

NHS BLOOD AND TRANSPLANT CARDIOTHORACIC ADVISORY GROUP

ZONAL BOUNDARIES CHANGES: SEPARATION OF HEART AND LUNG ALLOCATION ZONES

EXECUTIVE SUMMARY

1. It has been agreed that the cardiothoracic allocation zones should be split into separate heart and lung zones to more appropriately match individual organ supply with demand across centres. This paper presents past decisions and changes in cardiothoracic allocation zones and outlines two possible options to be decided between by members of the Cardiothoracic Advisory Group:

Option 1: Implement separate heart and lung allocation zones, matching as closely as possible (max difference 2%) each centre's zone size to their proportion of heart and lung registrations over the last two years (see **Figure 2** and Option 1 in **Figures 5 and 6**).

Option 2: Implement a 50% step change between the full change (Option 1) and the current zone sizes, for all centres, for both heart zones and lung zones, for a period of 6 months in order for the centres most affected to prepare (see **Figure 4** and Option 2 in **Figures 5 and 6**).

The decision that CTAG chooses will be implemented on 17 May 2017 with the introduction of the Super-Urgent and Urgent Lung Allocation Schemes.

Thereafter the separate zones will be monitored and assessed on an annual basis, using previously agreed CTAG methodology, and appropriate changes will be made to ensure equity.

BACKGROUND

2. The current cardiothoracic organ offering policies give priority to the "zonal centre". This means that when a donor arises in a centre's geographical zone, that centre gets first choice on whether or not to accept the organ. The allocation zones are the same for heart and lung allocation, with the exception of Scottish lung donors, who are considered to be within the Newcastle lung allocation zone. The only cardiothoracic allocation schemes which do not have an element of zonal priority are the imminent Super-Urgent and Urgent Lung Allocation Schemes, in which patients will be ordered by waiting time alone.
3. Each centre's geographical zone should be the appropriate size for the demand for transplantation at that centre. In April 2014 a CTAG Allocation Zone Working Group, consisting of unit directors from each of the 7 (adult and paediatric) cardiothoracic transplant units plus one of the two CTAG lay members and two representatives from NHSBT Statistics and Clinical Studies, agreed:
 - a process for assessing balance between donor and registration numbers (see **Appendix I**) for each allocation zone and a methodology for adjusting zonal boundaries when an imbalance occurs (based on a statistically significant difference

being observed between the percentage share of registrations and the percentage share of donors for any one cardiothoracic allocation zone), similar to the approach taken by the liver community;

- that the cardiothoracic allocation zones would be reviewed on an annual basis;
 - that the methodology would be applied to the current combined heart and lung allocation zones but the plan would be to uncouple these in the future to create separate heart and lung allocation zones once NHSBT IT resource is available.
4. Following the first analysis run in September 2014, an imbalance in the donor to registration percentage share was identified and changes to the allocation zones were made to address this: Harefield's zone size was increased from 19% to 24% of the cardiothoracic donor pool, Manchester's zone size was increased from 12% to 16% of the cardiothoracic donor pool and Papworth's zone was reduced from 26% to 19% of the cardiothoracic donor pool (all other centres experienced smaller changes).
 5. There were no statistically significant imbalances identified in the September 2015 analysis, so no changes were made to the allocation zones. In September 2016, a number of significant imbalances were identified but the decision was made not to adjust the joint heart and lung allocation zones pending separation of the zones which was estimated to be implemented in Spring 2017.

MOTIVATION FOR SEPARATING HEART AND LUNG ZONES

6. The motivation behind separating the zones is that the percentage share of heart and lung registrations differs across centres, as illustrated in **Table 1** and **Figure 1**. While this is the case, adjusting the joint zones will never lead to equity between the supply of donor hearts for heart patients and donor lungs for lung patients. This is widely appreciated and is reported to CTAG each Autumn in the Allocation Zonal Boundaries paper. For example, Birmingham registered 19% of all heart transplant registrants over the last two financial years, compared with 14% of lung registrants, meaning that their heart allocation zone should be larger than their lung allocation zone. There is also an issue whereby Scottish lungs are offered preferentially to Newcastle, which inappropriately enhances the size of Newcastle's zone for lung allocation. Separate heart and lung allocation zones would lead to a fairer and more appropriate supply of hearts and lungs to each transplant centre.

