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Impact of the COVID-19 pandemic on cancer incidence and mortality



The repercussions of the COVID-19 pandemic have indirectly affected the prevention and treatment of myriad diseases. Seminal research by Qingwei Luo and colleagues in *The Lancet Public Health*¹ underscores these impacts on cancer incidence and mortality in Australia. In the absence of the pandemic, Luo and colleagues estimate that cancer mortality rates would have continued the declining trend observed over the years before the emergence of SARS-CoV-2. However, delays in screening, diagnosis, and treatment due to the COVID-19 pandemic^{2,3} could lead to excess cancer deaths, and slow or even reverse the declining trend in mortality projected for some cancers. Specifically, Luo and colleagues estimate that in Australia alone, a 1-year interruption to health-care services and a 26-week delay in treatment would lead to 1719 (95% uncertainty interval 1333–2151) additional deaths between 2020–44 among colorectal cancer patients. For context, as of May 9, 2021, 7509 deaths directly attributable to COVID-19 have been reported in Australia.

Screening to diagnose cancers—such as colorectal, breast, prostate, cervical, and melanoma—at an early stage is instrumental to long-term survival.² However, screening for such cancers was postponed in many countries as COVID-19 hospitalisation rates surged. Surgeries and chemotherapy treatments were also postponed. The risk of death from colon cancer increases 6% every 4 weeks that surgery is delayed, and similar delays in adjuvant chemotherapy for colorectal cancer elevate the risk of mortality by 13%.² Before the pandemic, time-to-treatment initiation was approximately 4–5 weeks for patients with cancer in Canada.⁴ Results from a survey conducted by the Canadian Cancer Survivor network indicated that it took an average of 44 days to reschedule any procedure or surgery postponed due to pandemic.⁵ Delaying surgery or adjuvant treatment for colorectal cancer (from 31 to 75 days) is projected to more than double the elevated risk of death.² In addition to the pandemic affecting patient care, advances in cancer research and therapeutic developments were also impeded.⁶ Among surveyed cancer researchers, approximately a third of them had a clinical trial delayed or stopped, with

two-thirds stating their laboratory was shut down.⁶ It is estimated that the pandemic has delayed breakthroughs in cancer research by 18 months.⁶ As Luo and colleagues highlight, even after oncology diagnosis and treatment resume, the repercussions of the hiatus could continue for years into the future.

Luo and colleagues' findings have application for countries beyond Australia and for diseases beyond colorectal cancer. The pandemic hindered vaccinations for the human papillomavirus (HPV),^{7,8} which is essential to reducing risks of cervical and oropharyngeal cancers.⁸ Compounding reductions in HPV vaccination, cervical cancer screening was also disrupted during the pandemic.⁹ For example, HPV vaccination coverage among girls aged 12–13 years in the UK dropped from 88% in the 2018–19 school year to 59% in the 2019–20 school year;¹⁰ this occurred alongside a reduction in rates of cervical screening in the adult population.¹¹ The effects of the disturbance to the HPV vaccination and screening programmes will probably revibrate for decades. Modelling projections for the USA indicate up to 6200 additional oropharyngeal cancer cases among men by the year 2100 due to the HPV vaccine campaign interruption.⁸

In the wake of the 2022 Russian invasion of Ukraine, many public health programmes are being interrupted. During this time, many cancer patients struggle to receive the care they need. Over a two-month period, 5232014 Ukrainians have fled the country. Using 2020 annual cancer incidence in Ukraine according to the Global Cancer Observatory, there could be over 3200 of these refugees that will probably have their cancer diagnosis substantially delayed because of the Russian invasion. Moreover, cancer care in both Russia and Ukraine are suffering from the aftermath of the invasion. The statistical framework of Luo and colleagues could be used to provide insight into the impacts of the invasion on future cancer mortality among Ukrainians and Russians.

Luo and colleagues illustrate the indirect reverberations of the COVID-19 pandemic on cancer incidence and mortality in Australia. Understanding the future public health implications allows for the

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For more on the **number of deaths attributable to COVID-19** see <https://coronavirus.jhu.edu/data/mortality>

For more on the **2020 annual cancer incidence in Ukraine by the Global Cancer Observatory** see <https://gco.iarc.fr/today/data/factsheets/populations/804-ukraine-factsheets.pdf>

proper allocation of resources to regain any ground lost throughout the pandemic. Studies such as the one by Luo and colleagues are critical to understanding how large-scale public health crises influence the quality of and access to care.

We declare no competing interests.

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- 1 Luo Q, O'Connell DL, Yu XQ, et al. Cancer incidence and mortality in Australia from 2020 to 2044 and an exploratory analysis of the potential effect of treatment delays during the COVID-19 pandemic: a statistical modelling study. *Lancet Public Health* 2022; **7**: e537–48.
- 2 Hanna TP, King WD, Thibodeau S, et al. Mortality due to cancer treatment delay: systematic review and meta-analysis. *BMJ* 2020; **371**: m4087.
- 3 Malagón T, Yong JHE, Tope P, Miller WH Jr, Franco EL. Predicted long-term impact of COVID-19 pandemic-related care delays on cancer mortality in Canada. *Int J Cancer* 2022; **150**: 1244–54.
- 4 Barua B, Moir M. Waiting your turn wait times for health care in Canada, 2019 report. 2019. <https://www.fraserinstitute.org/sites/default/files/waiting-your-turn-2019-rev17dec.pdf> (accessed May 12, 2022).
- 5 Leger. Impact of COVID-19 crisis on cancer patients and their ability to receive treatment – 3rd survey. 2021. https://survivornet.ca/wp-content/uploads/2021/08/Survey-3-CCSN-Impact-on-Cancer-Patients-3rd-Report_July-30-2021.pdf (accessed April 25, 2022).
- 6 American Association for Cancer Research. AACR Report on the Impact of COVID-19 on Cancer Research and Patient Care, 2022. https://www.aacr.org/wp-content/uploads/2022/02/AACR_C19CR_2022.pdf (accessed May 2, 2022).
- 7 Toh ZQ, Russell FM, Garland SM, Mulholland EK, Patton G, Licciardi PV. Human papillomavirus vaccination after COVID-19. *JNCI Cancer Spectr* 2021; **5**: pkab011.
- 8 Damgacioglu H, Sonawane K, Chhatwal J, et al. Long-term impact of HPV vaccination and COVID-19 pandemic on oropharyngeal cancer incidence and burden among men in the USA: a modeling study. *Lancet Reg Health Am* 2022; **8**: 100143.
- 9 Masson H. Cervical pap smears and pandemics: the effect of COVID-19 on screening uptake & opportunities to improve. *Womens Health (Lond)* 2021; **17**: 17455065211017070.
- 10 Lakhani S, Saliba V, Roy P. Human papillomavirus (HPV) vaccination coverage in adolescent females and males in England: 2020 to 2021. 2021 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1040436/hpr2021_hpv-vc.pdf (accessed April 25, 2022).
- 11 NHS Digital. Cervical Screening Programme. England - 2020-21 [NS]. <https://digital.nhs.uk/data-and-information/publications/statistical/cervical-screening-annual/england---2020-21> (accessed April 26, 2022).