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Are Angioplasty Waiting Time Inequalities Growing Again?

Policy & Research Briefing

April 2018

- The NHS does not publish statistics on waiting time inequalities, and it is hard to get up-to-date information.
- We looked at angioplasty, a common heart revascularization procedure performed more than 20,000 times a year in England.
- Back in the early 2000s, when waiting times were long, patients in the most income deprived fifth of neighbourhoods waited about 50% longer for non-emergency angioplasty than those in the least income deprived fifth.
- This gap occurred within hospitals, and was not primarily due to richer patients choosing to travel further to hospitals with shorter waiting times.
- The gap fell to 10% by 2008 when waiting times were shortest, but started rising thereafter to around 20% by 2015 as waiting times started to grow again.

EQUIPOL
RESEARCH GROUP

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Introduction

Average hospital waiting times in England have been rising since 2008, after a sharp decline during the 2000s. This policy briefing presents new evidence that social inequality in waiting times within hospitals for a common heart procedure may also be on the rise. Non-emergency coronary angioplasty is a common cardiovascular procedure performed more than 20,000 times a year, which helps unclog the arteries using a tube or stent pushed through the blood vessel. We compare trends in waiting time from 2002/3 to 2015/16 by five equally sized socioeconomic groups ('quintile groups'), defined in terms of neighbourhood income deprivation. As Figure 1 shows, there was a substantial social inequality gap in the early 2000s, between waiting times in the most and least disadvantaged groups, which fell along with average waiting times from 2003-2008. Since then however, the gap appears to have started growing again along with average waiting times. We examine this carefully, using econometric methods to remove between hospital variation and control for patient level confounding factors such as age, sex, co-morbidity and previous admissions. We find year-on-year growth in within-hospital inequality between 2008 and 2014, with a small dip in 2015. The waiting time gap in 2015 was 20%, up from 10% in 2008 though down from 50% in the early 2000s. The difference between 2008 and 2014 is only significant at the 5% level, though the difference between 2008 and 2015 is only significant at 10%. We conclude that the gap probably is growing but we cannot yet be sure.

Methods

Our methods are described in a paper published in the Journal of Health Economics (Moscelli, Siciliani et al. 2018), which looked at data from 2002/3 to 2010/11. In this policy briefing we update the analysis to 2015/16, which is the most recent 'hospital episode statistics' (HES) data that we can access to make careful comparisons of waiting time by social group. Up-to-date waiting time performance data are only available for the average patient, access to more up-to-date 'secondary use service (SUS) data that could be used to provide inequality breakdowns requires special permissions, and SUS data are subject to revision before being released as more thoroughly validated HES data.

