Supplementary Analysis of Hospital Episode Statistics for the Bristol Royal Infirmary Inquiry

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Executive summary

This report, commissioned by the Bristol Royal Infirmary (BRI) Inquiry, presents further analysis of HES data relating to paediatric cardiac surgery at United Bristol Healthcare NHS Trust (UBHT) and elsewhere in England between 1st April 1991 and 31st December 1995. It is supplemental to the "Analysis of Hospital Episode Statistics for the Bristol Royal Infirmary Inquiry", also commissioned by the BRI Inquiry.

The report examines inter-hospital transfers, emergency admissions, Down's syndrome, the ages of patients undergoing procedures to correct complete Atrial Ventricular Septal Defects (AVSD), and data quality. It also revises the mortality tables, which were presented in chapter 3 of the main report, to include different age groupings and estimates of relative risk instead of excess deaths.

Inter-hospital transfers

Mortality experienced by children in some age groups transferred from other providers was higher than non-transfers in specialist centres in England (excluding UBHT). However when comparing the proportion of transfers in UBHT with elsewhere, UBHT had a smaller proportion of transfers than other specialist centres in both open and closed procedure classes and all age groups. The proportion of transfers can not therefore explain the excess mortality experienced at UBHT.

Recalculation of mortality tables excluding children transferred to another provider on discharge made little difference to the findings of the main report.

Emergency admissions

Mortality experienced by older children admitted as an emergency was higher than mortality in non-emergencies (excluding UBHT). However when comparing the proportion of emergencies in UBHT with elsewhere, higher proportions occurred in the under 90 days where mortality for emergencies was expected to be similar to non-emergencies. In the 1 to 15 year age groups, where mortality for emergencies was higher, the proportion of emergencies was less at UBHT. Mortality in UBHT was not significantly higher in emergency cases compared with non-emergency cases. The

proportion of children admitted as emergencies does not explain the excess mortality experienced at UBHT.

Down's syndrome

There was no significant difference between mortality experienced by children with Down's syndrome and children without Down's Syndrome in specialist centres in England (excluding UBHT). UBHT operated on less children with Down's syndrome in the under 90 days age group than other centres, but more than other centres in older age groups. Mortality at UBHT in children with Down's Syndrome was less than or equal to children without Down's syndrome in all age groups other than open operations in children aged 90 days to 1 year, where the difference was small (2%) and not statistically significant. The proportion of patients operated on with Down's Syndrome at UBHT cannot explain the excess in mortality seen in UBHT.

AVSDs

The age pattern of children operated on at UBHT for AVSDs and all open operations was very different to elsewhere in England. Although based on small numbers, the peak of activity in the month prior to the first birthday does not appear to be in keeping with practice elsewhere in the country. A similar pattern is present in procedures for interatrial TGAs and VSDs. Neonatal and infant cardiac surgery (NICS -for under ones) was designated a supra-regional service in 1984. Designated units for NICS, including UBHT submitted annual revenue and capital funding bids using information on workload including estimated *numbers of open heart operations*. This funding arrangement ceased on 31st March 1994. Although only small numbers are available for comparison, the activity peak in the month prior to the first birthday does not appear to be present after this date.

Data Quality

The specialty groupings are very broad. Within general surgery, only 0.5% (98/20,424) of episodes included an open or closed procedure. Within cardiothoracic surgery the proportion was much higher at 32% (1366/4242). From our data, it is not possible to know to what extent data quality measures based on activity for a whole speciality can be generalised to a smaller subset of procedures.

A possible marker of data quality is the ratio of episodes under HES and KP70 returns. For all years combined, percentage differences between KP70s and HES in UBHT for specific specialties was small and ranged from 0.0% in general surgery to 0.5% in cardiology. In England the range was 0.0% in general surgery and cardiology to 1.0% in cardiothoracic surgery.

Amalgamation of age groups - under 90 days and 90 days to under 1 year

In the main report, we allowed for different mortality rates amongst infants under 90 days compared to infants aged 90 days to 1 year. This analysis assumes that, in each centre, there is a common risk of mortality for all children aged under 1 year. Despite this assumption, the results are similar, with total excess deaths for open operations in all ages being reduced by only small amount from 32.9 to 30.1.

Observed and expected deaths for open/closed surgery

As an alternative way of viewing the results reported in the main report, the Inquiry panel requested that tables should be produced summarising, for each centre, the observed and predicted deaths for the three age groups for open and closed procedures. The Inquiry also requested the ratio between the observed and predicted deaths together with 95% intervals. Procedure groups with significantly high excess mortality in the main report, had a significantly high mortality ratio in these tabulations as they were based on the same data.

Conclusions

These findings support the conclusions in the main report, that UBHT had a high mortality for open operations in children aged under 1 year. This rate is more than would be expected given the variation in mortality of the other centres. Proportions of children transferred either in or out of UBHT, emergency admissions and children with Down's syndrome do not appear to explain these differences. The age pattern of children operated on at UBHT for AVSDs and all open operations is very different to elsewhere in England. The sudden peak of activity in the month prior to the first birthday does not appear to be in keeping with practice elsewhere in the country.

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s1. Background

s1.1.1. This analysis has been commissioned by the BRI Inquiry. It is supplemental to the "Analysis of Hospital Episode Statistics for the Bristol Royal Infirmary Inquiry",[1] also commissioned by the BRI Inquiry and henceforth referred to as the main report. The main report was an analysis of HES data relating to paediatric cardiac surgery at United Bristol Healthcare NHS Trust (UBHT) - comprising the Bristol Royal Infirmary and the Bristol Royal Hospital for Sick Children - and elsewhere in England between 1st April 1991 and 31st December 1995. The findings suggested that UBHT had a high mortality rate for open operations in children aged under 1 year, and particularly in children aged under 90 days. The rate was more than would be expected given the variation in mortality of the other centres.

s1.1.2. This report presents further analysis of HES data and examines inter-hospital transfers, emergency admissions, Down's syndrome, the ages of patients undergoing procedures for complete Atrial Ventricular Septal Defects (AVSD), and data quality. It also revises the mortality tables, which were presented in chapter 3 of the main report, to include different age groupings and estimates of relative risk instead of excess deaths. The classifications of procedure groupings and open/closed classes used within this supplemental analysis were taken from the main report.

s1.1.3. In addition, the panel requested tables separating out the numbers of procedures from the Bristol Royal Infirmary and the Bristol Children's Hospital. This was not possible because codes identifying the hospitals did not exist within our HES data set. PAS data may be more appropriate for this analysis.

s1.1.4. The panel also asked for an analysis of co-existing disease using HES data. McKee [2] urges caution when examining co-morbidity. Jencks et. al.[3] showed how some co-morbidities such as diabetes and hypertension, may fail to be coded for in cases where there is very severe illness as they are displaced by complications of the principal diagnosis from the limited number of spaces on the record for diagnostic codes. A further problem with data in the UK is the inability to distinguish secondary

[1] http://www.bristol-inquiry.org.uk/Documents/Hospital Episode Statistics (Aylin).doc
[2] McKee M. Routine data: a resource for clinical audit*? Qual Health Care* 1993;**2**:104-111

diagnoses present on admission from complications of treatment. Further analysis of our HES data using diagnoses in the ICD-9 range 996-999 (complications of surgical and medical care) shows that within open procedures, 26.3% (95%CI 22.5-30.4%) of spells in UBHT have complications recorded compared with 11.6% (95%CI 10.9-12.3%) elsewhere. However, McKee urges caution and suggests that the use of these codes for co-morbidities is likely to be less successful in the UK than in the US where there is the incentive to code more secondary diagnoses under a prospective payment system. More information on the consistency with which secondary diagnoses are coded in the UK is required before using them here. The use of outcome measures such as 'redos' of operations also requires that information systems link spells of care. Within HES, the absence of a patient identifier makes that even more difficult than linking episodes. As there was no specific new hypothesis as to what conditions to investigate, we felt that any further analysis of secondary diagnoses would result in comparisons of data quality between trusts rather than actual differences in co-morbidity.

[3] Jencks SF, Williams DK, Kay T. Assessing hospital associated deaths from discharge data: the role of length of stay and comorbidities. *JAMA* 1988;**260**:2240-6

s2. Inter-hospital transfers

s2.1.1. The Inquiry panel requested an analysis of HES data to examine mortality in children who were transferred from other hospitals. If mortality was higher in these transferred patients, and UBHT had a higher proportion of transfers from other providers, then this may provide some explanation for the higher mortality experienced in UBHT in some procedure groups and open operations. This analysis compares mortality for transfers and those admitted by other means (non-transfers) in specialist centres (excluding UBHT). It compares the proportion of transfers in UBHT with other specialist centres, and then examines mortality of transfers at UBHT.

s2.1.2. Tables from chapter 2. in the main report, showing mortality by procedure groups and age group in UBHT and elsewhere in England were recalculated excluding patients who were transferred to other hospitals on discharge to see the effect on mortality.

s2.2. Results

s2.2.1. Table s2.1. shows total numbers of spells and mortality (for spells whose outcomes are known) for open and closed operations by age group for patients transferred from another unit compared with non-transfers. For children aged less than 90 days, open procedures in transfers had a mortality (17%, 95%CI 15-19%) which was higher than in non-transfers (13%, 95%CI 10-17%). Closed procedures in transfers in this age group experienced similar mortality (5%, 95%CI 4-7%) to non-transfers (4%, 95%CI 3-7%). For transferred children aged 90 days to under one year, open procedures had a mortality (8%, 95%CI 5-12%) higher than non-transfers (6%, 95%CI 5-8%). Transferred children, who underwent closed procedures experienced slightly higher mortality (6%, 95%CI 2-11%) than non-transfers (3%, 95%CI 1-5%). None of the differences in mortality in this age group were statistically significant. For transferred children aged 1-15 years, open procedures had a mortality (9%, 95%CI 6-14%), higher than non-transfers (4%, 95%CI 4-5%) which was statistically significant. Transferred closed procedures experienced higher mortality (6%, 95%CI 3-12%) than those who were not transferred (1%, 95%CI 1-2%).

s2.2.2. Table s2.2 gives the proportion of spells admitted as transfers in UBHT and elsewhere. For open and closed procedures and all age groups, UBHT had consistently lower proportions of transfers than other specialist centres. For open operations in children aged less than 90 days, the proportion of transfers from other units to UBHT (51%, 95%CI 34-68%) was lower than elsewhere (69%, 95%CI 67-71%). There was also a lower proportion of transfers having closed procedures in UBHT (41%, 95%CI 32-52%) than elsewhere (73%, 95%CI 71-75%) in this age group. For children aged 90 days to under one year having open operations, the proportion of transfers in UBHT (7%, 95%CI 4-13%) was lower than elsewhere (17%, 95%CI 15-19%). There was a smaller proportion of transfers in closed procedures in this age group (11%, 95%CI 4-22%) than elsewhere (25%, 95%CI 21-29%). For children aged 1-15 years for open operations, the proportion of transfers from other units was again less in UBHT (1%, 95%CI 0-3%) than elsewhere (6%, 95%CI 5-7%). There was also a smaller proportion of closed procedures in this age group transferred in UBHT (6%, 95%CI 2-13%) than elsewhere (11%, 95%CI 9-13%).

s2.2.3. For the three age groups there were no statistically significant differences in mortality for open/closed procedures between transfers and those admitted by other means in UBHT. Table s2.3 gives mortality (for spells whose outcomes are known) for open and closed operations by age group for transfers compared with non-transfers. For many groups, counts of procedures were small and confidence intervals were correspondingly wide. For children aged less than 90 days, open procedures in transfers from other units had a mortality (69%, 95%CI 41-89%) slightly higher non-transfers (57%, 95%CI 29-82%). Closed procedures in this age group experienced similar mortality (5%, 95%CI 1-17%) as those who were not transferred (5%, 95%CI 1-15%). For transfers aged 90 days to under one year, open procedures had a mortality (38%, 95%CI 9-76%), higher than non-transfers (18%, 95%CI 11-27%). Closed procedures in transfers had no deaths (0%, 95%CI 0-46%) compared with non-transfers (4%, 95%CI 0-13%). For transfers aged 1-15 years, open procedures had a mortality (50%, 95%CI 1-99%), higher than that admitted through other means (6%, 95%CI 4-10%). Transferred closed procedures experienced no mortality.

s2.2.4. Tables s2.4 to s2.6 are similar tables to tables 2.2-2.4 in the main report. The difference is that children transferred to other hospitals on discharge have been

excluded from the calculations. Although absolute mortality increases due to a smaller denominator, the operations with significantly high mortality in the original analysis remain significantly high, and the mortality ratios remain similar.

