

One year into COVID-19 – the infodemiology of cancer screening

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Introduction. To investigate the public interest in cancer screening before, during and after one year of the COVID-19 pandemic, in relation to the number of cases and deaths caused by the coronavirus.

Material and methods. Google Trends (GT) was used to obtain data on online interest in screening for the most common cancer types during COVID-19 pandemic.

Results. It was found that although online interest in screening collapsed during the early stages of the pandemic, it managed to gradually return to its pre-pandemic levels six months later despite a growing number of COVID-19 related deaths. Nevertheless, some data and reports suggest that this unprecedented crisis may result in increased mortality and incidence rates.

Conclusions. The study raises the importance of continuous and active actions aimed at raising cancer awareness which appears to be crucially important during a public health crisis such as the COVID-19 pandemic.

Key words: cancer screening, cancer information seeking, COVID-19, infodemiology, public health

Introduction

Cancer is considered one of the leading causes of death globally, and the rate of cancer-related deaths is expected to increase significantly in the future. However, none of the calculations or estimates took into account the extraordinary situation that the world has been dealing with since the beginning of 2020 – the coronavirus pandemic that deprioritized, delayed or even ceased a lot of cancer care on a global scale [1]. It spurred the World Health Organization (WHO) to issue a statement saying that although COVID-19 poses multiple threats, the epidemic

of cancer is one that cannot be ignored and ensuring continuity of care is one of the key challenges [2].

The latest research and data indicate the alarming impact of the COVID-19 pandemic on healthcare systems, contributing to reduced cancer detection and treatment, which may increase cancer morbidity and mortality for years to come [3]. As early detection through screening may substantially increase the likelihood of cancer survival, reduce morbidity rates and improve patients' quality of life, the stakes are significant [4]. This refers not only to the human aspect but also the capabi-

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ilities of healthcare systems to absorb the additional burden. The unexpected circumstances may make some previously curable tumors more difficult to treat, increase their number and eventually lead to more deaths [5]. Snyder et al. already found that globally public interest in cancer screening tests decreased by as much as 76% during the first wave of the pandemic [6].

The common characteristic of this and numerous other studies is that they all investigated public health issues by using Google Trends (GT). This widespread tool presents data on keywords typed into the Google search engine and is used for identifying popular health topics as well as other purposes such as evaluating interventions for policymakers, monitoring population concerns or even predicting waves of influenza [7, 8].

The previous reports on online cancer screening covered only the early stages of the coronavirus pandemic [6]. This paper scrutinizes public interest in cancer screening during the pandemic at the global level, to cover the entire year, checks for any associations with the number of coronavirus deaths and the latest available data on cancer.

Methods

We used GT to obtain data on online interest in cancer screening during the COVID-19 pandemic.

Google Trends is an analytic tool, widely used in health research, that “analyzes Google Search searches and provides data on temporal patterns in relative search volumes (RSV) for user-specified terms”. RSV presents selected timeframes (weeks, months etc.) in which a period of time with the highest interest equals to 100 while others are shown as percentages relative to the 100 [9].

We performed worldwide searches in Google Trends on 7 May 2021 covering the period from 5 January 2020 to 2 May 2021. The following search terms were used: “mammogram” for breast cancer, “colonoscopy” for colorectal cancer, “Pap smear” for cervical cancer and “PSA test” for prostate cancer. We also performed the same search covering a 5-year period (from 8 May 2016 to 2 May 2021) to check for any cyclical changes over time. Each of the final search terms was selected based on its relative popularity measured with GT. For example, we compared terms “mammography”, “mammogram”, “breast cancer screening”, “breast examination” or “breast test” to eventually choose “mammogram”.

Three 10-week time periods were selected in order to compare online interest: one year before the COVID-19 outbreak (3 March 2019–5 May 2019), the COVID-19 outbreak (1 March 2020–3 May 2020), one year after the COVID-19 outbreak (28 February 2021–2 May 2021). RSV values were compared using the Wilcoxon test. Data are presented as median and interquartile range (IQR). The “health” query category was used to obtain the most relevant data.

The queries referred to screening tests for the most common global types of cancer were selected according to the

WHO Cancer Fact Sheets [10]. Lung cancer was excluded from the analysis to reduce the bias of increased interest in chest computed tomography (CT) used in medical procedures for COVID-19 [11].

Data on weekly COVID-19 deaths came from the OurWorld in Data and compared with GT results which allowed us to compare online interest in cancer screening against the course of the pandemic over time [12].