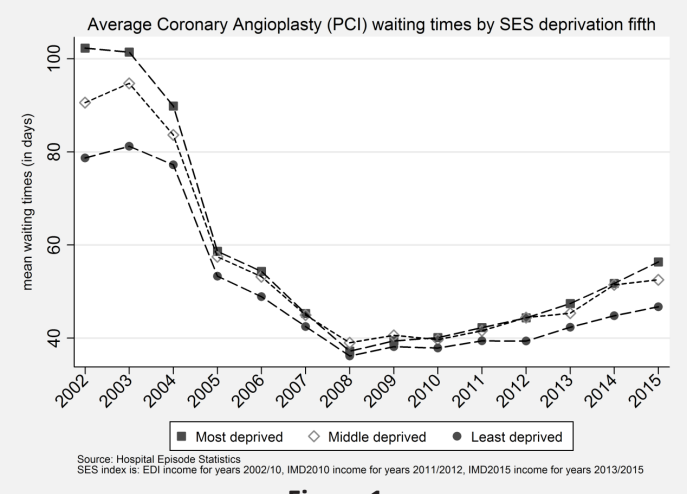

Figure 1

Our original paper looked at two cardiac treatments – coronary bypass and angioplasty. In this policy briefing we focus on the latter because coronary bypass is becoming less common and there are data issues with increasing numbers of missing reported waiting times in recent years. We ran Ordinary Least Squares (OLS) regressions, stratified by year, on the log of waiting time against neighbourhood income deprivation group, including hospital fixed effects and the following patient level covariates: gender, age (in ten year bands), number of comorbidities, dummies for the Charlson comorbidity index, number of all emergency admissions in the previous year, and month of admission (to allow for seasonality trends). Although we controlled for comorbidity and previous admissions, we were unable fully to control for clinical severity since hospital episode statistics does not contain detailed clinical information about the nature and severity of the coronary artery occlusion. It seems unlikely that more deprived patients are on average less severely ill than less deprived patients, meriting a longer wait, though it is conceivable that deprived patients are more likely to die following myocardial infarction (heart attack) leaving a less severely ill survivor group. We cannot be entirely sure because we do not have detailed clinical data. The inclusion of hospital fixed effects is important for the interpretation of the results, which provide evidence of social inequalities within hospitals, i.e. patients with different deprivation wait differently in the same hospital. We compared five equally sized deprivation groups ('quintile groups') based on standard indices of neighbourhood income deprivation. We examined the statistical significance of the trend using a test of the mean difference between 2008 and 2015, focusing on the estimated waiting time gap between the most and least deprived deprivation groups based on regressions with standard errors clustered at hospital level.

Unfortunately, due to changes in data availability, we have to use three different versions of the derivation index to cover the full period 2002/3 to 2015/16 – the 'Economic Deprivation Index' from 2002/2 to 2010/11, then the 'Index of Multiple Deprivation 2010' for 2011/12 and 2012/13 and finally the 'Index of Multiple Deprivation 2015' for 2013/14, 2014/15 and 2015/16. These indices are all based on broadly similar data and methodology, however, so it is reasonable to compare the rankings over time (http://indicesofdeprivation.co.uk/2015/10/01/what-can-and-cant-you-use-the-indices-for/). We also analysed trends in waiting time differences between the North and South of England, by using a model with random rather than fixed effects at hospital level.

Results

The main results are shown in figure 2. Patients in the most deprived fifth of English neighbourhoods waited about 50% longer than those in the least deprived fifth in 2002. This inequality gap fell to about 10% by 2008, and then rose thereafter to around 20% by 2015/16.

Although Figure 2 shows a small decline in the gap in the final year, from 2014/15 to 2015/16, this is more likely to be a transitory 'blip' due to missing data than a real decline. Figure 3 shows that there was a substantial and unexplained rise in missing data between 2014/15 and 2015/16, which was particularly large in the most deprived fifth but did not occur in the least deprived fifth.

In 2015/16, angioplasty patients from most deprived areas (LSOAs) waited 8.6 days more than patients from least deprived areas (52.6 waiting days vs 44 waiting days), which is equivalent to a 19.51% longer wait for the most deprived patients. The average angioplasty waiting time in 2015 was 48.7 days.

In 2008/09, angioplasty patients from most deprived areas (LSOAs) waited 3.9 days more than patients from least deprived areas (37.2 waiting days vs 33.3 waiting days), which is equivalent to a 11.56% longer wait for the most deprived patients. The average angioplasty waiting time in 2008 was 35.8 days.

In 2002/03, angioplasty patients from most deprived areas (LSOAs) waited 36.9 days more than patients from least deprived areas (107 waiting days vs 70.1 waiting days), which is equivalent to a 52.66% longer wait for the most deprived patients. The average angioplasty waiting time in 2008 was 88.1 days.

