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What can we learn about the impact of cancelled planned operations on waiting times? A case study using the 2017/18 winter flu postponement policy in England

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Abstract

Background Cancelled operations can potentially impact both health and patient experience through their effect on waiting times. However, identifying causal relationships is challenging. One possible solution is to consider 'exogenous shocks' to the system as a type of natural experiment to quantify impacts. In this study, we investigate the 2017/18 national cancellation policy in the English National Health Service (NHS), introduced to alleviate winter pressures due to influenza related admissions. Our aim is to see whether this policy can be used to isolate the impact of changes in the supply of care on waiting times and so inform system recovery from major exogenous shocks, such as the coronavirus pandemic.

Methods To assess the impact of cancellations on hospital activity and waiting times, we use aggregate quarterly hospital-level data on planned admissions and last-minute planned operations (2013/14 to 2019/20); and individual-level data on waiting times for planned care (2015/16 to 2018/19). We analyse trends in volume of activity and waiting times, and examine waiting times distributions for patients who were admitted for planned surgery from the waiting list before and after the 2017/18 cancellation policy.

Results The final quarter of 2017/18 had the highest number of cancelled planned operations since 2013/14 and the lowest number of planned admissions since 2015/16. However, the trend in mean and median waiting times was similar across the study period. Therefore, the 2017/18 national postponement policy had no identifiable impact on waiting times trends.

Conclusions Despite the high numbers of cancelled planned operations in 2017/18, we could not identify an impact on waiting times. A plausible explanation is that hospital managers routinely anticipate winter pressures and reduce planned activity to manage bed occupancy. Therefore, the 2017/18 national postponement policy merely reinforced existing local decisions. The lack of a suitable counterfactual from which to infer what would have happened in 2017/18 in the absence of a postponement policy makes it impossible to isolate the impact on waiting times. This

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means that previous NHS cancellation policies are of limited use for informing system recovery from major exogenous shocks, such as the coronavirus pandemic.

Keywords Waiting times, Cancellations, Planned admissions

Introduction

In February 2020, the English National Health Service (NHS) cancelled tens of thousands of planned operations to divert healthcare resources toward the treatment of patients with COVID-19 [1]. Such widespread and prolonged reductions in the supply of planned care are likely to impact patient health negatively through prolonged waiting times (WTs) [2, 3].

There is a limited literature analysing the impact of WTs for planned surgery on patient health, proxied by health outcomes, following treatment. To assess the causal impact of WTs on health outcomes, some studies have used randomised control trials (RCTs) [4, 5] or an instrumental variables (IV) framework [6]. Tuominen, Sintonen [5] and Moscelli, Siciliani [6] focus their studies on specific operations such as total knee replacement and coronary bypass, respectively. Hurst, Lambert [4] look at non-urgent referrals to rheumatology services. These studies find that the impact of WTs on health outcomes is very small and, in some cases, not statistically significant. In contrast, a study on hip and knee replacement surgery finds a negative association between WTs and health-related quality of life gains measured using, among other instruments, the EQ-5D index [7].

It is important to highlight that these studies focus on small (i.e. marginal) variations in WTs that might be observed in health care systems operating during non-pandemic times. However, there is a lack of studies inferring causal effects on health of large changes in WTs for surgery, as experienced during the pandemic. To study whether a WT shock impacts on health outcomes, it is first necessary to establish whether the policy creates a discontinuity in WTs. This paper investigates this issue using the 2017/18 national cancellation policy in the NHS due to concerns over an expected increase in influenza cases over the Winter months.

In recent years, several recommendations have been proposed to postpone planned admissions with operations during winter months in the English NHS [8–10]. These policies offer a natural experiment from which to infer changes to WTs and hence health outcomes. Natural experimental approaches are useful as they broaden the range of interventions that can be evaluated compared to planned experiments such as RCTs [11]. This study focuses on the 2017/18 national recommendation to postpone non-urgent planned operations in England. The policy aimed to free up hospital capacity to manage the high incidence of influenza cases and was issued on 20 December 2017 [10, 12, 13]. Our goal is to assess if this policy, which has clear parallels to the situation in English hospitals at the start of the COVID-19 pandemic, can be used as a centrally imposed shock from which to infer the direct impact of changes in the supply of care on WTs. This policy can be seen as a natural experiment where non-urgent planned operations were intentionally cancelled/reduced given the high rates of influenza and consequent hospitalisations, which are largely outside the control of the NHS [14]. If there is a direct impact, the causal effects of higher WTs on patient health, readmissions and mortality rates could be inferred by using the discontinuity in supply created by this policy as a first stage in an IV framework (for a discussion of regression discontinuity designs, see Lee and Lemieux [15]). This evidence might then inform the likely consequences for patient health following similar changes in WTs due to cancellations of planned activity during the COVID-19 pandemic.