Results

The interest of Internet users in cancer screening over the 4 years before the pandemic outbreak was fairly constant (fig. 1). Colonoscopy had the greatest number of searches (4-year mean RSV of 74), followed by mammogram (35), pap smear (30) and PSA test (9). A sharp drop of interest in cancer screening started around 15 March 2020. Approximately six months later RSV values managed to slowly return to their original pre-pandemic levels. There were cyclical declines of RSV values for each of the search terms in the second half of December. The interest in mammography grew cyclically each October.

The decline in cancer screening interest in March 2020 coincides with the COVID-19 outbreak (fig. 2). In the following months, RSV values began to increase despite a growing num-

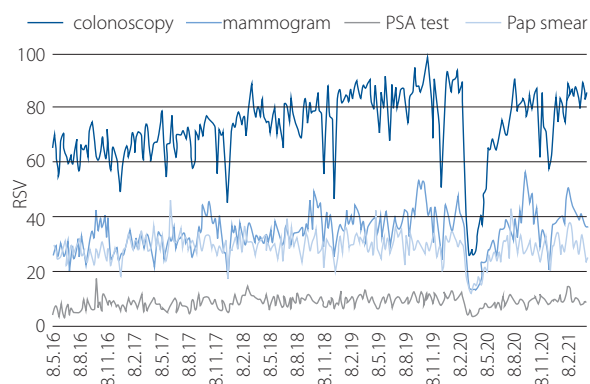


Figure 1. The interest of Internet users in cancer screening over 4 years before the pandemic outbreak (2016–2020)

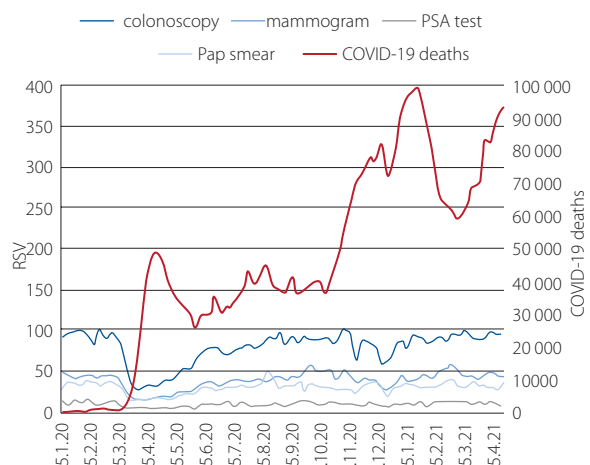


Figure 2. The interest of Internet users in cancer screening after the pandemic outbreak (March 2020–April 2021)

Table I. Comparison of RSV during three 10-week periods: one year before the COVID-19 outbreak (3 March 2019–5 May 2019), the COVID-19 outbreak (1 March 2020–3 May 2020) and one year after the COVID-19 outbreak (28 February 2021–2 May 2021)

Search term	One year before the COVID-19 outbreak median (IQR)		The COVID-19 outbreak median (IQR)		One year after the COVID-19 outbreak median (IQR)		p ^a	p ^b
colonoscopy	87	(84–88)	33	(28–48)	85	(85–87)	0.0077	0.5751
mammogram	38	(36–42)	15	(14–24)	41	(39–44)	0.0051	0.0191
PSA test	10	(9–11)	6	(4–6)	10	(9–10)	0.0051	0.4838
Pap smear	31	(29–33)	16	(14–18)	29	(27–30)	0.0051	0.6784

^a – comparison between the COVID-19 outbreak and one year after the COVID-19 outbreak periods; ^b – comparison between one year before the COVID-19 outbreak and one year after the COVID-19 outbreak periods

ber of cases and deaths. Moreover, the second wave of the pandemic that started in November 2020 did not coincide with a similar decline in cancer screening interest recorded during the first wave.

Table I presents median values of RSV for three 10-week periods: March–April 2019, March–April 2020 and March–April 2021. The data show that the RSV values in the initial period of the pandemic (March–April 2020) were significantly lower than in the corresponding period one year later. On the other hand, a comparison of RSVs one year after the COVID-19 outbreak with the year before the outbreak, indicates that they are comparable (the differences are not statistically significant for colonoscopy, PSA test, Pap smear), and mammography searches were even more frequent in the March–April 2021 than in March–April 2019. The largest drops independently for each of the search terms were:

- 76% for mammography,
- 75% for PSA test,
- 72% for colonoscopy,
- 66% for Pap smear.