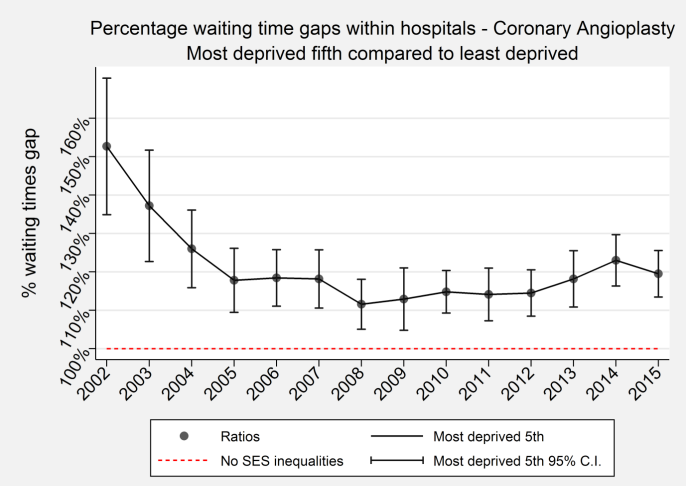

Figure 2

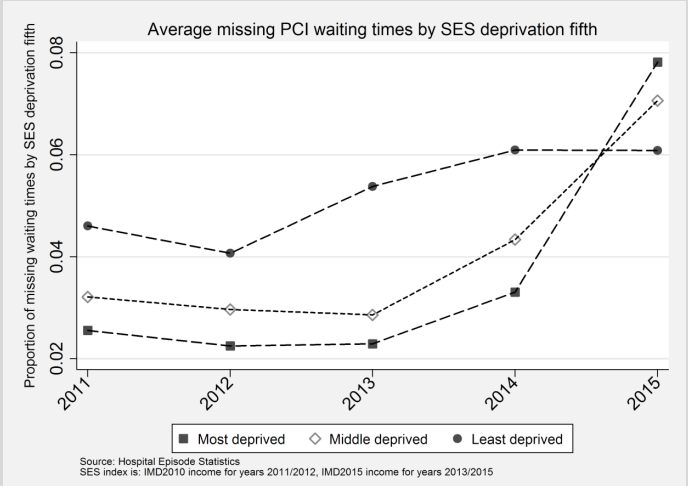

Figure 3

From 2008 to 2015, we see an increase in the average wait for angioplasty of 12.9 days (= 48.7 – 35.8 days). For the patients from most deprived LSOAs, the increase is of 15.4 days (= 52.6 – 37.2 days). For the patients from least deprived LSOAs, the increase is of 10.7 days (= 44 – 33.3 days).

The waiting time gap between patients living in the most and least deprived fifths of English neighbourhoods was 11.6% in 2008, 23.0% in 2014 and 19.5% in 2015. The 7.9% increase in this gap between 2008 and 2015 (19.5% minus 11.6%) has 95% confidence intervals 16.8% to -0.9%. This is not significantly different at the 5% level of confidence but is at the 10% level. The 11.4% increase in the gap between 2008 and 2014 (23.0% minus 11.6%) has 95% confidence intervals 20.8% to 2.1%, and so is significantly different at 5%.

Interestingly, there is little sign of a rising inequality gap between the middle fifth and the least deprived fifth of neighbourhoods in England. Figure 4 shows that the inequality gap between the least deprived and middle fifth has remained fairly constant since 2004, at just over 10%, with only very slight and non-significant upward shifts in 2013 and 2014.

There are no signs of 'breaks' in these data series immediately after 2010/11 or 2012/13, giving us further confidence that our findings are not driven by the change in deprivation indices in those years.

Full details of the main regression findings are shown in Table 1 (in particular, see Panel c for the % changes in waiting times for a patient living in the nth deprived fifth with respect to the least deprived fifth).

Finally, we found no significant North-South differences in waiting times, as shown in Figure 5. The y-axis shows the proportionate waiting time gap between the North and South of England for each year, such that 0.1 means a 10% gap. As you can see, the 95% confidence intervals for all of the gaps cross zero.