We find that the number of cancelled operations across the study period was highest in the three months after the cancellation policy was enacted (January – March 2018). This was accompanied by a sharp reduction in the total number of planned admissions. However, these did not translate into longer waits for patients treated after the policy ended. Rather, time-trends for weekly average WTs and WT distributions are similar across the full data period (from 2015/16 to 2018/19).

The paper is structured as follows. The institutional background is set out in Sect. 2. The data and methods are described in Sect. 3. Results are presented in Sect. 4 and discussed in Sect. 5. Section 6 concludes.

Institutional background

The NHS regularly experiences significant pressures in winter months, traditionally from mid-December to the end of February [16–18]. This period is marked by an escalation in demand for healthcare services, largely attributable to the prevalence of cold weather-related illnesses and outbreaks of respiratory diseases such as influenza and norovirus. These pressures lead to higher bed occupancy rates in hospitals, increased attendance at Accident and Emergency Departments (AEDs), and, consequently, a strain on healthcare delivery.

In response to these annual pressures, NHS hospital Trusts[1] have developed a series of adaptive strategies. One common approach is the postponement of

[1] A hospital Trust is a public sector corporation comprising one or more hospitals.

non-urgent, planned procedures to free up resources for acute care [9, 10, 19]. While this strategy is designed to optimise bed availability and staff allocation, it inevitably leads to longer WTs for elective care, impacting patient outcomes and satisfaction.

Significant in this operational context is the introduction of winter funding by the government. Initiated in the 2013/14 winter season, the funding aims to support the NHS in managing the surge in winter demands. Allocations have been used variably across Trusts to enhance urgent care capacity, increase the number of hospital beds, and streamline discharge processes to reduce bed occupancy rates. Despite being described as 'non-recurrent,' winter funding has become an anticipated element of annual NHS financial planning [20–22].

The winter of 2017/18 was particularly challenging, leading to the National Emergency Pressures Panel's recommendation on December 20, 2017, to postpone all non-urgent inpatient elective care until the end of January 2018, with the exception of cancer, urgent and time-critical care [10]. This recommendation was subsequently extended to the end of January 2018 due to the high number of influenza cases affecting bed occupancy [12, 13]. The number of influenza cases and demand for emergency care in England were considerably higher in 2017/18 than in previous years [23–25]. Postponement of planned care is not unique to 2017/18, but other policies have been more advisory in nature [8, 9, 17, 26, 27].

Understanding the dynamics of winter pressures and the impact on planned care is essential for putting our analysis of NHS operational decisions and their impact on waiting times into context. The routine strategic responses to winter pressures, such as postponing elective care and providing improved A&E services through winter funding, together with the exceptional measures such as the national postponement policy of elective care implemented during the 2017/18 winter reflect the unprecedented levels of demand driven by a severe influenza season [28]. However, in this period many patients were still being referred for surgery and added to the waiting list, leading to longer average WTs [27, 29]. The waiting list grew by about 5% in 2017/18 compared to the previous year [30].

Methods

We examine trends in cancellations and planned admissions using two aggregate datasets. First, we use quarterly data on the number of last-minute cancelled operations (Quarterly Monitoring of Cancelled Operations Return – QMCO) [31], which we restrict to cases cancelled for non-clinical reasons between 2013/14 and 2019/20. Last-minute cancellations for non-clinical reasons are defined as planned admissions with operations organised in advance and cancelled after hospital admission or on the day of the operation or surgery [32]. They exclude minor outpatient procedures, operations cancelled in advance, and operations rescheduled within 24 h. Therefore, operations cancelled more than 24 h in advance are not captured in this data. These data are reported at Trust level and do not include information on WTs. Second, we use the Quarterly Activity Return (QAR) for information on numbers of planned admissions (with and without operations) between 2013/14 and 2019/20 [33].[2]

To assess the impact of cancellations on WTs, we use individual-level inpatient data from the English Hospital Episode Statistics (HES) for patients admitted between 2015/16 and 2018/19. Although inpatient HES contain a flag for cancelled operations, this only applies to cancellations made following hospital admission not those occurring prior to admission. Most cancellations in the English NHS are made before the patient is admitted and therefore we do not use this data flag.

