

The Impact of the COVID-19 Pandemic on Collaboration and Innovation in Antiviral Drug Development: A Multi-Stakeholder Systems Dynamics Analysis

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OBJECTIVES

Explore **qualitative stakeholder perspectives**, in the context of the IMI CARE consortium, on how the drug development process is impacted by the time pressure caused by COVID-19 and by the steep learning curve that comes with a new disruptive disease.

Translate these insights into a **qualitative model**.

Generate **learnings** from this model to improve **future drug development**.

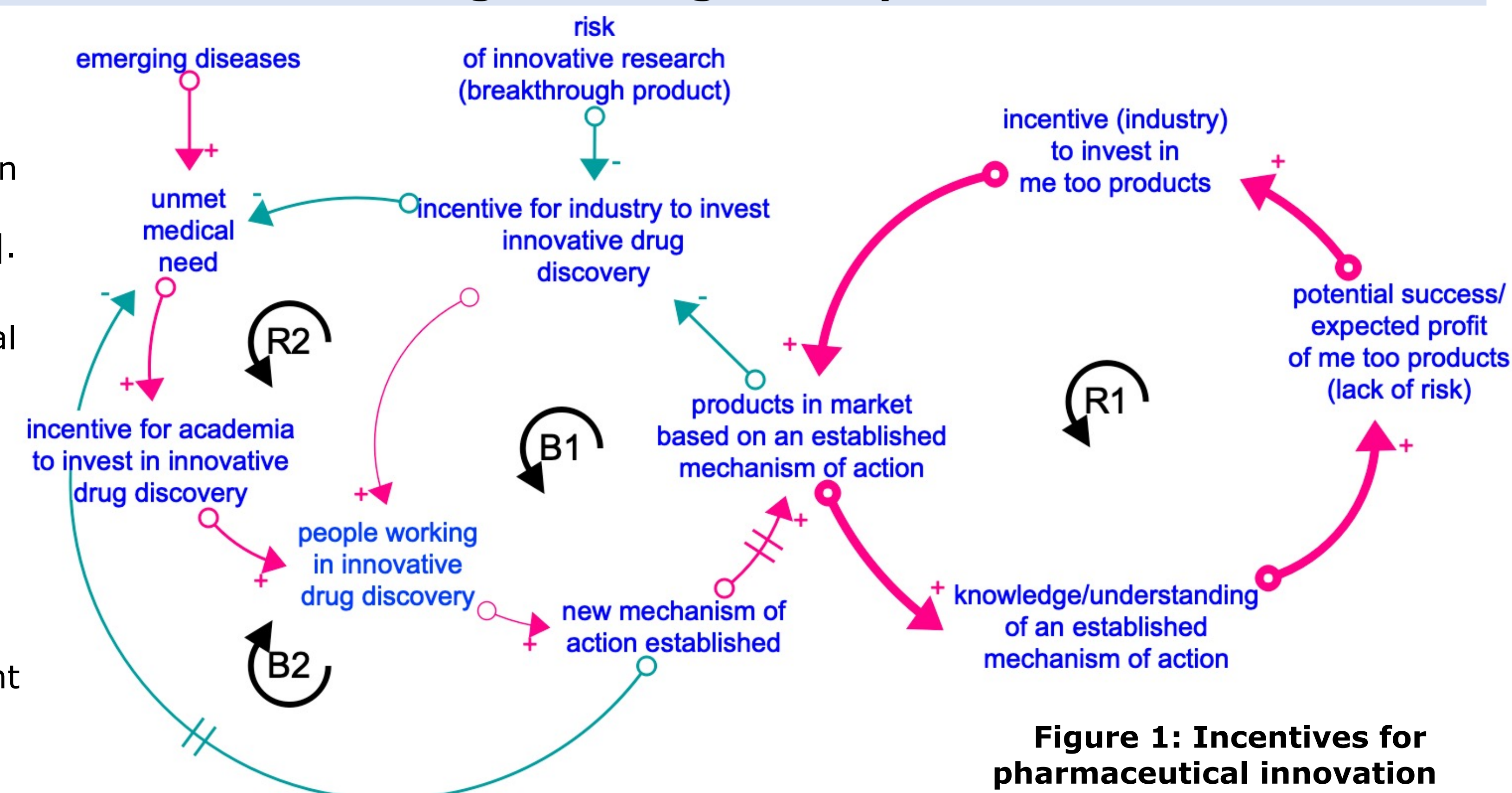
BACKGROUND: challenges in drug development

Disconnect across parts: Lack of communication and collaboration, problems of reproducibility, and segregation of the processes and partners across the drug life cycle [1-3].