OPTIONS

Option 1:

7. The first option is to implement separate heart and lung allocation zones for each centre that encompass enough donor hospitals to equate the percentage share of donors over the last 3 financial years with the percentage share of registrations over the last 2 financial years (i.e. using agreed CTAG methodology). The proposed boundaries in the maps labelled "Option 1" in **Figures 5 and 6** are the result of this approach. These boundaries would lead to the expected balance in donor and registration percentage share shown in **Figure 2** (maximum 2% difference). *(Please note that Option 1 is equivalent to the proposal presented at the CTAG Core Group on 10th March 2017, which for lungs has also been referred to as "Plan A").*

8. The biggest change that this would cause is a reduction in Harefield's heart allocation zone from 28% to 16% of the heart donor pool. This would closely match their 15% heart registration percentage share over the last 2 financial years. However, an issue is evident in **Figure 3**, which compares each centre's registration percentage share over the last two financial years with their waiting list percentage share as at 31 March 2016. Harefield's heart waiting list is larger than other centres' and is disproportionate to the number of new registrants being added. Therefore, Option 2 is an alternative that would help phase-in the effect of separating the zones.

Option 2:

9. The second option is to implement a 50% step change between the full change (Option 1) and the current zone sizes for all centres, for both heart zones and lung zones, for a period of 6 months in order for the centres most affected to prepare. For example, instead of reducing Harefield's heart allocation zone to 16% of the heart donor pool, it would only be reduced to 22%. As an additional example, Newcastle's lung allocation zone in the full change (Option 1) would be reduced from 27% of the lung donor pool to 20%, so Option 2 would see their zone decreased to 24% for a 6 month period initially, then down to 20% after that. The proposed boundaries in the maps labelled "Option 2" in **Figures 5 and 6** are the result of this approach, where the zone sizes are matched as well as possible (max difference 1%) to the mid-point between the current zone percentage shares and the full change percentage share. This would lead to imbalance in the expected donor to registration percentage share, as shown in **Figure 4**, but to a lesser extent than the current joint zones and these imbalances would be remedied after 6 months.

ACTION

10. CTAG are asked to consider the information in this paper and choose between **Option 1** and **Option 2** in the interests of all patients on the national heart and lung waiting lists. Members are reminded that this decision affects the Super-Urgent, Urgent and Non-Urgent Heart Allocation Schemes as well as the Non-Urgent Lung Allocation Scheme, all of which use zonal priority. The Super-Urgent and Urgent Lung Allocation Schemes will not use zonal priority.
11. The decision that CTAG chooses will be implemented on 17 May 2017 with the introduction of the Super-Urgent and Urgent Lung Allocation Schemes. Thereafter the separate zones will be monitored and assessed on an annual basis, using previously agreed CTAG methodology, and appropriate changes will be made to ensure equity.

Table 1 Number of heart and lung registrations, 1 April 2014 – 31 March 2016, and donors, 1 April 2013 – 31 March 2016, by registering centre/current allocation zone

Centre/zone	Heart registrations		Heart donors in current zone		Adjusted p-value	Lung registrations		Lung donors in current zone		Adjusted p-value
	N	%	N	%		N	%	N	%	
Birmingham	89	19	58	11	0.003	77	14	50	11	0.68
Glasgow	41	9	46	9	1.00	-	-	-	-	-
Harefield	69	15	143	28	<0.0001	184	33	132	28	0.53
Manchester	71	16	98	19	0.77	72	13	81	17	0.23
Newcastle	83	18	79	16	1.00	109	19	127	27	0.02
Papworth	106	23	87	17	0.11	119	21	79	17	0.38
UK	459	100	511	100		561	100	469	100	