Our sample is restricted to patients who were admitted from the waiting list for planned surgery. These are patients who have been placed on a waiting list for a specific procedure or treatment and will be admitted to the hospital as soon as a bed or operating room becomes available. These are individuals who were not given a firm date for their procedure when a decision was made that they would need an inpatient admission. We exclude patients provided with a date for admission since this type of admission refers to patients who have been scheduled in advance for a specific procedure or treatment and are less likely to be subjected to a cancellation. WTs (in days) are defined as the difference between patient referral and admission date. The referral date is the date on which a consultant, or other members of the clinical staff, decided to add the patient to the Trust waiting list. We exclude admissions with WTs longer than 730 days (longer waits may reflect coding errors or delays caused by factors that might influence treatment benefit [7] corresponding to 0.1% of all observations) and cases admitted at the weekend (which consists of, on average, less than a quarter of weekday admissions) since the risk profile of elective cases that are selected for weekend procedures are likely different from the weekday procedures [34].

The postponement policy was in place from 20 December 2017 until the end of January 2018 [13]. This policy aimed to postpone the operations of patients on the waiting list, affecting those without a specific scheduled date. Patients on the waiting list at the time of the introduction of the postponement policy, i.e., mid-December 2017, were therefore at a higher risk of a longer wait. To understand the likely impact of the postponement policy,

[2] In England the financial year starts in April. Hence, the first quarter corresponds to April-June; the second quarter to July-September; the third quarter to October-December; and the fourth quarter to January-March.

we assess trends in activity and WTs across four financial years. To analyse those consistently by week across the financial years, we define the cancellation window from 18 December 2017 to 31 January 2018. We first examine mean and median WTs and the number of planned admissions with operations across the pre- and post-policy periods.

Waiting times present seasonal variation within years together with different trends across years [35]. To disentangle time trends from the effects of the national cancellation policy, we compare the mean and median WTs for two subgroups: individuals subjected to the postponement policy (where treatment occurred after the policy ended and might be affected by the policy indirectly as additional cases were added to the waiting list); and individuals not subjected to the policy (where treatment predated the cancellation policy[3]), and we compute the mean and median WTs for patients on the waiting list at 1 January 2018 and treated between February and May 2018 (post-cancellation policy). We compare those figures with the mean and median WTs for patients on the waiting list at 1 January 2017 and treated between February and May 2017 (as this is before the cancellation policy we use the period as a counterfactual). In addition, we graph the WTs distribution for patients treated before and after the cancellation policy using kernel density plots. If the national cancellation policy had an effect on WTs, we would expect, on average, longer waits for patients treated in February to May 2018 compared to patients treated in February to May 2017. Specifically, we would expect the kernel density to shift to the right for patients treated after the policy. However, any observed changes might also reflect time trends. As a sense check to investigate trends separate from the impact of the national cancellation policy, we also compare the mean and median WTs for two cohorts of patients, all of whom were treated before the policy was implemented. For this purpose, we compare the mean and median WTs for patients on the waiting list at 1 June 2016 and treated between July and October 2016 with another cohort of patients who were on the waiting list at 1 June 2017 and treated in July – October 2017. An impact of the postponement policy on WTs should shift the kernel density plot for patients on the waiting list on 1 January 2018 (compared to those on the list at 1 June 2017), but could not impact patients on the waiting list before June 2017 (compared to those on the list at 1 June 2016). Any observed changes in the latter comparison will be due to temporal (annual) changes to WTs, due to changing demand and/or supply.

Results

Cancelled operations and planned admissions

In this section, and using aggregate data at Trust level, we present the trends in cancellations and planned admissions. The left panel of Fig. 1 shows quarterly cancellations. Over the period 2013/14 to 2019/20, last-minute planned cancellations for non-clinical reasons were highest in the fourth quarter of the financial year 2017/18, which includes January 2018 when the cancellation policy was in place and the two months after its end (February – March 2018). There were over 25,500 cancellations in this quarter.

The large increase in cancellations was mirrored by a substantial fall in total planned admissions (right-hand panel). There were 1,374,072 planned admissions in the fourth quarter of 2017/18, 4.9% lower than the previous quarter and 5.3% lower than the subsequent quarter.

Overall, the fourth quarter of 2017/18 had the highest number of cancelled planned operations and was associated with a concurrent fall in admissions.

Planned admissions (from the waiting list) with operations

To understand the likely impact of the 2017/18 postponement policy on WTs, we first analyse the year-on-year changes on planned admissions, namely planned admissions from the waiting list with an operation using individual level data. We compare this subset of Trust planned activity across four financial years, and for three periods: (i) October to mid-December; (ii) February to March, and (iii) April to May. (i) represents the pre-policy period, while periods (ii) and (iii) cover post-policy implementation.[4] For all years, we use the term 'cancellation window' to describe the period from mid-December to the end of January, i.e. the months corresponding to the implementation of the policy in financial year 2017/18.

