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Centre for Market and Public Organisation  
Bristol Institute of Public Affairs  
University of Bristol  
2 Priory Road  
Bristol BS8 1TX  
<http://www.bris.ac.uk/Depts/CMPO/>

*Tel: (0117) 33 10799*

*Fax: (0117) 33 10705*

*E-mail: [cmo-office@bristol.ac.uk](mailto:cmo-office@bristol.ac.uk)*

### **Did ‘targets and terror’ Reduce Waiting Times in England for Hospital Care?**

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# Did 'targets and terror' Reduce Waiting Times in England for Hospital Care?

Carol Propper<sup>1,2,3</sup>  
Matt Sutton<sup>4</sup>, Carolyn Whitnall<sup>1</sup>  
and  
Frank Windmeijer<sup>1,2</sup>

<sup>1</sup>CMPO, Centre for Market and Public Organisation

<sup>2</sup> Department of Economics, University of Bristol

<sup>3</sup>Centre for Economic Policy Research

<sup>4</sup> HERU, University of Aberdeen

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## Abstract

Waiting times have been a central concern in the English NHS, where care is provided free at the point of delivery and is rationed by waiting time. Pro-market reforms introduced in the NHS in the 1990s were not accompanied by large drops in waiting times. As a result, the English government in 2000 adopted the use of an aggressive policy of targets coupled with publication of waiting times data at hospital level and strong sanctions for poor performing hospital managers. This regime has been dubbed 'targets and terror'. We estimate the effect of the English target regime for waiting times for hospital care after 2001 by a comparative analysis with Scotland, a neighbouring country with the same healthcare system that did not adopt the target regime. We estimate difference-in-differences models of the proportion of people on the waiting list who waited over 6, 9 and 12 months. Comparisons between England and Scotland are sensitive to whether published or unpublished data are used but, regardless of the data source, the 'targets and terror' regime in England lowered the proportion of people waiting for elective treatment relative to Scotland.

**Keywords:** health care, waiting times, targets

**JEL Classification:** I18, L32

**Electronic version:** <http://www.bris.ac.uk/Depts/CMPO/workingpapers/wp179pdf>

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## Address for Correspondence

CMPO, Bristol Institute of Public Affairs  
University of Bristol  
2 Priory Road  
Bristol  
BS8 1TX  
Carol.Propper@bristol.ac.uk  
[www.bris.ac.uk/Depts/CMPO/](http://www.bris.ac.uk/Depts/CMPO/)

## 1. Introduction

The productivity of the public sector is a concern of governments around the world. The use of market type incentives has been advocated as a means of raising productivity, leading to a number of experiments in granting greater autonomy for public service providers and payment for performance (Osborne and Gaebler 1992; Heckman et al. 1997). The UK government has generally followed this trend. But in an important area – the management of waiting times for treatment in the public health service - it has recently reverted to an older style of ‘command and control’. The government of the largest country in the UK – England - has used centrally imposed targets for waiting times and penalties for managerial failure in a regime so strong that it has been dubbed one of ‘targets and terror’ and likened to the targets set for managers of state enterprises in pre-reform Soviet Russia (Bevan and Hood, 2006; Hood and Bevan, 2005). The aim of this paper is to exploit a quasi-natural experiment in the use of this regime to evaluate whether it has achieved its goals.

These goals were to reduce the very long waits for elective care in the English National Health Service. Health care in the United Kingdom (UK) is predominantly provided by the National Health Service (NHS), which is funded by general taxation, free to the consumer at the point of use and employs around 1.2 million people<sup>1</sup>. For emergency care, individuals have direct access to specialist treatment, but for all other hospital care (known as elective care), which accounts for around half of all care, they must first contact their General Practitioner (GP). The GP provides a referral to a specialist employed in an NHS hospital. The individual waits for this first specialist appointment and, if more intensive treatment is required, then waits again for admission to hospital. These waits, particularly for admission, have historically been very long: for example in the early 1990s waits of over two years were not unknown.

Not surprisingly, the length of these waits has been a key political issue for several UK governments. During the 1990s, the Conservative government instituted market-orientated reforms on the supply side of the UK healthcare market (Cutler, 2002; Propper, 1995a) to improve NHS productivity. One of the primary aims was to reduce waiting times for elective care. These did fall, but not by as much as the government - or the public – wanted. In 1997

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<sup>1</sup> A limited private sector, specialising in treatments for which there are long waiting lists, exists.

mean waits were still around 23 weeks (Siciliani and Hurst 2004) and maximum waiting times of over 18 months still existed when a new Labour administration was voted in, partly on the basis of concerns over NHS performance<sup>2</sup>. In response, the incoming administration instituted an end to the market reforms and reverted to an older policy of central ‘command and control’. Initially, these changes emphasised co-operation and collaboration (Oliver, 2005), but starting in 2000 the English NHS instituted a more aggressive target based policy.

A key target was waiting times for inpatient care. Waiting times were published and used as a basis for direct sanctions and rewards. The sanctions were the dismissal of key managers of hospitals for poor performance against these targets and the rewards were the granting of greater autonomy (the freedom to keep certain surpluses and less central control) for hospital managers who performed well.

However, while this regime was implemented in England beginning in 2000, it was not implemented in other parts of the UK. In 1999, the UK government devolved responsibility for health services and new administrations with responsibility for the provision of NHS care were created in Scotland, Wales and (for some time) Northern Ireland. The previously UK-wide Department of Health’s remit was restricted to England only. So while in 2000 NHS hospitals in England were set a target of a maximum wait for inpatient treatment of 18 months by the end of March 2001, which was to decrease annually by 3 months until a maximum of six months in March 2005, targets such as these and the associated sanctions for non-performance were not imposed in all three other countries. However, while maximum waits have fallen in England since 2000, it has not been systematically empirically tested whether this is due to the target regime.

More generally, there have been very few empirical tests of command and control strategies in the NHS despite their popularity with successive administrations (the market reforms of 1991-1997 are an exception). The reason is simple: UK governments tend not to introduce policy experiments. Instead, policies are introduced in all of government – including the NHS - at once. So robust empirical testing of the use of targets as a way of implementing policy was not possible before devolution.

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<sup>2</sup> In addition to concerns over waiting times, there were also concerns that the chief agents of change – a selection of GPs who purchased hospital care directly – instituted a policy which favoured their patients at the expense of others. For evidence see Propper et al., 2002; Gravelle et al., 2002; Dusheiko et al., 2005, 2006.

This paper exploits the ‘natural experiment’ of the common policy environment operating in England and one of the other three countries in the UK - Scotland - prior to devolution and the policy divergence post-2000 to test the impact of the ‘targets and terror’ regime on elective waiting times in England between 1997/98 and 2003/04. We use a difference-in-differences estimator to net out the effect of common trends combined with different pre-policy levels. We select Scotland, rather than Northern Ireland or Wales, as the appropriate comparator to England. It is the largest of the three devolved administrations and has a greater degree of devolution and independence of its Parliament. It also has a more self-contained healthcare system (there are less cross-border flows between England and Scotland as compared to between England and Wales). While Scotland is the more obvious choice of comparator than the two other smaller counties, previous analyses have not been able to examine Scotland because of potentially important differences in the published data on waiting times. In this paper, we use both the data which is published for monitoring purposes and the data which is not published to overcome this problem. In all we use three data sources (detailed below).