Figure 1 Comparison of % heart and lung registrations at each centre, 1 April 2014 – 31 March 2016, with % heart and lung donors in each CURRENT allocation zone, 1 April 2013 – 31 March 2016

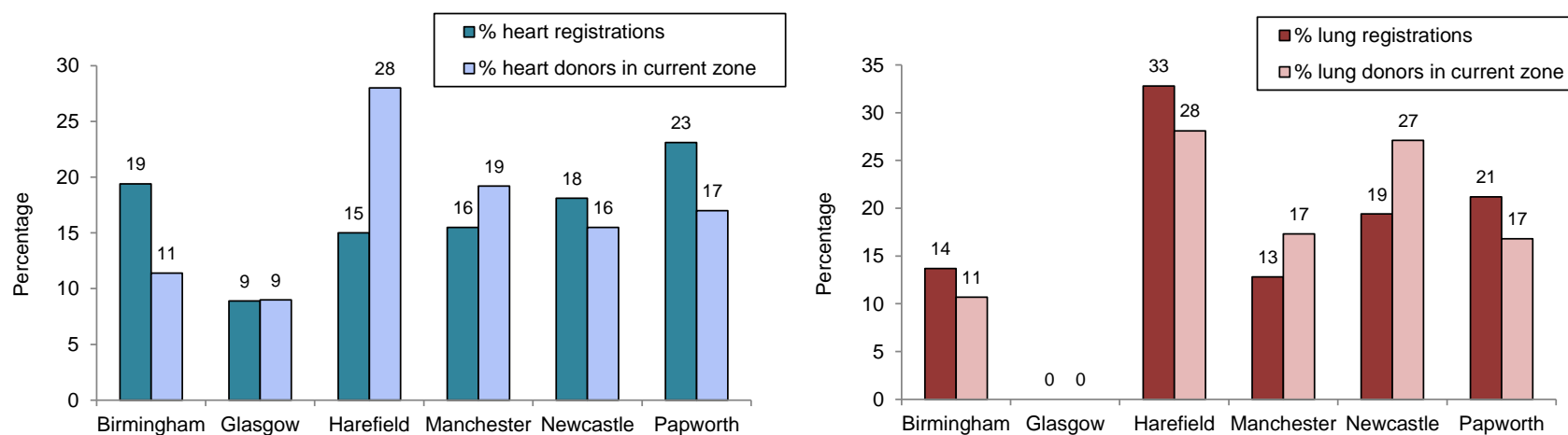


Figure 2 Comparison of % heart and lung registrations at each centre, 1 April 2014 – 31 March 2016, with % heart and lung donors in each allocation zone in the FULL CHANGE PROPOSAL, 1 April 2013 – 31 March 2016