s2.2.5. For children aged less than 90 days (table s2.4), open procedures in UBHT had a mortality (66%, 95%CI 46-82%) nearly four times higher (3.7) than that elsewhere in England (18%, 95%CI 16-20%). Among the 11 specific open procedures, switch (other operations for Transposition of Great Vessels, TGA) procedures had a mortality (90%, 95%CI 55-100%) which was over eight times higher (8.2) than elsewhere (11%, 95%CI 8-14%). Some of the other procedures (groups 2, 5, 8 and 10) had mortality rates of 100%, but the small numbers (1 or 2 cases in each group) meant it was difficult to draw any conclusions about them. Closed procedures in this age group had slightly lower mortality (6%, 95%CI 2-13%) as elsewhere (7%, 95%CI 6-9%) although CIs overlapped completely.

s2.2.6. For children aged 90 days to under one year (table s2.5) there were also variations in mortality outcomes between procedural groups. Open procedures had a mortality (20%, 95%CI 13-29%), three times higher (3.0) than that elsewhere in England (7%, 95%CI 6-8%). Among the 11 specific open procedure groups, mortality at UBHT for AVSD procedures (45%, 95%CI 23-68%) was four to five times higher (4.5) than elsewhere in England (10%, 95%CI 7-14%). Closure of ASD mortality (63%, 95%CI 24-91%) was seventeen times higher (16.9) than elsewhere (4%, 95%CI 1-10%). No other procedure groups had a significantly high mortality in this age group. Closed procedures had the same mortality (4%, 95%CI 0-13%) as elsewhere (4%, 95%CI 2-6%).

s2.2.7. For children aged 1-15 years, there were no significantly elevated mortality rates for any of the 13 procedure groups or the open/closed categories.

s2.3. Discussion

s2.3.1. Mortality experienced by children transferred from other providers in some age groups was higher than non-transfers in specialist centres in England (excluding UBHT). However when comparing the proportion of transfers in UBHT with elsewhere, UBHT has a smaller proportion of transfers than other specialist centres in

both open and closed procedure classes and all age groups. The proportion of transfers can not therefore explain the excess mortality experienced at UBHT.

s2.3.2. Recalculation of mortality tables excluding children transferred to another provider on discharge made little difference to the findings of the main report.

s3. Emergency admissions

s3.1.1. The Inquiry panel requested an analysis of HES data to examine the mortality in emergency admissions at UBHT. If mortality was higher in patients who were admitted as emergencies, and UBHT had higher rates of emergencies than other centres, this may provide some explanation for the higher mortality experienced in UBHT in some procedure groups and open operations. This analysis compares mortality in patients admitted as emergencies in specialist centres (excluding UBHT). It then compares the proportion of emergency admissions in UBHT with other specialist centres, and then examines mortality of emergencies at UBHT.

s3.2. Results

s3.2.1. Table s3.1 shows total numbers of spells and mortality (for spells whose outcomes are known) for open and closed operations by age group for patients admitted as emergencies compared with non-emergencies. For children aged less than 90 days, open procedures in emergency admissions had a mortality (17%, 95%CI 14-22%) which was not significantly different to children admitted as non-emergencies (15%, 95%CI 13-17%). Emergency closed procedures in this age group experienced lower mortality (3%, 95%CI 2-5%) than non-emergencies (6%, 95%CI 4-7%). For emergency admissions aged 90 days to under one year, open procedures had a mortality (5%, 95%CI 2-9%), not significantly less than non-emergencies (7%, 95%CI 6-8%). Emergency admissions undergoing closed procedures experienced higher mortality (7%, 95%CI 3-14%) than non-emergencies (3%, 95%CI 1-5%), but the confidence intervals overlap. For emergency admissions in children aged 1-15 years, open procedures had a mortality (9%, 95%CI 6-14%), higher non-emergencies (4%, 95%CI 4-5%). Emergency closed procedures experienced slightly higher mortality (3%, 95%CI 2-6%) than non-emergencies (1%, 95%CI 1-2%).

s3.2.2. Table s3.2 shows the proportion of emergency admissions in UBHT and elsewhere. For children aged less than 90 days, for open operations, the proportion of emergencies was higher in UBHT (46%, 95%CI 29-63%) than elsewhere (20%, 95%CI 19-22%). There was also a higher proportion of closed procedures in this age group who were emergencies in UBHT (46%, 95%CI 36-57%) than elsewhere (28%, 95%CI 26-30%). For children aged 90 days to under one year for open operations, the

proportion of emergencies was the same in UBHT (11%, 95%CI 6-18%) as elsewhere (11%, 95%CI 10-13%). There was a smaller proportion of emergencies in closed procedures in this age group (14%, 95%CI 6-26%) than elsewhere (21%, 95%CI 17-24%). For children aged 1-15 years for open operations, the proportion of emergencies was again less in UBHT (1%, 95%CI 0-3%) than elsewhere (6%, 95%CI 5-6%). There was a smaller proportion of emergency closed procedures in UBHT (13%, 95%CI 7-22%) than elsewhere (22%, 95%CI 20-25%).

s3.2.3. For the three age groups there were no significant differences in mortality for open/closed procedures between emergencies and non emergencies in UBHT. Table s3.3 gives mortality (for spells whose outcomes are known) for open and closed operations by age group for emergencies compared with non-emergencies. For children aged less than 90 days, open procedures in emergency admissions had a mortality (69%, 95%CI 39-91%) slightly higher than children admitted through other means (59%, 95%CI 33-82%). Closed procedures in this age group experienced similar mortality (7%, 95%CI 1-19%) to those who were non-emergencies (4%, 95%CI 0-13%). For emergency admissions aged 90 days to under one year, open procedures had a mortality (25%, 95%CI 5-57%), more than that admitted through other means (19%, 95%CI 12-28%). Closed procedures in emergency admissions experienced zero mortality (0%, 95%CI 0-37%) compared with non-emergencies (4%, 95%CI 0-14%). For emergency admissions in children aged 1-15 years, open procedures had a mortality (33%, 95%CI 1-91%), higher than that admitted through other means (6%, 95%CI 4-10%). Transferred closed procedures experienced no mortality.

s3.3. Discussion

s3.3.1. Mortality experienced by older children admitted as an emergency was higher than mortality in non-emergencies (excluding UBHT). However when comparing the proportion of emergencies in UBHT with elsewhere, higher proportions occur in the under 90 days where mortality for emergencies was expected to be similar to non-emergencies. In the 1 to 15 year age groups, where mortality for emergencies was higher, the proportion of emergencies was less at UBHT. Mortality in UBHT was not significantly higher in emergency cases compared with non-emergency cases. The

proportion of children admitted as emergencies does not explain the excess mortality experienced at UBHT.

s4. Down's Syndrome

s4.1.1. The Inquiry panel requested an analysis of HES data to examine whether operative mortality in children who had Down's Syndrome could account for differences in mortality at UBHT. If mortality was higher in patients with Down's syndrome, and if UBHT had a higher proportion of children with Down's syndrome than other centres, then this may provide some explanation for the higher mortality experienced in UBHT in some procedure groups and open operations. This analysis gives mortality for spells with and without a mention of Down's syndrome in the diagnoses fields for all specialist centres (excluding UBHT). It compares the proportion of Down's syndrome children in UBHT with other centres, and then determines the mortality of Down's syndrome children at UBHT.

s4.2. Results

s4.2.1. Table s4.1 shows that in all specialist centres (excluding UBHT), for open and closed procedures and within the three age groups, mortality for Down's syndrome children was either less than or equal to mortality in children without Down's syndrome, except for open operations in children aged 90 days to 1 year where Down's syndrome children had a mortality (9%, 95%CI 6-13%), slightly higher than those without (6%, 95%CI 5-8%). This difference was not statistically significant.

s4.2.2. Table s4.2 gives the proportion of spells with Down's syndrome in UBHT compared with elsewhere. For children aged less than 90 days, for open operations, the proportion of children with Down's was lower in UBHT (0%, 95%CI 0-9%) than elsewhere (6%, 95%CI 5-7%). There was also a smaller proportion of spells with a mention of Down's syndrome in closed procedures (2%, 95%CI 0-7%) than elsewhere (3%, 95%CI 2-3%). For children aged 90 days to under one year for open operations, the proportion of children with Down's was higher in UBHT (22%, 95%CI 16-30%) than elsewhere (15%, 95%CI 14-17%). There was also a higher proportion of Down's syndrome (11%, 95%CI 4-22%) in closed procedures in this age group than elsewhere (6%, 95%CI 4-8%). For children aged 1-15 years for open operations, the proportion of children with Down's was more in UBHT (7%, 95%CI 4-10%) than elsewhere (4%, 95%CI 4-5%). There was an equal proportion of closed procedures in this age group

with Down's syndrome (2%, 95%CI 0-8%) was the same as elsewhere (2%, 95%CI 1-3%).

s4.2.3. Table s4.3 shows mortality for open and closed operations by age group for children with Down's syndrome and those without in UBHT. For the three age groups there were no significant differences in mortality for open or closed procedures between children with Down's syndrome and those without in UBHT. For children aged less than 90 days, there were no open procedures in children with Down's syndrome. Closed procedures in children with Down's syndrome in this age group experienced no deaths compared with those without Down's (5%, 95%CI 2-12%). For children with Down's aged 90 days to under one year, open procedures had a mortality (21%, 95%CI 8-40%), slightly more than those without (19%, 95%CI 11-29%), but not statistically significant. Closed procedures in Down's syndrome children experienced no mortality (0%, 95%CI 0-46%) compared to those who did not have Down's (4%, 95%CI 0-13%). For children aged 1-15 years, open procedures in Down's syndrome children had a lower mortality (5%, 95%CI 0-23%), than those without Down's (7%, 95%CI 4-10%). Closed procedures in Down's syndrome children in this age group experienced no mortality.

s4.3. Discussion

s4.3.1. There are no significant differences between mortality experienced by children with Down's syndrome and children without Down's Syndrome in specialist centres in England (excluding UBHT). UBHT operated on less children with Down's syndrome in the under 90 days age group than other centres, but slightly more than other centres in older age groups. Mortality at UBHT in children with Down's Syndrome was less than or equal to children without Down's syndrome in all age groups other than open operations in children aged 90 days to 1 year, where the difference was small (2%) and not statistically significant. There was therefore no evidence to suggest that the proportion of patients operated on with Down's Syndrome at UBHT can explain the excess in mortality seen in UBHT.

s4.3.2. Quality of coding (including completeness) for Down's syndrome may be variable between centres, particularly if it is recorded as a secondary diagnosis.

s5. Atrial Ventricular Septal Defects

s5.1.1. The Inquiry panel requested an examination of age of patients at admission, undergoing procedures for atrial ventricular septal defects (AVSDs). The main report had suggested that UBHT had a high mortality in children under 1 year. The panel requested information on whether children were operated on at an older age than elsewhere. The panel also wanted to know whether there was any difference in age at admission between the period when supra-regional funding (up to 31st March 1994) was based on the number of children aged under one year having open heart operations, and after this period when the arrangement was withdrawn. This analysis looks at the proportion of AVSDs by three age groups at UBHT compared with elsewhere and then further breaks down age groups into months for the first 18 months of life for AVSD and other procedure groupings.

s5.2. Results

s5.2.1. Table s5.1 shows that a higher proportion of AVSD procedures in children aged under one occurred at UBHT (25/36, 70%) than elsewhere (417/797, 52%). Within children aged under one, a greater proportion were operated on in the 90 days to one year age group in UBHT (23/25, 92%) than elsewhere (286/417, 68%).

s5.2.2. Figure s5.1 gives a further age breakdown in months in children aged under 18 months for AVSD procedures from 1st April 1991 to 31st March 1994 when supra-regional funding was based on the number of operations performed on children aged under one year. The first year of life includes months 0 to 11. The pattern for UBHT was different to elsewhere. There was a spike of activity in UBHT (50% of operations carried out in month 11) just prior to their first birthday. This was not seen elsewhere in England, where there was a much gentler peak at month 3 and 4.

s5.2.3. Figure s5.2 shows the pattern of operations between 1st April 1994 and 31st December 1995 when the funding arrangement based on numbers of open heart surgery had been withdrawn. Numbers are very small, but the peak at month 11 is no longer present. Elsewhere in England, the peak occurs around month 2 and 3.

s5.2.4. Figure s5.3 gives the age breakdown in months of all open procedures from 1st April 1991 to 31st March 1994 when the supra-regional funding arrangement was in

place. The open operation group has much larger numbers and allows for more stable comparisons. Again, the pattern for UBHT was different to elsewhere. The spike of activity is still present where 18% of operations were carried out in children in month 11. This was different to elsewhere in England, where there was an initial peak in the first month of life and a gentle tailing off of activity after that.