Using all three sources, our estimates indicate that the ‘targets and terror’ policy significantly reduced waiting times. Our estimates show that numbers waiting fell across the whole distribution of waiting time, with the greatest proportionate fall being for the longest waits. The proportionate reduction in the numbers waiting over six months was around 20%; the proportionate reduction in the numbers waiting 12 months or more was closer to 60%. We conclude that the policy of ‘targets and terror’ met its stated aim<sup>3</sup>.

## **2. The Devolution of the NHS as a Quasi-Natural Experiment**

Since 1948 the UK NHS has provided universal coverage that is free at the point of use, largely funded from taxation. Reforms have come and gone, and while the policies have been administered by different organisations in the four countries, the broad thrust of policy has been the same in all four and the policy differences have been marginal in comparison to the similarities (Alvarez-Rosete et al., 2005). However, in 1999, the UK government devolved responsibility for the health service, creating new administrations with responsibility for

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<sup>3</sup> There is a large literature on the unintended consequences of target setting and the impact of publication of data on behaviour of service providers. A well known example in health care is the publication of data on outcomes

policy and provision of NHS care in Scotland, Wales and (for some time) Northern Ireland. The previously UK-wide Department of Health's remit was restricted to England only. While the specific powers of each devolved administration are slightly different, each has significant freedoms with respect to NHS policy (Alvarez-Rosete et al., 2005). As the policies of the three non-English countries differ and we use only Scotland as a comparison in this paper, we discuss only Scotland and England here.

Before devolution waiting times targets were set by the Patients' Charter (Department of Health, 1995). The Charter was common to the two countries and set a maximum waiting time of 18 months for 1997 and 1998. Although Scotland offered a guarantee that from April 1997 no-one would wait more than 12 months (Scottish Office, 1997), this guarantee (as all Patients' Charter targets) was not backed up by strong managerial sanctions.

Post devolution the Department of Health in England in 2000 announced an ambitious 'modernisation and reform' programme (Department of Health, 2000). Waiting list policy shifted to how long patients had to wait. The NHS Plan set out a set of escalating targets for waits: "*[b]y the end of 2005, the maximum wait for inpatient treatment will be cut from 18 months now to six months [...] The Plan will see a staged reduction of maximum inpatient waits from 18 months through 15, 12, 9 down to 6, and eventually [by 2008] 3 months.*" (Department of Health, 2000, p.105).

The targets were strongly linked to managerial sanctions for non-performance. The main lever was the threat to senior management's jobs. There is a strong internal career structure for managers within the NHS, so that publicly recorded performance is an important aspect of NHS managers' career concerns. Waiting times from referral to inpatient admission, with a limited set of other key targets and a 'balanced score card' of a wider set of indicators, were used to calculate an annual star rating (which ranged from zero to three) for each NHS hospital. These were published and used as a basis for direct sanctions and rewards in a regime so aggressive it has been likened to the behaviour of the Stalinist regime in the USSR and dubbed 'targets and terror' (Bevan and Hood, 2006; Hood and Bevan, 2005). The sanctions were the dismissal of key managers of hospitals for poor performance against these

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for coronary care in New York (e.g. Hannan et al. 1994) and numerous examples exist in the education literature (e.g. Kane and Staiger 2002). The data used here do not enable us to examine unintended consequences.

targets and the rewards were the granting of greater autonomy (the freedom to keep certain surpluses and less central control) for hospital managers who performed well.

The Scottish Executive adopted a different policy. From devolution in 1999 it focused on the abolition of the 1990s ‘quasi-market’ and the re-introduction of a professionally-led, integrated system based on concepts such as managed clinical networks (Alvarez-Rosete et al., 2005). Targets played little role. In particular, even compared to the Patients’ Charter, waiting times were considerably downplayed<sup>4</sup>. The overall guarantees of 12 months remained, though there were (new) exceptions for certain (undefined) conditions of ‘low clinical priority.’

In 2000 the Scottish Executive set down an “expectation” that waiting times should not exceed 9 months by the end of December 2003 and signalled that specific targets were to be developed for key specialties (angiography, angioplasty and cancer investigations) (Scottish Executive 2000). Waiting times at hospital level were not made public and the waiting times “expectation” was not strongly monitored. Even as late as 2002 most of the focus was on the management, rather than the length, of lists (Audit Scotland, 2002). At this point, the Executive expressed a concern over the increasing size of the ‘deferred’ waiting list, on which patients had no guaranteed waiting time (details of this list are discussed in the data section below)<sup>5</sup>.

By 2003, there were some signs that the policy in Scotland was changing. The White Paper issued in February 2003 (Scottish Executive, 2003) offered patients “a guarantee that our national targets will be met...[and] monitored... If a patient is not treated by their local NHS within the National Guarantee, we will give them the right to be treated elsewhere.” This was still not accompanied by publication of performance at hospital level or the coupling of performance against targets and managerial sanctions that operated in England. In November 2003 the Scottish Executive did refine its objectives to “12 National Priorities”, one of which was reducing waiting times.

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<sup>4</sup> This history of policy to tackle waiting times since devolution in Scotland draws heavily on [http://www.audit-scotland.gov.uk/docs/health/2005/nr\\_060216\\_waiting\\_times.pdf](http://www.audit-scotland.gov.uk/docs/health/2005/nr_060216_waiting_times.pdf)

<sup>5</sup> Indication of the weakness of commitment to waiting time reductions is further given by the fact that the 2002 Performance Assessment Framework included ‘progress towards the waiting times targets’ as only one of more than 60 indicators on which NHS Boards were judged at their annual performance review.

Table 1 summarises the differences in the maximum waiting times set for hospitals in each year. The level in England was higher initially. The announcement in 2000 - which covered the time period upto 2005 - was to drive the maximum waiting time steadily downwards in England through a set of ever-stricter targets. The Scottish administration maintained their target of 12 months until 2003/4 and only then lowered it. The net effect was that by 2004/5 the target in England was below that allowed in Scotland despite being 6 months higher in 2000.

In summary, between 1997 and 1999 both countries focused on reducing the numbers on the list without strong managerial sanctions. From 2000 policy in the two countries diverged, England implemented a policy of a planned reduction in waiting times backed up by managerial sanctions whilst Scotland had no planned reductions until 2003 and no link between waiting times and assessment of managerial performance. What we test here therefore is not the effect of targets per se, but the effect of a stringently-monitored targets policy with associated sanctions for failure relative to a set of aspirational and historical targets that had no associated sanctions and little bite.

Differences in the use of targets also existed between England and the other two countries of the UK. We do not use these as comparators here, partly because they are smaller – Scotland has a population of over 5 million, Wales just under 3 million and Northern Ireland around 1.7 million - and partly because previous research has shown differences in the effect of waiting times targets for England compared to Wales and Northern Ireland.

Alvarez-Rosete et al. (2005) compare published waiting times in England, Wales and Northern Ireland at two dates - 1996/7 and 2002/3. They examine the total proportion of the population waiting, the proportion of those waiting less than 3 months for an outpatient appointment and the proportion waiting less than six months for an elective admission and conclude that on all these measures performance in England improved, whilst in the two other countries performance worsened. Bevan and Hood (2005) examine annual data on the percentage of patients waiting over 6 and 12 months for 1999 to 2005 in Northern Ireland, Wales and England. The data show a sharp fall in England in both series, while the performance in Northern Ireland and Wales is much poorer, with no fall in either of those two countries in the percentage waiting longer than six months, and some fall in the percentage waiting over 12 months in Wales, but little change in Northern Ireland until 2005. Neither of

these papers undertake statistical tests of whether the policy resulted in the differences in performance.