Unsustainable growth: financial return not compensating investment [4-5].

Insufficient incentives for innovation and unmet medical need (figure 1) [5-7].

Insufficient patient involvement in drug development [1,8].



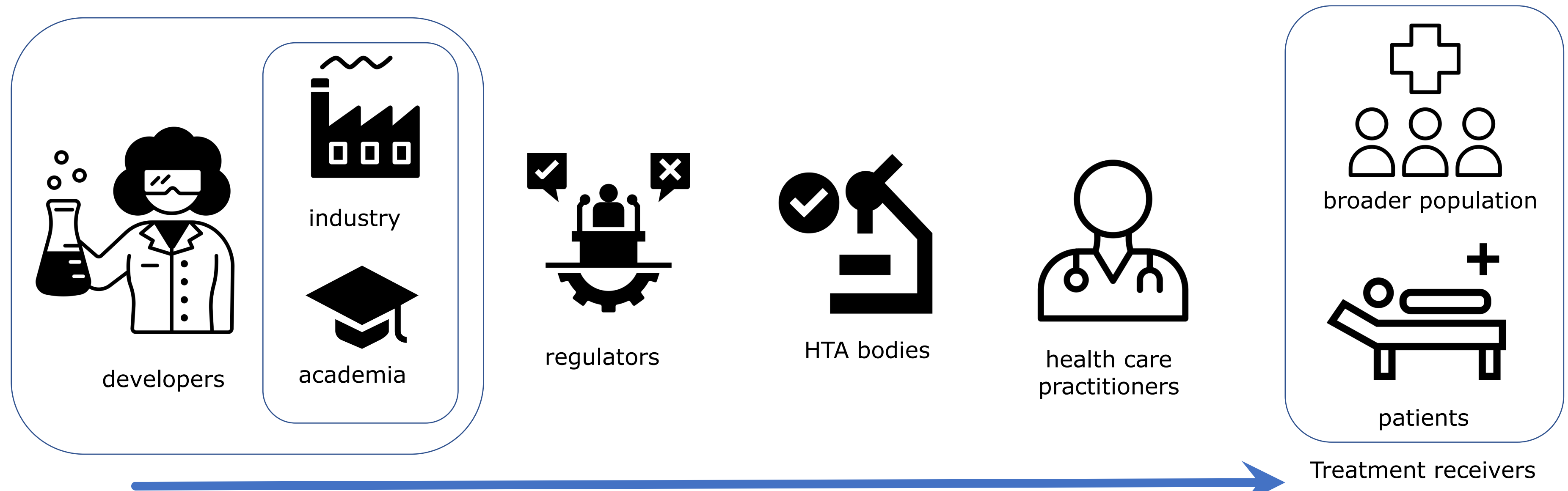
METHODS

Systems dynamics is based on the idea that a problem cannot be considered in isolation, but in the full context of everything it could potentially influence. This gives a full picture of the added value to the entire health system of a particular intervention [9].

Our **systems modelling** process consists of two steps:

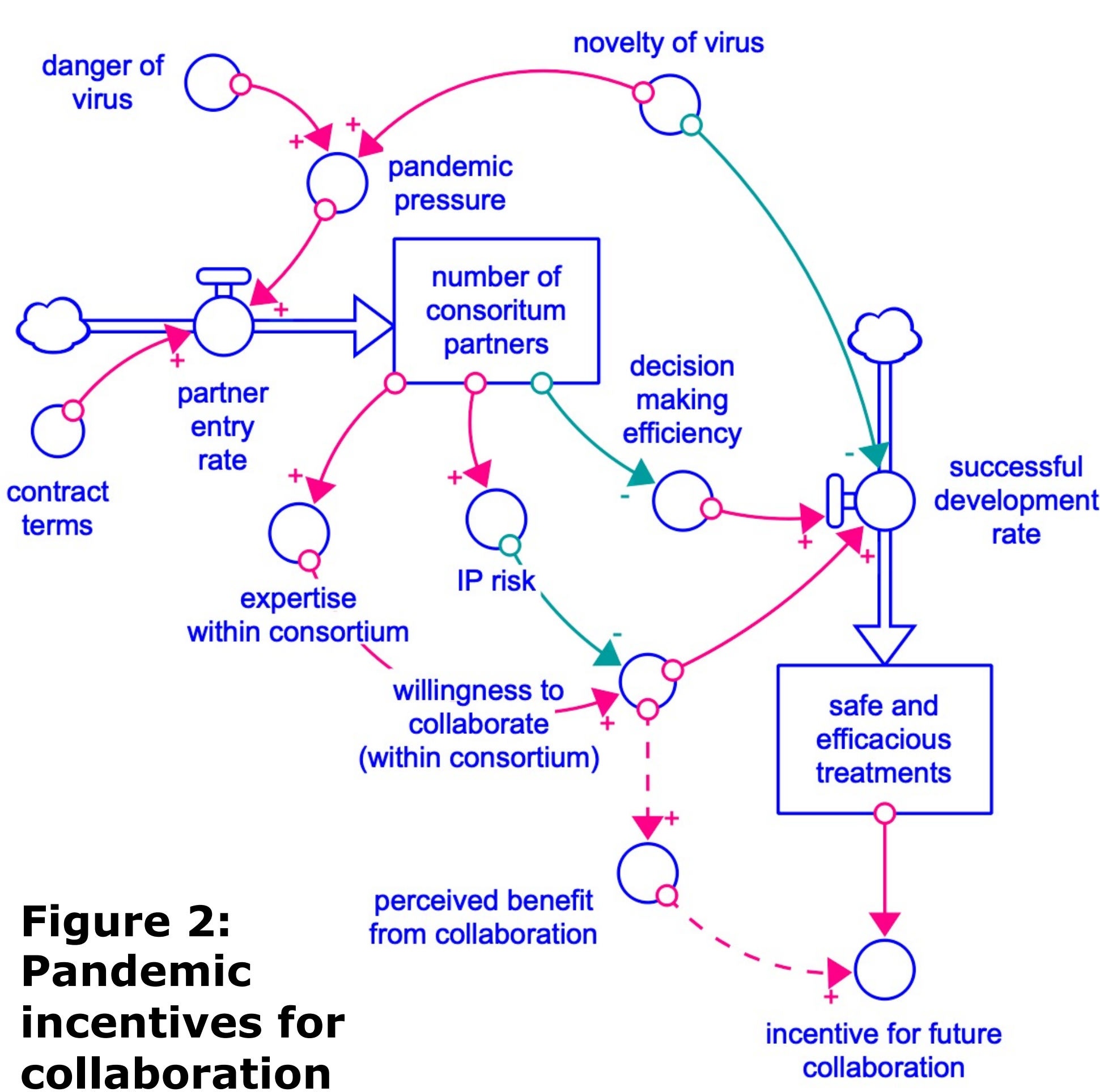
- Model building sessions:** During model building interviews we develop the model based on in-depth discussion of the system with stakeholders across the drug life cycle. The final model is based on the shared perspectives of stakeholders.
- Model validation sessions:** We conduct model validation interviews or workshops to ensure that we have accurately represented the insights from each stakeholder.

