

# **Disruption and recovery of cancer from COVID-19**

**The disruption and recovery of cancer from  
COVID-19: pathway, outcomes and  
restarting**

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# Executive summary

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It is becoming increasingly clear that one of the biggest threats to health in the UK brought on by the COVID-19 pandemic, apart from COVID-19 itself, is to cancer services and cancer patients. The major disruptions to the cancer pathway have effectively stopped cancer screening, reduced referrals by more than 40%, and as a consequence have impacted considerably on cancer diagnosis and treatment, (including surgery, chemotherapy, and radiotherapy). In addition, there has been a major disruption to clinical research activity, including access of patients to innovative clinical trials.

These gaps and the overall challenge have been recognised by NHS England and the response has been to put cancer as the top priority for NHS planning for the rest of this year, in the guidance issued on July 31<sup>st</sup>. This announcement clearly demonstrates that the NHS and the government are seeking to address the challenge. However, the scale of the challenge is large and widespread and, hence, we have sought to help paint a detailed picture of the current position and what should be done to respond in the best interest of citizens and patients.

Inevitably, the slowdown in activity that has been experienced will lead to delays in the detection and treatment of cancer, which in turn can be expected to adversely affect cancer outcomes. As a result of these delays, the NHS' stated desire to increase early stage detection from 44% to 75% could be set back to 42%, potentially reversing years of progress.

The worse outcomes associated with later-stage detection may lead to nearly 3,600 for 3 months of disruption and 7,200 excess deaths for 6 months of disruption this year for the cohort of patients whose cancer care is disrupted. Taking the reduction in urgent referrals of citizens to cancer diagnostic services as a starting point, we modelled the anticipated change in the distribution of diagnosis by stage. Patients who are detected at later stages will have lower chances of survival, which implies that overall survival rates will drop. This analysis is consistent with other findings recently published, suggesting a range of 1,412 deaths for one month of assumed disruption to 9,280 deaths for six months of disruption.<sup>1</sup>

The impact of the COVID-19 disruption of cancer services could also be expected to lead to changes in five-year survival—potentially setting the UK's progress back by up to 8 years, and render its survival rates comparable to poorer performing countries such as New Zealand, Turkey, and Lithuania for the period 2010-2014 (ignoring any impact of COVID-19 on survival in those countries).

In light of these findings, it has become evident that restarting cancer as rapidly as possible is urgent, as well as ensuring minimal disruption to activities in the event of further COVID-19 peaks. Perhaps the most critical step is to restore confidence and make patients feel safe in presenting to their GP or specialist services if they show any potential signs of cancer. The "Phase III Letter" from NHS England lays out mandatory steps to address cancer, listing it as the first priority for recovery. Broadly, the actions are all in the right direction including an imperative to recover to 100% of usual volumes in Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Endoscopy. We would note that recovery to this level will be demanding, but in reality will need to go further and exceed pre COVID-19 levels so as to reverse the consequences highlighted above.

We have outlined the necessary steps to recover and restore cancer services, namely creating safe diagnostic hubs for patients, increasing diagnostic capacity (CT, MRI, and endoscopy), dramatically increasing rapid testing for patients and staff, and working with GPs to better understand and address the bottlenecks. Creating COVID-secure diagnostic hubs will require:

- A 131% increase in diagnostic capacity (CT, MRI and endoscopy) over the period of 3 months
- 124,000 to 172,000 additional COVID-19 tests per week for patients and staff to give confidence that cancer services are COVID-secure
- 305,000 urgent referrals per month for a 6-month period, with the attendant encouragement of patients to present to GPs and GPs to refer to specialist cancer services

There are a number of challenges to be resolved in order to achieve the ambitious goals that we have set, including: 1) the scale and urgency of capacity response, 2) the shortage of available capacity in the NHS, 3) the delays and gaps in data, and 4) ensuring sufficient funding.

Similar challenges were overcome in the NHS' response to COVID-19 – and a similar breadth and scale of response will be needed to address cancer. This will require a massive surge in activity and capacity, which needs to be implemented in each Integrated Care System (ICS), in each cancer alliance, and between providers in the NHS and the independent sector. We suggest that this entails: 1) developing a detailed demand and capacity view for each ICS and alliance (across the NHS and independent sector), 2) setting-out a detailed workforce plan, 3) expanding data flow, and 4) securing sufficient funding to enhance our future health.

# Context

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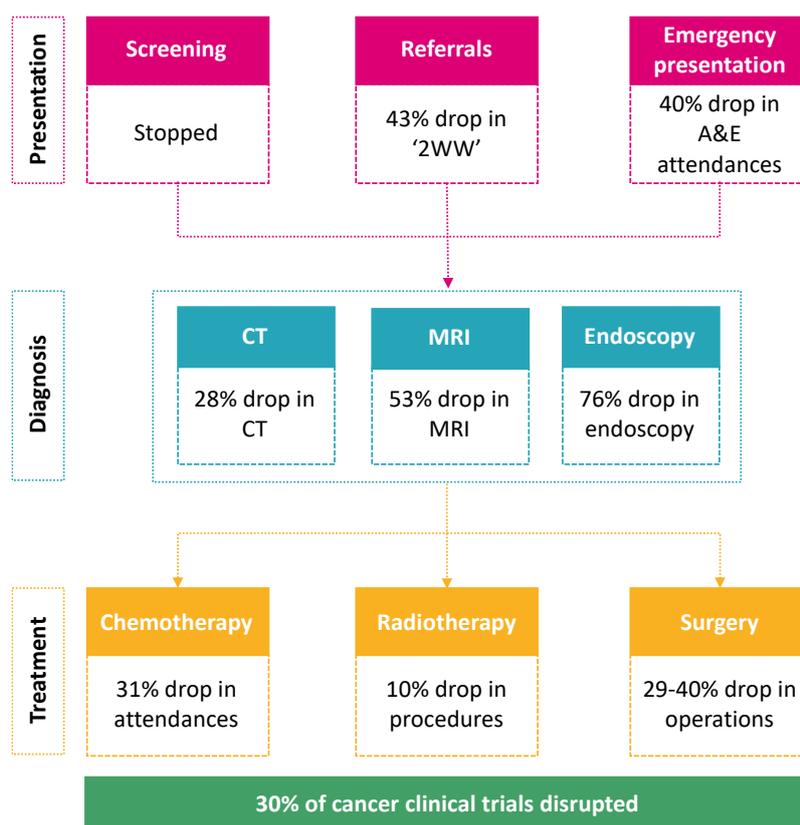
Cancer is one of the biggest killers in the United Kingdom and affects one in every two people throughout their lives, with an incidence of over three hundred thousand new cases every year.<sup>2</sup> Improving cancer services has been an essential target for the NHS over the years, to yield better patient outcomes. This has meant working towards making improvements in early diagnosis and treatment, leading to better survival rates (although still lagging behind other developed economies like Sweden, Australia, Canada and Norway).<sup>3</sup> However, the onset of the COVID-19 pandemic has deeply affected cancer research and cancer services and may have put the progress already achieved in jeopardy, as it is likely to have repercussions on patient outcomes for years to come. It is becoming increasingly clear that the biggest threat to health in the UK brought on by COVID-19, after COVID-19 itself, is on cancer services and cancer patients.