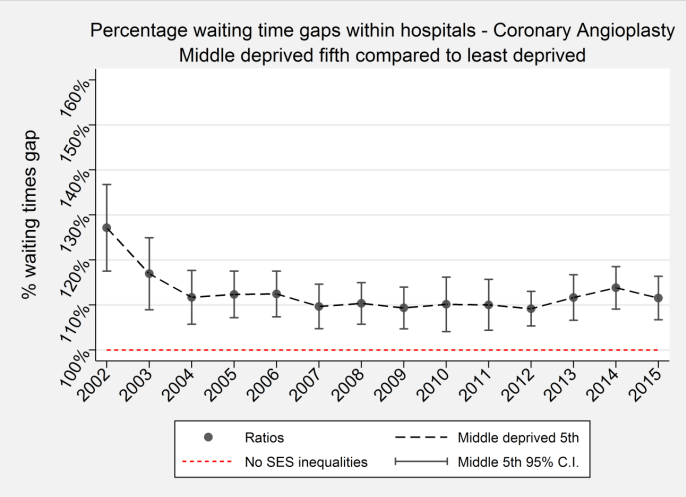

Figure 4

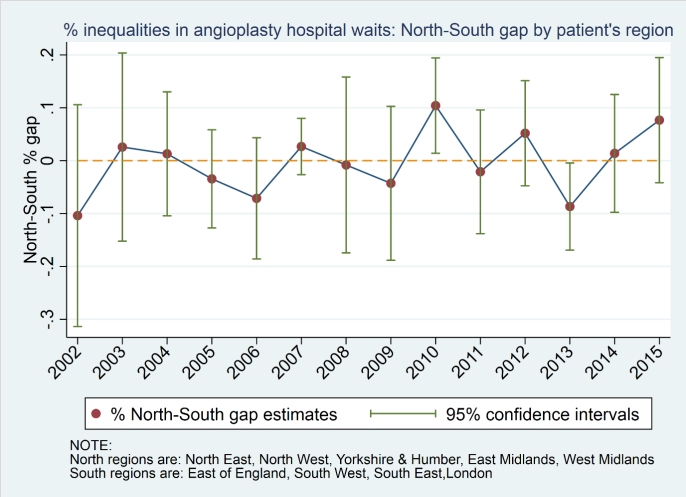

Figure 5

Table 1

Effect of Income Deprivation on within hospital waiting times for Coronary Angioplasty treatment