Table A1 reports the year-on-year changes in planned activity between 2015/16 and 2018/19 (a full table with the planned activity can be found in the Appendix, Table A1.).

Across the four years, planned activity was least volatile between October and mid-December. Year-on-year change in activity in planned admissions was highest in the February/March period from 2015/16 to 2016/17 (8.5% increase). This pattern was reversed across the same period in 2017/18 where admissions fell by 8.4%. This is what we would expect to observe, given the postponement policy shock on planned activity in the winter of 2017/18.

[3] We examine the overall impact on WTs because it is not possible to identify whether an individual's planned care was postponed or cancelled.

[4] We split the postponement period into February – March and April – May because they refer to different financial years.

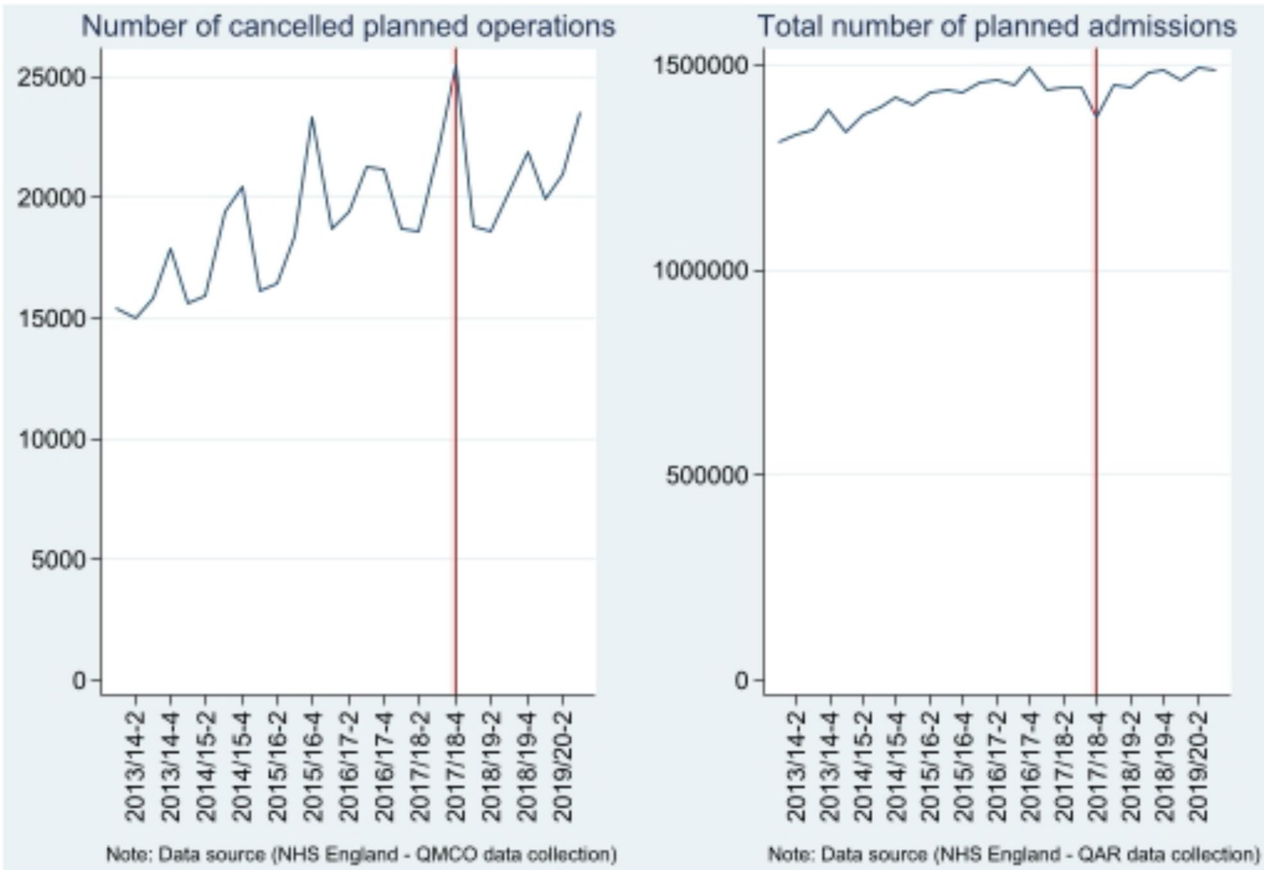

Fig. 1 Number of cancelled operations and planned admissions, 2013/14 to 2019/20

Table 1 Total number of planned admissions (from the waiting list) with operations