s5.2.5. Figure s5.4 shows the pattern of operations from the 1st April 1994, after withdrawal of supra-regional funding based on numbers of children aged under one year. The activity spike at month 11 has disappeared.

s5.2.6. Figure s5.5 gives the age patterns by age (in months) for all 13 procedure groups and open/closed class of procedures. In many groups, small numbers hamper interpretation, but similar activity peaks were observed during the supra-regional funding period in the month prior to the first birthday in interatrial TGAs and closure of VSDs. Both peaks disappear in the period after 31st March 1994. None of the closed operation groups share this activity peak in month 11.

s5.2.7. Figure s5.6 shows cumulative numbers of cases and deaths for open operations in the period prior to 1st April 1994 and reflects the peak in operation activity in the month 11.

s5.3. Discussion

s5.3.1. The age pattern of children operated on at UBHT for AVSDs and all open operations was very different to the age pattern seen elsewhere in England. A similar pattern has been found within the Clinically Coded Records exercise (personal communication). The sudden peak of activity immediately before the first birthday and the subsequent rapid decline in numbers thereafter does not appear to be in keeping with clinical practice elsewhere in the country.

s5.3.2. There are several possible explanations for the activity peak prior to patients' first birthday. The first of these may be that the difference is due to chance. This seems unlikely, given the relatively large numbers in the open class of procedures. There may be variations between centres, which are obscured by comparison with a total figure for units elsewhere in England. However, if the proportions of operations by age are plotted for open operations by centre (shown in figure s5.7), no other centre showed

this peak at month 11. The second explanation is that patients' operations were being delayed until just before their first birthday or that patients were being referred to the unit later than they should have been (coinciding with their first birthday). Because there is no data on referral dates within the HES records, it is not possible to distinguish between these hypotheses.

s5.3.3. The absence of the activity peak at month 11 after 31st March 1994 is of note. The period 1st April 1994 to 31st December 1995 is relatively short and therefore numbers are small. It is also known that the two surgeons at UBHT had stopped much of their complex cardiac paediatric surgery by the end of March 1995 and the types of operations carried out changed substantially in the remaining time. Neonatal and infant cardiac surgery (NICS -for under ones) was designated a supra-regional service in 1984. Designated units for NICS, including UBHT submitted annual revenue and capital funding bids using information on workload including estimated numbers of open heart operations. It may be of relevance that these funding arrangements ceased on 31st March 1994.

s6. HES data quality

s6.1.1. As well as electronic returns, hospitals are obliged to submit paper counts (called KP70s) of patient episodes, which should be collected independently from the HES counts. DH use KP70 totals as the "gold standard" totals against which HES is compared. The Inquiry panel asked for an analysis of HES coverage, comparing KP70 and HES returns for UBHT and England. Data were provided by the Department of Health, HES section, on KP70 and HES returns for episodes classed as ordinary admissions (those requiring a hospital stay of at least one night) by specialty across four years 1991/92 to 1994/95.

s6.2. Results

s6.2.1. There are a total of 66 specialty codes recorded in HES, which describe the specialty of the consultant caring for the patient. Table s6.1 shows the number and percentage of open and closed procedures by specialty code recorded in HES between 1991 and March 1995 in UBHT and England (including UBHT).

s6.2.2. In UBHT, 98% of open procedures fell under cardiothoracic surgery (specialty code 170). Closed procedures fell under a variety of codes, most of them (54%) under cardiothoracic, 27% under general surgery (specialty code 100) and 7% under cardiology (specialty code 320). These three speciality codes were used to assess coverage.

s6.2.3. In England, 93% of open procedures fell under cardiothoracic. Closed procedures fell under a variety of codes, 36% fell under cardiology, only 10% under cardiothoracic, 26% under general surgery and 20% under general medicine (specialty code 300).

s6.2.4. Table s6.2 shows the number of ordinary admission episodes recorded in HES and in KP70 returns and their ratio. Figures for England (including UBHT) show an annual increase in total activity except in 1993/4 when HES recorded total activity was higher than in 1994/5. Overall, annual agreement between HES and KP70 (a possible marker of data quality) was high with figures differing by not more than 2.5%. Agreement within the three selected specialties was similarly high with figures again differing by not more than 2.6%.

s6.2.5. Within UBHT, HES figures were higher than KP70 across all years. Overall annual agreement was variable with HES returns 6.8% higher than KP70 in 1992/93. Within the three selected speciality groups, agreement was much stronger with figures differing by not more than 1.5%.

s6.2.6. For all years combined, for all specialities in UBHT, HES figures were 2.9% higher than KP70 returns. In England (including UBHT) HES figures were 0.8% lower than KP70 returns. For all years combined, percentage difference between KP70s and HES in UBHT for specific specialties ranged from 0.0% in general surgery to 0.5% in cardiology. In England the range was 0.0% in general surgery and cardiology to 1.0% in cardiothoracic surgery.

s6.3. Discussion

s6.3.1. The specialty groupings are very broad. Within general surgery, only 0.5% (98/20,424) of episodes included an open or closed procedure. Within cardiothoracic surgery the proportion was much higher at 32% (1366/4242). From our data, it is not possible to know to what extent we can generalise data quality measures based on activity for a whole speciality to a smaller subset of procedures.

s6.3.2. All specialty annual agreement between HES and KP70 was more variable in UBHT than in England. Within the selected specialties, agreement was higher in UBHT than in England. The differences however, were small, and in the range of a few percent at most.

s7. Amalgamation of age groups - under 90 days and 90 days to under 1 year

s7.1.1. The Inquiry Panel requested that we combine the data for under 90 days and 90 days to under 1 year to give results for a single age group of under 1 year, i.e. for infants. This was to allow better comparison with UKCSR data (which use the under 1 age group).

s7.2. Results

s7.2.1. Tables s7.1 and s7.2 are equivalent to Tables 3.1 and 3.2 in the original report, but with age groups under 90 days and 90 days to under 1 year combined into a single age group – under 1 year. In total there are 32 total excess deaths out of 67 in UBHT (95% interval 17-45) based on 13 groups and 28.5 total excess deaths out of 69 in UBHT (95% interval 4-46) based on open & closed groups. We can be more than 95% certain that there was a positive excess mortality in UBHT for procedure groups 3, 5, 6 and open procedures in children aged under 1 year. UBHT was also ranked worst for 4 of the 13 procedure groups plus open procedures carried out in children aged under 1 year and 1 out of 12 procedure groups carried out in children aged 1 to 15 years. However, statistical uncertainty due to the small number of admissions upon which these mortality rates and ranks are based means that we can be greater than 95% certain that UBHT ranks worst only for open procedures and for procedure group 3 in children under 1 year.

s7.3. Discussion

s7.3.1. This analysis assumes that, in each centre, there is a common risk of mortality for all children aged under 1 year. In the main report, we allowed for different mortality rates amongst infants under 90 days compared to infants aged 90 days to 1 year. Despite this assumption, the results are similar, with total excess deaths for open operations in all ages being reduced by only small amount from 32.9 to 30.1.

s8. Observed and expected deaths for open/closed surgery

s8.1.1. The panel requested that tables should be produced summarising, for each centre, the observed and predicted deaths for the 3 age groups for open and closed procedures. The Inquiry also requested the ratio between the observed and predicted deaths together with 95% intervals.

s8.2. Results

s8.2.1. Table s8.1 reports the ratio of observed to predicted deaths for each centre, procedure and age group. The predicted deaths are calculated as already described in the main report.

s8.2.2. Table s8.2 reports the observed and predicted number of deaths, plus 95% uncertainty interval for the predicted deaths, for open and closed procedures by centre and age group. Again, the predicted deaths are calculated as described in the main report. The ratio of observed to predicted deaths is also given, together with a 95% uncertainty interval for this ratio. The lower and upper limits of this interval are simply the ratio of the observed deaths divided by the upper and lower limits of the 95% interval for the predicted deaths, respectively.

s8.2.3. Both tables have been produced adopting both the original 3 age groups (a) and the two age groups (b) which combine the under 90 days and 90 days to under 1 year age groups in to one common age group of under 1 year.

s8.3. Discussion

s8.3.1. These tables are an alternative way of presenting the data. Instead of excess deaths (the difference between observed and predicted deaths), we give a ratio of observed to predicted deaths. Procedure groups with significantly high excess mortality in the main report had a significantly high mortality ratio in these tabulations because they were based on the same data.

s8.3.2. The ratio of the observed to predicted deaths differs from the usual Standardised Mortality Ratio (SMR) for two reasons:

- We report the ratios separately for each age group, and so (except for the ratios for all ages combined), there is no need for age standardisation;

- The usual definition of an SMR is the ratio of observed to expected deaths, where the expected deaths are given by the population (in this case, number of operations) times a reference mortality rate which is assumed to be known and is the same for all centres. Ideally, these reference rates should be derived from a different set of data to that used for the present analysis. However, no suitable external data set or published mortality rates exist for the specific age and procedure groups used in this analysis. The alternative would be to calculate reference rates from the HES data used for the main analysis. Two alternative sets of reference rates could then be obtained:

1) $$\frac{\text{Total number of deaths in other 11 centres}}{\text{Total number of admissions in other 11 centres}}$$

   This would represent the mortality rate for a typical child treated in the rest of England (excluding the centre of interest). Age-specific reference rates could be calculated by stratifying the above ratio by age-group. However, there are two problems with using this as the reference rate for calculating SMRs:

   i) no allowance is made for uncertainty in the calculated rates. Even after pooling the data across centres, these reference rates will be based on quite small numbers for some age and procedure groups;

   ii) a different set of reference rates would be needed to calculate the SMRs for each centre, since the reference rates are be based on the data for the other 11 centres excluding the centre of interest. Hence the SMRs would not be comparable across centres, since a different reference was used for each centre.

2) The main focus of the analysis was to compare Bristol's performance with that of other specialist centres in England. This suggests that an alternative reference rate would be the mortality rate for a child treated in a typical centre (excluding the centre of interest). This is given by the average of the centre-specific mortality rates excluding the centre of interest, i.e. the mean of the mortality rates for each of the other 11 centres (again, age-specific mortality

rates could be used to get age-specific reference rates). Note that this is not the same as the mortality rate for a typical child treated elsewhere in England (see paragraph 4.3.2 in the original report). For example, consider 3 centres with mortality rates of 110/1000 (11% mortality), 5/100 (5% mortality) and 1/100 (1% mortality) respectively. The mortality for a typical patient is (110+5+1)/(1000+100+100) = 116/1200 or 9.6% chance of dying. However, the mortality rate for a patient attending a typical centre is (11%+5%+1%)/3 = 5.7%. Use of typical centre reference rates suffers from the same problems as the typical patient reference rates in 1) i.e. no allowance is made for uncertainty in the rates, and the SMRs thus derived would not be comparable across centres since different reference rates are obtained for each centre.

s8.3.3. For these reasons, we did not calculate SMRs, but instead report the ratio of observed to predicted deaths. The predictive distribution for the number of deaths expected in a particular centre is based on the posterior distribution for the underlying mortality rates in the other 11 centres (estimated according to the multilevel model described in the statistical appendix to the original report) plus allowance for binomial sampling variation in the observed number of deaths. The predicted number of deaths for each centre is therefore similar to the reference rate described in (2) above but takes into account uncertainty due to variation in mortality rates between centres, plus random fluctuations between the observed and true mortality rate per centre. Note that the predictive distribution for the number of deaths is different for each centre, since it is based on the estimated mortality rates for the other 11 centres excluding the centre of interest, and so changes according to the centre of interest, However, while calculation of SMRs requires a known common reference rate to be used for all centres, there is no formal reason why we should use a common predictive distribution for the number of deaths across centres when reporting ratios of observed to predicted deaths.