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Panel a. Regression coefficients														
Income deprivation 1st quintile (Most deprived fifth)	0.4230	0.3162	0.2311	0.1637	0.1691	0.1668	0.1094	0.1215	0.1381	0.1321	0.1353	0.1670	0.2070	0.1783
	(0.0595)***	(0.0540)***	(0.0409)***	(0.0361)***	(0.0317)***	(0.0327)***	(0.0297)***	(0.0367)***	(0.0247)***	(0.0306)***	(0.0269)***	(0.0316)***	(0.0278)***	(0.0258)***
Income deprivation 2nd quintile	0.3402	0.2649	0.1986	0.1581	0.1641	0.1201	0.0952	0.1186	0.1193	0.1136	0.0935	0.1348	0.1598	0.1269
	(0.0559)***	(0.0397)***	(0.0266)***	(0.0251)***	(0.0301)***	(0.0347)***	(0.0265)***	(0.0305)***	(0.0230)***	(0.0264)***	(0.0212)***	(0.0248)***	(0.0241)***	(0.0231)***
Income deprivation 3rd quintile	0.2402	0.1565	0.1106	0.1164	0.1174	0.0924	0.0984	0.0893	0.0966	0.0955	0.0877	0.1102	0.1293	0.1092
	(0.0386)***	(0.0349)***	(0.0273)***	(0.0236)***	(0.0230)***	(0.0231)***	(0.0214)***	(0.0216)***	(0.0280)***	(0.0262)***	(0.0179)***	(0.0231)***	(0.0211)***	(0.0221)***
Income deprivation 4th quintile	0.1079	0.0928	0.0490	0.0361	0.0670	0.0667	0.0524	0.0540	0.0490	0.0548	0.0483	0.0957	0.0892	0.1005
	(0.0364)***	(0.0232)***	(0.0226)**	(0.0180)*	(0.0199)***	(0.0204)***	(0.0180)***	(0.0249)**	(0.0220)**	(0.0162)***	(0.0192)**	(0.0229)***	(0.0210)***	(0.0211)***
Female patient	0.1064	0.0678	0.0691	0.0501	0.0467	0.0487	0.0390	0.0280	0.0184	0.0093	0.0088	-0.0154	-0.0067	0.0005
	(0.0208)***	(0.0239)***	(0.0143)***	(0.0119)***	(0.0119)***	(0.0142)***	(0.0103)***	(0.0105)***	(0.0106)*	(0.0128)	(0.0135)	(0.0133)	(0.0123)	(0.0164)
Number of past emergency admissions in last 365 days	-0.1973	-0.1845	-0.1281	-0.0895	-0.0842	-0.0627	-0.0402	-0.0275	-0.0219	-0.0136	-0.0253	-0.0240	-0.0249	-0.0369
	(0.0214)***	(0.0167)***	(0.0155)***	(0.0118)***	(0.0104)***	(0.0097)***	(0.0083)***	(0.0091)***	(0.0101)**	(0.0057)**	(0.0090)***	(0.0065)***	(0.0053)***	(0.0086)***
Patient age	-0.0005	0.0032	0.0014	0.0016	0.0041	0.0044	0.0032	0.0021	0.0001	0.0040	0.0018	0.0028	-0.0002	0.0025
	(0.0031)	(0.0034)	(0.0025)	(0.0019)	(0.0014)***	(0.0020)**	(0.0014)**	(0.0019)	(0.0020)	(0.0022)*	(0.0018)	(0.0019)	(0.0020)	(0.0019)
Number of co-morbidities	0.0254	0.0254	0.0167	0.0232	0.0192	0.0226	0.0155	0.0196	0.0223	0.0207	0.0295	0.0233	0.0245	0.0243
	(0.0102)**	(0.0103)**	(0.0091)*	(0.0070)***	(0.0069)***	(0.0089)**	(0.0051)***	(0.0050)***	(0.0058)***	(0.0047)***	(0.0044)***	(0.0028)***	(0.0040)***	(0.0044)***
Constant	3.6234	3.5383	3.7216	3.3364	3.1488	2.7737	2.9050	2.9222	3.0620	2.8054	2.9726	2.9479	3.2131	3.1314
	(0.2110)***	(0.2321)***	(0.1693)***	(0.1317)***	(0.1005)***	(0.1534)***	(0.0955)***	(0.1189)***	(0.1400)***	(0.1525)***	(0.1302)***	(0.1367)***	(0.1263)***	(0.1265)***
Panel b. Regression Statistics														
Patients	16094	20137	24353	25631	26771	25543	25397	23859	23759	21845	22065	21991	22937	22519
Hospital sites	37	42	44	52	60	66	73	76	83	91	90	94	95	92
R-squared	0.13	0.14	0.13	0.12	0.10	0.15	0.16	0.18	0.16	0.19	0.19	0.20	0.17	0.17
Panel c. Percentage waiting times gap (with respect to least deprived fifth)														
Income deprivation 1st quintile (Most deprived)	52.65%	37.19%	26.00%	17.79%	18.42%	18.15%	11.56%	12.92%	14.81%	14.12%	14.49%	18.18%	23.00%	19.52%
Income deprivation 2nd quintile	40.52%	30.33%	21.97%	17.13%	17.83%	12.76%	9.99%	12.59%	12.67%	12.03%	9.80%	14.43%	17.33%	13.53%
Income deprivation 3rd quintile	27.15%	16.94%	11.69%	12.34%	12.46%	9.68%	10.34%	9.34%	10.14%	10.02%	9.17%	11.65%	13.80%	11.54%
Income deprivation 4th quintile	11.39%	9.72%	5.02%	3.68%	6.93%	6.90%	5.38%	5.55%	5.02%	5.63%	4.95%	10.04%	9.33%	10.57%

Notes. The complete list of control variables are: age, age bands dummies, admission month, Charlson index comorbidities dummies, gender, number of secondary diagnoses, past emergency admissions, hospital sites fixed effects. Income deprivation index is EDI income from 2002 to 2010, IMD income 2010 for years 2011 and 2012, IMD income 2015 for years 2013 onwards. Standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01. Percentage waiting times gaps in *Panel c* are computed as: [exponential(constant + coefficient of nth deprived fifth) / exponential(constant)] – 1.