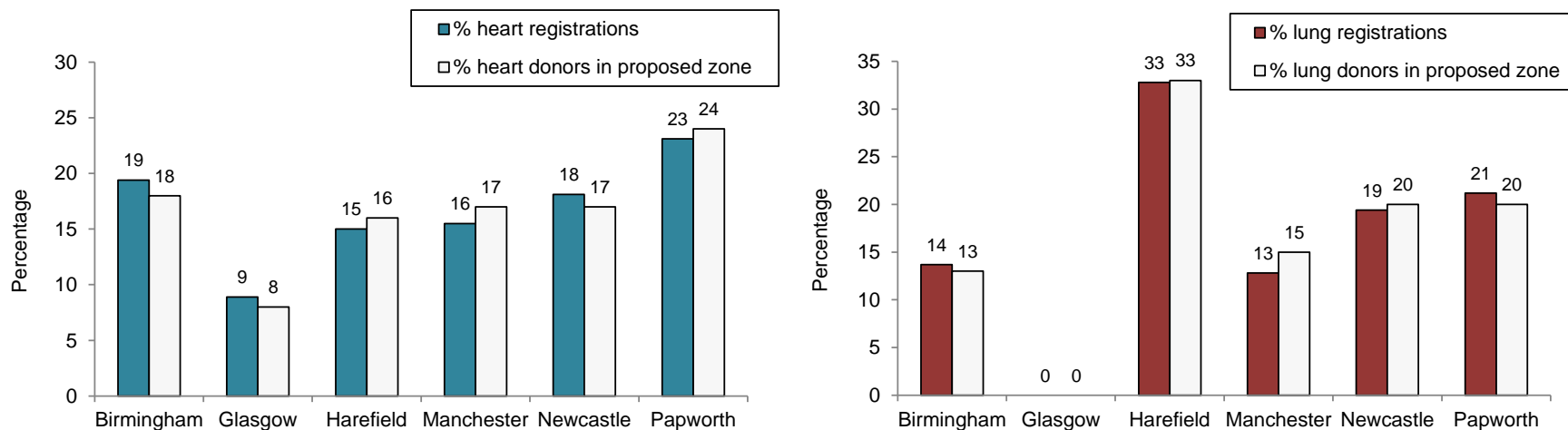


Figure 3 Comparison of % heart and lung registrations at each centre, 1 April 2014 – 31 March 2016, with % adult patients waiting for a heart or lung transplant at each centre on 31 March 2016

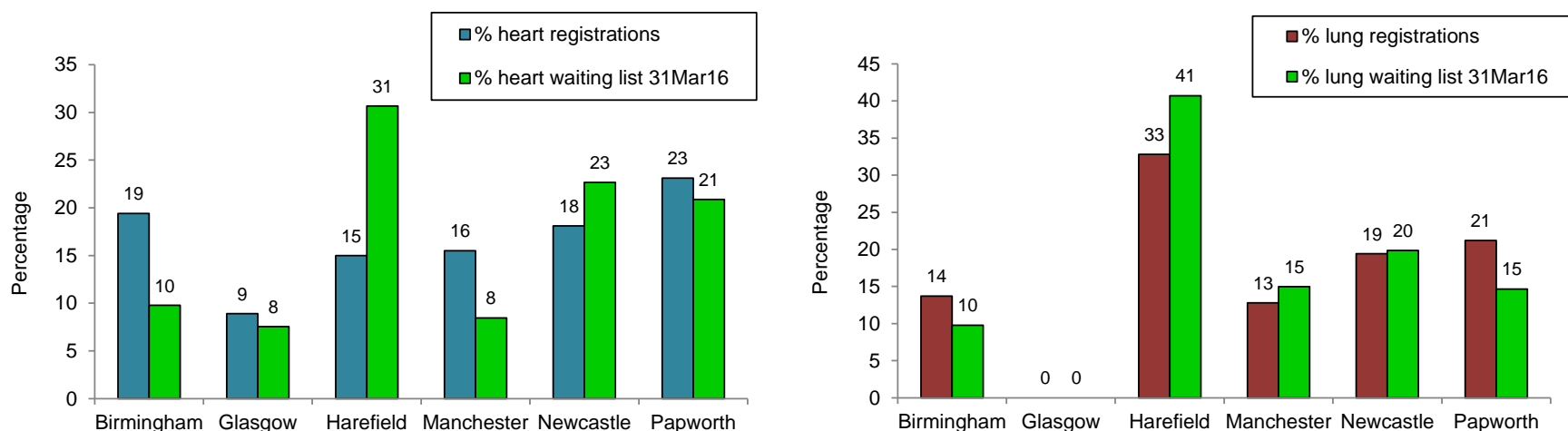


Figure 4 Comparison of % heart and lung registrations at each centre, 1 April 2014 – 31 March 2016, with % heart and lung donors in each allocation zone in the 50% STEP CHANGE PROPOSAL, 1 April 2013 – 31 March 2016