Period	Year-on-year change (%)		
	2016/17 vs. 2015/16	**2017/18 vs. 2016/17**	**2018/19 vs. 2017/18**
Oct-Mid Dec	23,592 (3.2%)	-619 (-0.1%)	16,146 (2.1%)
Mid Dec-Jan	28,414 (8.3%)	3,864 (1.0%)	10,040 (2.7%)
Feb-Mar	45,789 (8.5%)	-49,469 (-8.4%)	19,029 (3.5%)
Apr-May[§]	-1,867 (-0.3%)	25,004 (4.6%)	-

Data Source: HES

Notes: Includes all planned admissions with operations from the waiting list. We exclude admissions with a WT longer than 730 days and weekend admissions

[§]Apr-May refers to the following financial year

Waiting times

In this section, we examine variations in WT for patients admitted for planned surgery from the waiting list. We use the same three pre- and post-policy periods as we did in the analysis of planned admissions (Planned admissions (from the waiting list) with operations) to compare WT distributions using their mean and median values. We also analyse the weekly variation in WTs from 2015/16 to 2018/19 (Mean and median waiting times).

Finally, we examine cohorts of patients on the waiting list at a particular date, and compare the WT distributions of those treated before and after the policy period (Patients on the waiting list at the time of the postponement policy).

Mean and median waiting times

Table 2 shows mean and median WTs between October to mid-December (which in 2017/18 corresponds to the pre-policy period) and between February to March and April to May (which corresponds to the post-policy period in 2017/18 and 2018/19, respectively). Mean WT is lower between October and mid-December than in the period between February – March and April – May in all years. The difference between the mean WTs in pre-policy period (October to mid-December 2017/18) and the post-policy period (February – March 2017/18 and April – May 2018/19) is less than one day.

Between 2015/16 and 2017/18, mean WT rose by around 10% for both the immediate pre- and post-policy periods, peaking at 62.5 days during the period April to May 2018. When comparing pre- and

Table 2 Total admissions with operations and mean and median WTs, 2015/16 to 2018/19

Period	Financial year											
	2015/16			**2016/17**			**2017/18**			**2018/19**		
	Total admissions	**Mean WT (days)**	**Median WT (days)**	**Total admissions**	**Mean WT (days)**	**Median WT (days)**	**Total admissions**	**Mean WT (days)**	**Median WT (days)**	**Total admissions**	**Mean WT (days)**	**Median WT (days)**
Oct-Mid Dec	730,197	53.9	37	753,789	56.7	37	753,170	59.1	37	769,316	61	37
Feb-Mar	539,914	56.1	37	585,703	59	38	536,234	59.9	36	555,263	61.5	37
Apr-May$	540,821	57.8	40	538,954	59.3	39	563,958	62.5	39			

Data Source: HES

Notes: Includes all planned admissions with operations from the waiting list. We exclude admissions with a WT longer than 730 days and weekend admissions. Pre-period: 1 October – 17 December; Two post-periods: 1 February – 31 March; and 1 April – 31 May

$ Apr-May refers to the following financial year

post-postponement periods using median WT values, year-on-year differences are small – two or three days at most – and their clinical importance is unclear. The relative difference when comparing mean and median WT across the full period of observation in Table 2 suggests that waiting times were increasing at the upper end of the WT distribution (beyond the 50th percentile that defines the median), which can be seen in the appendix (Table A3) where we provide the waiting times for the percentiles 10, 25, 75, and 90. The changes in the upper end of the WT distribution are similar to the changes in the mean.

So far, our analysis has focused on the mean and median WTs for specific pre- and post-policy periods. To provide a more detailed analysis of mean WTs, we analyse its weekly pattern beginning with the first week of October (week 1) to the last week of May (week 35) for each of the years 2015/16 to 2018/19 (see Fig. 2, left-hand panel).

Mean WTs fell during the Christmas period (week 13 and 14), in all years. The general trends in WTs are similar across the four financial years, except after week 25 where activity appears more volatile in the time series for 2017/18 (after the postponement policy period) compared to other years. The different absolute levels across years illustrate how mean WTs have increased over time.

The right-hand panel of Fig. 2 illustrates the relative change in WTs, by normalising each year to 100 in week 1. Mean WT growth is largest for 2015/16 (which had the lowest baseline WT) and lowest for 2018/19 (which had the highest baseline WT). Growth in 2017/18 is fairly modest across the majority of the series but increases notably between weeks 27 and 30 before falling back.

This analysis shows that WTs rose over time with, on average, a two-day increase following the winter period.