STAKEHOLDERS ACROSS THE DRUG LIFE CYCLE



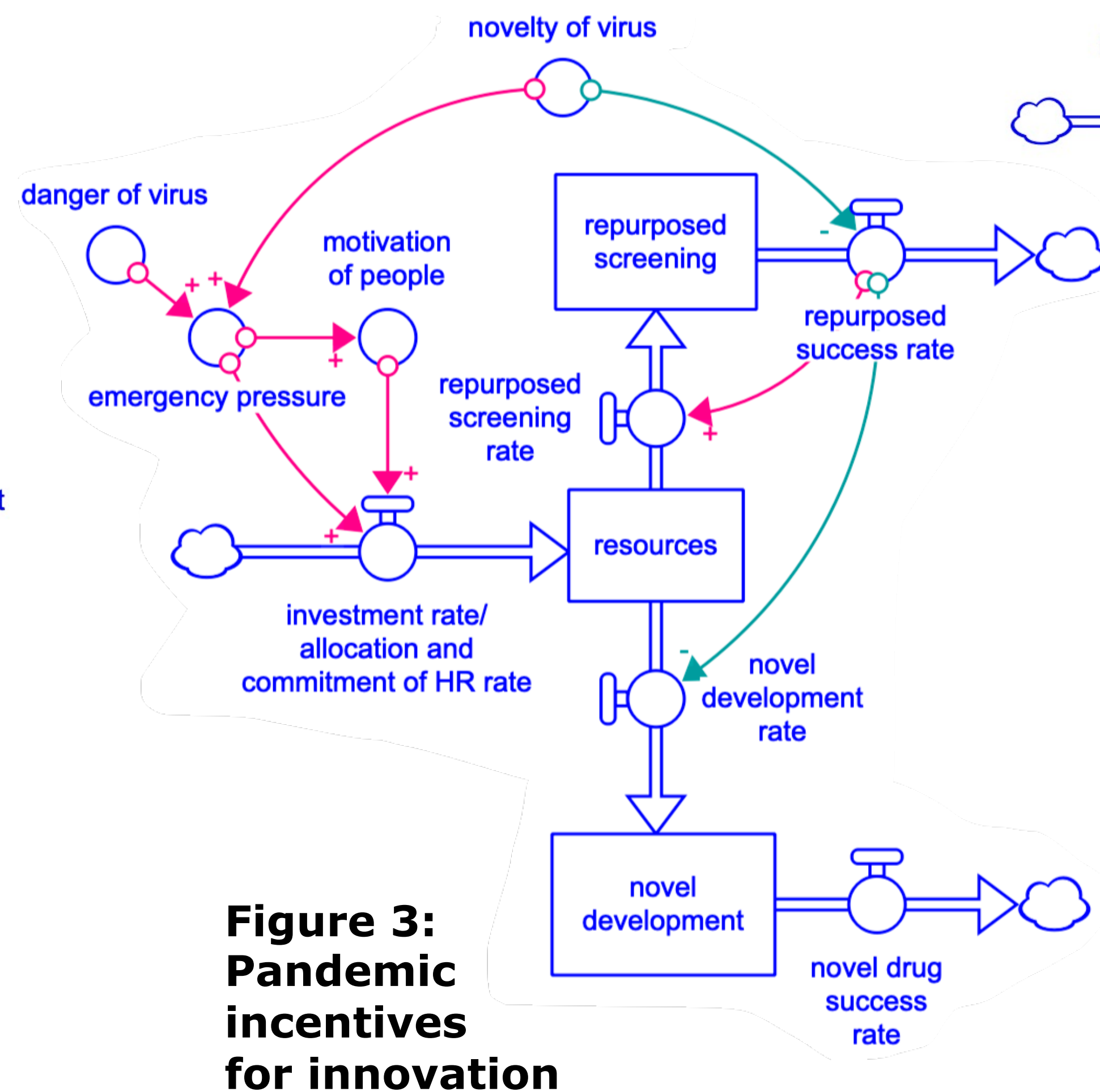
RESULTS

The modelling process has identified important variables and mechanisms that facilitated collaboration and innovation during the pandemic. Challenges were also identified related to the uncertainty of project planning and intermediate results with effect on the progress and allocation of work packages to the IMI CARE consortium partners.



