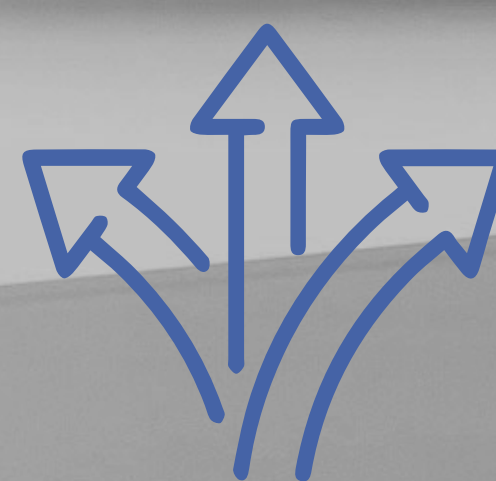


In silico study of medical decision-making for rare diseases: heterogeneity of decision-makers in a population improves overall benefit



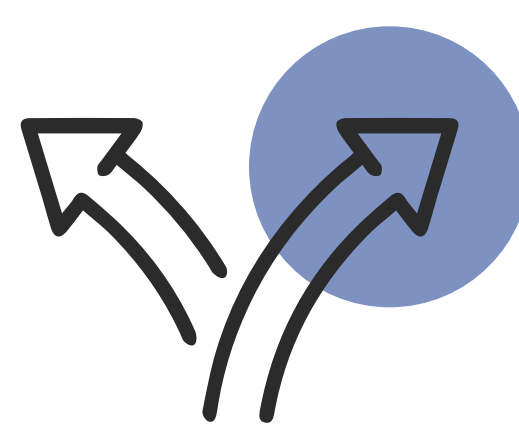
BACKGROUND

Medical decision-making is difficult when information is limited due to rareness. For example: there are two treatment options for patients affected by a rare disease with high lethality. The information about both treatment effects is unavailable or very limited. Patients are inclined to accept one of the interventions rather than waiting for death, but they are reluctant to be assigned the inferior one. Here we studied how differences in choices can benefit the population.

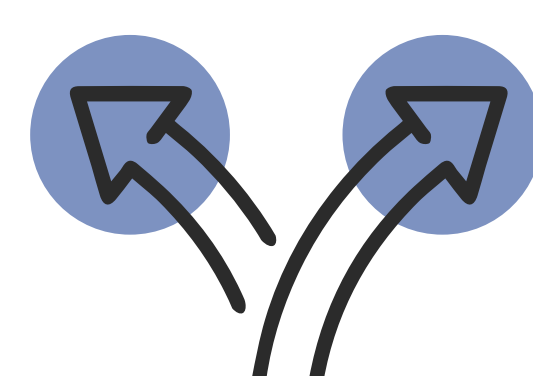
HETEROGENEITY AND HOMOGENEITY

Assume you are sick with a rare disease, and you have 2 treatment choices, but not much is known about them. **In a heterogeneous population, some patients will choose the 1st treatment, while others will choose the 2nd treatment. In a homogeneous population, all patients will select the same treatment.**

HOMOGENEOUS HETEROGENOUS



Everyone chooses the same treatment



Some people choose the 1st treatment, some the 2nd treatment

THE STUDY

In this study, we modelled two types of individuals. The first type “E” always chooses the treatment with the larger maximum expected success rate. The second type “T” is somehow optimistic or pessimistic and selects the treatment with a higher value that is different from the expected value and depends on each individual’s optimistic/pessimistic preference.

TYPE E



Always chooses treatment with larger maximum expected success rate

TYPE T



Can be optimistic or pessimistic and will select different treatments

THE RESULTS

The heterogeneity of decision-makers in a population improved the overall benefit of treatment under some conditions. **Homogeneous populations could fail to select the better treatment periodically, but heterogeneous populations could avoid this mistake.**

CONCLUSION

We found that heterogeneity of decision making among individuals is important for overall benefit of a population. Our findings can be applied to any social conditions and could work for the contexts in clinics where conventional clinical trials can not be designed because the contexts are too rare to design such trials or too personalized for patients.

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