Figures and tables

Table s2.1 Comparison of mortality between spells transferred from other units and non-transfers in open and closed procedures carried out in England (excluding UBHT), Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	Transfer	N	valid n*	Died	%Died	95% CI
<90 days	Open	Yes	1174	1138	190	17%	*15 - 19%*
		No	522	485	64	13%	*10 - 17%*
	Closed	Yes	1043	1033	55	5%	*4 - 7%*
		No	388	382	17	4%	*3 - 7%*
90days-1yr	Open	Yes	275	264	22	8%	*5 - 12%*
		No	1366	1298	80	6%	*5 - 8%*
	Closed	Yes	128	126	7	6%	*2 - 11%*
		No	383	383	11	3%	*1 - 5%*
1-15yrs	Open	Yes	258	254	24	9%	*6 - 14%*
		No	4150	4039	171	4%	*4 - 5%*
	Closed	Yes	131	129	8	6%	*3 - 12%*
		No	1075	1071	13	1%	*1 - 2%*

* Excludes spells with unknown outcome (i.e. both length of stay less than 30 days and discharge destination unknown)

Table s2.2 Comparison of the proportion of spells transferred from other units between UBHT and elsewhere in open and closed procedures carried out in England, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	UBHT	n	Transferred	%	95% CI
<90 days	Open	Yes	37	19	51%	*34 - 68%*
		No	1696	1174	69%	*67 - 71%*
	Closed	Yes	99	41	41%	*32 - 52%*
		No	1431	1043	73%	*71 - 75%*
90 days - 1 yr.	Open	Yes	135	10	7%	*4 - 13%*
		No	1641	275	17%	*15 - 19%*
	Closed	Yes	57	6	11%	*4 - 22%*
		No	511	128	25%	*21 - 29%*
1 – 15 yrs	Open	Yes	333	3	1%	*0 - 3%*
		No	4408	258	6%	*5 - 7%*
	Closed	Yes	89	5	6%	*2 - 13%*
		No	1206	131	11%	*9 - 13%*

Table s2.3 Comparison of mortality between spells transferred from other units and non-transfers in open and closed procedures carried out in UBHT, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	Transfer	n	valid n*	Died	%Died	95% CI
<90 days	Open	Yes	19	16	11	69%	*41 - 89%*
		No	18	14	8	57%	*29 - 82%*
	Closed	Yes	41	39	2	5%	*1 - 17%*
		No	58	57	3	5%	*1 - 15%*
90days-1yr	Open	Yes	10	8	3	38%	*9 - 76%*
		No	125	105	19	18%	*11 - 27%*
	Closed	Yes	6	6	0	0%	*0 - 46%*
		No	51	51	2	4%	*0 - 13%*
1-15yrs	Open	Yes	3	2	1	50%	*1 - 99%*
		No	330	312	20	6%	*4 - 10%*
	Closed	Yes	5	5	0	0%	*0 - 52%*
		No	84	84	0	0%	*0 - 4%*

* Excludes spells with unknown outcome (i.e. both length of stay less than 30 days and discharge destination unknown)

Table s2.4 Comparison of mortality between UBHT and the rest of England (excluding spells ending in transfers), Hospital Episode Statistics 1 April 1991 to 31 March 1995, age less than 90 days

Procedure group	Total	UBHT					Elsewhere					
	n	n	Valid n* (%)	Died	%Died	95% CI	n	Valid n* (%)	Died	%Died	95% CI	Mortality Ratio
1 Fallot †	40	0	0	0			40	35 (88)	6	17%	7 - 34%	0.0
2 Interatrial TGA †	66	1	1 (100)	1	100%	3 - 100%	65	52 (80)	9	17%	8 - 30%	5.8
3 Other TGA †	591	13	10 (77)	9	90%	55 - 100%	578	493 (85)	54	11%	8 - 14%	8.2
4 TAPVD †	156	13	10 (77)	5	50%	19 - 81%	143	114 (80)	22	19%	13 - 28%	2.6
5 AVSD †	133	2	2 (100)	2	100%	16 - 100%	131	110 (84)	22	20%	13 - 29%	5.0
6 Closure of ASD †	70	2	2 (100)	0	0%	0 - 84%	68	47 (69)	8	17%	8 - 31%	0.0
7 Closure of VSD †	290	1	1 (100)	0	0%	0 - 97%	289	230 (80)	31	13%	9 - 19%	0.0
8 Truncus †	79	3	2 (67)	2	100%	16 - 100%	76	69 (91)	26	38%	26 - 50%	2.7
9 Fontan type †	38	0	0	0			38	32 (84)	10	31%	16 - 50%	0.0
10 Aortic and pulmonary valves †	157	1	1 (100)	1	100%	3 - 100%	156	138 (88)	22	16%	10 - 23%	6.3
11 Mitral valves †	13	0	0	0			13	9 (69)	6	67%	30 - 93%	0.0
12 Closed Shunts +	484	25	22 (88)	2	9%	1 - 29%	459	358 (78)	45	13%	9 - 16%	0.7
13 Simple Coarctation +	436	52	47 (90)	2	4%	1 - 15%	384	321 (84)	15	5%	3 - 8%	0.9
88 Open	1733	37	29 (78)	19	66%	46 - 82%	1696	1428 (84)	254	18%	16 - 20%	3.7
99 Closed	1530	99	87 (88)	5	6%	2 - 13%	1431	1029 (72)	72	7%	6 - 9%	0.8

* Excludes spells with unknown outcome (i.e. length of stay less than 30 days together with discharge destination unknown) and spells ending in transfer to other unit.
† Open procedure, + Closed procedure

Table s2.5 Comparison of mortality between UBHT and the rest of England (excluding spells ending in transfers), admissions between 1st April 1991 to 31st March 1995, aged 90 days to under 1 year

Procedure group	Total	UBHT					Elsewhere					
	n	n	Valid n* (%)	Died	%Died	95% CI	n	Valid n* (%)	Died	%Died	95% CI	Mortality Ratio
1 Fallot †	263	3	3 (100)	0	0%	0 - 71%	260	237 (91)	12	5%	3 - 9%	0.0
2 Interatrial TGA †	52	19	14 (74)	1	7%	0 - 34%	33	30 (91)	2	7%	1 - 22%	1.1
3 Other TGA †	50	5	3 (60)	1	33%	1 - 91%	45	40 (89)	6	15%	6 - 30%	2.2
4 TAPVD †	46	4	4 (100)	0	0%	0 - 60%	42	34 (81)	1	3%	0 - 15%	0.0
5 AVSD †	309	23	20 (87)	9	45%	23 - 68%	286	259 (91)	26	10%	7 - 14%	4.5
6 Closure of ASD †	99	9	8 (89)	5	63%	24 - 91%	90	81 (90)	3	4%	1 - 10%	16.9
7 Closure of VSD †	629	56	42 (75)	0	0%	0 - 8%	573	518 (90)	14	3%	1 - 4%	0.0
8 Truncus †	27	4	2 (50)	1	50%	1 - 99%	23	21 (91)	5	24%	8 - 47%	2.1
9 Fontan type †	87	4	4 (100)	2	50%	7 - 93%	83	76 (92)	10	13%	6 - 23%	3.8
10 Aortic and pulmonary valves †	109	3	3 (100)	1	33%	1 - 91%	106	96 (91)	3	3%	1 - 9%	10.7
11 Mitral valves †	46	3	3 (100)	2	67%	9 - 99%	43	39 (91)	6	15%	6 - 31%	4.3
12 Closed Shunts +	192	13	12 (92)	1	8%	0 - 38%	179	163 (91)	13	8%	4 - 13%	1.0
13 Simple Coarctation +	67	12	12 (100)	0	0%	0 - 26%	55	50 (91)	2	4%	0 - 14%	0.0
88 Open	1776	135	108 (80)	22	20%	13 - 29%	1641	1481 (90)	102	7%	6 - 8%	3.0
99 Closed	568	57	55 (96)	2	4%	0 - 13%	511	474 (93)	18	4%	2 - 6%	1.0

* Excludes spells with unknown outcome (i.e. length of stay less than 30 days together with discharge destination unknown) and spells ending in transfer to other unit.
† Open procedure, + Closed procedure

Table s2.6 Comparison of mortality between UBHT and the rest of England (excluding spells ending in transfers), admissions between 1st April 1991 to 31st March 1995, aged 1 to 15 years

Procedure group	Total	UBHT					Elsewhere					
	n	n	Valid n* (%)	Died	%Died	95% CI	n	Valid n* (%)	Died	%Died	95% CI	Mortality Ratio
1 Fallot †	625	48	44 (92)	5	11%	4 - 25%	577	553 (96)	27	5%	3 - 7%	2.3
2 Interatrial TGA †	47	4	3 (75)	1	33%	1 - 91%	43	41 (95)	3	7%	2 - 20%	4.6
3 Other TGA †	61	9	6 (67)	1	17%	0 - 64%	52	47 (90)	3	6%	1 - 18%	2.6
4 TAPVD †	34	1	0 (0)	0	0%		33	31 (94)	1	3%	0 - 17%	0.0
5 AVSD †	391	11	11 (100)	1	9%	0 - 41%	380	364 (96)	14	4%	2 - 6%	2.4
6 Closure of ASD †	1177	81	80 (99)	0	0%	0 - 5%	1096	1058 (97)	3	0%	0 - 1%	0.0
7 Closure of VSD †	525	48	46 (96)	1	2%	0 - 12%	477	466 (98)	20	4%	3 - 7%	0.5
8 Truncus †	7	1	1 (100)	0	0%	0 - 97%	6	6 (100)	1	17%	0 - 64%	0.0
9 Fontan type †	572	38	34 (89)	3	9%	2 - 24%	534	518 (97)	51	10%	7 - 13%	0.9
10 Aortic and pulmonary valves †	725	47	46 (98)	3	7%	1 - 18%	678	661 (97)	18	3%	2 - 4%	2.4
11 Mitral valves †	216	20	20 (100)	1	5%	0 - 25%	196	185 (94)	13	7%	4 - 12%	0.7
12 Closed Shunts +	339	27	27 (100)	4	15%	4 - 34%	312	300 (96)	18	6%	4 - 9%	2.5
13 Simple Coarctation +	194	28	28 (100)	0	0%	0 - 12%	166	165 (99)	0	0%	0 - 2%	
88 Open	4741	333	314 (94)	21	7%	4 - 10%	4408	4248 (96)	195	5%	4 - 5%	1.5
99 Closed	1295	89	87 (98)	0	0%	0 - 4%	1206	1183 (98)	21	2%	1 - 3%	0.0

* Excludes spells with unknown outcome (i.e. length of stay less than 30 days together with discharge destination unknown) and spells ending in transfer to other unit.
† Open procedure, + Closed procedure

Table s3.1 Comparison of mortality between emergency spells and non-emergency in open and closed procedures carried out in England (excluding UBHT), Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	Emergency	n	valid n*	Died	%Died	95% CI
<90 days	Open	Yes	347	326	57	17%	*14 - 22%*
		No	1349	1297	197	15%	*13 - 17%*
	Closed	Yes	398	390	12	3%	*2 - 5%*
		No	1033	1025	60	6%	*4 - 7%*
90days-1yr	Open	Yes	184	177	8	5%	*2 - 9%*
		No	1457	1385	94	7%	*6 - 8%*
	Closed	Yes	105	103	7	7%	*3 - 14%*
		No	406	406	11	3%	*1 - 5%*
1-15yrs	Open	Yes	252	248	23	9%	*6 - 14%*
		No	4156	4045	172	4%	*4 - 5%*
	Closed	Yes	270	267	9	3%	*2 - 6%*
		No	936	933	12	1%	*1 - 2%*

* Excludes spells with unknown outcome (i.e. both length of stay less than 30 days and discharge destination unknown)

Table s3.2 Comparison of the proportion of emergency spells between UBHT and elsewhere in open and closed procedures carried out in England, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	UBHT	n	Emergency	%emergency	95% CI
<90 days	Open	Yes	37	17	46%	*29 - 63%*
		No	1696	347	20%	*19 - 22%*
	Closed	Yes	99	46	46%	*36 - 57%*
		No	1431	398	28%	*26 - 30%*
90days-1yr	Open	Yes	135	15	11%	*6 - 18%*
		No	1641	184	11%	*10 - 13%*
	Closed	Yes	57	8	14%	*6 - 26%*
		No	511	105	21%	*17 - 24%*
1-15yrs	Open	Yes	333	4	1%	*0 - 3%*
		No	4408	252	6%	*5 - 6%*
	Closed	Yes	89	12	13%	*7 - 22%*
		No	1206	270	22%	*20 - 25%*

Table s3.3 Comparison of mortality between emergency spells and non-emergencies in open and closed procedures carried out in UBHT, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	Emergency	n	valid n*	Died	%Died	95% CI
<90 days	Open	Yes	17	13	9	69%	*39 - 91%*
		No	20	17	10	59%	*33 - 82%*
	Closed	Yes	46	44	3	7%	*1 - 19%*
		No	53	52	2	4%	*0 - 13%*
90days-1yr	Open	Yes	15	12	3	25%	*5 - 57%*
		No	120	101	19	19%	*12 - 28%*
	Closed	Yes	8	8	0	0%	*0 - 37%*
		No	49	49	2	4%	*0 - 14%*
1-15yrs	Open	Yes	4	3	1	33%	*1 - 91%*
		No	329	311	20	6%	*4 - 10%*
	Closed	Yes	12	12	0	0%	*0 - 26%*
		No	77	77	0	0%	*0 - 5%*