The entire cancer pathway has experienced disruptions, from screening programmes and referrals to different treatment modalities, including chemotherapy, radiotherapy, and surgery, which have all seen significant delays or even suspension of activities. Delays in presentation and diagnosis will inevitably translate into worse outcomes for cancer patients, including higher mortality. Whether these disruptions originate from reduced uptake by citizens/patients or a reduction in services, there is an urgent need to address these bottlenecks in order to minimise the excess deaths and worse outcomes that will likely occur.

# Disruptions to the cancer pathway

Activities across the whole cancer pathway have been affected by the pandemic (**Figure 1**). Overall, there has been a drop of 30% to 100% in activity across screening, referrals, diagnosis, and treatment. A huge number of citizens/patients have been affected, as normally there are 300,000 new cancer cases per year and about 2.4 million urgent referrals.

**Figure 1. Disruptions to cancer services across the pathway due to the COVID-19 pandemic**



## Screening

Screening is an important approach for detecting cancer at an early stage and accounts for approximately 6% of total cancer diagnosis, specifically 34% of breast, 10% of colorectal, and 40% of cervical cancer diagnoses.<sup>4</sup>

National screening programmes (breast, colorectal, and cervical cancer), as well as the targeted Lung health CT screening programme, have been suspended across the UK. This was announced in Wales,<sup>5</sup> Scotland,<sup>6</sup> and Northern Ireland,<sup>7</sup> while England has yet to officially announce this, although invitations are not being sent out from screening hubs.<sup>8</sup> Cancer Research UK has highlighted that as a result of these measures, approximately 210,000 people per week are not being screened, thus missing the opportunity for early detection of cancer in a significant number of citizens.<sup>8</sup>

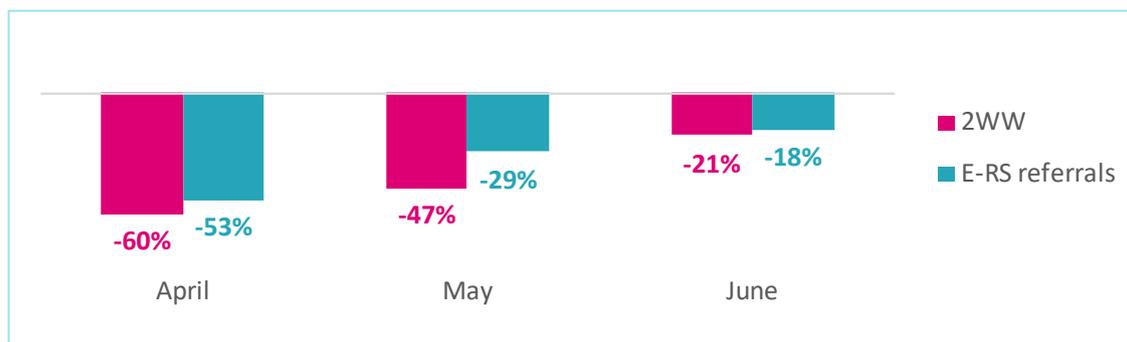
## Referrals

Referrals from GPs, on an urgent or non-urgent basis, are the most significant method of cancer detection, covering 62% of cancer diagnosis (39% through 'two-week-wait' and 23% through other GP referrals).<sup>4</sup>

Amid the pandemic, urgent referrals have decreased significantly compared to usual levels in England. Early data from April by DATA-CAN, the UK Health Data Research Hub for Cancer, showed a drop as high as 76% in 'two-week-wait' (2WW) referrals in selected sites,<sup>9</sup> while their more recent data show that this has recovered to a level that is 45% lower than normal.<sup>10</sup> National data shows that '2WW' referrals

were down by more than 40% on average for April, May and June 2020 compared to the same time last year.<sup>11</sup> A similar drop is observable for bookings made through the e-Referral Service,<sup>12</sup> however the reduction seems more pronounced for urgent referrals (Figure 2).

**Figure 2. Reduction in ‘two-week-wait’ referrals and of e-Referral Service bookings in 2020 by month, compared to baseline<sup>11,12</sup>**



We cannot be certain about the reasons behind these decreases in referral volumes, however, given the dramatic fall in GP attendances in general, whether virtual or in person, the main assumption remains that patients have stayed away from the fear of infection or potentially of burdening the health system or their GP, although reduced access to rapid referral services cannot be ruled out.

## Diagnosis

It is obvious that there have been significant delays in diagnosis, given the drop in screening and referrals. Additionally, 19% of cancer diagnoses come through emergency presentations,<sup>4</sup> which could have been affected by the 40% reduction in A&E attendances experienced in April through July 2020 compared to last year's levels.<sup>13</sup>

Another challenge that has emerged is having sufficient diagnostic capacity for cancer. This was a pre-existing area of weakness in the UK, as it is lagging in its number of Computed Tomography (CT) machines (9.5 machines per 100,000 inhabitants) and Magnetic Resonance Imaging (MRI) machines (7.2 machines per 100,000) compared to the OECD average.<sup>14,15</sup> Due to the COVID-19 outbreak, the number of performed CT scans dropped by 28% in April, May and June 2020 compared to the same time last year, with the additional challenge that CT scanning has been used to diagnose COVID-19. MRI scanning has also decreased by 53%.<sup>16</sup>

Endoscopy has been the most problematic due to the significant risk of infection as an aerosol generating procedure. Consequently, the British Society of Gastroenterology recommended to pause all endoscopy except for emergency and essential procedures.<sup>17</sup> This was clearly apparent in the 76% drop in volume of tests performed in April through June 2020 compared to last year.<sup>16</sup>

## Treatment

Treatment, including chemotherapy and radiotherapy, has also experienced a reduction, in part due to decreased patient presentation. Early reports from DATA-CAN showed a 60% drop in chemotherapy attendances, which later recovered to a 31% reduction.<sup>9,10</sup> Radiotherapy has reportedly experienced a 10% reduction, however, this includes procedures that have been performed to replace certain surgeries.<sup>18</sup>

Surgery has been affected by guidelines from Infection and Prevention Control (IPC) for surgical procedures during COVID-19, and the requirements for testing, self-isolation, re-testing, and deep cleaning of surgical theatres.<sup>19</sup> Surgery has been delayed because of the risk to patients, and some surgeries have been replaced with radiotherapy. Data from May shows a 29% cancellation rate of cancer surgery, equivalent to more than 36,000 surgeries,<sup>20</sup> while more recent estimates suggest a reduction of up to 40%.<sup>21</sup>

## Clinical trials

Most clinical trials have been suspended in light of the pandemic, in large part to protect cancer patients from the immunosuppressant effects of cancer treatment. Candesic has found that 30% of cancer trials

have been disrupted due to COVID-19, with breast, prostate and respiratory cancers being disproportionately impacted.<sup>22</sup>

The inevitable impact is large delays in new drug development and advancement. Additionally, this may have effects on patient outcomes, as several studies have found that treating cancer patients in research-active hospitals is linked to better patient outcomes.<sup>23,24</sup> Clinical trials are also important because they contribute to the financial sustainability of the NHS and give access to the latest innovative therapies to cancer patients.

