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Optimal intervention strategies to minimize spread of infectious diseases and economic impact on a dynamic small-world network

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We investigate the economic impacts of pharmaceutical and non-pharmaceutical interventions on a labor force during an epidemic. Specifically, we study an optimal control problem on a dynamic SIV-type small world network model with the controls corresponding to vaccinations, lockdown orders, and other intervention strategies. The cost functional utilized is a Cobb-Douglas production function measuring labor productivity as well as a functional measuring the cost of treating the disease. Using Pontryagin's maximum principle we can numerically approximate the optimal control strategy which allows us to determine the optimal level of intervention. These methods illustrate the usefulness of this approach to inform policymakers and better equip society for emerging epidemics.