Conclusion

Although we cannot yet be sure, early indications suggest that socioeconomic inequality in waiting times for non-emergency coronary angioplasty within hospitals may have started rising in England since 2008, along with the rise in average waiting times. Patients in the most income deprived fifth of English neighbourhoods waited about 10% longer than those in the least income deprived fifth in 2008, but this gap has gradually grown since then to around 20% by 2015/16. However, although this trend was consistent up to 2014/15, and the difference between 2008/9 and 2014/15 was statistically significant, there was a small unexplained fall in 2015/16 associated with a rise in missing data. A formal statistical test of the difference in the gap between 2008/9 and 2015/16 shows that this difference is only statistically significant at the 10% level.

Average hospital times have continued to grow since 2015/16 (http://www.qualitywatch.org.uk/indicator/treatment-waiting-times) so our expectation is that social inequality in waiting times will also have continued to grow since 2015/16. We cannot be sure, however, until data for 2016/17 are analysed. The UK government still does not publish routine analysis of social inequality in waiting times alongside its standard waiting time performance data, and so the best we can do as academic researchers is to find out what has been happening to waiting time inequalities with a two or three year lag.

We also examined North-South differences in waiting times, and found no significant differences.

We do not know why within-hospital inequalities in angioplasty waiting times occur. One potential cause is differential care seeking behaviour between more and less deprived patients, with socially advantaged patients better able to attend appointments and engage in effective “elbowing behaviour” to convince clinicians that their case is particularly urgent (Cookson et al., 2016). Another potential cause is unconscious bias by clinicians, and the practice of a form of “defensive medicine” when setting waiting list priorities for relatively affluent and educated patients capable of lodging effective complaints (Moscelli et al., 2018).

When considering the policy implications of our findings, it is important to note emerging clinical evidence since 2007 that elective PCI for stable angina may be no more effective than medical therapy (Al-Lamee et al., 2018; Boden et al., 2007). If so, then longer waits for elective angioplasty may not harm inequality in healthcare outcomes for this large sub-group of non-emergency PCI patients. However, this information was not available in the early 2000s when the largest inequalities in waiting times were observed – at that time it was believed that angioplasty had better outcomes than medical therapy. Furthermore, this inequality may impact health outcomes for other sub-groups of PCI patients without stable angina, and inequality in waiting time may be of concern anyway on grounds of patient experience and choice, even if health outcomes are uncertain.

Given that there seems to be a relationship between average waiting times and social inequality in waiting times for angioplasty, the obvious solution to this potentially emerging equity problem would be to reduce average waiting times through national level investments in capacity. That may not be a realistic option in the immediate future, however, due to ongoing financial pressures on the NHS. The socioeconomic inequalities we observe occur within hospitals, rather than between hospitals or large geographical regions. A sensible place to look for alternative remedies would therefore seem to be demand-side measures to modify the individual-level behaviour of patients and clinicians, rather than supply-side measures to re-allocate resources between hospitals or geographical regions of the country.

References

Al-Lamee, Thompson, Dehbi, Sen, Tang, Davies, et al. (2018). Percutaneous coronary intervention in stable angina (ORBITA): a double-blind, randomised controlled trial. *The Lancet;*391:31-40.

Boden, O'Rourke, Teo, Hartigan, Maron, Kostuk, et al. (2007). Optimal medical therapy with or without PCI for stable coronary disease. *New England Journal of Medicine;*356:1503-1516.

Cookson, Propper, Asaria, Raine. (2016). Socioeconomic inequalities in health care in England. *Fiscal Studies;*37:371-403.

Moscelli, Siciliani, Gutacker, Cookson (2018). Socioeconomic inequality of access to healthcare: Does choice explain the gradient? *J Health Econ;* 57:290-314.

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Further information about equity in health policy (Equipol) research at York:
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