# Worsening outcomes

In light of these disruptions to the cancer pathway, we investigated the potential repercussions on outcomes, namely on early detection, survival, and additional deaths, due to the shift in the stage of diagnosis caused by the COVID-19 pandemic.

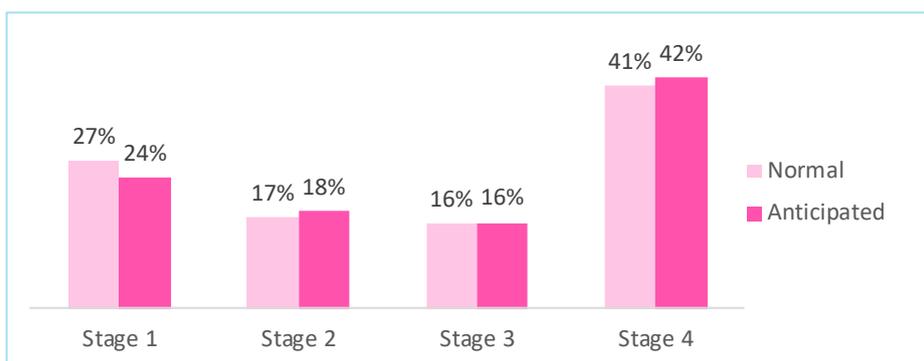
## Setback to earlier detection

The impact of the reduction in cancer activity may be reasonably expected to result in delays in detection, diagnosis, and treatment, which lead to higher mortality. The main routes to cancer diagnosis are screening (breast, colorectal, and cervical), GP referral (urgent or not), and emergency presentation. The most common route to diagnosing cancer is through ‘two-week-wait’ and GP referrals which accounts for around two-thirds of cancer diagnoses.<sup>4</sup>

We have looked at the impact of the 44% average drop in urgent referrals observed for April, May and June 2020, compared to the same period last year,<sup>11</sup> for two periods of assumed levels of disruption to cancer services. The first assumes that the disruption will last for 3 months, while the second assumes a longer disruption lasting 6 months.

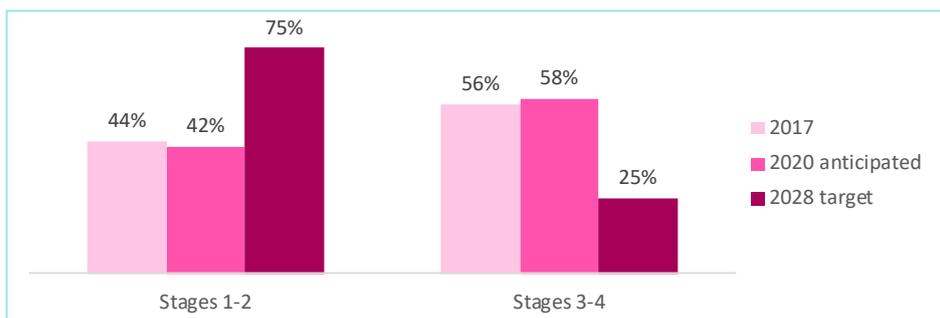
For both periods of disruption, we have modelled the impact of the decrease in urgent referrals on stage of diagnosis,<sup>25</sup> assuming that patients who are not diagnosed on time will be detected one stage later.<sup>26</sup> The results for a 3-month disruption are illustrated in **Figure 3**, and clearly demonstrate that, if our assumptions hold true, many patients stand to be diagnosed at a later stage than they should have been, leading to a stage shift in diagnosis.

**Figure 3. Normal stage distribution of cancer diagnosis (2017) and anticipated stage distribution for 2020 (for 3 months of disruption)<sup>25</sup>**



The last 20 years of national cancer policy have focused on earlier detection and accelerating the start of treatment. Indeed, improving cancer early detection is an important part of the NHS’ Long-Term Plan, with a target of having 75% of cancer diagnosis in stages 1 and 2 by 2028.<sup>27</sup> Looking at the effect of disruptions due to COVID-19 on stage of diagnosis for this patient cohort, we can see that, based on our analysis, we are now going in the wrong direction in reaching these early diagnosis targets (**Figure 4**).

**Figure 4. Normal stage distribution of cancer diagnosis (2017), anticipated distribution for 2020 (for 3 months of disruption), and Long Term Plan target for 2028<sup>25,27</sup>**



## Reduced expected survival

A stage shift in diagnosis implies that patients who will have a later detection will presumably experience worse survival rates and therefore higher mortality. This means that, if our assumptions come to pass, we expect that overall one-year survival rates to fall.

Lower survival rates directly translate into higher mortality. Therefore, we set out to find the estimated number of additional deaths that would occur by modelling the effect of the stage shift in diagnosis, and consequent drop in one-year survival, on cancer mortality. We found that, for 3 and 6 months of disruption, there could be 3,580 to 7,160 excess deaths respectively as a result of the reduced survival brought on by later cancer detection (**Table 1**).

**Table 1. Estimated number of excess cancer deaths resulting from a stage shift in diagnosis and drop in 1-year survival by period of disruption<sup>25,28</sup>**

	3 months of disruption	6 months of disruption
Normal 1-yr survival	65.3%	65.3%
Anticipated 1-yr survival	64.1%	63.0%
Normal # of people dead	106,003	106,003
Anticipated # of people dead	109,584	113,164
Additional people dead	<b>3,580</b>	<b>7,160</b>

This estimate is consistent with other analyses of the potential impact of COVID-19 on cancer (**Table 2**). It has already been estimated that somewhere between 7,164 and 35,830 excess cancer deaths could occur due to COVID-19.<sup>9</sup> A more recent study estimated that, for breast, lung, colorectal and oesophageal cancers, there will be between 3,291 and 3,621 additional deaths within 5 years due to the effects of delayed diagnosis on survival.<sup>29</sup> Yet another study conducted by the Institute for Cancer Research and DATA-CAN also looked at how the aggregated impact of universal delays in the '2WW' pathway would affect cancer mortality based on ten-year survival, and found that the number of excess deaths would fall in a range of 1,412 for one month of disruption and 9,280 for 6 months of disruption within 20 common tumour types.<sup>1</sup>