Hauck and Street (2007) examine the difference in policy in England and Wales. Waiting times targets were abandoned in Wales in the immediate post devolution period. They use routine discharge data collected over the period 1997/8-2002/3 from three English and one Welsh hospital trusts close to the English-Welsh border to ascertain whether there is evidence of differential performance that relates to the country where the hospital is located. They find that activity levels remained constant in Welsh hospitals, the proportion of day cases fell, and mortality rates rose. They also examine whether patients wait less time if funded by an English compared to a Welsh purchaser of care. While Hauck and Street (2007) find that the stronger waiting times regime for hospital managers in England has a positive impact on throughput and an outcomes, they do not actually test what is examined here - whether English hospitals have shorter waiting times than non-English ones after the introduction of the ‘target and terror’ policy. Instead they test whether hospitals respond differentially to Welsh and English purchasers of health care who post-1999 also operated under a different waiting times target regimes.

In terms of policy assessment, it should be noted that devolution allowed Scotland to pursue its own policies with respect to resources and staffing of the NHS. NHS allocations per capita have historically been higher in Scotland than in England (in part due to the poorer levels of population health and greater population dispersion in Scotland). Post devolution, resources have increased in both countries, but there is some evidence that they have risen faster in England than in Scotland (e.g. Munro and Tosi, 2005; Alvarez-Rosete et al., 2005). Isolating the impact of waiting list targets therefore may require controls for changes in resources and we address this in our empirical analysis.

### **3. Methods**

We focus on the impact of the policy at the maximum announced waiting times and at a shorter wait as well. We analyse quarterly data at country level for the two countries from 1997/8 to 2003/4 on the percentage of persons waiting for elective care for more than ‘ $m$ ’ months, where  $m$  is defined as six, nine and twelve. The latter two cut-offs are maximum targets in England during our data period: twelve months was the permitted maximum at the

end of the 2002/3 financial year and nine months was the maximum at the end of 2003/4. Six months is below the English target for the period we analyse, but was a target for just after the period covered by our data and one that was publicly announced in 2001. As the majority of waiters actually wait for under 6 months examining this cut-off allows us to examine the impact of the policy on the bulk of the distribution of individuals waiting for care.

We first present graphical analyses to show patterns. To statistically test whether the target regime lowered waiting times we estimate a difference-in-differences (DiD) estimator.

The model is:

$$(1) \quad p_{jt}^m = \alpha_m + \beta_m E_j + \gamma_m I_{[t \in 1]} + \delta_m I_{[t \in 1]} E_j + x_{jt}' \theta_m + \varepsilon_{jt}^m$$

where  $p_{jt}^m$  is the proportion of people on the waiting list waiting longer than  $m$  months ( $m = 6, 9, 12$ ) in country  $j = \{Scotland, England\}$  in quarter  $t$ ,  $E_j = 1$  denotes England,  $I_{[t \in 1]} = 1$  if the period  $t$  is during the policy regime (2000/1 onwards), 0 otherwise and  $x_{jt}$  is a set of other time varying covariates which may affect the outcomes. The coefficients of interest are  $\delta_m$ .

Devolution took place in 1999/00. Although this was one year before the targets and target regime was introduced in England, we omit 1999/0 from our analysis in order not to contaminate the policy-off years with any changes that might have happened in the year of devolution. 1997/8 and 1998/9 are policy-off years and 2000/1-2003/4 are policy-on years in England and policy-off years in Scotland.

As  $\delta_m$  in (1) recovers the effect of the policy changes in England only if there are no (exogenous) differential time trends in Scotland and England (Blundell and Costa Dias, 2002). To test for these we re-estimated (1) allowing for a full set of country specific year dummies. In this analysis we include 1999/00.

We initially estimate models without time-varying covariates that measure resources at the country level. We then allow for time varying covariates to test that the results are not driven by other policy changes.

## 4. Data

We use two types of data to overcome the problem of lack of comparability in the data published by the two governments. The sources are waiting list census and hospital discharge data. Census data are published by the Department of Health (England) and NHS Scotland, but are not comparable between the two countries in their published form. Census data give a snapshot of the list on a particular date, with information about length of time at the census date but do not provide information on the total wait realised when patients are admitted to hospital. Hospital discharge data are not used by the authorities in either country to monitor performance against waiting time targets. Waiting times in discharge data are collected at the start of the hospital episode and so provide information about realised waits but not about patients who are still on waiting lists.

### *Census data*

Quarterly country-level census data for England are from the KH07 returns (Department of Health, unpublished; Department of Health, 2007) for 1997/8-2003/4. These cover NHS provided care<sup>6</sup>. They show the size of the list and the numbers waiting in 3 month bands on each census date – the last day of the month in June, September, December and March. The comparable data for Scotland are taken from the monthly SMR3 return (ISD Scotland, unpublished). This is individual level data which includes specialty, date joined the waiting list, and information about eligibility for a waiting list guarantee. We use this to construct quarterly country-level data for Scotland that match the English KH07 returns.

In both Scotland and England the census data exclude anyone on a “planned” programme of treatment, as this is scheduled according to clinical factors rather than resource availability<sup>7</sup>. For the period analysed here, such planned treatments comprised 24% of total admissions in England and 18% of those in Scotland. However, data for the two countries differ in the inclusion and treatment of certain other patients.

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<sup>6</sup> In the last year of our data, some NHS activity in England was provided in private sector treatment centres that specialised in providing elective care characterised by long waiting lists. Data are not available on the waiting times for care in these centres. These providers accounted for a small proportion of elective care. As they were used because their waiting times were shorter than those of NHS providers, exclusion of these providers will overestimate the size of any positive gap between England and Scotland.

<sup>7</sup> An example of a planned treatment is a course of chemotherapy.

Most importantly, there are those who for personal or medical reasons defer admission (turn down a reasonable offer of admission or fail to turn up for an arranged admission date) or are suspended from the list for a period of time (because they pre-arrange with the hospital that they are unavailable for admission). Such patients are included in the census statistics for England provided they are not suspended from the list on the census date itself. The waiting times of such patients are generally reset to run from the date of deferral. For patients who are suspended, waiting times are calculated excluding the time spent suspended. In contrast, in Scotland, patients with a deferral or suspension were allocated an availability status code (ASC; until 2003/04 known as waiting list guarantee exception codes), which indicated the circumstances that had made them unavailable for admission. These patients were then not covered by waiting list guarantees and were excluded altogether from the published statistics. Until 2003/04, such patients would usually have been put onto the 'deferred' waiting list for which recording of the waiting time was not mandatory.

The SMR3 and KH07 also differ in the treatment of patients judged of low clinical priority, patients awaiting highly specialised treatments and patients waiting for treatment at a time of exceptional strain on the NHS. In Scotland these patients are also covered by ASCs and excluded from reported statistics, whereas in England they are included. As an illustration of the size of the issue, in December 2002, there were just under 109,000 persons waiting in Scotland. The number excluding those with ASCs was just under 79,000 indicating that 28% of persons waiting have an ASC code.

Hence the census data cannot be adjusted to make an entirely like-for-like comparison between the two countries. We cannot identify, from the English data, patients who are equivalent to the patients allocated ASCs in Scotland, so we cannot exclude them from the English data. Nor can we adjust the waiting times of deferred and suspended patients in Scotland in the same manner as for English patients. Finally, a large proportion of patients with ASCs had unknown waiting times prior to 2003/04.