Patients on the waiting list at the time of the postponement policy

Lastly, we examine the WTs distribution for cohorts of patients on the waiting list at a particular date, and who were treated before or after the postponement policy. We compare the mean and median WT for patients treated between February and May in 2017 with the same months in 2018. These patients were on the waiting list at 1 January 2017 (pre-policy change) and 1 January 2018 (post-policy change), respectively.

As shifts in the WT distribution can be due to the postponement policy or to a general increasing trend in WTs, we also compare the mean and median WTs for patients on the waiting list at 1 June 2016 with those on the list at 1 June 2017, i.e., patients who could not have been affected by the 2017/18 postponement policy. These waiting list dates and analyses periods were selected to avoid

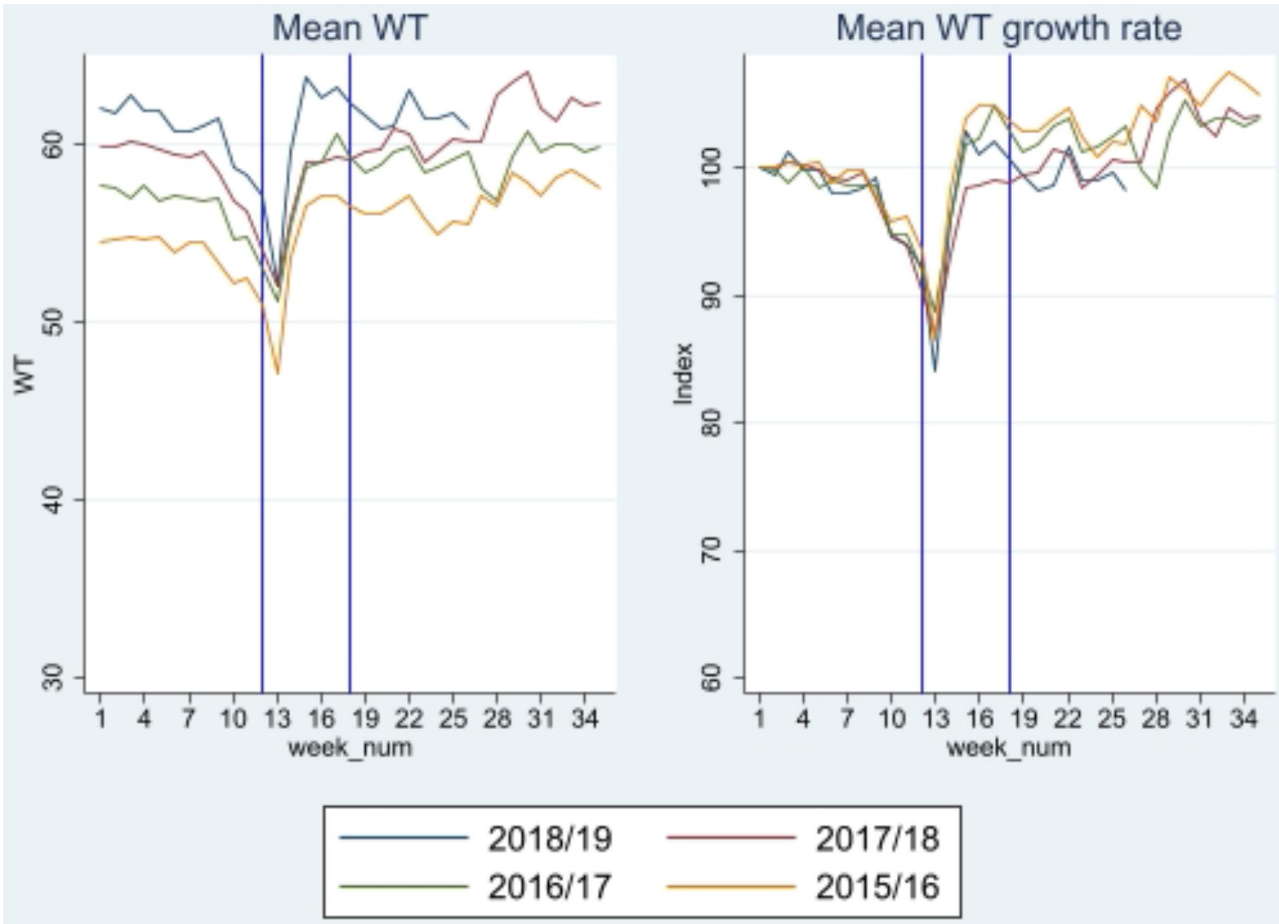

Fig. 2 Weekly mean WTs. Data Source: HES Note: WTs for planned admissions with operations from the waiting list. We exclude admissions with a WT longer than 730 days and weekend admissions. The growth rate is calculated using the first week of October (week 1) as the base week for each financial year (FY). The blue vertical lines indicate the cancellation window