**Table 2. Estimates of excess cancer deaths from other studies<sup>1,9,29</sup>**

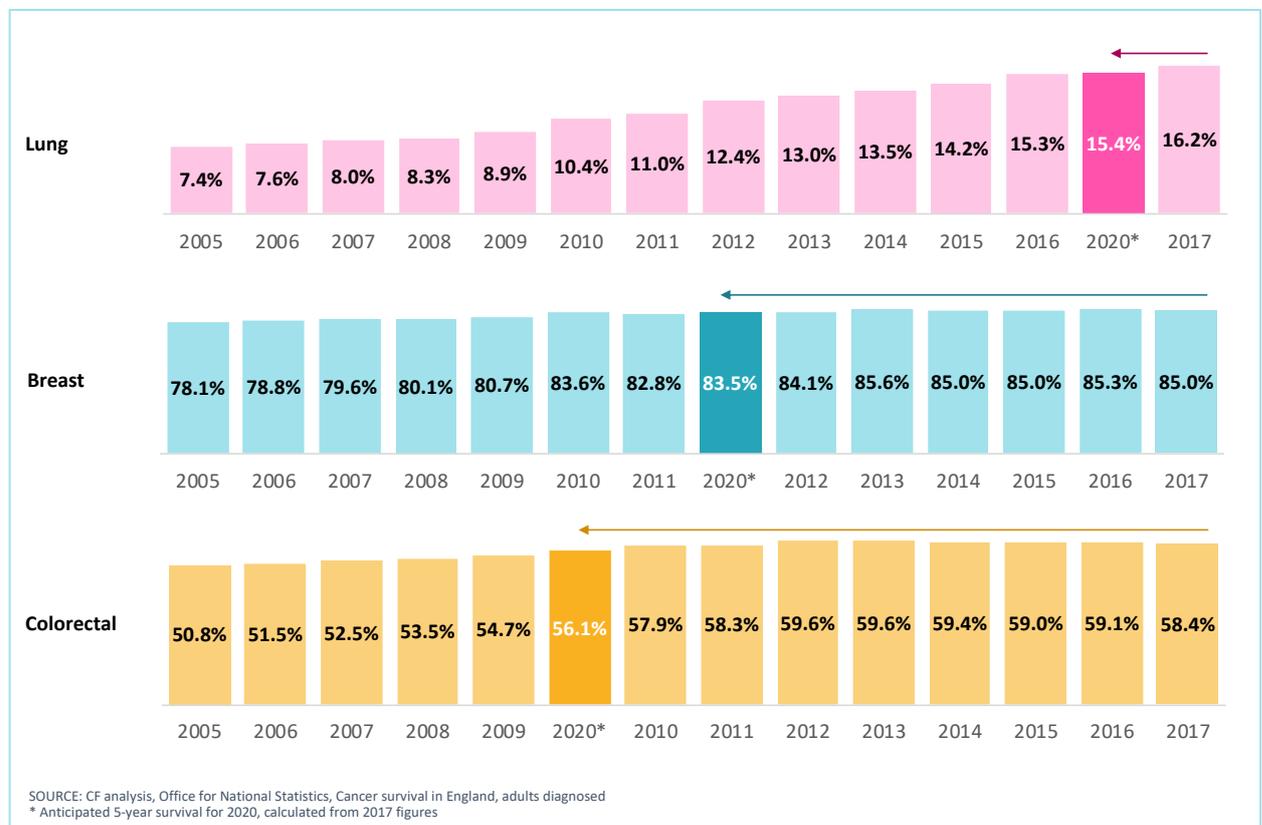
	Excess deaths	Methodology
UCL and DATA-CAN (April 2020)	7,000-36,000	From expected COVID-19 infection rates in the population, with assumed increased risk of death for patients with cancer
Maringue et al. (July 2020)	3,300-3,600	From effects of delayed diagnosis on survival from breast, lung, colorectal and oesophageal cancers (over 5 years)
CF Consulting (August 2020)	<b>3,600-7,200</b>	From stage shift in diagnosis for an assumed 3 to 6 months of disruption, and the consequent drop in one-year survival
ICR and DATA-CAN (July 2020)	1,400-9,300	From the aggregated impact of universal delays in the 'two-week-wait' pathway based on ten-year survival, from 1 to 6 months of disruption (20 cancers)

## Setting the UK back in time

We then evaluated how this stage shift in detection could affect five-year survival rates for lung, breast, and colorectal cancers, to find an estimate of the anticipated survival rates for 2020 for patients with these disease indications brought on by the disruptions to the cancer pathway. Based on the same assumptions, we found that, based on an assumed 3 months of disruption, five-year survival could drop from 16.2% to 15.4% for lung cancer, while for breast cancer it stands to decrease from 85.0% to 83.5%, and for colorectal cancer from 58.4% to 56.1%.<sup>28</sup> While we have focused our analysis here on these three cancer types, similar trends are expected to be seen in other cancer types.

To better illustrate what these decreases in survival mean, we have looked at how these anticipated rates compare to five-year survival rates across time in England. We found that, while England had been experiencing a near-steady improvement in five-year survival across these three cancers for the past decade, the disruptions to cancer activities due to the pandemic could have the impact of setting back cancer outcomes by several years (**Figure 5**). More specifically, our estimates show that five-year survival is likely to be set back by one year for lung cancer, by six years for breast cancer, and by eight years for colorectal cancer.

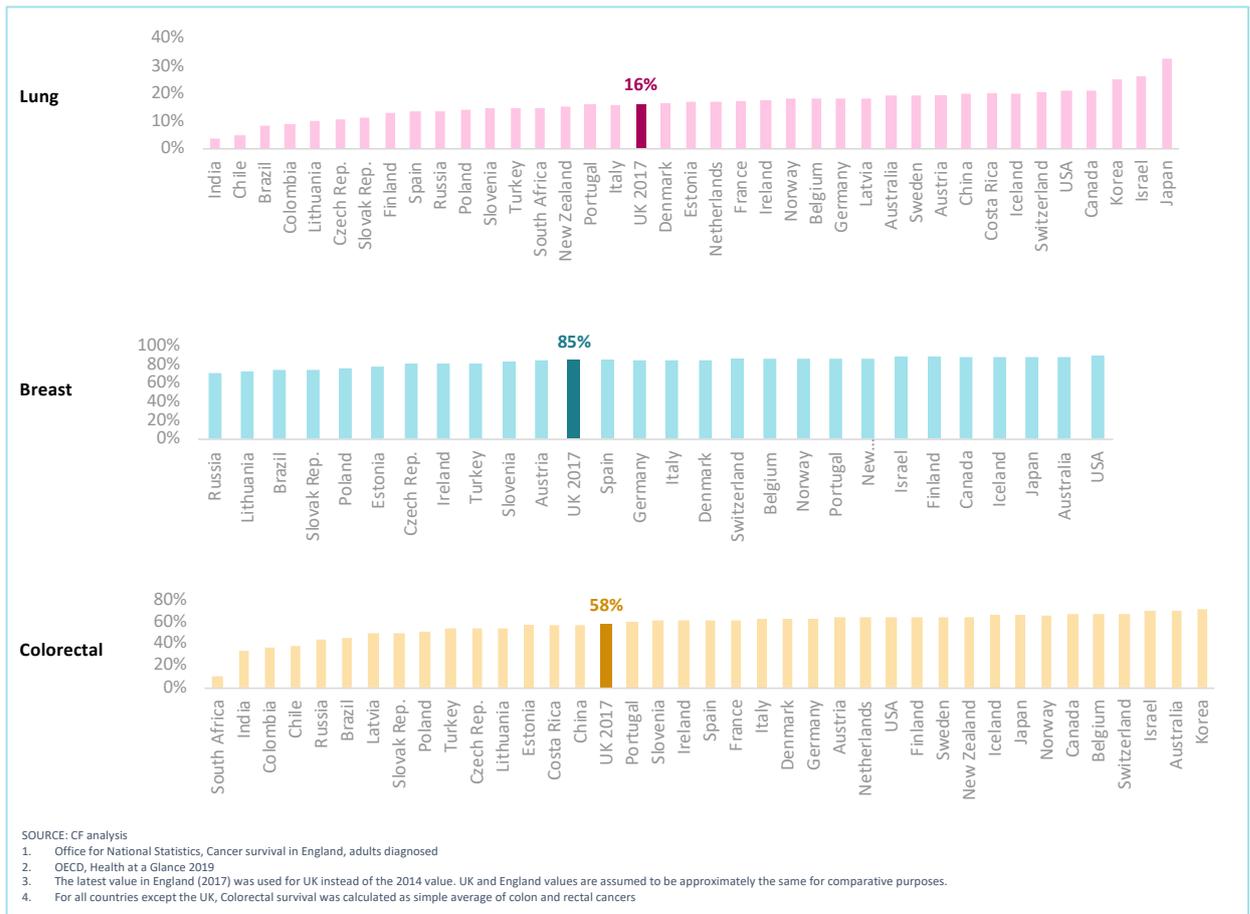
**Figure 5. Five-year survival over time and anticipated for 2020, in England<sup>28</sup>**