* Excludes spells with unknown outcome (i.e. both length of stay less than 30 days and discharge destination unknown)

Table s4.1 Comparison of mortality between spells with Down's Syndrome and non-Down's syndrome in open and closed procedures carried out in England (excluding UBHT), Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	Downs syndrome	n	valid n*	Died	%Died	95% CI
<90 days	Open	Yes	95	95	11	12%	*6 - 20%*
		No	1601	1528	243	16%	*14 - 18%*
	Closed	Yes	36	36	1	3%	*0 - 15%*
		No	1395	1379	71	5%	*4 - 6%*
90days-1yr	Open	Yes	252	251	22	9%	*6 - 13%*
		No	1389	1311	80	6%	*5 - 8%*
	Closed	Yes	30	30	0	0%	*0 - 12%*
		No	481	479	18	4%	*2 - 6%*
1-15yrs	Open	Yes	192	191	10	5%	*3 - 9%*
		No	4216	4102	185	5%	*4 - 5%*
	Closed	Yes	25	25	0	0%	*0 - 14%*
		No	1181	1175	21	2%	*1 - 3%*

* Excludes spells with unknown outcome (i.e. both length of stay less than 30 days and discharge destination unknown)

Table s4.2 Comparison of the proportion of Down's syndrome spells between UBHT and elsewhere in open and closed procedures carried out in England, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	UBHT	n	Down's syndrome	%Down's	95% CI
<90 days	Open	Yes	37	0	0%	*0 - 9%*
		No	1696	95	6%	*5 - 7%*
	Closed	Yes	99	2	2%	*0 - 7%*
		No	1431	36	3%	*2 - 3%*
90days-1yr	Open	Yes	135	30	22%	*16 - 30%*
		No	1641	252	15%	*14 - 17%*
	Closed	Yes	57	6	11%	*4 - 22%*
		No	511	30	6%	*4 - 8%*
1-15yrs	Open	Yes	333	22	7%	*4 - 10%*
		No	4408	192	4%	*4 - 5%*
	Closed	Yes	89	2	2%	*0 - 8%*
		No	1206	25	2%	*1 - 3%*

Table s4.3 Comparison of mortality between Down's syndrome spells and non-Down's in open and closed procedures carried out in UBHT, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age group	Open/Closed	Downs syndrome	n	valid n*	Died	%Died	95% CI
<90 days	Open	Yes	0	0	0		-
		No	37	30	19	63%	*44 - 80%*
	Closed	Yes	2	2	0	0%	*0 - 84%*
		No	97	94	5	5%	*2 - 12%*
90days-1yr	Open	Yes	30	29	6	21%	*8 - 40%*
		No	105	84	16	19%	*11 - 29%*
	Closed	Yes	6	6	0	0%	*0 - 46%*
		No	51	51	2	4%	*0 - 13%*
1-15yrs	Open	Yes	22	22	1	5%	*0 - 23%*
		No	311	292	20	7%	*4 - 10%*
	Closed	Yes	2	2	0	0%	*0 - 84%*
		No	87	87	0	0%	*0 - 4%*

* Excludes spells with unknown outcome (i.e. both length of stay less than 30 days and discharge destination unknown)

Table s5.1 Comparison of the proportion of spells in each age group for AVSDs between UBHT and elsewhere in England, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Age	UBHT		Elsewhere	
	n	%	n	%
0-90 days	2	6%	131	16%
90 days-1 year	23	64%	286	36%
1-15 years	11	31%	380	48%
Total	**36**		**797**	
Total under 1 year	**25**		**417**	

Table s6.1 Number and percentage of open and closed procedures by specialty code recorded, Hospital Episode Statistics 1 April 1991 to 31 March 1995 in UBHT and England (including UBHT)

	100 - General Surgery		170 - Cardiothoracic Surgery		300 – General Medicine		320 - Cardiology		Other specialties		Total
Procedure	**N**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
UBHT											
Open	1	0%	1,187	98%	2	0%	24	2%	2	0%	1,216
Closed	97	29%	179	54%	4	1%	22	7%	28	8%	330
Total	98	6%	1,366	88%	6	0%	46	3%	30	2%	1,546
England											
Open	34	0%	26,463	93%	128	0%	1,295	5%	425	1%	28,345
Closed	8,743	26%	3,267	10%	6,720	20%	11,819	36%	2,563	8%	33,112
Total	8,777	14%	29,730	48%	6,848	11%	13,114	21%	2,988	5%	61,457

Table s6.2 Comparisons of ordinary admissions by HES and KP70 returns for selected specialities 1 April 1991 to 31 March 1995 in UBHT and England (including UBHT)

	91/92			92/93			93/94			94/95			Total		
Specialty	**HES**	**KP70**	**Ratio x100**	**HES**	**KP70**	**Ratio x100**	**HES**	**KP70**	**Ratio x100**	**HES**	**KP70**	**Ratio x100**	**HES**	**KP70**	**Ratio x100**
UBHT															
100 - General Surgery	5,240	5,239	*100.0*	5,010	4,996	*100.3*	4,938	4,936	*100.0*	5,236	5,259	*99.6*	20,424	20,430	*100.0*
170 - Cardiothoracic Surgery	930	930	*100.0*	1,014	1,012	*100.2*	1,127	1,117	*100.9*	1,171	1,168	*100.3*	4,242	4,227	*100.4*
320 - Cardiology	2,398	2,397	*100.0*	2,171	2,139	*101.5*	1,908	1,905	*100.2*	2,223	2,213	*100.5*	8,700	8,654	*100.5*
All specialties	54,204	52,245	*103.7*	55,882	52,319	*106.8*	56,991	56,710	*100.5*	59,066	58,474	*101.0*	226,143	219,748	*102.9*
England															
100 - General Surgery	975,446	982,858	*99.2*	984,240	975,833	*100.9*	969,268	958,597	*101.1*	941,673	953,348	*98.8*	3,870,627	3,870,636	*100.0*
170 - Cardiothoracic Surgery	54,840	55,130	*99.5*	58,321	57,447	*101.5*	59,816	61,216	*97.7*	61,577	63,224	*97.4*	234,554	237,017	*99.0*
320 - Cardiology	96,067	95,185	*100.9*	103,352	101,947	*101.4*	113,816	113,065	*100.7*	120,226	121,212	*99.2*	433,461	431,409	*100.0*
All specialties	7,637,320	7,755,438	*98.5*	7,855,123	7,827,601	*100.4*	8,018,442	7,989,062	*100.4*	7,862,331	8,066,064	*97.5*	31,373,216	31,638,165	*99.2*

Table s7.1 Excess mortality and ranking for UBHT relative to the other 11 centres in England by procedure group, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Procedure Group	Other 11 centres†			UBHT									
	Valid n	Died	%	Valid n	Died	%	Predicted Deaths	Excess deaths	(95%interval)	Prob excess >0	# of centres	Rank (95% interval)	Prob Worst
Age group under 1 year													
1: Fallot	281	18	6%	3	0	0%	0.2	-0.2	(-1 - 0)	0	12	9 (1 - 12)	0.21
2: Interatrial TGA	98	11	11%	15	2	13%	1.6	0.4	(-3 - 2)	0.53	12	6 (1 - 11)	0.02
3: Other TGA	573	60	10%	13	10	77%	1.5	8.5	(6 - 10)	1	12	12 (11 - 12)	0.96
4: TAPVD	166	23	14%	14	5	36%	2.0	3.0	(0 - 5)	0.94	11	10 (6 - 11)	0.39
5: AVSD	402	48	12%	23	11	48%	3.0	8.0	(3 - 11)	1	12	12 (10 - 12)	0.85
6: Closure of ASD	149	11	7%	10	5	50%	0.7	4.3	(2 - 5)	1	11	11 (9 - 11)	0.81
7: Closure of VSD	811	45	6%	47	0	0%	2.7	-2.7	(-7 - 0)	0	12	1 (1 - 8)	0
8: Truncus	97	31	32%	4	3	75%	1.3	1.7	(0 - 3)	0.87	12	11 (4 - 12)	0.21
9: Fontan type	118	20	17%	4	2	50%	0.7	1.3	(0 - 2)	0.85	11	10 (4 - 11)	0.42
10: Aortic/pul val	250	25	10%	4	2	50%	0.4	1.6	(0 - 2)	0.93	12	12 (7 - 12)	0.75
11: Mitral valve	51	12	24%	3	2	67%	0.7	1.3	(0 - 2)	0.84	12	10 (5 - 12)	0.20
12: Closed shunts	598	58	10%	38	3	8%	3.8	-0.8	(-7 - 3)	0.35	12	6 (1 - 11)	0.01
13: Simple coarct	426	17	4%	64	2	3%	2.6	-0.6	(-5 - 2)	0.32	12	4 (1 - 10)	0
Groups 1-13 Total	4020	379	12%	242	47	19%	21.2	25.8	(14 - 35)	1			
Age group 1 to 15 years													
1: Fallot	557	27	5%	44	5	11%	2.2	2.8	(-2 - 5)	0.89	12	11 (6 - 12)	0.13
2: Interatrial TGA	43	3	7%	3	1	33%	0.2	0.8	(0 - 1)	0.81	10	10 (3 - 10)	0.37
3: Other TGA	47	3	6%	6	1	17%	0.4	0.6	(-1 - 1)	0.68	8	6 (2 - 8)	0.09
4: TAPVD	32	1	3%	0	0	NA	NA	NA		NA	NA	NA	NA
5: AVSD	367	14	4%	11	1	9%	0.5	0.5	(-1 - 1)	0.64	12	9 (3 - 12)	0.13
6: Closure of ASD	1015	3	0%	80	0	0%	0.2	-0.2	(-2 - 0)	0	12	5 (1 - 11)	0.01
7: Closure of VSD	465	20	4%	46	1	2%	2	-1	(-5 - 1)	0.17	12	3 (1 - 11)	0.01
8: Truncus	6	1	17%	1	0	0%	0.2	-0.2	(-1 - 0)	0	6	3 (1 - 6)	0.13
9: Fontan type	525	51	10%	34	3	9%	3.5	-0.5	(-7 - 3)	0.41	12	7 (2 - 11)	0
10: Aortic/pul val	645	18	3%	46	3	7%	1.4	1.6	(-2 - 3)	0.83	12	11 (4 - 12)	0.18
11: Mitral valve	180	13	7%	20	1	5%	1.4	-0.4	(-4 - 1)	0.31	12	8 (1 - 11)	0.01
12: Closed shunts	292	18	6%	27	4	15%	1.8	2.2	(-2 - 4)	0.86	12	11 (4 - 12)	0.11
13: Simple coarct	159	0	0%	28	0	0%	0	0	(0 - 0)	0	12	6.5 (1 - 10)	0
Groups 1-13 Total	4333	172	4%	346	20	6%	13.8	6.2	(-4 - 15)	0.9			
All ages (0 – 15 years)													
1: Fallot	838	45	5%	47	5	11%	2.4	2.6	(-2 - 5)	0.88			
2: Interatrial TGA	141	14	10%	18	3	17%	1.8	1.2	(-2 - 3)	0.70			
3: Other TGA	620	63	10%	19	11	58%	1.9	9.1	(6 - 11)	1			
4: TAPVD	198	24	12%	14	5	36%	2.0	3.0	(0 - 5)	0.94			
5: AVSD	769	62	8%	34	12	35%	3.5	8.5	(4 - 12)	1			
6: Closure of ASD	1164	14	1%	90	5	6%	0.9	4.1	(2 - 5)	1			
7: Closure of VSD	1276	65	5%	93	1	1%	4.7	-3.7	(-10 - 0)	0.02			
8: Truncus	103	32	31%	5	3	60%	1.5	1.5	(-1 - 3)	0.82			
9: Fontan type	643	71	11%	38	5	13%	4.2	0.8	(-5 - 5)	0.61			
10: Aortic/pul val	895	43	5%	50	5	10%	1.8	3.2	(0 - 5)	0.95			
11: Mitral valve	231	25	11%	23	3	13%	2.1	0.9	(-3 - 3)	0.65			
12: Closed shunts	890	76	9%	65	7	11%	5.6	1.4	(-5 - 6)	0.68			
13: Simple coarct	585	17	3%	92	2	2%	2.6	-0.6	(-6 - 2)	0.32			
Groups 1-13 Total	8353	551	7%	588	67	11%	35.0	32.0	(17 - 45)	1			

