

## STATISTICAL SIGNIFICANCE

*Statistics play a crucial role in combating epidemic diseases. Decision makers rely on data to devise effective policies that control the spread while considering resource constraints. By understanding the relationship between vaccination rates, social connectivity, and other relevant factors, we can make informed choices to halt the disease's propagation. Utilizing statistical insights empowers us to optimize strategies, effectively manage epidemics, and safeguard public health.*

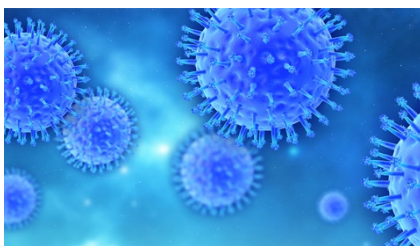
### Social connection, vaccination, and infection

#### What is the optimal policy?

The optimal policy to combat an epidemic disease varies depending on the specific disease, affected population, and available resources. Examples of effective public policies include limiting human interaction through stay-at-home measures, reducing infection rates with mandatory face masks, and making the disease less severe through vaccination. Striking a balance between these approaches is crucial, as complete vaccination may be costly, and cutting off all social connections can harm the economy. Policymakers must study the relationship between social connectivity and infection rates to find the best strategies for effective disease control.

#### Correlation and causation:

Statisticians oftentimes focus more on correlations and predictions. However, in order to evaluate a public policy, we are interested in the causation as our objective is to measure the effect of the policy. However, causal inference in this setting is challenging. Most causal inference models are developed under the no-interference assumption which means that the vaccination of other units does not affect the individual's unit's outcome. It is clear that in our case,



the treatment of other units affects your infection. In the policy evaluation, we should address this problem.



#### How to handle interference?

Handling interference is crucial for accurate policy evaluation when the no-interference assumption is violated. One effective approach is implementing contact tracing to create a social network. By incorporating this network structure into the model, we can distinguish the direct effect of an individual's vaccination from the indirect effect of the vaccination status of their contacts. However, contact tracing for everyone can be costly and raise privacy concerns.

#### Statistics learn network:

While tracing every individual may not be feasible, statistics can play a vital role in generalizing from small samples to larger populations using network modeling. By predicting the absence of connections based on individuals' features, we can construct the social network from

smaller experiments. This way, statistics help us make more comprehensive predictions and provide valuable insights into the indirect effects of vaccination within a population without the need to trace every single contact. This approach strikes a balance between efficiency and accuracy, enabling policymakers to evaluate the policy's impact and make informed decisions while considering limited resources and privacy concerns.

#### Statistics lead the world to a safer place:

By quantifying the causal impact of social connections, vaccinations, and available resources, statistics play a crucial role in devising safer policies for society. This data-driven approach enables policymakers to make informed decisions, effectively controlling the interaction of these factors. Through rigorous analysis, statistics provide valuable insights that lead to safer and more effective policy implementations, ultimately contributing to the well-being and security of the community.