## Lagging behind even further internationally

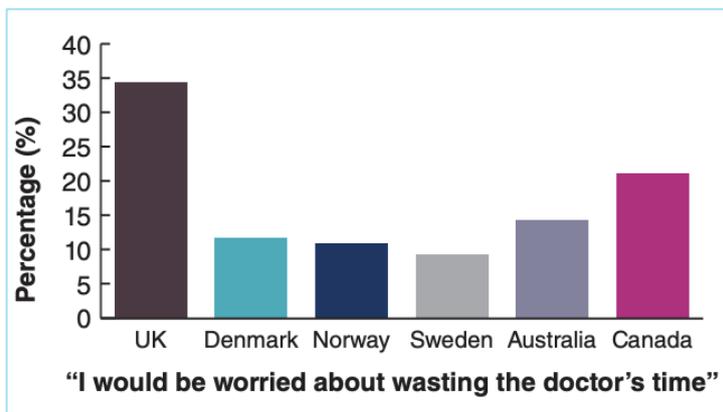
To further understand the impact of the drop in survival, we looked at how COVID-19 influenced UK survival rates compare to those of other countries as they were prior to the pandemic. Our modelling shows that, for 3 months of disruption, the anticipated reduction in five-year survival is likely to make the UK lag even further behind other OECD countries, reaching the pre-pandemic survival levels of New Zealand, Turkey, and Lithuania (**Figure 6**).<sup>30</sup>

**Figure 6. Five-year survival in OECD countries (2010-2014) and UK<sup>28,31</sup>**



The World Health Organization (WHO) conducted a survey in May to assess the impact of COVID-19 on non-communicable diseases, and found that 42% of 155 countries experienced partial or full disruption to cancer services, rising to 56% in countries where the virus has reached the level of community transmission.<sup>32</sup> While only 25% of countries reported that one of the main causes for the disruption is due to patients not presenting, this might have been disproportionately the case in the UK. In fact, a survey conducted by the International Cancer Benchmarking Partnerships on barriers to symptomatic presentation prior to the pandemic revealed that British citizens were much more likely to be worried about wasting the doctor’s time than in other countries (Figure 7).<sup>3</sup> If this were true in a pre-COVID-19 environment, it seems only reasonable to expect that British citizens and patients would feel even more so in a world where all non-COVID symptoms and illnesses have been de-prioritised.

**Figure 7. Barriers to symptomatic presentation, by country<sup>3</sup>**

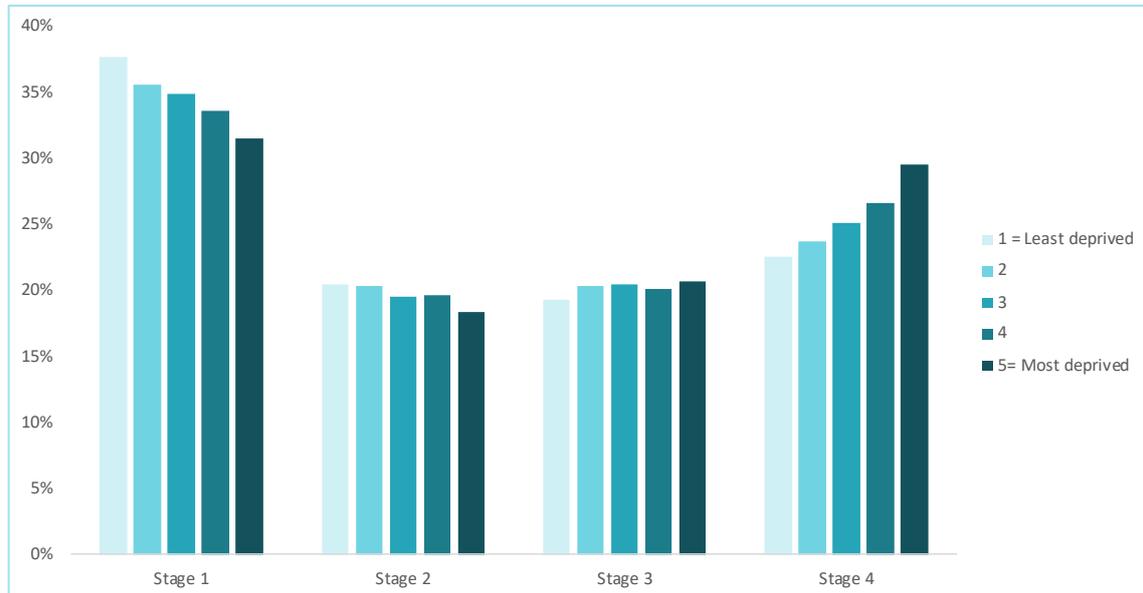


From a European perspective, the recently established special focused network on COVID-19 and cancer, hosted by the European Cancer Organisation,<sup>33</sup> will provide valuable insights on exemplars of best practice and lessons learned across the European continent.

## Exacerbating inequalities

Prior to the pandemic, the UK already had significant inequalities in cancer, in terms of access to services and outcomes, across geographies and ethnicities. This is clearly apparent in data presented in **Figure 8** which shows that citizens from more deprived areas in England are more likely to have their cancer diagnosed at a later stage.

**Figure 8. Proportion of patients diagnosed with cancer by stage and deprivation category, 2018, in England<sup>34</sup>**



These inequalities can also be conveyed through patient experiences of cancer care. In England, patients from black and minority ethnic communities were more likely to report worse experiences of cancer care, compared to patients from a white background (**Figure 9**).