NA indicates that no operations were carried out for that centre, procedure and age group

† Totals for 'Valid n' and 'Died' for the 11 specialist centres do not correspond exactly to the totals for 'elsewhere' in Section 2 which include a small number of admissions to other centres

Table s7.2 Excess mortality and ranking for UBHT relative to the other 11 centres in England for open and closed procedures, Hospital Episode Statistics 1 April 1991 to 31 March 1995

Procedure Group	Other 11 centres†			UBHT								
	Valid n	Died	%	Valid n	Died	%	Predicted Deaths	Excess deaths (95%interval)	Prob excess >0	# of centres	Rank (95% interval)	Prob Worst
Age group under 1 year												
88: Open	3176	356	11%	143	41	29%	16.9	24.1 (12 - 34)	1.00	12	12 (11 - 12)	0.97
99: Closed	1784	78	4%	153	7	5%	6.9	0.1 (-8 - 5)	0.51	12	7 (2 - 11)	0.02
Open+Closed	4960	434	9%	296	48	16%	23.8	24.2 (9 - 36)	1.00			
Age group 1 to 15 years												
88: Open	4211	194	5%	314	21	7%	15	6 (-14 - 17)	0.80	12	11 (6 - 11)	0.01
99: Closed	893	15	2%	89	0	0%	1.7	-1.7 (-7 - 0)	0.00	12	3.5 (1 - 9)	0.00
Open+Closed	5104	209	4%	403	21	5%	16.7	4.3 (-16 - 16)	0.73			
All ages (0 – 15 years)												
88: Open	7387	550	7%	457	62	14%	31.9	30.1 (7 - 46)	0.99			
99: Closed	2677	93	3%	242	7	3%	8.6	-1.6 (-11 - 5)	0.34			
Open+Closed	10064	643	6%	669	69	10%	40.5	28.5 (4 - 46)	0.98			

† Totals for 'Valid n' and 'Died' for the 11 specialist centres do not correspond exactly to the totals for 'elsewhere' in Section 2 which include a small number of admissions to other centres

Table s8.1a Ratio of observed / predicted deaths for each centre relative to the remaining centres by procedure and age group (<90 days; 90 days – 1 year; >1 year), Hospital Episode Statistics 1 April 1991 to 31 March 1995

Procedure Group	1	2	3	4	5	6	7	8	9	10	11	12	13	1-13	Open	Closed	Open & Closed
Centre	**Age Group < 90 days**																
UBHT	NA	7.5	7.8	3.0	4.9	0.0	0.0	2.8	NA	6.4	NA	0.8	0.9	2.6	3.7	1.1	2.5
2	0.0	0.0	0.8	0.6	1.4	2.7	0.4	1.3	0.0	1.6	NA	0.0	2.6	0.9	0.8	1.3	0.9
3	0.0	0.0	0.5	0.4	0.2	0.0	0.4	0.2	0.0	0.6	NA	0.5	1.4	0.4	0.4	0.8	0.5
4	2.0	0.0	1.0	1.0	4.5	2.1	2.2	2.8	NA	2.2	2.3	0.4	1.0	1.4	1.4	0.7	1.2
5	NA	NA	0.3	1.8	1.8	NA	1.1	0.4	4.2	0.8	0.0	1.6	0.0	0.9	1.1	1.4	1.1
6	6.7	1.5	1.2	0.6	0.8	0.0	0.8	0.3	4.2	0.0	0.0	2.0	1.4	1.1	0.8	1.9	1.0
7	0.4	0.0	0.9	0.0	1.4	NA	0.5	1.8	0.9	0.6	NA	1.2	0.0	0.8	0.7	0.6	0.7
8	0.0	0.0	0.5	1.3	0.0	0.0	1.6	1.2	0.0	1.4	1.4	0.3	0.7	0.7	0.7	1.0	0.7
9	NA	NA	0.4	1.3	1.7	0.0	0.5	1.8	NA	1.2	NA	1.3	0.0	1.0	1.0	0.9	1.0
10	3.2	1.2	2.9	NA	1.7	1.1	2.2	0.0	0.0	0.0	NA	2.4	1.9	1.5	1.0	1.6	1.1
11	0.6	NA	0.1	0.9	0.0	1.7	0.7	1.0	1.1	0.7	0.9	1.2	1.1	0.6	0.6	0.8	0.6
12	6.7	1.7	0.7	0.0	0.7	0.0	1.9	1.3	0.0	2.1	NA	0.4	0.0	0.8	0.8	0.1	0.7
Centre	**Age Group 90 days – 1 year**																
UBHT	0.0	1.2	2.3	0.0	4.5	16.8	0.0	2.1	3.8	11.1	4.4	1.0	0.0	2.8	2.9	1.0	2.5
2	0.0	5.0	NA	0.0	2.1	0.0	2.0	4.3	0.0	4.3	0.0	0.5	0.0	1.3	1.2	0.6	1.1
3	0.0	0.0	2.1	0.0	0.9	0.0	0.0	0.0	NA	0.0	0.0	0.8	0.0	0.7	0.7	1.0	0.7
4	0.0	NA	NA	0.0	0.0	0.0	4.3	5.2	NA	0.0	NA	0.0	7.5	1.9	1.1	0.0	0.9
5	2.9	0.0	0.0	NA	0.4	NA	2.9	4.4	0.0	0.0	0.0	0.0	NA	0.8	0.8	1.7	0.9
6	2.9	0.0	0.0	0.0	0.5	0.6	0.4	0.0	1.9	0.0	1.0	0.4	0.0	0.7	0.7	1.0	0.7
7	0.8	0.0	0.0	0.0	0.3	0.0	1.0	0.0	1.7	0.0	0.0	6.7	0.0	0.5	0.6	0.0	0.6
8	1.0	3.4	0.5	Inf	0.6	2.1	0.4	0.0	0.9	0.0	3.4	1.5	6.7	1.1	1.0	1.2	1.0
9	0.7	0.0	2.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.7	0.9	0.0	0.8
10	2.6	0.0	0.0	NA	1.3	0.0	1.9	0.0	2.3	0.0	0.0	3.4	0.0	1.3	1.3	2.5	1.4
11	0.5	0.0	1.7	0.0	0.3	0.0	0.0	0.6	0.3	1.3	0.9	2.1	0.0	0.5	0.7	1.3	0.7
12	0.5	0.0	0.0	0.0	1.0	0.0	1.7	0.0	0.0	2.9	0.0	0.3	0.0	0.5	0.5	1.3	0.7
Centre	**Age Group 1-15 years**																
UBHT	2.3	4.7	2.4	NA	2.2	0.0	0.5	0.0	0.9	2.2	0.7	2.3	0.0	1.5	1.4	0.0	1.2
2	0.9	0.0	NA	0.0	1.2	0.0	0.0	NA	0.4	0.9	0.0	0.6	NA	0.6	0.4	0.0	0.4
3	0.7	0.0	8.4	0.0	3.4	0.0	1.0	NA	0.0	1.5	1.0	1.6	0.0	1.1	1.0	0.0	0.9
4	0.6	NA	NA	0.0	3.4	9.2	0.0	NA	1.5	0.0	0.0	1.0	0.0	0.9	0.7	1.7	0.8
5	0.0	NA	0.0	0.0	0.5	0.0	1.1	NA	0.2	1.0	3.2	1.5	0.0	0.6	0.7	0.8	0.7
6	0.8	0.0	0.0	0.0	0.8	1.9	1.1	0.0	0.8	0.3	0.0	0.0	0.0	0.7	0.7	0.0	0.7
7	0.0	0.0	2.9	0.0	1.3	0.0	0.9	0.0	0.0	1.2	0.6	0.0	0.0	0.6	0.5	0.8	0.5
8	0.7	3.5	0.8	0.0	0.3	0.0	0.6	0.0	1.1	0.7	4.5	1.1	0.0	1.0	1.0	0.0	0.9
9	1.1	0.0	NA	Inf	0.4	0.0	1.7	0.0	2.1	0.0	0.0	1.3	0.0	1.1	1.2	2.5	1.3
10	4.3	0.0	NA	NA	0.0	0.0	2.5	96.2	3.1	3.4	0.0	3.7	0.0	2.9	2.7	10.0	3.0
11	0.8	0.0	0.0	0.0	0.0	3.6	1.3	NA	0.5	0.3	1.5	0.5	0.0	0.6	0.5	1.9	0.6
12	0.2	4.5	0.0	0.0	4.1	0.0	1.2	NA	1.4	1.1	0.4	0.0	0.0	0.9	1.1	0.0	1.0
Centre	**All Ages (0 -15 years)**																
UBHT	2.1	2.5	5.5	2.8	4.2	6.3	0.3	2.2	1.3	3.2	1.6	1.3	0.8	2.1	2.2	0.8	1.9
2	0.5	0.7	0.8	0.6	1.7	1.6	0.6	1.7	0.3	1.5	0.0	0.3	2.2	0.9	0.8	0.9	0.8
3	0.6	0.0	0.7	0.4	0.7	0.0	0.5	0.2	0.0	1.1	0.6	0.8	1.2	0.6	0.6	0.7	0.6
4	0.9	0.0	1.0	0.9	1.4	2.4	1.6	4.0	1.5	1.5	1.7	0.5	1.7	1.3	1.1	0.7	1.0
5	0.3	0.0	0.3	1.8	0.9	0.0	1.3	0.8	0.3	0.8	1.4	1.5	0.0	0.8	0.9	1.3	0.9
6	1.2	1.3	1.1	0.5	0.6	0.7	0.8	0.2	1.0	0.1	0.3	1.3	1.3	0.8	0.7	1.5	0.8
7	0.4	0.0	0.9	0.0	0.8	0.0	0.7	1.3	0.5	0.8	0.4	1.2	0.0	0.7	0.6	0.6	0.6
8	0.7	1.4	0.5	1.5	0.4	0.9	0.9	1.1	1.0	1.0	3.0	0.8	1.0	0.9	0.8	0.8	0.8
9	0.9	0.0	0.6	1.7	1.0	0.0	0.7	0.8	1.8	0.7	0.9	1.1	0.0	1.0	1.1	1.0	1.1
10	3.8	1.0	1.5	NA	1.3	0.5	2.2	1.5	2.7	1.6	0.0	2.9	1.6	2.0	1.7	3.1	1.8
11	0.6	0.0	0.2	0.8	0.1	1.1	0.7	0.9	0.6	0.6	1.1	1.1	1.0	0.6	0.6	0.9	0.6
12	0.5	2.2	0.7	0.0	1.1	0.0	1.7	1.0	1.2	1.5	0.2	0.3	0.0	0.8	0.8	0.4	0.8

Indicates that we are at least 95% certain that the ratio of observed/predicted deaths > 1

NA Indicates that no operations were carried out for that centre, procedure and age group

Inf Indicates that the ratio of observed/predicted deaths equals infinity, since the predicted deaths = 0

Centre codes

2 Glenfield Hospital Leicester, 3 Killingbeck Hospital, Leeds, 4 The John Radcliffe, 5 Guys Hospital, 6 Royal Liverpool Children's Hospital, 7 Southampton General Hospital, 8 Great Ormond Street Hospital, 9 Freeman Hospital, Newcastle, 10 Harefield Hospital, 11 Birmingham Children's Hospital, 12 Brompton Hospital.