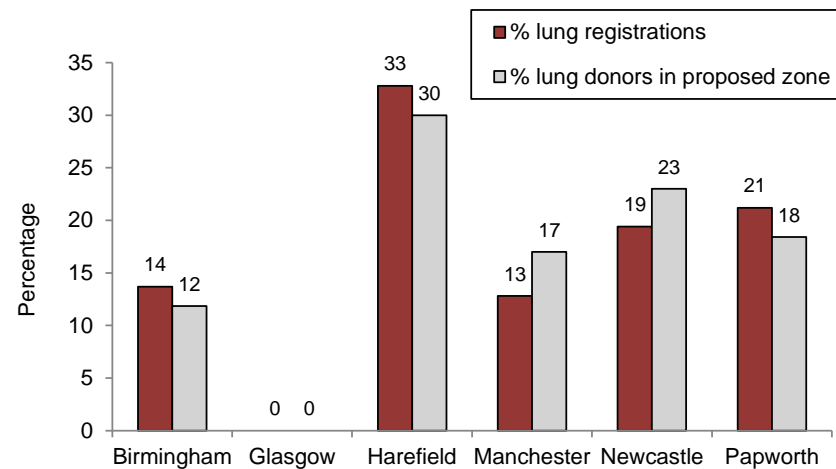
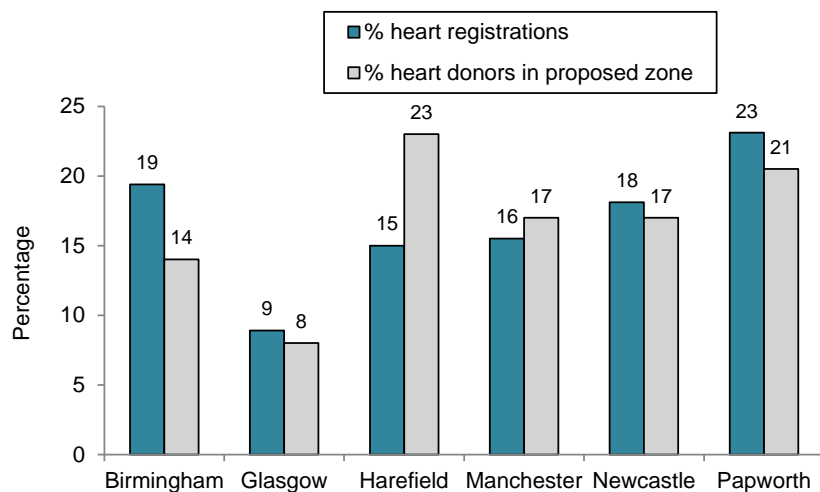