Discussion

The need for investigation into how COVID-19 impacts long-term cancer-related mortality has already been emphasized, nevertheless some negative effects of the pandemic are already observable [1].

The largest drop of online interest in cancer screening was around mid-March to mid-April 2020, which corresponds with the onset of the coronavirus pandemic officially declared on 11 March 2020 by the WHO. This may well be an important observation as it has been recognized that people who seek health information online are more likely to get a timely screening [13]. However, it has also been found that patients with initial symptoms, diagnosed cancer, or limited access to medical care turn to the Internet for information, especially social media, cancer institute's websites, or support groups [14, 15].

Thus, it seems that the world had experienced a novel situation of both phenomena – limited access to care caused by lockdowns and a drop in interest at the same time. The natural cause of this seems to be the unprecedented redirecting of

everybody's attention to coronavirus – the most popular topic in 2020 globally according to Google's Year in Search 2020 [16].

Another finding is that one year into the pandemic people were looking for information on cancer screening more often, although the number of deaths from COVID-19 is much higher. It is not clear to what extent this may be triggered by prevention needs or first symptoms. However, this short-lasting phenomenon – regardless of its root causes, be it lack of interest, lockdowns or both – appears to already have real and serious consequences regarding delayed diagnoses [2].

Although the long-term consequences of limited access to healthcare and screening due to all sorts of lockdowns are yet to be seen, the alarmingly high number of excess deaths not directly associated with the COVID-19 in some countries is already concerning [17].

The data from Poland, collected on a monthly basis, show that the monthly number of new suspected cases of cancer dropped significantly during the first lockdown in March 2020 (by 38.4% in March 2020 year to year) to increase to all-time highs a year later (by 82.9% in March 2021 year to year) [18]. The study of Koczkodaj et al. showed a decrease in the number of issued oncology diagnosis and treatment cards in breast, cervix and colorectal cancers during the pandemic [19]. Data confirm that sudden and significant drops in cancer diagnoses that started in March 2020 were observed also in the United States [20], Denmark [21], or even Sweden [22] where a full lockdown was not enforced.

Although the long-term consequences of limited access to healthcare and screening due to all sorts of lockdowns are yet to be seen, the alarmingly high number of excess deaths not directly associated with COVID-19 in some countries is concerning. In 2018, the number of new cancer cases worldwide was predicted to reach 19.3 million by 2020. Naturally, this estimate did not include the impact of the COVID-19 pandemic. It is likely though that it will have a potential impact on mortality and delay diagnosis [23]. The WHO already reported that 1 in 3 European Union countries had partially or completely disrupted cancer services [2]. Some researchers suggested that preventive cancer screening should not be limited – even during pandemics [24].

One year after the pandemic unfolded, the Google Trends data suggest that the number of searches was gradually returning to its pre-pandemic level. Although we saw significant declines in searches in December, long-term data presented in the publication of Ellery et al. suggest that interest seen in health-related searches is cyclical [25]. Data suggest that the pandemic did not change search behaviors in this regard. There were occasional increases of online interest in specific types of cancer screening procedures during the pandemic with the most notable referring to mammography searches that regularly spiked in October. This is most likely linked to the Breast Cancer Awareness Month and a clear indication that proper prevention campaigns may have considerable impact [26].

The pandemic did not affect the order of the most popular cancer screening searches with colonoscopy still topping the list.

Conclusions

The unprecedented drop in March–April 2020 was the largest one in the entire history of searching for cancer screening online. As this decline coincided with the peak of “covid test” searches, it is likely that the online interest and health-related concerns of people shifted largely to pandemic related threats. It took approximately six months for online interest to return to its original values, however this gap is likely to result in increased rates of mortality and incidence.

The study raises the importance of continuous and active actions aimed at raising cancer awareness, something that is critically important during a public health crisis such as the COVID-19 pandemic. Strengthening cancer awareness and targeting health strategies at cancer screening is crucial as patients with cancer history are over four times more likely to develop critical illness while being hospitalized with COVID-19 [27].

The Google Trends cannot be used as a substitute for traditional data about cancer screening. Nevertheless, as GT has already proven effective in predicting flu waves, one cannot exclude that GT fluctuations in cancer screening would be eventually followed by real data. There are some concerning indications that such processes may already be taking place. There is a need to closely monitor how the situation evolves and possibly brace cancer care for additional burdens.

Availability of data and material

The data that support the findings of this study are openly available at www.trends.google.com and www.ourworldindata.org/covid-death.

Conflict of interest: none declared

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