**Figure 9. Reported experience of cancer care in England, by ethnicity group<sup>35</sup>**



Reducing inequalities in cancer care is part of the NHS's Long-Term Plan priorities,<sup>27</sup> however, with the disruption to cancer services brought on by COVID-19, it can be expected that these inequalities will only be exacerbated. The delays in cancer activities will affect different people in different ways, and those from more deprived areas and from minority ethnic backgrounds are likely to be disproportionately impacted.

At the moment, we do not have a detailed view of the disproportionate impact on health inequalities but expect that it will be significant. To address this, we urgently need to ensure the sufficient capture of ethnicity data in cancer data collection and to work particularly hard to help patients in these communities to come forward should they have concerns about cancer.

# Restarting cancer activities

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Our analysis and those of others highlight the urgent need to restart cancer pathways as rapidly as possible using all necessary means. The current bottlenecks are capital, workforce, and behaviours. There is an opportunity to leapfrog in the digital and diagnostic domains, as the aim should not be to just recover capacity, but to permanently increase it to overcome pre-existing weaknesses that COVID-19 has exposed.

On July 31<sup>st</sup> 2020, the NHS released a Phase III letter of response to COVID-19. Cancer was featured as the first priority on the list, with ambitions to fully restore cancer services, which is to be overseen by a national cancer delivery taskforce to ensure delivery from September 2020 to March 2021.<sup>36</sup> The letter outlines an objective to restore activity for both overnight electives and outpatient/day-case procedures to 90% of last year's levels by October, to bring back MRI, CT and endoscopy volumes to a 100% by October 2020, and to resume 100% of last year's activity for first patient attendances and follow-ups from September. These plans are all necessary and go in the right direction, and clearly demonstrate that the NHS is aware of the gaps and is prioritising the response to cancer.

However, the challenge we are faced with is two-fold; on one hand, there is a crucial need to recover from the diagnostic and therapeutic backlog of patients, and on the other hand, it is essential to ensure minimal damage to cancer services in the event of future COVID waves. The quicker we implement a credible cancer diagnostics plan, the less the adverse effects of the disruption to cancer services will last. This might require going beyond the ambitions stated in the Phase III letter so that we moved to a level of delivery that is significantly above pre COVID-19 levels. We outline below the necessary steps to achieve this.

## The rebound requirement

To rebound and recover the lost volume that the pandemic has produced, we will need to see activity levels rise to immediately clear the backlog, while also resuming "normal" levels. Crudely, if activity has been running at 50% of normal levels, recovering the backlog will require doubling normal levels for a period of 3 to 6 months, depending on how long the disruption lasts. This is clearly an enormous undertaking, therefore, a reasonable first step would be achieving normal activity levels as fast as possible. Once that is achieved, we can then seek to go above normal levels to clear the backlog and enhance the service.

## Recover GP referrals and patient presentation

Increasing patient presentation and GP referrals is crucial. If there are approximately 2.4 million urgent referrals per year,<sup>11</sup> we will need to elevate activity for a 3 to 6 months period of time to compensate for the missed activity. This means that instead of 200,000 urgent referrals per month, we would expect at least 305,000 for a period of 3 to 6 months, based on how long the disruption lasts.

It will be important to work closely with GPs to get their insight on what is the "on the ground" situation with citizens/patients attending their clinics and how to best address the issues that are arising, including the stratification of risk to different population groups and developing a response that is as virtual/digital as possible.

Additionally, there should be campaigns targeting GPs and citizens/patients with behavioural messaging to support them in regaining trust in cancer services, once the underlying issues have been addressed. These messages should be very clear and contain guidelines on managing symptoms suspicious of cancer in the context of COVID-19. There should be an active effort to encourage patients to come forward, including building partnerships with patient groups to better understand their fears and needs and communicate to them their options and the latest policies and decisions. These efforts can be strengthened by sending targeted invitations to citizens/patients who are able to attend screening, diagnosis and treatment, based on the use of robust data for risk stratification to prioritise people from more deprived geographies and backgrounds.

## Understand and use risk

Anecdotal evidence suggests that patients are misunderstanding the risk of contracting COVID-19 or dying from it. The latest estimates show that 1 in 1,900 people in England recently had COVID-19.<sup>37</sup> With an average of 0.8-1.0 (R number) of secondary infections produced by a single infected person,<sup>38</sup> this suggests that the risk of catching COVID-19 is around 1 in 2,140, and the death rate is approximately 13% of total cases.<sup>39</sup> On the other hand, the lifetime risk of getting cancer in the UK is 50%, as 1 in 2 people will be diagnosed with cancer in their lifetime.<sup>40</sup>

Of course, the specific risk will depend upon a number of factors, for both COVID-19 and cancer. The risk of transmission of COVID-19 is highly dependent on the infection levels of the location (e.g. hospitals and care homes have higher risk), and, once infected, COVID-19 is more fatal for people from older age groups, and for those with pre-existing conditions (e.g. diabetes, respiratory disease, cardiovascular disease, etc.). On the other hand, risk factors of getting cancer include smoking, obesity, a sedentary lifestyle, etc, with the highest mortality for people aged 75 and above.<sup>41</sup>

At the moment, very little is understood about the relative risks of COVID-19 versus cancer. More needs to be done to get a better understanding of this and communicate it to citizens and patients so that they can make an educated decision about whether to utilise cancer services or to avoid them. This needs to be done through the analysis of real-time data, including risk factors of different populations, and by sending out targeted invitations for screening, diagnosis and treatment as required.

## Create safe diagnostic hubs

The most obvious hypothesis for why citizens/patients have been staying away from GP clinics and cancer diagnostic services is that they are afraid. Apart from care homes, hospitals are potentially the most dangerous places to attend. Therefore, it is crucial to provide a recognised safe environment that is able to support diagnosis, thus enabling people with symptoms suspicious of cancer to safely return now that we are post the peak of the pandemic—and to also continue to attend even in the face of further waves of COVID-19.

The essential enabler for this approach is to set up safe diagnostic hubs that are COVID-minimal, which would be located away from hospital sites or on sites that are COVID-free. A clear assumption is that diagnostic hubs that are not on hospital sites will be more easily understood by the general public as COVID-secure. This will require the provision of more diagnostic capacity and more testing.