Table 3 Mean and median WT for patients from waiting list at the 1 January and 1 June of 2016/19 and 2017/18

Waiting list date	Financial year	Analysis period	*N*	Mean WT (days)	Median WT (days)
1 June 2016	2016/17	01Jul16–31Oct16	283,897	133.3	120
1 January 2017	2016/17	01Feb17–31May17	297,143	137.5	122
1 June 2017	2017/18	01Jul17–31Oct17	291,826	140.8	126
1 January 2018[§]	2017/18	01Feb18–31May18	290,805	147.7	132

Data Source: HES

Note: WTs for planned admissions with operations from the waiting list. We exclude admissions with a WT longer than 730 days and weekend admissions

[§] Post-policy period

overlaps and to ensure they excluded the policy period (defined here as 18 December 2017 to 31 January 2018).

Table 3 shows the mean and median WTs for patients on the waiting list at these four time points and who were admitted for planned care.

Relative to the financial year 2016/17, median (mean) WTs for the January list were 10 (10.2) days higher after the 2017/18 postponement policy. For patients on the June waiting list in 2017/18 (compared to 2016/17) with planned admissions between July and October, the corresponding figure was 6 (7.5) days.

In part, the increase in WTs, therefore, appears to predate the cancellation window (Fig. 3). Specifically, if the policy had had an impact on WTs, we would expect the kernel density distribution to shift to the right for patients treated after the policy, which does not seem to happen. Therefore, the increase in WTs observed from February to May 2018 cannot be solely attributed to the postponement policy of cancelling non-urgent planned operations.