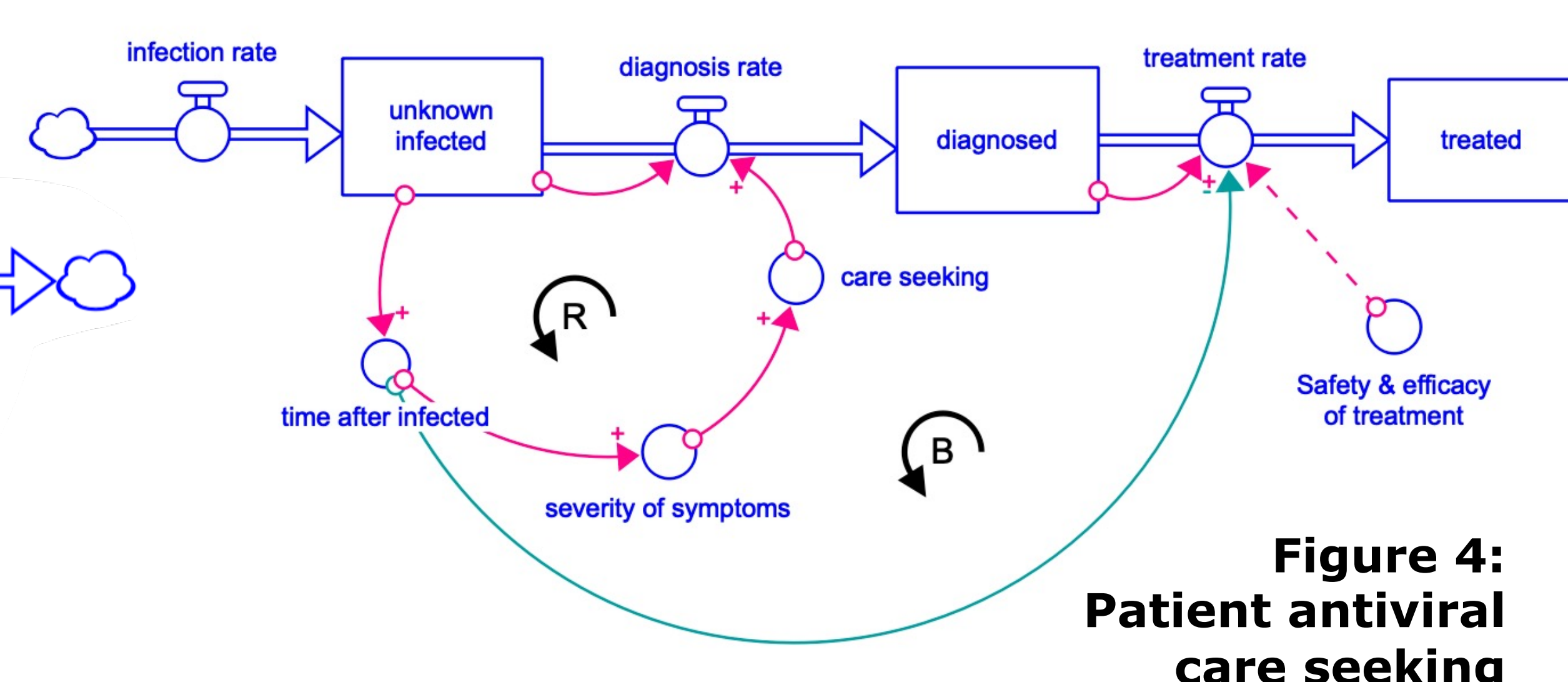
The model building process identified key determinants of successful collaboration such as number of consortium partners, expertise of partners, intellectual property risk and perceived benefit of collaboration.

Due to high levels of uncertainty in drug development, innovative techniques and positive collaboration will not always lead to a successful drug candidate. This research can be used to provide additional evidence of successful collaboration to promote future collaboration.

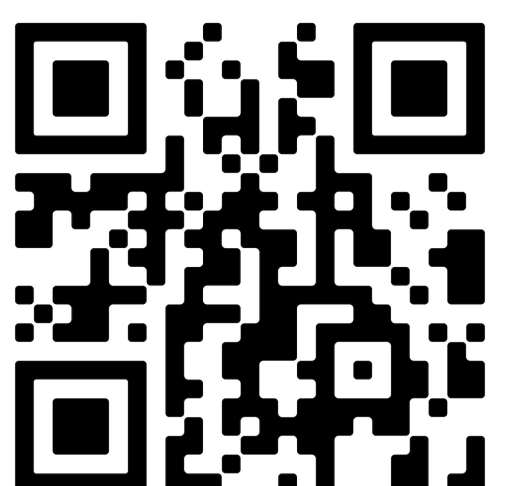


This figure shows that the novelty of coronavirus actually promoted innovation and novel development. Failed repurposing efforts created incentive to channel resources (budget and personnel) to novel drug search. Since covid is so different to any existing virus, there was no existing mechanism of action to rely on or existing treatment that could be repurposed, which forced increased innovation.

Additionally, the emergency pressure (also exaggerated by the novelty of the virus) caused an influx in the availability of budget and resources, which further led to and facilitated innovation.



This figure represents the downstream health impact of an antiviral treatment. No matter how safe or efficacious a treatment is, it is not successful if people do not use it. Since antivirals need to be administered early in the course of infection, timely patient care seeking is extremely important. Initial patient interviews have shown that patients are unlikely to seek care in time to receive an antiviral treatment with the current culture of patient behaviour.



For more information on the **systems dynamics (SD) methodology**, a key for the legends used in the figures, and the **SD explanation** of the figures please see the supplementary **handout** or scan this **QR code**

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CONCLUSION

The conceptual systems dynamics modelling process confirmed that pandemic pressure promoted successful public-private-academic collaboration and positive momentum in drug development. Stakeholder interviews revealed key determinants for collaboration and innovation. All determinants were translated into the model that can be used for strategic decision making throughout the drug life cycle. In this way, the model can be used to contribute to more sustained responsiveness to emergencies in drug development going forward. These are preliminary results, more model building interviews will be conducted to further validate results and quantify these initial qualitative insights.