

Propositions

attached to the thesis

Mathematical Optimization in Vaccine Allocation

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I

Applying Operations Research techniques to solve resource allocation problems in epidemiology does not only provide decision makers with optimal allocations, but also with valuable insights in complex decision problems.

(This thesis)

II

The OR/OM community can contribute to literature on the vaccine supply chain, because the similarities with other supply chains provide ample opportunities for contribution and studying the differences can bring new insights in other supply chains.

(Chapter 2)

III

The herd effect of vaccination in the SIR model is convex-concave in the vaccination fraction, which implies that concentrating vaccine effort on a limited number of populations is essential for efficient vaccine usage.

(Chapter 3)

IV

Minimizing the number of vaccines required to achieve an effective reproduction ratio equal to 1 in an age-structured population is equivalent to maximizing the herd effect and these problems can easily be solved to optimality by a greedy algorithm, under the assumption of separable mixing.

(Chapter 4)

V

Vaccination strategies in which a limited budget is entirely spent on an early aspecific vaccine or on a late specific vaccine can result in significantly higher number of infections than strategies in which the budget is divided over the two vaccine types.

(Chapter 5)

VI

Accounting for stochasticity in the driving range of electric vehicles, when deciding on the location of refueling facilities, can improve network coverage.

(Vries, H. de and Duijzer, E, 2017. Incorporating driving range variability in network design for refueling facilities. Omega 69:102-114.)

VII

Good vaccination strategies allocate to all populations equally, but better vaccination strategies allocate to some populations more equally than to others.

VIII

If Operations Researchers want to make a valuable contribution to multidisciplinary projects, they should avoid the pitfall of thinking that optimization is better than scenario analysis. Instead, they should use optimization to make scenario analysis better.

IX

Excellent education is only possible if not only students but also teachers have the room to make mistakes, the opportunity to improve, and the time to put sufficient effort into their courses.

X

To be good in optimization one should always look for improvement and not be satisfied with anything but the best, to be content in life one should do the opposite.

XI

All that is incomprehensible, does thereby not cease to exist.

(after Blaise Pascal, French mathematician and Christian philosopher, 1623-1662)