#### *Hospital discharge data*

We use a 10 per cent random sample of the discharge Hospital Episode Statistics database (HES) (Department of Health, various) for England and a 50 per cent random sample of the Scottish Morbidity Record (SMR01) (ISD Scotland, various) for Scotland. These discharge data are known as episode data and contain information about inpatient and day-case

(ambulatory surgical treatment) episodes in the NHS. The episode data comprise admitted patients only and are recorded at the end of each episode when the patient is discharged from care. Waiting times are derived as the difference between the date of decision to admit the patient and the admission date. Around 11% of admissions have unknown waits in England; the comparable figure in Scotland is less than 1%.

To construct quarterly country-level waiting time series comparable to the census data we follow the method described by Dixon (2004) to match discharge data to census data. We use waiting times information from inpatients and day-cases discharged from April 1997 to March 2006, excluding those on a planned programme of treatment<sup>8</sup>. We then aggregate across all patients within country and quarter.

Even with these adjustments the episode data are not totally comparable with the Census data. As the episode data are collected after the patient has left the list to be admitted into hospital, they do not include patients who leave the waiting list for other reasons, for example, because they die or no longer need treatment. In England, about 15% of those leaving the list each quarter are removed rather than admitted. The equivalent figure for Scotland is not publicly available.

Table 2 summarises the main differences between the three data sources. As the data cannot be made totally comparable, the analyses presented here use all three sources, so we make three estimates of the impact of the policy. The differences between these data could lead to the following bias. Suspended patients are recorded in the English census data with their re-set dates. They are excluded completely from the Scottish census data. If we assume that English suspended patients have recorded waits that are shorter than the average waits<sup>9</sup> the use of census data could create a bias towards finding shorter waits in England. However, as we undertake a DiD analysis, this potential bias only arises if there were significant changes in the number of suspensions in England or the number of ASCs in Scotland.

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<sup>8</sup> We undertake our difference-in-differences analyses for quarters upto and including March 2004 but use the episode data for a longer period in order to avoid the obvious problem of censoring. Individuals will then only be censored if they have to wait more than 24 months after March 2004. There were less than 1% of individuals on waiting lists at the end of March 2003 who waited more than 24 months.

<sup>9</sup> We cannot assess this assumption using available data.

The number of suspensions in a quarter as a percentage of the number waiting at the census date is quite constant for most of the period in England, but with some marked increases at the beginning and the end of the period. The quarterly number of ASCs in Scotland as a percentage of the number waiting at the census date is weakly increasing over the period<sup>10</sup>. Therefore the bias discussed above may arise. Of course, it could also be the case that ASCs are being used to move long waiters off the list. In that case there would be a bias towards longer waits in England when ASCs were excluded.

The episode data do not include patients who leave the list for other reasons than admission, for example because they die or no longer need treatment. This is the case for both Scotland and England. Deferred and suspended patients are treated equally in the episode data for the two countries, as their waits are recorded from the date at which the decision is taken to put them on the waiting list for admission until the point at which they are admitted and the treatment takes place. There is therefore no bias towards shorter waits in England or Scotland using episode data, unless there are differences over time as to the number and reasons why patients leave the list. We are unable to assess the latter as there is no information available as to why people leave the list in Scotland.

Table 3 presents simple descriptive statistics for the variables included in our models.

## 5. Results

### 5.1 Descriptive analysis

Fig. 1 presents Census data for the two countries, with and without ASCs for Scotland, for June 1997 to March 2004. The first panel shows the proportion on the list waiting 6 months or more, the second those waiting 9 months or more, and the third those waiting 12 months or more. The first panel shows that the percentages waiting 6 months or more in England is higher than the comparable figure from the published data in Scotland for the whole period. Using the published Census data, it would therefore be inferred that the percentages waiting in England were higher. These were the comparisons made by the government in Scotland. However, if the number of ASCs with known waiting times, which were not published, are added back into the Scottish data, the picture is reversed: the percentage waiting in Scotland is

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<sup>10</sup> Data available from the authors.

higher from March 2000. The percentage waiting including ASCs rises steadily after 1999 with a peak in March 2002. After this there is a fall, and the levels return by the end of the period to a level comparable with that at the beginning.

In terms of the potential impact of the target policy, the English data show a fall in the percentage waiting from the date of the policy onwards, while the Scottish data, with or without ASCs, do not fall for another 2 years.

The second panel presents the percent waiting 9 months or more. The target of zero was to be reached in England by March 2004 and is shown by the vertical line. The figure shows the percentage waiting in England fell after 2001 and did appear to reach zero in time for the target deadline of 31<sup>st</sup> March 2004. In Scotland there was no fall in 2001: any downward trend appears later. There is again a large difference in the picture for Scotland with and without ASCs. Excluding ASCs, the percentage waiting over 9 months appears to reach zero by the end of the period, but including ASCs, the percentage waiting over 9 months is still over 10% at the end of the period.

The third panel presents the percent waiting 12 months or more. The vertical line marks the date at which the target in England was zero. In England there is a fall after 2001 and the percentage appears to have reached zero by the target deadline of 31<sup>st</sup> March 2003. In Scotland the picture is very different depending on whether ASCs are included or excluded. When they are excluded the percentage waiting over 12 months is zero (or very near) for the whole period. But this is not the case when patients with ASCs are included, so Scotland appears to have met its target but would not have done if it had adopted English rules for classifying patients on inpatient waiting lists.

Figure 2 presents the comparable figures derived from admissions data for the same period. The proportions waiting, in all three panels, are higher in England than in Scotland for all the period. However, as for the census data, the gap between the two countries narrows after the introduction of the policy in England.

A difference between the admissions and the census data in England is evident. The former are less clearly downwardly trended than the published census data. As discussed above, the difference between these two series could be due to the treatment of deferred and suspended

cases in England in the Census data. In Scotland the admission and census series are more comparable, with the admissions data taking values between the census series with and without ASCs.

## 5.2 Estimation results

Table 4 presents the difference-in-differences estimates. The estimates are from equation (1) with no time varying controls and a single time trend. The first set of estimates in panel (a) shows that the policy significantly reduced the proportions waiting 6 months in England relative to Scotland. The proportion waiting 6 months or more fell by between 6 and 9 percentage points more in England, the amount depending on the data source. The estimate of the policy effect using the admissions data is very similar to that using the census data without ASCs. Adding in the ASCs increases the estimated impact of the target regime as expected from Figure 1.

The results in panels (b) and (c) show that the estimated impacts of the policy on 9 and 12 month waits are also statistically significant. Again these results are robust to whichever data source is used. Comparing data sources, the patterns in the estimates are very similar across all three waiting times. The estimates from the episode data are very similar to those from the census data without ASCs. These indicate a fall of 4 percentage points in the percentages waiting over 9 months and around 2 to 3 in the proportions waiting over 12 months. Again, the inclusion of ASCs increases the estimated impact of the policy in England.

In terms of proportionate change, the fall of 6 percentage points for the episode and Census data without ASCs for the six months wait is in the order of a 20 percent fall from the proportions waiting in June 1997. The comparable estimates for 9 and 12 months are of the order of a 35 and 60 percent fall respectively. The largest proportionate fall is therefore for the longest waits i.e. those that were subject to the targets.

### *Allowing for more complex time effects and time varying covariates*

To test the robustness of our results to possible differences in effects of policies implemented before devolution, we re-estimated (1) allowing for a full set of country specific year dummies. Table 5 present the results for this specification. For all three sets of results, relating to the proportion waiting more than 6, 9 and 12 months, we find that there are no significant differences between the year effects in Scotland and England pre-devolution, supporting the

view that a similar policy was operating in both countries and that the DiD results we found in Table 4 are not due to differential trends pre-policy.

