>