

COVID-19 Pandemic is Expected to Cause a Delayed Increase in Cancer Rates Due to Its Effect on Lifestyles

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Abstract: It is thought that cancer is caused in large by environmental exposures, as well as poor lifestyle choices. Examples of proven risk factors for cancer include air pollution, occupational exposure, exposure to ionizing radiation, smoking and exposure to secondhand smoke, alcohol intake, poor diet, excess body weight, insufficient physical activity, insufficient breastfeeding, postmenopausal hormone therapy and oral contraceptives. However, an alternative point of view emerged recently that DNA replication errors during stem cell divisions are the major cause of cancer. Hence, the relative contribution of environmental, lifestyle and cellular causes to carcinogenesis is still an open question that requires further investigation. We have recently developed a statistical methodology to estimate the number of events driving cancer progression from the age distribution of cancer incidence. It is important to understand how these predictions relate to established risk factors. We found that the predicted number of driver events per tumor strongly correlates with the proportion of cancer cases attributable to environmental and lifestyle risk factors for all cancers except those induced by infection or ultraviolet radiation. The correlation was confirmed for three countries, three corresponding incidence databases and risk estimation studies, as well as for both sexes: USA, males [$r=0.80$, $P=0.002$], females [$r=0.81$, $P=0.0003$]; England, males [$r=0.90$, $P<0.0001$], females [$r=0.67$, $P=0.002$]; Australia, males [$r=0.90$, $P=0.0004$], females [$r=0.68$, $P=0.01$]. This study suggests that the majority of driver events (60-80% in males, 50-70% in females) are induced by environmental carcinogens and poor lifestyle choices, and not by DNA replication errors or other internal processes. As COVID-19 pandemic has had and continues to have strong influence on people's lifestyles, such as causing a sharp decrease in physical activity, it is expected to have a strong delayed impact on the rates of cancer in the future.

Keywords: cancer; carcinogenesis; environmental exposures; lifestyle choices; risk factors; DNA replication errors; stem cell division; statistics; epidemiology; age distribution; incidence; preventable cause; modifiable risk; external risk; population attributable fraction; cancer drivers; COVID-19

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