Post devolution, the results in Table 5 indicate that the percentages waiting longer than 6, 9 and 12 months rose significantly in Scotland in 2001 and 2002, compared to the base year 1997. This result holds using either the episode data or the census data including ASCs. These increases are not found in the census data excluding ASCs. For all data sets, however, the pattern of coefficients show that the policy of target and terror in England significantly reduced the percentages waiting longer than 6, 9 and 12 months in England relative to Scotland in all years post 2000. The gap is significant in all years 2001 onwards and grows monotonically post policy implementation in all of the nine estimates except one. These patterns are suggestive that the forward knowledge of tighter targets did not deter managers from making effort in the later years and that the policy had an impact almost immediately<sup>11</sup>.

Both the English and the Scottish governments increased health spending during the period following devolution. There is some lack of clarity about the relative rates of growth: Alvarez-Rosete et al. (2005) show that the growth in Scotland in spending per capita in the six years from 1996/7 was slightly less than in England, though these results are very sensitive to the exact time period analysed and which measure of resources is examined. It is possible therefore that the difference we observe is due to differences in resources rather than the effect of targets. We therefore re-estimated the DiD specification (1) adding in a control for total healthcare expenditure per capita in both countries<sup>12</sup>. The results are shown in the second column of Table 6 for the census data without ASCs (the results are similar using the other data sources). The estimates without the time varying controls are repeated in column 1 for comparative purposes. The DiD estimates fall for the shorter waits, but all estimates of the policy remain significant and negative. The coefficients on health care resources per capita are not significantly different from zero in any of the three models.

As an alternative control for resources, we used total (country level) all NHS staff (full time equivalent) per capita. The results in Table 6, third column, show that the DiD estimates of the policy effects are still negative but again smaller than without the control (and also

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<sup>11</sup> The forward announcement may have led to switching of effort between years and we cannot identify this: however, we can conclude that it did not lead to so much switching that there was no effort undertaken in the initial years.

smaller than those when controlling for health expenditure). The staffing levels have a significant negative impact in all three models showing that higher levels of staffing decrease waiting times.

It is also possible that the results are driven by differences in population health. Levels of health in both Scotland and England have been improving over time. There is no obvious single measure of health at country level that is related to the need for inpatient care, but the various UK governments use standardised mortality ratios (SMRs) to measure of need in the allocation formulae when allocating healthcare expenditure to bodies at sub-national level. We therefore use SMRs to measure need and estimated (1) adding annual standardised mortality ratios for each country as a control. The results are shown in Table 6, column 4. The DiD estimates again fall a little, but all estimates of the policy remain significant and negative. The coefficient of the measure of need is significant and negative for the 6 months results, but is not significantly different from zero in the other two models.

## **6. Discussion**

The Labour administration in England in the last decade has used targets widely to achieve key political goals for the public sector. The NHS has been a particular recipient of this approach, with waiting lists being a central focus of an aggressive target regime with heavy sanctions for failure to achieve published targets. In this paper we exploit the natural experiment arising from policy differences between Scotland and England to assess whether this regime reduced waits for inpatient care in England. After devolution, the Scottish government did not adopt the target regime that was adopted in England. Scotland is a good comparator to England because of its size, the independence of its Parliament with respect to health policy making, and the fact that it is a relatively self-contained healthcare system.

Using a difference-in-differences approach to net out the effect of common trends combined with different pre-policy levels, and three different sets of data to overcome the particular deficiencies of any one single source, our results show that the target regime in England led to a significant reduction in the percentage of patients waiting at various points of the distribution of waiting times. Using the 1999 final quarter Census population as a steady state population, we can use our estimates to estimate the reduction in person months per year

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<sup>12</sup> Sources in Table 6.

spent waiting above a six months target. This equals approximately 0.58 million person months. Using the value of a month spent on waiting for elective treatment from Propper (1995b) updated to 2002 prices, this reduction in waiting time amounts to a value of around £58 million, which is approximately 0.1% of the NHS budget in 2002-3. Since what we estimate in this paper is whether a certain target time was met (and not the average reduction in waiting time) our estimates cannot be used to measure the full benefits of the policy since they exclude any estimate of the benefits of the policy for those who wait under 6 months. Under the assumption that the fall in waiting times over six months was accompanied by a fall in time for those waiting less than 6 months, our estimate of the value of the benefit is a lower bound.

Our methodology cannot isolate the use of targets from the use of sanctions put in place to punish those who did not meet them, as the English policy post-devolution had both components. In fact the policy we study had three components which differed from the pre-devolution and the Scottish post devolution regime – escalating targets, managerial sanctions and a greater focus on the performance of the individual delivery unit. We have found that the combination of the three resulted in changed behaviour on the part of English hospitals. We can therefore conclude that the three of these together had an effect, but cannot disentangle precisely which of the three drove the performance improvement.

Part of our analyses use published data, which may be subject to manipulation precisely because it is published (e.g. Propper and Wilson 2003). Our results do suggest that one possible reason the Scottish Census data was published without ASCs was to hide the longer waits that would have been apparent if these data had been made public. Our results also perhaps suggest that making data available in the public domain probably improves – at least over time - its quality. The Scottish Census data including ASCs, which were not published, shows a rise in percentages waiting from 1999 to 2002. Some of this may measure true rises, but comparison with the admissions data suggests some of these increases may reflect lack of attention to ensuring this series was correct, which is likely to be a function of the fact that it was not subject to intense scrutiny by government at provider level<sup>13</sup>.

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<sup>13</sup> It is interesting to note that the reduction in the length of time waiting by those with ASCs appears at about the same time (late 2002) as the Scottish Executive expressed a concern with these lists (see Figure 1). This perhaps

Finally, a decrease in waiting times does not, on its own, imply that the policies have been welfare increasing. Reducing long waits does not necessarily lead to shorter mean or median waiting times, though in fact we find that waiting times fell at the lower (non targeted) end of the distribution as well as at the top. More generally, there is a large literature on the unintended consequences of target setting and the impact of publication of data on behaviour of service providers<sup>14</sup>. In the context of waiting times, it has been argued that shorter waiting times may have been achieved by targeting less needy patients or by reducing other activities. At present there is little evidence of either of these responses (Bevan and Hood, 2006) in the UK: a welfare calculation of the use of waiting times targets would need to establish whether such practices were widespread and remains for future research.

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indicates that making this deferred list the subject of public concern might have improved the recording of waiting times for patients on this list.

<sup>14</sup> A well known example in health care is the publication of data on outcomes for coronary care in New York State (Hannan et al. 1994), which led to physicians with higher death rates practicing outside the state as well as to improvement in performance by those remaining in the state. Numerous examples exist in the education literature (Kane and Staiger 2002).