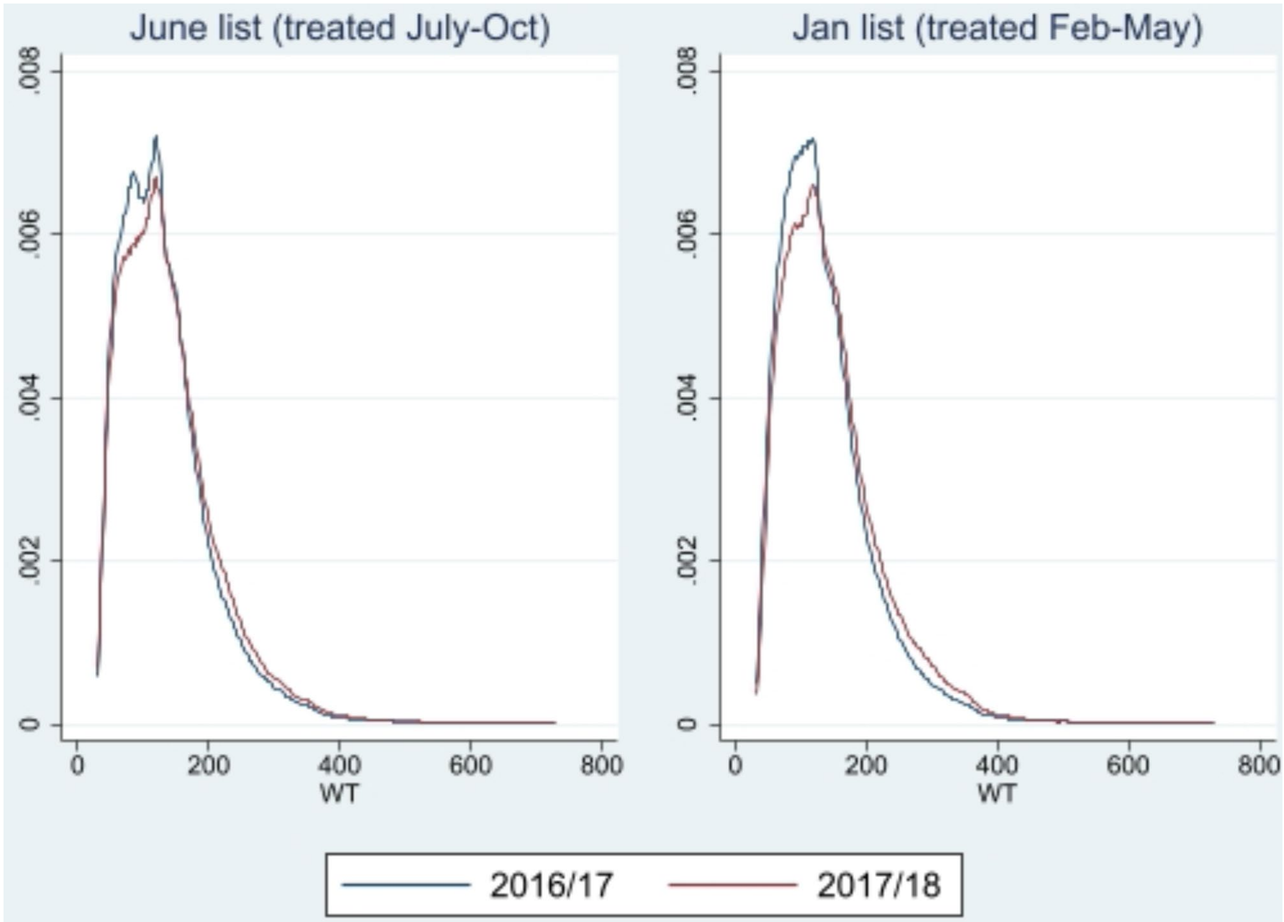

Fig. 3 Kernel density WT distribution for cohorts of patients on the list on 1st June (left) and 1st January (right). Data Source: HES Note: WTs for planned admissions with operations from the waiting list. Sample excludes admissions with a WT longer than 730 days and weekend admissions

Discussion

In 2017/18 there was an unprecedented number of hospital admissions due to winter flu. To relieve pressure on the NHS, the National Emergency Pressures Panel recommended a national policy to postpone non-urgent elective inpatient procedures. The policy commenced on the 20 December 2017 and ran to the end of January 2018. This study sought to investigate the causal impact of changes in the supply of hospital care on WTs. This would allow us to infer the likely consequences of the prolonged periods of cancellations of non-emergency operations due to the COVID-19 pandemic.

The final quarter of 2017/18 (January to March 2018) had the highest number of cancelled planned operations and was followed by a concurrent fall in admissions. However, although WTs increased in the months following the postponement policy, a similar pattern was observed in the same period across both the previous and the subsequent financial years. In other words, WTs typically rose by two days in February to May each year, while median WTs were more stable and substantially lower.

This common pattern is likely due to the prudent management of NHS capacity during winter months to deal with the expected seasonal health impacts associated with cold weather [16, 36]. Even in the absence of a formal national cancellation policy, winter pressures can lead to significant levels of cancellations locally. This makes it difficult to isolate the impact of a specific postponement policy on WTs separately from general seasonal time trends. Analysis of the waiting list in 2016/17 and 2017/18 indicates that increases in mean and median WTs, in part, predated the postponement policy and, hence, cannot be caused by this alone. An increasing WT trend is also observed after the policy ended. These dynamic cycles of winter pressures and the NHS' response mean that it is not possible to use the national postponement policy for causal inference.

A better understanding of the consequences of cancellation policies on patient health is, however, important to inform planning for future epidemics or pandemics. This would help hospitals to manage admissions in order to minimise health losses. However, this would require routinely collected administrative data at an individual level that covers all cancellations irrespective of whether they are made following a hospital admission (as in existing data collections), or in advance (where new data collection is needed). Such information would allow more detailed and robust analyses of the impact of policies on cancellations, subsequent changes to WTs, and ultimately patient health outcomes. The reliance on WTs data for treated patients only allows, at best, a partial understanding of the impacts of policy changes.

Conclusion

The rise in WTs following the 2017/18 national cancellation exhibited a similar time trend to that observed in other financial years. Our findings indicate that changes in NHS planned activity and WTs occur in most winters. This renders the use of evidence from other time periods unhelpful as a suitable counterfactual from which to infer what would have happened in 2017/18 in the absence of the national postponement policy. Accordingly, without further individual data on patient cancellations it is challenging to use such policies within a natural experimental framework to identify the effect of cancellations on WTs and hence on patient health outcomes. To analyse the impact of future exogenous shocks to the NHS, such as the coronavirus pandemic, on WTs, routine recording of all cancellations in hospital administrative data is essential, irrespective of whether cancellations are made in advance of or following hospital admission.

Supplementary Information

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Supplementary Material 1

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Author contributions

NR contributed to conceptualising the study. MAM and RS designed the study, analysed, interpreted the data and prepared the manuscript draft. AM, NG and NR provided feedback and edited the manuscript. All authors read and approved the final manuscript.

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Data availability

The NHS England website provides data on the number of all last-minute planned operations cancelled for non-clinical reasons and on the total number of planned admissions per quarter. The data supporting this study's findings are available from NHS England under data-sharing agreement. Hospital Episode Statistics ©2015/16-2018/19, NHS England. Re-used with the permission of NHS England.

Declarations

Ethical approval and consent to participate

Not applicable.

Consent for publication

The Department of Health and Social Care (DHSC) has approved the manuscript.

Competing interests

The authors declare no competing interests.

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