Table s8.1b Ratio of observed / predicted deaths for each centre relative to the remaining centres by procedure and age group (0 – 1 year; >1 year; all ages), Hospital Episode Statistics 1 April 1991 to 31 March 1995

Procedure Group	1	2	3	4	5	6	7	8	9	10	11	12	13	1-13	Open	Closed	Open & Closed
Centre	**Age Group 0 – 1 year**																
UBHT	0.0	1.2	6.7	2.6	3.7	6.6	0.0	2.3	2.9	4.6	2.8	0.8	0.8	2.2	2.4	1.0	2.0
2	0.0	0.9	0.9	0.6	1.8	1.7	0.9	1.8	0.0	1.8	0.0	0.2	2.2	1.0	1.0	1.1	1.0
3	0.0	0.0	0.7	0.4	0.5	0.0	0.2	0.2	0.0	0.7	0.0	0.5	1.2	0.5	0.5	0.9	0.6
4	2.2	0.0	1.1	0.9	0.8	1.8	2.1	3.1	NA	2.3	4.5	0.4	1.7	1.5	1.4	0.5	1.2
5	2.1	0.0	0.3	2.3	1.3	NA	1.9	0.8	0.9	0.7	0.0	1.5	0.0	1.0	1.1	1.5	1.2
6	3.1	1.9	1.3	0.5	0.5	0.4	0.5	0.3	1.7	0.0	0.6	1.5	1.3	0.9	0.8	1.7	0.9
7	0.8	0.0	0.8	0.0	0.8	0.0	0.8	1.4	1.4	0.4	0.0	1.7	0.0	0.7	0.7	0.5	0.7
8	0.6	0.8	0.5	1.7	0.3	1.0	1.0	1.2	0.6	1.2	2.6	0.7	1.0	0.8	0.8	1.1	0.8
9	0.5	0.0	0.6	1.2	1.2	0.0	0.3	0.8	0.0	1.1	2.0	1.0	0.0	0.8	1.0	0.7	0.9
10	2.6	1.5	1.5	NA	1.4	0.5	1.5	0.0	1.4	0.0	0.0	2.6	1.6	1.4	1.1	1.9	1.1
11	0.6	0.0	0.2	0.9	0.1	0.8	0.8	0.9	0.7	0.8	1.2	1.3	1.0	0.7	0.7	0.9	0.7
12	0.8	1.0	0.8	0.0	0.9	0.0	2.4	0.9	0.0	1.7	0.0	0.4	0.0	0.7	0.8	0.4	0.7
Centre	**Age Group 1-15 years**																
UBHT	2.3	4.7	2.4	NA	2.2	0.0	0.5	0.0	0.9	2.2	0.7	2.3	0.0	1.5	1.4	0.0	1.2
2	0.9	0.0	NA	0.0	1.2	0.0	0.0	NA	0.4	0.9	0.0	0.6	NA	0.6	0.4	0.0	0.4
3	0.7	0.0	8.4	0.0	3.4	0.0	1.0	NA	0.0	1.5	1.0	1.6	0.0	1.1	1.0	0.0	0.9
4	0.6	NA	NA	0.0	3.4	9.2	0.0	NA	1.5	0.0	0.0	1.0	0.0	0.9	0.7	1.7	0.8
5	0.0	NA	0.0	0.0	0.5	0.0	1.1	NA	0.2	1.0	3.2	1.5	0.0	0.6	0.7	0.8	0.7
6	0.8	0.0	0.0	0.0	0.8	1.9	1.1	0.0	0.8	0.3	0.0	0.0	0.0	0.7	0.7	0.0	0.7
7	0.0	0.0	2.9	0.0	1.3	0.0	0.9	0.0	0.0	1.2	0.6	0.0	0.0	0.6	0.5	0.8	0.5
8	0.7	3.5	0.8	0.0	0.3	0.0	0.6	0.0	1.1	0.7	4.5	1.1	0.0	1.0	1.0	0.0	0.9
9	1.1	0.0	NA	Inf	0.4	0.0	1.7	0.0	2.1	0.0	0.0	1.3	0.0	1.1	1.2	2.5	1.3
10	4.3	0.0	NA	NA	0.0	0.0	2.5	96.2	3.1	3.4	0.0	3.7	0.0	2.9	2.7	10.0	3.0
11	0.8	0.0	0.0	0.0	0.0	3.6	1.3	NA	0.5	0.3	1.5	0.5	0.0	0.6	0.5	1.9	0.6
12	0.2	4.5	0.0	0.0	4.1	0.0	1.2	NA	1.4	1.1	0.4	0.0	0.0	0.9	1.1	0.0	1.0
Centre	**All Ages (0 - 15 years)**																
UBHT	2.1	1.6	5.8	2.6	3.5	5.0	0.2	2.1	1.2	2.8	1.4	1.3	0.8	1.9	1.9	0.8	1.7
2	0.5	0.7	0.9	0.6	1.7	1.5	0.7	1.8	0.4	1.4	0.0	0.3	2.2	0.9	0.8	0.9	0.8
3	0.6	0.0	0.7	0.4	0.8	0.0	0.5	0.2	0.0	1.2	0.5	0.8	1.2	0.6	0.7	0.7	0.7
4	1.0	0.0	1.1	0.9	1.2	2.5	1.3	3.1	1.5	1.7	2.7	0.5	1.6	1.3	1.2	0.7	1.1
5	0.3	0.0	0.3	2.2	1.0	0.0	1.6	0.8	0.3	0.8	1.7	1.5	0.0	0.8	1.0	1.3	1.0
6	1.2	1.6	1.2	0.5	0.6	0.6	0.6	0.3	1.0	0.1	0.3	1.3	1.3	0.8	0.7	1.5	0.8
7	0.6	0.0	0.9	0.0	0.8	0.0	0.8	1.3	0.5	0.7	0.4	1.2	0.0	0.7	0.7	0.6	0.6
8	0.6	1.3	0.5	1.6	0.3	0.8	0.9	1.2	1.0	1.0	3.4	0.8	1.0	0.9	0.9	0.8	0.9
9	0.8	0.0	0.6	1.6	0.9	0.0	0.7	0.7	1.8	0.8	0.8	1.1	0.0	0.9	1.1	1.1	1.1
10	3.7	1.2	1.5	NA	1.3	0.5	1.8	1.4	2.7	1.5	0.0	2.9	1.6	1.9	1.6	3.2	1.8
11	0.7	0.0	0.2	0.9	0.1	1.1	0.9	0.9	0.6	0.6	1.3	1.1	1.0	0.6	0.7	1.0	0.7
12	0.4	2.1	0.7	0.0	1.1	0.0	2.0	0.9	1.2	1.3	0.2	0.3	0.0	0.8	0.9	0.3	0.8

Indicates that we are at least 95% certain that the ratio of observed/predicted deaths > 1

NA Indicates that no operations were carried out for that centre, procedure and age group

Inf Indicates that the ratio of observed/predicted deaths equals infinity, since the predicted deaths = 0

Centre codes

2 Glenfield Hospital Leicester, 3 Killingbeck Hospital, Leeds, 4 The John Radcliffe, 5 Guys Hospital, 6 Royal Liverpool Children's Hospital, 7 Southampton General Hospital, 8 Great Ormond Street Hospital, 9 Freeman Hospital, Newcastle, 10 Harefield Hospital, 11 Birmingham Children's Hospital, 12 Brompton Hospital.

Table 8.2a Observed and predicted deaths and ratio (observed / predicted) for each centre relative to the remaining centres, by open/closed group and age group (0-90 days; 90 days – 1 year; 0-15 years; all ages), Hospital Episode Statistics 1 April 1991 to 31 March 1995

	Open procedures			Closed procedures			Open and closed procedures		
	Obs	Predicted (95% interval)	Obs/Predicted (95% interval)	Obs	Predicted (95% interval)	Obs/Predicted (95% interval)	Obs	Predicted (95% interval)	Obs/Predicted (95% interval)
Centre	**Age Group < 90 days**								
UBHT	19	5.1 (1- 11)	3.7 (1.7- 19.0)	5	4.6 (0- 11)	1.1 (0.5- Inf)	24	9.7 (3- 18)	2.5 (1.3- 8.0)
2	16	20.2 (4- 47)	0.8 (0.3- 4.0)	6	4.6 (0- 12)	1.3 (0.5- Inf)	22	24.8 (8- 52)	0.9 (0.4- 2.8)
3	17	41.9 (12- 89)	0.4 (0.2- 1.4)	7	8.5 (1- 21)	0.8 (0.3- 7.0)	24	50.4 (19- 99)	0.5 (0.2- 1.3)
4	18	13.3 (2- 31)	1.4 (0.6- 9.0)	3	4.2 (0- 11)	0.7 (0.3- Inf)	21	17.5 (5- 37)	1.2 (0.6- 4.2)
5	20	18.9 (4- 45)	1.1 (0.4- 5.0)	3	2.1 (0- 6)	1.4 (0.5- Inf)	23	21.0 (6- 47)	1.1 (0.5- 3.8)
6	29	34.5 (8- 79)	0.8 (0.4- 3.6)	15	7.9 (1- 19)	1.9 (0.8- 15.0)	44	42.4 (14- 88)	1.0 (0.5- 3.1)
7	18	25.2 (6- 58)	0.7 (0.3- 3.0)	2	3.2 (0- 9)	0.6 (0.2- Inf)	20	28.4 (8- 62)	0.7 (0.3- 2.5)
8	34	51.2 (13- 119)	0.7 (0.3- 2.6)	8	7.7 (1- 20)	1.0 (0.4- 8.0)	42	58.9 (19- 128)	0.7 (0.3- 2.2)
9	18	17.4 (3- 42)	1.0 (0.4- 6.0)	4	4.6 (0- 12)	0.9 (0.3- Inf)	22	22.0 (7- 47)	1.0 (0.5- 3.1)
10	14	14.0 (3- 32)	1.0 (0.4- 4.7)	3	1.9 (0- 6)	1.6 (0.5- Inf)	17	15.9 (4- 35)	1.1 (0.5- 4.2)
11	46	78.0 (21- 176)	0.6 (0.3- 2.2)	9	11.7 (2- 29)	0.8 (0.3- 4.5)	55	89.7 (30- 188)	0.6 (0.3- 1.8)
12	24	28.8 (7- 66)	0.8 (0.4- 3.4)	1	8.8 (2- 19)	0.1 (0.1- 0.5)	25	37.6 (14- 76)	0.7 (0.3- 1.8)
Centre	**Age Group 90 days – 1 year**								
UBHT	22	7.6 (2- 15)	2.9 (1.5- 11.0)	2	2.1 (0- 6)	1.0 (0.3- Inf)	24	9.7 (3- 18)	2.5 (1.3- 8.0)
2	9	7.2 (1- 18)	1.2 (0.5- 9.0)	1	1.6 (0- 5)	0.6 (0.2- Inf)	10	8.8 (2- 20)	1.1 (0.5- 5.0)
3	7	10.6 (2- 25)	0.7 (0.3- 3.5)	2	2.0 (0- 6)	1.0 (0.3- Inf)	9	12.6 (4- 27)	0.7 (0.3- 2.2)
4	5	4.4 (0- 11)	1.1 (0.5- Inf)	0	1.4 (0- 5)	0	5	5.8 (1- 13)	0.9 (0.4- 5.0)
5	5	5.9 (1- 15)	0.8 (0.3- 5.0)	1	0.6 (0- 2)	1.7 (0.5- Inf)	6	6.5 (1- 16)	0.9 (0.4- 6.0)
6	13	19.8 (5- 44)	0.7 (0.3- 2.6)	2	2.1 (0- 7)	1.0 (0.3- Inf)	15	21.9 (7- 47)	0.7 (0.3- 2.1)
7	6	9.9 (2- 23)	0.6 (0.3- 3.0)	0	0.7 (0- 3)	0	6	10.6 (2- 24)	0.6 (0.2- 3.0)
8	19	19.7 (5- 47)	1.0 (0.4- 3.8)	3	2.5 (0- 8)	1.2 (0.4- Inf)	22	22.2 (7- 50)	1.0 (0.4- 3.1)
9	8	8.9 (1- 21)	0.9 (0.4- 8.0)	0	1.0 (0- 4)	0	8	9.9 (2- 22)	0.8 (0.4- 4.0)
10	11	8.5 (2- 20)	1.3 (0.6- 5.5)	2	0.8 (0- 3)	2.5 (0.7- Inf)	13	9.3 (2- 21)	1.4 (0.6- 6.5)
11	12	18.4 (5- 42)	0.7 (0.3- 2.4)	2	1.6 (0- 5)	1.3 (0.4- Inf)	14	20.0 (6- 44)	0.7 (0.3- 2.3)
12	7	13.7 (3- 31)	0.5 (0.2- 2.3)	4	3.1 (0- 9)	1.3 (0.4- Inf)	11	16.8 (6- 34)	0.7 (0.3- 1.8)
Centre	**Age Group 1-15 years**								
UBHT	21	15.0 (4- 35)	1.4 (0.6- 5.2)	0	1.8 (0- 7)	0	21	16.8 (5- 38)	1.2 (0.6- 4.2)
2	5	11.2 (2- 27)	0.4 (0.2- 2.5)	0	1.3 (0- 7)	0	5	12.5 (3- 30)	0.4 (0.2- 1.7)
3	20	20.5 (5- 50)	1.0 (0.4- 4.0)	0	2.5 (0- 11)	0	20	23.0 (6- 54)	0.9 (0.4- 3.3)
4	6	8.6 (1- 22)	0.7 (0.3- 6.0)	2	1.2 (0- 7)	1.7 (0.3- Inf)	8	9.8 (2- 25)	0.8 (0.3- 4.0)
5	10	14.1 (3- 35)	0.7 (0.3- 3.3)	1	1.2 (0- 7)	0.8 (0.1- Inf)	11	15.3 (4- 38)	0.7 (0.3- 2.8)
6	27	38.3 (10- 92)	0.7 (0.3- 2.7)	0	1.7 (0- 9)	0	27	40.0 (12- 94)	0.7 (0.3- 2.2)
7	6	13.0 (3- 32)	0.5 (0.2- 2.0)	1	1.3 (0- 7)	0.8 (0.1- Inf)	7	14.3 (4- 35)	0.5 (0.2- 1.8)
8	32	32.3 (8- 79)	1.0 (0.4- 4.0)	0	3.0 (0- 14)	0	32	35.3 (10- 84)	0.9 (0.4- 3.2)
9	14	11.4 (2- 29)	1.2 (0.5- 7.0)	3	1.2 (0- 7)	2.5 (0.4- Inf)	17	12.6 (3- 31)	1.3 (0.5- 5.7)
10	35	12.8 (4- 27)	2.7 (1.3- 8.8)	5	0.5 (0- 3)	10.0 (1.7- Inf)	40	13.3 (4- 27)	3.0 (1.5- 10.0)
11	14	27.9 (7- 66)	0.5 (0.2- 2.0)	3	1.6 (0- 9)	1.9 (0.3- Inf)	17	29.5 (9- 69)	0.6 (0.2- 1.9)
12	25	23.7 (6- 57)	1.1 (0.4- 4.2)	0	2.3 (0- 11)	0	25	26.0 (7- 61)	1.0 (0.4- 3.6)
Centre	**All Ages (0-15 years)**								
UBHT	62	27.7 (13- 49)	2.2 (1.3- 4.8)	7	8.5 (2- 18)	0.8 (0.4- 3.5)	69	36.2 (20- 59)	1.9 (1.2- 3.4)
2	30	38.6 (17- 70)	0.8 (0.4- 1.8)	7	7.5 (2- 18)	0.9 (0.4- 3.5)	37	46.1 (23- 78)	0.8 (0.5- 1.6)
3	44	73.0 (35- 129)	0.6 (0.3- 1.3)	9	13.0 (4- 29)	0.7 (0.3- 2.2)	53	86.0 (46- 144)	0.6 (0.4- 1.2)
4	29	26.3 (11- 49)	1.1 (0.6- 2.6)	5	6.8 (1- 16)	0.7 (0.3- 5.0)	34	33.1 (16- 57)	1.0 (0.6- 2.1)
5	35	38.9 (17- 72)	0.9 (0.5- 2.1)	5	3.9 (0- 11)	1.3 (0.5- Inf)	40	42.8 (20- 76)	0.9 (0.5- 2.0)
6	69	92.6 (46- 163)	0.7 (0.4- 1.5)	17	11.7 (4- 25)	1.5 (0.7- 4.2)	86	104.3 (57- 176)	0.8 (0.5- 1.5)
7	30	48.1 (22- 87)	0.6 (0.3- 1.4)	3	5.2 (1- 13)	0.6 (0.2- 3.0)	33	53.3 (26- 92)	0.6 (0.4- 1.3)
8	85	103.2 (49- 186)	0.8 (0.5- 1.7)	11	13.2 (4- 31)	0.8 (0.4- 2.8)	96	116.4 (61- 200)	0.8 (0.5- 1.6)
9	40	37.7 (17- 69)	1.1 (0.6- 2.4)	7	6.8 (1- 16)	1.0 (0.4- 7.0)	47	44.5 (22- 76)	1.1 (0.6- 2.1)
10	60	35.3 (17- 61)	1.7 (1.0- 3.5)	10	3.2 (0- 8)	3.1 (1.2- Inf)	70	38.5 (20- 64)	1.8 (1.1- 3.5)
11	72	124.3 (57- 229)	0.6 (0.3- 1.3)	14	14.9 (4- 34)	0.9 (0.4- 3.5)	86	139.2 (70- 246)	0.6 (0.3- 1.2)
12	56	66.2 (32- 116)	0.8 (0.5- 1.8)	5	14.2 (5- 29)	0.4 (0.2- 1.0)	61	80.4 (45- 132)	0.8 (0.5- 1.4)