## References

- Alvarez-Rosete, A., Bevan, G., Mays, N. and Dixon, J. (2005) 'Effects of diverging policy across the NHS', *British Medical Journal* 331, 946-950.
- Audit Scotland (2002) 'Review of the management of waiting lists in Scotland'. Audit Scotland: Edinburgh.
- Bevan G, Hood C. (2006) 'Have targets improved performance in the English NHS?' *British Medical Journal* 332, 419-22.
- Blundel, R., Costa Dias, M. (2002) 'Alternative approaches to evaluation in empirical microeconomics, *Portuguese Economic Journal* 1, 91-115.
- Cutler, D (2002) 'Equality, Efficiency, and Market Fundamentals: The Dynamics of International Medical Care Reform' *Journal of Economic Literature* 40, 881-906.
- Department of Health (2000) 'The NHS Plan: A plan for investment, A plan for reform'. Cm 4818-I. Stationery Office: London.
- Department of Health (2007) 'Hospital waiting times/list statistics: England. Quarterly, 1999/00 to 2003/04' Available from: <http://www.performance.doh.gov.uk/waitingtimes/> (accessed 27th March 2007).
- Department of Health (unpublished) 'Hospital waiting times/list statistics: England. Quarterly, 1997/98 to 1998/99'. Obtained by request from the Department of Health.
- Department of Health (various) 'Hospital Episode Statistics: England.' Financial years 1997/98 to 2005/06.
- Dixon, S. (2004) 'Trends in waiting time to date and total time waited: are the sources compatible?' *Health Statistics Quarterly* 24, 23-29.
- Dusheiko, M., Gravelle, H., Jacobs, R. (2005). The effect of practice budgets on patient waiting times. *Health Economics* 13, 941-958.
- Dusheiko, M., Gravelle, H., Jacobs, R., Smith, P. (2006) 'The effect of financial incentives on gatekeeping doctors: evidence from a natural experiment', *Journal of Health Economics* 25, 449-478.
- Gravelle H, Dusheiko M, Sutton M. (2002) 'The demand for elective surgery in a public system: time and money prices in the UK National Health Service', *Journal of Health Economics* 21, 423-449.
- Hannan, E, Kilburn, H Jnr, Racz, M, Shields, E and Chassin, M (1994) 'Improving the outcomes of coronary artery bypass surgery in New York State', *Journal of the American Medical Association* 271, 761-766.
- Heckman, J, Heinrich, C and Smith, J (1997) 'Assessing the Performance of Performance Standards in Public Bureaucracies', *American Economic Review* 87, 389-395.

- Hood C, Bevan G. 'Governance by Targets and Terror: Synecdoche', *Gaming and Audit*. Westminster Economics Forum, 2005 Issue 15.
- ISD Scotland. (unpublished) 'SMR3 – Waiting list census. Quarterly, 1997/98 to 2003/04'. Summary data obtained by request from ISD Scotland.
- ISD Scotland. (various) 'SMR01 – General acute inpatient/daycase record.' Financial years 1997/98 to 2005/06.
- Kane, T and Staiger, D (2002) 'The promise and pitfalls of using imprecise school accountability measures', *Journal of Economic Perspectives* 16, 91-114.
- Oliver A. 'The English National Health Service: 1979-2005', *Health Economics* 14, S75–S99.
- D Osborne, T Gaebler (1992). *Reinventing Government*. Addison-Wesley
- Propper, C (1995a) 'Agency and incentives in the NHS internal market', *Social Science and Medicine* 40, 1683-1690.
- Propper, C (1995b) The disutility of time spent on NHS waiting lists, *Journal of Human Resources* 30 (4), 677-701.
- Propper C, Croxson B, Shearer A. (2002) 'Waiting times for hospital admissions: the impact of GP fundholding', *Journal of Health Economics* 21, 227–252
- Propper, C and Wilson, D (2003) 'The Use and Usefulness of Performance Measures', *Oxford Review of Economic Policy* 19, 250-267.
- Scottish Executive (2000) 'Our National Health: A plan for action, a plan for change', Scottish Executive: Edinburgh.
- Scottish Executive (2003) 'Partnership for care: Scotland's Health White Paper', Scottish Executive: Edinburgh.
- Scottish Executive (2004) 'Fair to all, personal to each: the next steps for NHS Scotland', Scottish Executive: Edinburgh.
- The Scottish Office (1997) 'The Scottish Health Service: Ready for the Future', Cm 3551. The Stationery Office: London 1997.
- Siciliani, L and Hurst, J (2004) 'Tackling excessive waiting times for elective surgery: a comparative analysis of policies in 12 OECD countries', *Health Policy* 72, 201-215.

**Table 1. Target maximum waiting times (months) in England and Scotland**

	1997/98	1998/09	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
England	18	18	18	18	15	12	9	6
Scotland	12	12	12	12	12	12	9	9

Sources: see text.

**Table 2. Categories of patients included in Census and Episode data**

Patient category	Census data			Episode data
	England	Scotland (published)	Scotland (inc. ASCs)	
Patients admitted as part of a planned program of treatment	Excl.	Excl.	Excl.	Excl.
Patients suspended from list on census date	Excl.	Excl.	Incl.	Incl.
Patients who have deferred/been suspended prior to census date	Incl. (with adjusted waits)	Excl.	Incl.	Incl.
NHS patients treated in private facilities	Excl.	Excl.	Excl.	Excl.
Patients not discharged (at the end of the episode) by 31 <sup>st</sup> March 2004	Incl.	Incl.	Incl.	Excl.
Patients never eventually admitted (e.g., those who die, or recover without treatment)	Incl.	Incl.	Incl.	Excl.

**Table 3. Summary Statistics**

<b>Variable</b>	<b>Frequency</b>	<b>Country</b>	<b>Data source</b>	<b>Mean</b>	<b>St dev</b>	<b>Min</b>	<b>Max</b>
Log of per capita health expenditure	Annual	England	Public Expenditure Statistical Analyses	6.8	0.2	6.6	7.1
		Scotland	Public Expenditure Statistical Analyses	7.0	0.2	6.8	7.3
Staff per 1000 of population	Annual	England	NHS Workforce Statistics	18.7	1.3	17.4	20.6
		Scotland	NHSScotland Workforce Statistics	22.9	1.0	22.0	24.5
Age standardised mortality rate (per 10,000)	Annual	England	ONS Population Trends	68.7	3.2	66.0	73.2
		Scotland	ONS Population Trends	82.0	3.5	79.2	86.9
Percentage waiting 6 months or more	Quarterly	England	Census data	24.2	4.9	9.1	29.7
			Episode data	24.5	3.4	13.6	28.6
		Scotland	Census data excluding ASCs	13.8	2.2	7.1	16.6
			Census data including ASCs	28.2	2.8	23.7	33.3
Percentage waiting 9 months or more	Quarterly	England	Census data	10.4	3.9	0.1	14.8
			Episode data	12.3	2.8	4.4	15.5
		Scotland	Census data excluding ASCs	3.5	1.6	0.1	5.3
			Census data including ASCs	17.3	2.5	14.2	22.1
Percentage waiting 12 months or more	Quarterly	England	Census data	3.2	2.1	0.0	5.6
			Episode data	5.6	1.6	2.4	7.4
		Scotland	Census data excluding ASCs	0.1	0.2	0.0	0.7
			Census data including ASCs	11.7	1.9	8.8	15.2
			Episode data	4.5	0.8	3.2	6.1

**Table 4. Difference-in-differences estimates of the impact of the target policy****(a) Percentage waiting 6 months or more**

	Episode data b/se	Census data including ASCs b/se	Census data excluding ASCs b/se
Constant	16.71*** 0.74	26.89*** 0.98	14.76*** 0.89
Year	-1.06*** 0.31	-1.93*** 0.41	-2.19*** 0.37
Country = England	10.97*** 1.02	2.15 1.36	14.41*** 1.22
Policy = on	6.84*** 1.52	11.11*** 2.02	8.99*** 1.82
Policy on in England	-6.59*** 1.25	-9.25*** 1.66	-6.08*** 1.50
Number of obs	48	48	48
R-squared	0.793	0.655	0.867

