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RESEARCH ARTICLE

# Is "no test is better than a bad test"? Impact of diagnostic uncertainty in mass testing on the spread of COVID-19

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**Citation:** Gray N, Calleja D, Wimbush A, Miralles-Dolz E, Gray A, De Angelis M, et al. (2020) Is "no test is better than a bad test"? Impact of diagnostic uncertainty in mass testing on the spread of COVID-19. PLoS ONE 15(10): e0240775. https://doi.org/10.1371/journal.pone.0240775

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**Data Availability Statement:** https://github.com/Institute-for-Risk-and-Uncertainty/SIRQ-imperfect-testing.

## Abstract

Testing is viewed as a critical aspect of any strategy to tackle epidemics. Much of the dialogue around testing has concentrated on how countries can scale up capacity, but the uncertainty in testing has not received nearly as much attention beyond asking if a test is accurate enough to be used. Even for highly accurate tests, false positives and false negatives will accumulate as mass testing strategies are employed under pressure, and these misdiagnoses could have major implications on the ability of governments to suppress the virus. The present analysis uses a modified SIR model to understand the implication and magnitude of misdiagnosis in the context of ending lockdown measures. The results indicate that increased testing capacity alone will not provide a solution to lockdown measures. The progression of the epidemic and peak infections is shown to depend heavily on test characteristics, test targeting, and prevalence of the infection. Antibody based immunity passports are rejected as a solution to ending lockdown, as they can put the population at risk if poorly targeted. Similarly, mass screening for active viral infection may only be beneficial if it can be sufficiently well targeted, otherwise reliance on this approach for protection of the population can again put them at risk. A well targeted active viral test combined with a slow release rate is a viable strategy for continuous suppression of the virus.

## Introduction

During the early stages of the United Kingdoms SARS-CoV-2 epidemic, the British government's COVID-19 epidemic management strategy was been influenced by epidemiological modelling conducted by a number of research groups [1, 2]. The analysis of the relative impact of different mitigation and suppression strategies concluded that the "only viable strategy at the current time" is to suppress the epidemic with all available measures, including the lockdown of the population with schools closed [3, 4]. Similar analysis in other countries lead to over half the world population being in some form of lockdown by April 2020 and over 90% of

# ANCIENT HISTORY

12th April - Spend 8 hours on a zoom call finalising paper

14th April - Submit paper to The Lancet Journal and upload it

15th April - Paper is rejected by The Lancet

6th May - After a rewrite and reformatting paper is submitted

21st October - Paper published

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# EPIDEMIOLOGICAL MODELS