RESEARCH INSIGHTS

How Can Public Policies Curb Pandemics?

- In general, stringent lockdowns are warranted when a disease's infectiousness is high, but less so when only a disease's deadliness is elevated.

- Optimal lockdown policies for some infectious diseases include imposing different restrictions on different age groups.

- Intensive testing enables a less restrictive lockdown, reduces GDP losses, and facilitates a quicker easing of restrictions.

CONTEXT

The implementation of lockdown measures in response to a pandemic is a complex challenge. Some diseases are highly contagious, while others are more lethal. Furthermore, many infectious diseases, particularly those caused by viruses such as COVID-19 (see figure), are much more deadly for the elderly than the young. This steep age gradient in raises several important questions. How much voluntary protective behavior do different age groups engage in? What does that imply for a policy that aims to balance economic and health effects? Moreover, how would optimal policy be different for a disease with a less steep age gradient?

PROJECT

The project develops an economic model of the pandemic that features age heterogeneity and individual choice, allowing agents to choose rationally how much social distancing to undertake in relation to forgone earnings and leisure. The government can curb infections by imposing restrictions on outside activities separately by age to decrease the number of interactions. The model, calibrated to data from the COVID-19 pandemic in the United States, assesses the importance of individual behavioral changes and is applied to pandemics caused by different viruses (among others the Spanish flu of the 1910s) to examine the influence of economic conditions on optimal policies.

RESULTS

In the calibrated model, during COVID outside activities are restricted both by both voluntary protective behavior and a government-imposed lockdown. This lower activity leads to a death toll 80% lower than in a purely epidemiological model where individuals do not adjust their behavior. Voluntary behavior alone is important. In a no-lockdown counterfactual scenario, older individuals shield themselves substantially. The young also reduce work and outside leisure, but much less so due to their lower risk of dying and the need to earn a living. Though the young can telework, this is a lower-productivity activity. The death toll in this no-lockdown world is 65% lower than in the epidemiological scenario in which individuals do not change their behavior.

This framework can additionally be used to compute a socially optimal lockdown. This optimal lockdown, stricter than what was implemented in the United States, reduces deaths across both age groups. Increased restrictions predominantly impact the young, while the old gain more outdoor time due to a lower threat of infection. This asymmetry is intentional, because the young tend to neglect taking strong precautions to limit the spread of the disease due to low personal risk, leaving the old to bear an undue burden.

POLICY IMPLICATIONS

Stringent lockdowns are warranted when the disease's infectiousness is high, but less so when only the case fatality rate (CFR) is elevated. The age gradient is a crucial factor: if the CFR is high among the young, a sizable and active group, fewer additional restrictions are necessary due to increased voluntary precautions. Furthermore, economic conditions have a big impact on the optimal lockdown. In scenarios where the older population is smaller, life expectancy is lower, or teleworking is easy, a less restrictive policy is optimal. Importantly, the optimal policy may not completely prevent all deaths, and the welfare benefits can be unevenly distributed across age groups.

Testing is also important. While testing alone does not eliminate COVID-19, it significantly alleviates the impact of the virus by providing individuals with information on their infected or non-infected status and enabling them to act accordingly. Moreover, the quality of the testing regime influences the choice of measures to be implemented. A robust testing regime permits a less restrictive lockdown, reducing GDP losses and facilitating a quicker easing of restrictions. In situations where tests are costly and scarce, it is beneficial to prioritize them for the young, who generally spend more time outside than the old and are thus more likely to contract or spread the disease.

Key Concept

OPTIMAL LOCKDOWN
A set of shelter-at-home policies that aims to maximize thewelfare of individuals of all age groups.
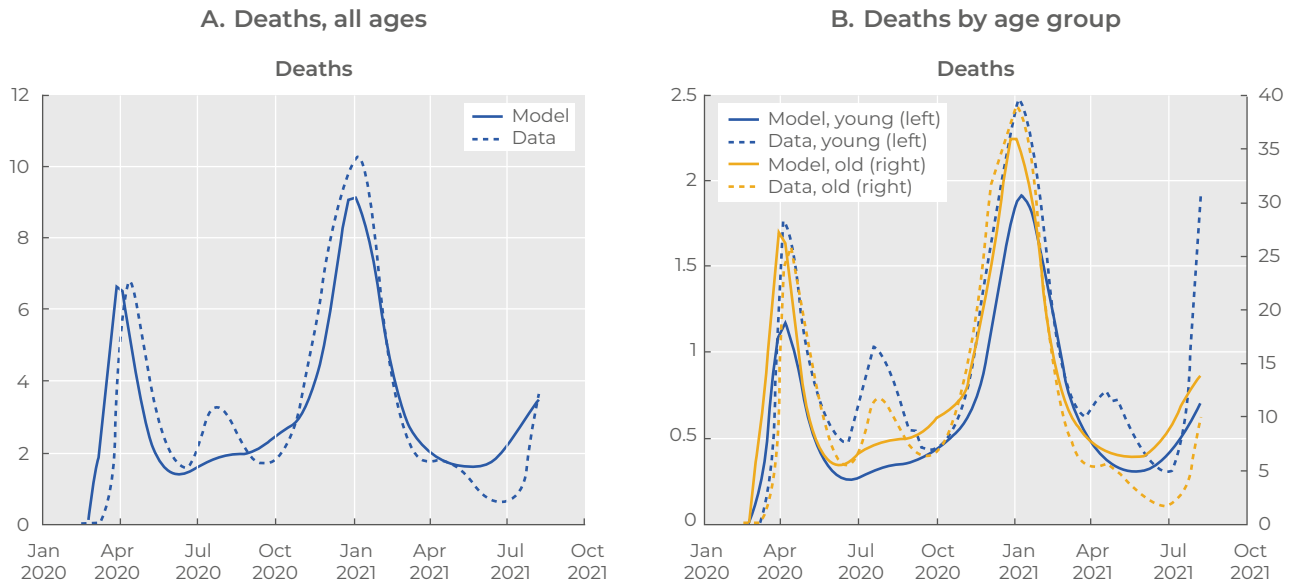
Key Concept

CASE FATALITY RATE
The fraction of people who die from a disease among all individuals infected with the disease.

Figure 1. COVID Deaths per 100,000 People

A. Deaths, all ages

Deaths

B. Deaths by age group

Deaths

Note: Data from Centers for Disease Control and Prevention (CDC).

📘 **FULL STUDY**

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DEPARTMENT OF RESEARCH AND CHIEF ECONOMIST

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