**(b) Percentage waiting 9 months or more**

	Episode data b/se	Census data including ASCs b/se	Census data excluding ASCs b/se
Constant	8.26*** 0.54	16.51*** 0.76	5.00*** 0.60
Year	-1.09*** 0.23	-1.84*** 0.32	-1.96*** 0.25
Country = England	6.77*** 0.75	-2.00* 1.05	9.57*** 0.84
Policy = on	5.73*** 1.11	9.83*** 1.56	7.07*** 1.24
Policy on in England	-4.60*** 0.92	-7.35*** 1.29	-4.10*** 1.02
Number of obs	48	48	48
R-squared	0.746	0.822	0.877

**(c) Percentage waiting 12 months or more**

	Episode data b/se	Census data including ASCs b/se	Census data excluding ASCs b/se
Constant	3.89*** 0.32	10.49*** 0.48	0.54 0.33
Year	-0.55*** 0.13	-0.94*** 0.20	-0.78*** 0.14
Country = England	3.16*** 0.44	-5.09*** 0.67	4.78*** 0.46
Policy = on	3.54*** 0.65	6.25*** 0.99	3.11*** 0.68
Policy on in England	-3.08*** 0.54	-5.08*** 0.82	-2.55*** 0.56
Number of obs	48	48	48
R-squared	0.619	0.927	0.828

## Notes

1. Standard error in parentheses: \* significant at 10%, \*\* 5%, \*\*\* 1%.
2. Data are quarterly for 1997/8-2003/4; 1999/2000 omitted.

3. Estimates for census data for Scotland weighted by the size of deferred and true lists.
4. Data sources: Hospital waiting times/list statistics: England, 1997/98 to 2003/04. SMR3 Waiting list census: Scotland, 1997/98 to 2003/04. Hospital Episode Statistics: England, 1997/98 to 2005/06. SMR01 General acute inpatient/daycase record: Scotland, 1997/98 to 2005/06.

**Table 5: Regressions with country specific year dummies****(a) Percentage waiting 6 months or more**

	<b>Episode data</b>	<b>Census data including</b>	<b>Census data excluding</b>
	<b>b/se</b>	<b>ASCs</b>	<b>ASCs</b>
	<b>b/se</b>	<b>b/se</b>	<b>b/se</b>
Constant	16.03***	26.33***	14.11***
	0.71	0.91	0.93
Country = England	11.07***	1.99	14.22***
	1.00	1.29	1.31
Year = 1998	0.29	-0.82	-0.89
	1.00	1.29	1.31
Year = 1999	-0.60	-1.12	-2.09
	1.00	1.29	1.31
Year = 2000	1.74*	2.17	0.51
	1.00	1.29	1.31
Year = 2001	4.25***	5.23***	1.73
	1.00	1.29	1.31
Year = 2002	3.39***	4.89***	0.47
	1.00	1.29	1.31
Year = 2003	1.58	-0.31	-3.55***
	1.00	1.29	1.31
England*(Year = 1998)	-0.20	0.31	0.38
	1.42	1.82	1.85
England*(Year = 1999)	-1.52	-1.45	-0.48
	1.42	1.82	1.85
England*(Year = 2000)	-3.53**	-4.74**	-3.09
	1.42	1.82	1.85
England*(Year = 2001)	-6.09***	-8.41***	-4.91**
	1.42	1.82	1.85
England*(Year = 2002)	-6.88***	-10.75***	-6.34***
	1.42	1.82	1.85
England*(Year = 2003)	-10.27***	-12.48***	-9.23***
	1.42	1.82	1.85
Number of obs	56	56	56
R-squared	0.921	0.849	0.938

**(b) Percentage waiting 9 months or more**

	<b>Episode data</b>	<b>Census data including</b>	<b>Census data excluding</b>
	<b>b/se</b>	<b>ASCs</b>	<b>ASCs</b>
	<b>b/se</b>	<b>b/se</b>	<b>b/se</b>
Constant	7.53*** 0.46	16.04*** 0.62	4.34*** 0.56
Country = England	6.74*** 0.65	-2.44*** 0.88	9.26*** 0.80
Year = 1998	0.37 0.65	-0.89 0.88	-0.64 0.80
Year = 1999	0.11 0.65	-0.73 0.88	-0.91 0.80
Year = 2000	1.17* 0.65	1.60* 0.88	-0.07 0.80
Year = 2001	2.83*** 0.65	4.10*** 0.88	0.38 0.80
Year = 2002	2.17*** 0.65	3.89*** 0.88	-0.95 0.80
Year = 2003	0.01 0.65	-1.41 0.88	-3.67*** 0.80
England*(Year = 1998)	0.08 0.91	0.87 1.24	0.62 1.13
England*(Year = 1999)	-0.96 0.91	-0.46 1.24	-0.29 1.13
England*(Year = 2000)	-1.85** 0.91	-2.84** 1.24	-1.17 1.13
England*(Year = 2001)	-4.06*** 0.91	-6.48*** 1.24	-2.76** 1.13
England*(Year = 2002)	-5.39*** 0.91	-9.48*** 1.24	-4.64*** 1.13
England*(Year = 2003)	-6.95*** 0.91	-8.84*** 1.24	-6.58*** 1.13
Number of obs	56	56	56
R-squared	0.922	0.941	0.953

(c) Percentage waiting 12 months or more

	Episode data	Census data including	Census data excluding
	b/se	ASCs	ASCs
	b/se	b/se	b/se
Constant	3.42*** 0.21	10.49*** 0.36	0.26 0.23
Country = England	3.11*** 0.29	-5.65*** 0.50	4.58*** 0.33
Year = 1998	0.38 0.29	-0.95* 0.50	-0.24 0.33
Year = 1999	0.45 0.29	-0.74 0.50	-0.07 0.33
Year = 2000	1.06*** 0.29	1.24** 0.50	0.07 0.33
Year = 2001	1.95*** 0.29	3.22*** 0.50	-0.21 0.33
Year = 2002	2.10*** 0.29	3.77*** 0.50	-0.21 0.33
Year = 2003	1.03*** 0.29	-0.12 0.50	-0.23 0.33
England*(Year = 1998)	0.11 0.41	1.13 0.71	0.42 0.47
England*(Year = 1999)	-0.42 0.41	0.56 0.71	-0.11 0.47
England*(Year = 2000)	-0.89** 0.41	-1.37* 0.71	-0.21 0.47
England*(Year = 2001)	-2.40*** 0.41	-4.55*** 0.71	-1.12** 0.47
England*(Year = 2002)	-4.16*** 0.41	-7.44*** 0.71	-3.45*** 0.47
England*(Year = 2003)	-4.66*** 0.41	-4.69*** 0.71	-4.58*** 0.47
Number of obs	56	56	56
R-squared	0.930	0.981	0.964

**Notes**

1. Standard error in parentheses: \* significant at 10%, \*\* 5%, \*\*\* 1%.
2. Data are quarterly for 1997/8-2003/4.
3. Estimates for census data (Scotland) have been weighted by the size of deferred and true lists.
4. Data sources: Hospital waiting times/list statistics: England, 1997/98 to 2003/04. SMR3 Waiting list census: Scotland, 1997/98 to 2003/04. Hospital Episode Statistics: England, 1997/98 to 2005/06. SMR01 General acute inpatient/daycase record: Scotland, 1997/98 to 2005/06.