Figure 5 Heart Allocation Zone Boundary Options – Full change vs 50% change

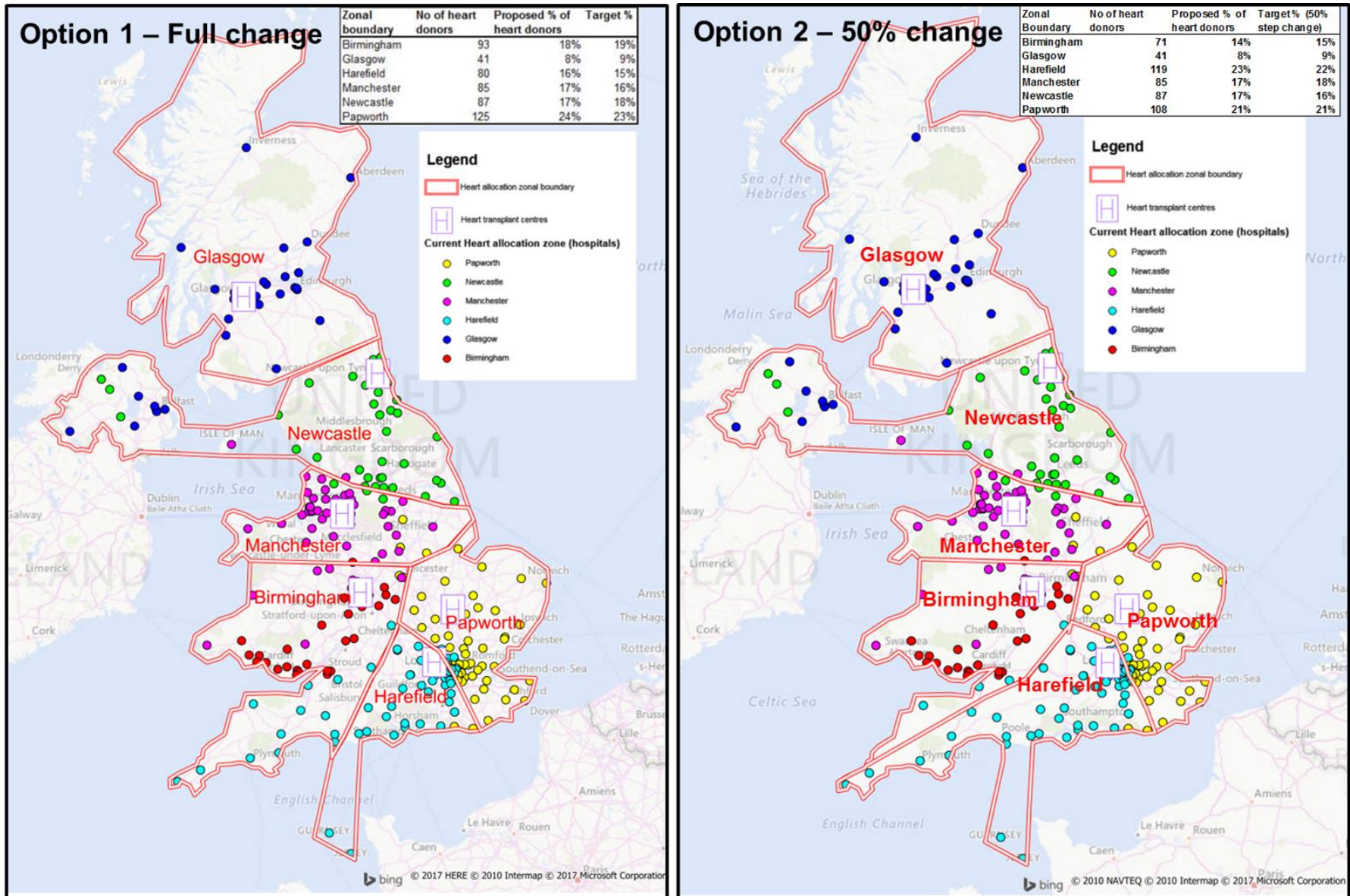
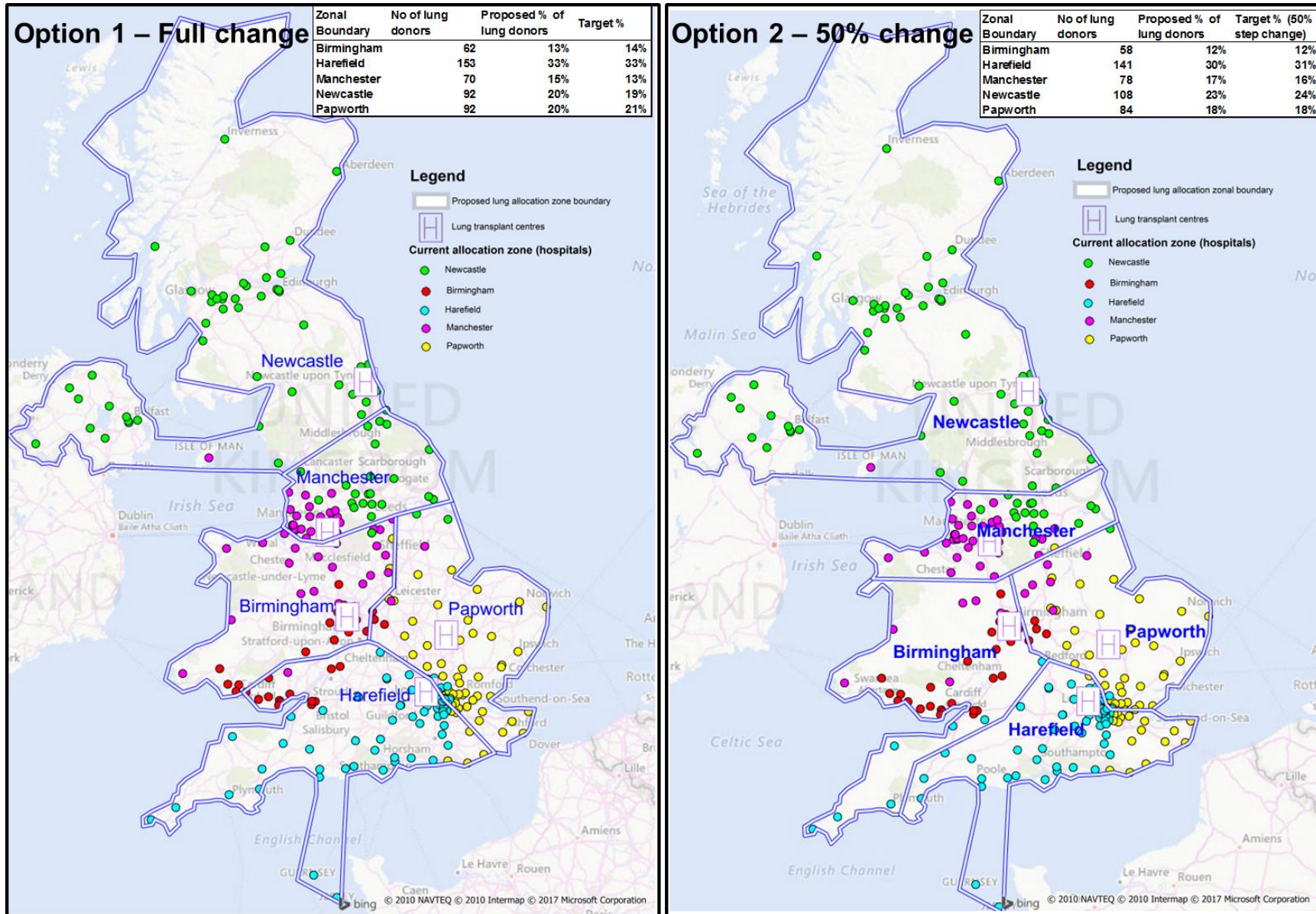