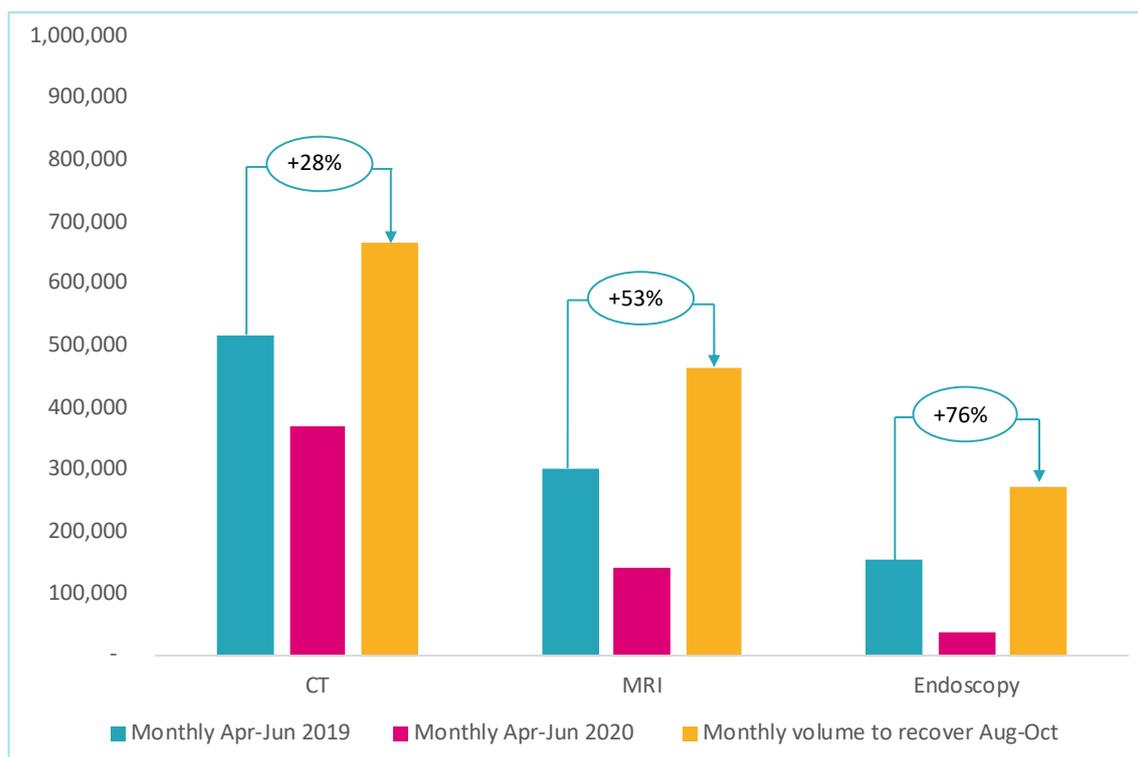
## Capacity triple challenge

Regardless of where the safe diagnostic hubs are set up, there is a clear requirement for increased CT, MRI, and endoscopy capacity. Waiting for 6+ weeks has increased by more than 12 fold for CT and MRI scanning, and by about 10 fold for endoscopy in April, May and June 2020 compared to the same time last year, while waiting for 13+ weeks has increased by over 54 fold for CT and MRI and 15 fold for endoscopy tests compared to the same period last year.<sup>16</sup> The need for a COVID-secure operation implies accepting that there will be a 40% to 50% slower throughput<sup>42</sup> due to the time needed for cleaning and ensuring a safe operation, which will be a three-fold challenge.

First, CT and MRI machines both require the same cleaning time but MRI scans have shorter examination/image acquisition time, which meaning that the effective utilisation of CT scanning will drop more than that for MRI scanning. It will be crucial to maximise the use of artificial intelligence (AI) to enable more rapid and accurate processing of scans. This increased capacity of diagnostic services should be matched with increased capacity of clinical decision-making, powered by software that enables large-scale remote multi-disciplinary teams to decide initial treatment on simpler cases more rapidly and leave sufficient time for more complex cases.

Second, the volume required to deliver optimal cancer diagnostic services is 3 to 4 times the current level. Normal volumes would be 518,000 CT scans, 303,000 MRI and 154,000 Endoscopy scans per month.<sup>16</sup> To reach the NHS' Phase III ambition of getting back to 100% of normal capacity by October 2020,<sup>36</sup> the volume of CT scans will need to be increased by 28% from normal levels, MRI by 53% and Endoscopy by 76% per month during August, September and October 2020 (**Figure 10**). Increasing scanning capacity will cost more than double the current rates because of the need for extended working hours. Currently, it seems evident that there is insufficient machine and workforce capacity to do so, which is why it would be advisable to make use of the independent sector capacity.

**Figure 10. Estimating the needed volume to recover the backlog in CT, MRI and endoscopy procedures by October 2020<sup>16</sup>**



Third, we were already operating on about half of the required capacity before a portion of it was lost to COVID-19 detection. To move from recovery to addressing the NHS' stated intention of increasing early diagnosis would require an even more dramatic increase in capacity. This is a pre-existing area of weakness in the UK which needs to increase the number of CT machines (9.5 machines per 100,000 inhabitants) and MRI machines (7.2 machines per 100,000) to reach the OECD average.<sup>14,15</sup> We should be looking to make this increase in diagnostic capacity a permanent one, to address the pre-existing need for it in order to improve patient outcomes.

### Ramp-up COVID-19 testing

No matter where diagnostics are performed, there is an obvious need for a dramatic increase in testing in order to increase utilisation of services. All patients should have access to rapid testing for COVID-19 when they turn up for cancer diagnosis or treatment, as opposed to having to self-isolate and conduct multiple tests. This should also be implemented with staff who will be constantly interacting with patients. This is critically needed to give confidence to patients to come forward and present with suspicious symptoms.

This approach will be required for approximately 300,000 cancer cases and 2.4 million urgent referrals per year,<sup>11</sup> as well as all diagnostics and cancer staff – which constitute around 6% to 10% of the total 1.2 million workforce, conducting tests weekly. This suggests a need for a total of 6.4 to 8.9 million tests per year (or 124,000 to 172,000 tests per week) for cancer care alone.

### Develop partnerships with the independent sector and Life Sciences

There is a huge opportunity in building partnerships with the independent sector, given the severe need to increase capacity, especially in light of the need for COVID-free spaces for safe diagnostics and treatment. However, such partnerships also raise different issues for the pathway, which will become more complex to navigate, as well as for managing staffing and economics.

Partnerships with life sciences and pharmaceutical companies can facilitate access to and delivery of medicines, especially those that can be administered outside hospital settings, reduce the need for direct interactions, or offer the benefits of being less immunosuppressant.

These partnerships can also be beneficial for increasing diagnostic capacity through greater access to diagnostic kits. In practice, achieving any of this will need to be done through locally-specific agreements

about accountability and responsibility. This may be facilitated through nationally-led partnerships that clearly set out who is responsible to deliver what.

## Workforce

We have not yet tackled the question of the workforce. Anecdotally, we know that the capacity to return to normal volume is there and not being used. There are many stories about cancer clinicians who are keen to provide treatment but are lacking the patients. We know that before the pandemic there were shortages in key staff grades. In seeking to ramp up capacity, it will be essential to understand where and how this will happen. Indeed, one of the key challenges to the idea of using the independent sector for the surge in capacity is working out where the corresponding workforce would come from.

