



The Impact of the COVID-19 Pandemic on Research

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Abstract

The COVID-19 pandemic has precipitated the worst global recession in decades. Academic institutions inevitably have been affected through cuts to funding. The charity sector, a significant source of research funding, has particularly suffered from loss of income. National lockdowns and social distancing measures implemented by laboratories have had a detrimental impact on laboratory research, with researchers being forced to temporarily abandon biological experiments. The worldwide research community has responded strongly and decisively through a shift to basic and clinical research into COVID-19. This has resulted in the swift elucidation of the transmission, pathogenesis and treatment of COVID-19. The rapid development of effective vaccines against COVID-19 is a testament to the international research community, however it is imperative that double-blinded randomised controlled trials are continued. Despite the success of COVID-19 research, it is important to note that there has been significant substandard, poor quality research published without peer-review, which has subsequently proven to be false with larger randomised studies. Evidence suggests that COVID-19 has worsened gender inequality within academia. The long-lasting effects of the pandemic on the international research landscape will be of great importance.

COVID-19 is responsible for the deepest global recession in decades. The World Bank predicts a 5.2% contraction in global GDP in 2020, stating that “over the long horizon, the deep recessions triggered by the pandemic are expected to leave lasting scars through lower investment, an erosion of human capital through lost work and schooling, and fragmentation of global trade and supply linkages” [1]. Academic institutions worldwide are experiencing massive losses of income from accommodation, catering and conferences, which is estimated to be around £790 million in the UK, equivalent to roughly 2% of the UK universities’ total income [2]. The loss of university income could mean difficulty in meeting research grants and fostering new research partnerships between charities and businesses. Medical charities have a huge role in facilitating medical research through grants and have been greatly affected by the pandemic. In the UK, in 2018, medical research charities invested £1.3 billion of their income into research and, due to the pandemic, 75% of the Association of Medical Research Charities’ members anticipate a reduction of

25% or more of their funding income, which could mean a reduction of £325 million in research funding [3].

In response to the COVID-19 pandemic and national lockdowns, laboratories worldwide were forced to close abruptly. Laboratory work was largely halted for several months during national lockdowns. Researchers were forced to discontinue or suspend valuable experiments which often involved the discarding of cell cultures and culling of animal models (mainly mice), some of which will have taken several years to establish. The true extent of this loss of productivity and its tangible impact on research output will become evident in months to come. Early researchers were arguably worst affected; the loss of more than 6 months of a 3-4 year PhD study has the potential to prevent the achievement of sufficient results by the end course of the PhD study.

Once lockdowns eased, laboratories and institutions were reopened in a phased manner, with social distancing restrictions affecting the total number of researchers allowed into laboratories at one time. Furthermore, social distancing has meant that laboratories are operating at a fraction of their capacity. Biological research often occurs over the span of months due to the need to grow cell cultures or animals. With the potential for another lockdown, researchers are unwilling to start long-term experiments for fear of having to discard their experiments again, often erring on the side of caution [4]. The restrictions imposed upon researchers due to social distancing may have negative impacts on healthcare provision by limiting clinicians to important information related to patient care. Additionally, significant adjustments to laboratory operations, may demoralise staff and increase anxiety [5]. From a clinical point of view, although modern technology in primary care is not a particularly recent advent, it is currently unclear whether the widespread adoption of online consultations has had, or will potentially have, a negative impact on patient outcomes.

The COVID-19 pandemic has dramatically shifted the research landscape towards both preclinical and clinical research surrounding COVID-19. It seems that the behemoth that is the scientific research community has di-

verted a huge proportion of its resources to the pandemic and the many facets that it encompasses. Many researchers were redeployed to COVID-19 research which has had great benefits in the fight against COVID-19. In the UK, following lockdown, clinical academics were re-deployed to projects involving therapeutic trials for COVID-19[6]. The UK has had a notable positive impact with the prominent RECOVERY trial which has found the only proven effective treatment against COVID-19 thus far [7]. Additionally, research into a COVID-19 vaccine has yielded unprecedented results at a staggering pace. Usually, vaccines take between 8 to 17 years to develop [8]; however, the concerted global focus on developing a COVID-19 vaccine has resulted in potentially effective and scalable vaccines being developed in less than a year of COVID-19 appearing in China [9,10]. In fact, on 2nd December 2020, the UK government accepted the recommendation from the independent Medicines and Healthcare products Regulatory Agency (MHRA) to approve the Pfizer/BioNTech's COVID-19 vaccine for use¹⁰. This remarkable feat has taken place within only one year of the first case of COVID-19 being reported to the World Health Organization (WHO) in December 2019. The collaborative effort of researchers has resulted in the fastest production of a vaccine in the history of modern medicine.

Whilst the rapid development and recruitment for COVID-19 trials has undoubtedly resulted in success and is a testament to the worldwide research community, the rushed nature of this research has led to much duplication and production of many poor-quality trials. The Centre for Evidence-Based Medicine (CEBM) in Oxford, highlights that most COVID-19 clinical trials are open-label, and only a minority are placebo-controlled. They suggest that data which have been swiftly published, often preliminary and without peer review, haven't been of use to clinicians or patients, often leading to incorrect conclusions subsequently proven to be false once invalidated by well-designed large randomised controlled trials [11]. Notably in the rush to disseminate knowledge, prestigious journals such as the *New England Journal of Medicine* and *The Lancet* have retracted previously published articles that were seen as major COVID-findings at the time of publication [12,13]. A full list of retracted COVID-19 papers can be found at Retraction Watch [14].

Furthermore, COVID-19 and lockdowns may have exacerbated existing gender inequality within research. Early analysis suggests that female academics are commencing fewer projects and publishing fewer articles compared to male academics. This may be because women are disproportionately taking on childcare, and caring for their families whilst also expecting to be working from home [15]. COVID-19 seems to have had a disproportionate effect on scientists within different

disciplines; scientists working with time-sensitive biological experiments and in physical laboratories reported the greatest loss of research time, around 30-40% less than pre-pandemic levels[16].

In conclusion, COVID-19 has a significant detrimental impact on research output secondary to national lockdowns and social distancing measures, as well as impacting the completion of research projects by PhD candidates. However, the incredible efforts towards rapid and effective vaccine discovery is a true testament to the joint collaborative efforts by researchers throughout the UK and globally. It is also important to note that the pandemic has precipitated the production of substandard, often poorly conducted, studies investigating the virus, as COVID-19 research has become increasingly popular vogueish. Evidence suggests that the pandemic may have also worsened existing gender inequality within research. It will be interesting to see the outcomes of COVID-19 research in terms of vaccine discovery and public health interventions, as well as the long-term consequences of the pandemic on the overall landscape of scientific research.

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