**Table 6: Difference-in-differences estimates allowing for healthcare resources and population need**

**(a) Percentage waiting 6 months or more**

	No control variable b/se	Log of per capita health expenditure b/se	NHS Staff per 1000 of population b/se	Population Standardised Mortality Ratio (per 10,000) b/se
Constant	14.76*** 0.89	10.65*** 2.85	18.81*** 1.71	37.44*** 9.98
Year	-2.19*** 0.37	1.37 2.38	0.71 1.12	-3.46*** 0.66
Country = England	14.41*** 1.22	6.91 5.09	-4.14 6.94	-13.79 12.42
Policy = on	8.99*** 1.82	4.08 3.70	2.55 2.92	0.23 4.21
<b>Policy on in England</b>	<b>-6.08***</b> <b>1.50</b>	<b>-4.55**</b> <b>1.79</b>	<b>-3.73**</b> <b>1.65</b>	<b>-4.79***</b> <b>1.54</b>
Control variable		-34.79 22.93	-4.04*** 1.49	-2.06** 0.90
Number of obs	48	48	48	48
R-squared	0.867	0.874	0.887	0.881

**(b) Percentage waiting 9 months or more**

	No control variable b/se	Log of per capita health expenditure b/se	NHS Staff per 1000 of population b/se	Population Standardised Mortality Ratio (per 10,000) b/se
Constant	5.00*** 0.60	2.05 1.93	8.60*** 1.09	18.09** 6.92
Year	-1.96*** 0.25	0.60 1.61	0.62 0.72	-2.69*** 0.46
Country = England	9.57*** 0.84	4.19 3.46	-6.91 4.43	-6.70 8.61
Policy = on	7.07*** 1.24	3.55 2.51	1.35 1.87	2.01 2.92
<b>Policy on in England</b>	<b>-4.10***</b> <b>1.02</b>	<b>-3.00**</b> <b>1.22</b>	<b>-2.01*</b> <b>1.05</b>	<b>-3.35***</b> <b>1.07</b>
Control variable		-24.96 15.59	-3.59*** 0.95	-1.19* 0.63
Number of obs	48	48	48	48
R-squared	0.877	0.884	0.908	0.887

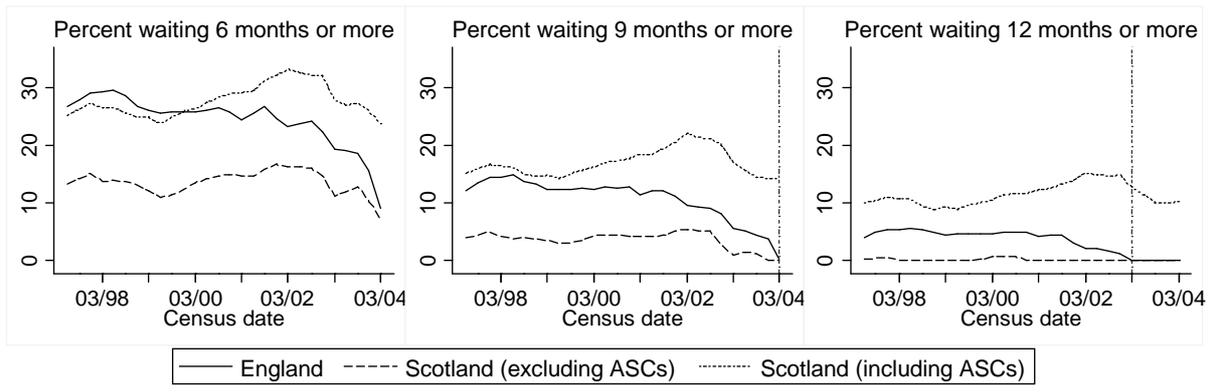
(c) Percentage waiting 12 months or more

	No control variable	Log of per capita health expenditure	NHS Staff per 1000 of population	Population Standardised Mortality Ratio (per 10,000)
	b/se	b/se	b/se	b/se
Constant	0.54	0.90	2.05***	-4.30
	0.33	1.10	0.64	3.91
Year	-0.78***	-1.10	0.29	-0.51*
	0.14	0.92	0.42	0.26
Country = England	4.78***	5.45***	-2.12	10.79**
	0.46	1.96	2.62	4.87
Policy = on	3.11***	3.54**	0.71	4.98***
	0.68	1.43	1.10	1.65
<b>Policy on in England</b>	<b>-2.55***</b>	<b>-2.68***</b>	<b>-1.67**</b>	<b>-2.82***</b>
	<b>0.56</b>	<b>0.69</b>	<b>0.62</b>	<b>0.60</b>
Control variable		3.08	-1.50**	0.44
		8.86	0.56	0.35
Number of obs	48	48	48	48
R-squared	0.828	0.829	0.853	0.834

Notes

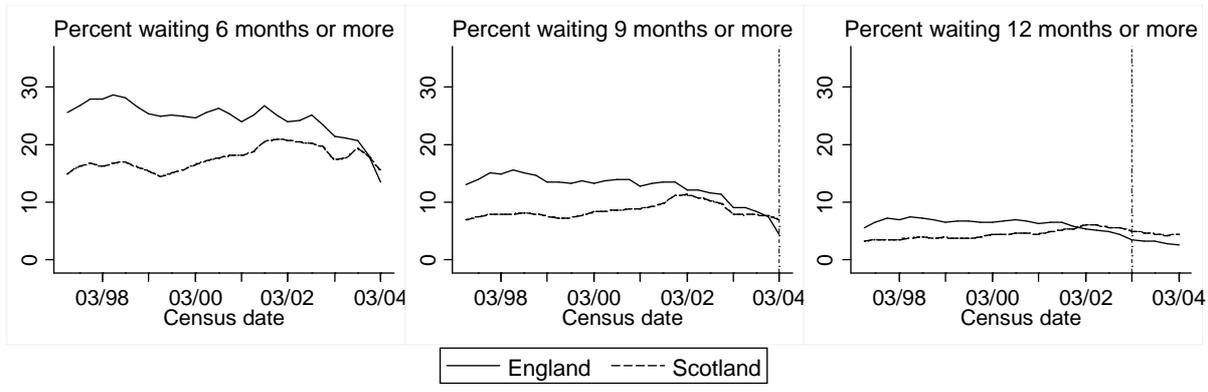
1. Standard error in parentheses: \* significant at 10%, \*\* 5%, \*\*\* 1%.
2. Data are quarterly for 1997/8-2003/4; 1999/2000 is omitted.
3. The above results are estimated from census data excluding ASCs. Our other data sources give similar results.
4. Estimates for census data for Scotland weighted by the size of deferred and true lists.
5. Data sources: Hospital waiting times/list statistics: England, 1997/98 to 2003/04. SMR3 Waiting list census: Scotland, 1997/98 to 2003/04. Health expenditure: Public Expenditure Statistical Analyses 2003 (Table 8.3a) 2004 (Table 8.5a) and 2005 (Table 8.5a). National GVA: ONS Regional trends 39 (Table 12.1). Age standardised mortality rate: ONS Population trends 125 (Table 2.2). Staffing numbers are all NHS staff (whole time equivalent).

**Fig 1. Percentages waiting over 6, 9 and 12 months: Census data June 1997-March 2004.**



- Notes:
1. Data sources: Hospital waiting times/list statistics for England, 1997/98 to 2003/04; SMR3 Waiting list census for Scotland, 1997/98 to 2003/04.
  2. Vertical lines indicate dates at which the relevant target had to be achieved.

**Fig 2. Percentages waiting over 6, 9 and 12 months: Episode data June 1997-March 2004**



- Notes:
1. Data sources: Hospital Episode Statistics for England, 1997/98 to 2005/06; SMR01 General acute inpatient/daycase record for Scotland, 1997/98 to 2005/6
  2. Vertical lines indicate dates at which the relevant target had to be achieved.