## More rapid application of medicine

NHS England/Improvement published a set of interim cancer treatment recommendations in an effort to enable more flexible applications of medicine and to reduce the risk to cancer patients of contracting COVID-19.<sup>43</sup> This is suggested to be done by choosing treatment options that are less immunosuppressant and ones that can be administered at the patient's home or other places that have lower risks of infection than hospital sites. Additionally, they are recommending to select treatments that can be administered more easily or for shorter periods of time in the hospital, in order to maximise the use of available capacity.<sup>43</sup>

## Clinical trials

Restarting clinical research and trials will require having a clear strategy, including the evaluation of certain innovative and flexible approaches that have emerged during the pandemic for conducting clinical trials, and assessing the possibility of applying them where possible.<sup>44</sup> The life sciences industry in partnership with academics and regulators should take this opportunity to transform the clinical research process, by making it possible to rapidly approve, set-up and deliver research across the NHS, through the use of advanced technologies, more real time data and novel approaches.<sup>44</sup>

## Rapid release of data

Currently, publicly available data is at best 3 to 6 months old—and in some cases 2 years old. Anecdotally, some of the national datasets are missing significant proportions of their data, and due to the lag between data capture and publication, the feedback loop is not being closed, which makes it very difficult to rely on such datasets or to improve them. Additionally, this makes it challenging to rapidly assess the changes in activity and cancer services across the pathway, which means that they cannot accurately inform new policies and recovery efforts. As such, there is an urgent need to, close the feedback loop, increase the capture of activity using existing data, and make more real-time data available.

DATA-CAN has exemplified how, with access to real-time data from selected hospital sites, quick and highly relevant analyses can be conducted which both initially highlighted the challenge of COVID-19 to cancer services but also showed how this real time data can be used to plan for recovery.<sup>9</sup> These efforts should be expanded<sup>45</sup> and upscaled across the UK.

As noted above, it is particularly important to capture data on ethnicity and on socio economic status to be able understand and address any gaps in health inequality that COVID-19 has revealed.

# Implications

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The COVID-19 pandemic has adversely affected cancer activities along the entire cancer pathway. The consequent drop in urgent referrals is expected to cause a shift in stage of cancer diagnosis, which means that many patients could experience a delay in cancer detection. This delay can, in turn, lead to lower survival rates due to the worse outcomes of later stages of cancer, potentially causing between 3,640 excess deaths for 3 months of disruption and 7,160 for 6 months of disruption, and setting the UK's progress back in survival from cancer by up to 8 years.

These worsening outcomes highlight the fact that the impact of the country's overwhelming focus on COVID-19 has not been without cost. We now face a risk of a second peak but also the certainty of cancer deaths if the right actions are not taken immediately. Efforts to recover and restore cancer services should be comparable in vigour and energy to those applied to the COVID-19 response.

The NHS' phase three letter sets out the requirement to get back to pre-COVID activity levels with an assigned national cancer taskforce to oversee the delivery of its recommendations. Specifically, it is asking Cancer Alliances to quickly develop delivery plans for September 2020 to March 2021, setting out to 1) reduce the unmet need and health inequalities, 2) address the backlog of people requiring cancer diagnosis and treatment through increasing diagnostic capacity in COVID-secure locations, restoring endoscopy capacity back to normal levels, expanding the capacity of surgical hubs, and fully restarting screening programmes.<sup>36</sup>

While these plans are all necessary and recognise cancer as a priority area for recovery, we will need to go further in a number of areas. Additionally, delivering these ambitions comes with a set of challenges, including: 1) the scale and urgency of the capacity response; 2) the shortage of available capacity in the NHS; 3) the different levels of infection across the country; 4) the delays and gaps in data; and 6) the insufficient funding allocated to achieve what is urgently required.

We propose that, in order to achieve rapid recovery and adequate restoration of cancer services, the following set of recommendations will need to be delivered and addressed:

1. Ensure that patients feel safe to present when they have suspicious symptoms. This will be enabled through the accelerated development of COVID-secure rapid access diagnostic hubs dedicated to cancer, which should be kept, wherever possible, off the main hospital site – with sufficient capacity not to be affected by a second peak. This will require significant funding to achieve.
2. Go further in diagnostic activity to catch up the backlog. Specifically, there will need to achieve 128% of normal activity in CT, 153% in MRI, and 176% in Endoscopy for 3 months in order to get back to normal levels by October 2020. We should use this opportunity to permanently increase diagnostic capacity beyond those minimum requirements.
3. Maximise the use of technology, specifically innovative approaches such as artificial intelligence, to enable rapid processing of scans and therefore meet the demand more quickly.
4. Dramatically increased levels of COVID-19 testing for all cancer patients and staff.
5. Help patients understand the relative risks of contracting COVID-19 and cancer including the variations for different locations, so that they can make educated decisions about presenting or avoiding diagnosis and treatment.
6. Develop a stratification based on the differential risk within the population, especially for citizens and patients from more deprived geographies and minority ethnic groups, in order to reduce health inequalities. Combining that with the relative risk of cancer versus COVID-19 should allow for the segmentation of demand.
7. Address the behavioural aspects of why patients are not coming forward, which needs to be done by working with GPs and patient groups to better understand and communicate the challenges and options, as well as by sending out targeted invitations based on the risk to different groups.

8. Allow sites flexibility in Infection Prevention Control requirements, in order to address the challenge of having different levels of infection in different parts of the country. This can be done by taking into account the risk of contracting COVID-19, given the level of testing and the physical site configuration, in order to work out how to maximise capacity.
9. Release data rapidly and in real-time with expanded data flow in all relevant domains. This will allow for a timely understanding of the changes to cancer services and patients, which in turn can enable appropriate, informed and timely decisions and strategies. We need to close the feedback loop so that requests for daily/weekly data enable the capture of information that is processed and fed-back to physicians rapidly so that they can understand the progress that they are making in restarting, restoring and enhancing cancer services.
10. Develop a detailed demand and capacity view for each ICS and alliance (across the NHS and independent sector). This has been asked for in aggregate in the NHS' Phase III guidance, however, at the moment, demand and capacity are being monitored in silos, while it is critical to understand the linkages across the cancer pathway.
11. Address the shortage of available capacity in the NHS by making use of independent sector capacity. This involves finding out where there is unused capacity (e.g., London Nightingale, Harrogate), especially to ensure rapid access to testing.
12. Develop partnerships with the independent sector and life sciences to expand capacity and ensure quick access and delivery of medicines that offer more advantageous options in light of the pandemic.
13. Set-out a detailed workforce plan, including for the use of the independent sector capacity.
14. Secure sufficient funding to cover the costs of the delivery of these recommendations. This should critically cover a rapid restart of services, the potential use of independent sector, the establishment of community diagnostics, as well as expanded data flow.
15. Capture the lessons learned from the effects of COVID-19 on cancer, to ensure adequate preparation for future challenges that may arise, including additional COVID waves. In short, we need to ensure that, whether due to local or national lockdown, cancer services are never shutdown again.

Similar challenges were overcome in the NHS' response to COVID-19, and a similar breadth and scale of response will be needed to address cancer. This includes a massive surge in activity and capacity, which will need to be put in place in each ICS, in each cancer alliance, and between providers in the NHS and the independent sector.

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