Figure 6 Lung Allocation Zone Boundary Options – Full change vs 50% change



Appendix I – methodology for counting registrations and donors in order to calculate zone sizes as agreed by CTAG Allocation Zone Working Group in April 2014

a) Registrations should be defined as:

The total number of UK adult (≥ 16 years at time of registration) Group 1 heart, lung or heart/lung registrations in the latest two year period between 1 April and 31 March, but excluding a) any registrations made by Great Ormond Street Hospital and b) any patients with no active waiting time. Registrations that ended in a domino or live donor transplant, multi-organ registrations and urgent heart registrations will be included. Retrospective registrations made after an unlisted patient was transplanted will also be included.

For patients registered twice in the registration period, the following rules apply:

- If a patient was registered, removed then reregistered, only the first registration is included.
- If a patient was registered, transplanted then reregistered, both registrations are included.
- If a patient was active, suspended then reactivated, only the first activation is included.
- If a patient was non-urgent, then made urgent, only the first registration is included, and vice versa.

Note that registrations for heart/lung transplantation are included in the number of heart registrations as heart/lung blocks are allocated according to the cardiac centre rota.

VAD patients listed for transplant will be included.

b) Donors should be defined as:

The total number of UK adult (≥ 16 years at time of death) heart and/or lung donors after brain death over the latest three year period between 1 April to 31 March. Donors whose heart or lungs were not transplanted will be excluded. If only one lung from a donor was transplanted, this will be included as a lung donor. Paediatric donors who donated to adult patients will be included, along with adult donors whose organs are transplanted into paediatric patients.

The cardiothoracic donor pool will count donors who donate both heart and lung(s) twice.

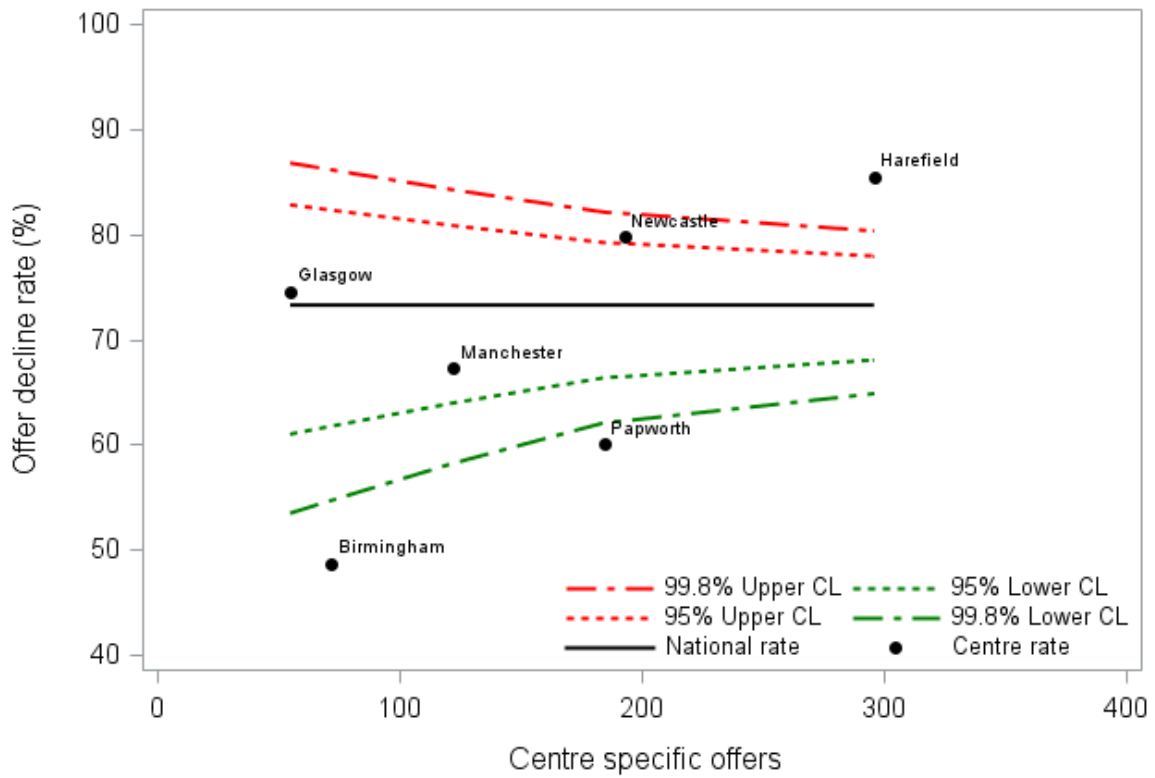
c) The approach above has three key differences from the liver zone methodology:

- the liver analysis just considers registrations made over the most recent one-year period. Due to lower volume cardiothoracic activity, a two year period for registrations should be used here.
- super-urgent registrations are excluded from the liver analysis, along with donors whose livers were used for super-urgent transplants.
- patients registered with a UKELD score less than 49 and 'chronic liver disease' as their only indication are excluded from the liver analysis. These are patients with a high projected one-year survival without liver transplant ($\geq 90\%$).

d) Since Glasgow do not register patients for lung transplantation, their share of the donor pool will be derived simply from their heart registrations. Since Newcastle's lung allocation zone would effectively include this percentage of donors, their total number of cardiothoracic registrations will be reduced by the equivalent percentage. The remainder of the donor pool is then split between the five English centres, before recalculating these proportions for the entire donor pool (100%) for the final proposal.

Appendix II – Zonal and non-zonal heart offer decline rates, 1 April 2013 to 31 March 2016

Zonal heart offer decline rates from UK adult DBDs that resulted in transplant



Non-zonal heart offer decline rates from UK adult DBDs that resulted in transplant