Inf Indicates that the upper end of the 95% interval for the ratio of observed/predicted deaths equals infinity, since the lower end of the 95% interval for predicted deaths equals zero.

Centre codes

2 Glenfield Hospital Leicester, 3 Killingbeck Hospital, Leeds, 4 The John Radcliffe, 5 Guys Hospital, 6 Royal Liverpool Children's Hospital, 7 Southampton General Hospital, 8 Great Ormond Street Hospital, 9 Freeman Hospital, Newcastle, 10 Harefield Hospital, 11 Birmingham Children's Hospital, 12 Brompton Hospital.

Table 8.2b Observed and predicted deaths and ratio (observed / predicted) for each centre relative to the remaining centres, by open/closed group and age group (0-1 year; 0-15 years; all ages), Hospital Episode Statistics 1 April 1991 to 31 March 1995

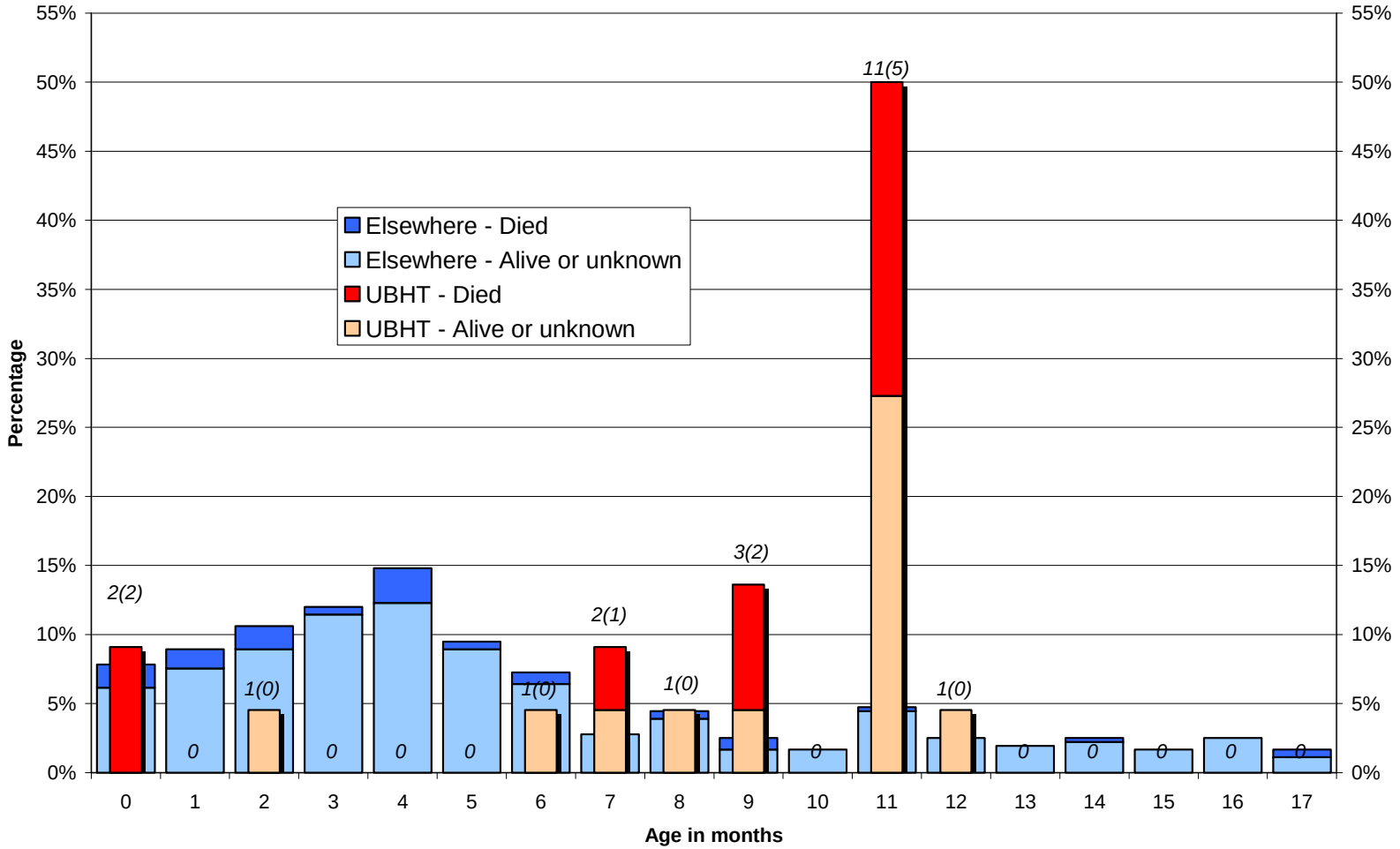
	Open procedures			Closed procedures			Open and closed procedures		
	Obs	Predicted (95% interval)	Obs/Predicted (95% interval)	Obs	Predicted (95% interval)	Obs/Predicted (95% interval)	Obs	Predicted (95% interval)	Obs/Predicted (95% interval)
Centre	**Age Group 0-1 year**								
UBHT	41	16.8 (7- 29)	2.4 (1.4- 5.9)	7	6.8 (1- 15)	1.0 (0.5- 7.0)	48	23.6 (12- 38)	2.0 (1.3- 4.0)
2	25	25.3 (8- 53)	1.0 (0.5- 3.1)	7	6.2 (1- 15)	1.1 (0.5- 7.0)	32	31.5 (13- 60)	1.0 (0.5- 2.5)
3	24	45.4 (18- 90)	0.5 (0.3- 1.3)	9	10.3 (2- 24)	0.9 (0.4- 4.5)	33	55.7 (26- 102)	0.6 (0.3- 1.3)
4	23	15.9 (5- 32)	1.4 (0.7- 4.6)	3	5.5 (1- 13)	0.5 (0.2- 3.0)	26	21.4 (9- 40)	1.2 (0.6- 2.9)
5	25	22.0 (7- 47)	1.1 (0.5- 3.6)	4	2.6 (0- 7)	1.5 (0.6- Inf)	29	24.6 (9- 51)	1.2 (0.6- 3.2)
6	42	55.9 (20- 113)	0.8 (0.4- 2.1)	17	10.0 (3- 22)	1.7 (0.8- 5.7)	59	65.9 (29- 124)	0.9 (0.5- 2.0)
7	24	33.0 (11- 69)	0.7 (0.3- 2.2)	2	3.9 (0- 10)	0.5 (0.2- Inf)	26	36.9 (15- 73)	0.7 (0.4- 1.7)
8	53	66.7 (24- 137)	0.8 (0.4- 2.2)	11	10.2 (2- 24)	1.1 (0.5- 5.5)	64	76.9 (32- 148)	0.8 (0.4- 2.0)
9	26	26.2 (8- 55)	1.0 (0.5- 3.2)	4	5.4 (1- 13)	0.7 (0.3- 4.0)	30	31.6 (13- 61)	0.9 (0.5- 2.3)
10	25	23.6 (8- 49)	1.1 (0.5- 3.1)	5	2.6 (0- 7)	1.9 (0.7- Inf)	30	26.2 (10- 52)	1.1 (0.6- 3.0)
11	58	81.1 (29- 167)	0.7 (0.3- 2.0)	11	12.7 (3- 28)	0.9 (0.4- 3.7)	69	93.8 (41- 181)	0.7 (0.4- 1.7)
12	31	41.2 (15- 84)	0.8 (0.4- 2.1)	5	12.2 (4- 25)	0.4 (0.2- 1.2)	36	53.4 (25- 97)	0.7 (0.4- 1.4)
Centre	**Age Group 1-15 years**								
UBHT	21	15.0 (4- 35)	1.4 (0.6- 5.2)	0	1.8 (0- 7)	0	21	16.8 (5- 38)	1.2 (0.6- 4.2)
2	5	11.2 (2- 27)	0.4 (0.2- 2.5)	0	1.3 (0- 7)	0	5	12.5 (3- 30)	0.4 (0.2- 1.7)
3	20	20.5 (5- 50)	1.0 (0.4- 4.0)	0	2.5 (0- 11)	0	20	23.0 (6- 54)	0.9 (0.4- 3.3)
4	6	8.6 (1- 22)	0.7 (0.3- 6.0)	2	1.2 (0- 7)	1.7 (0.3- Inf)	8	9.8 (2- 25)	0.8 (0.3- 4.0)
5	10	14.1 (3- 35)	0.7 (0.3- 3.3)	1	1.2 (0- 7)	0.8 (0.1- Inf)	11	15.3 (4- 38)	0.7 (0.3- 2.8)
6	27	38.3 (10- 92)	0.7 (0.3- 2.7)	0	1.7 (0- 9)	0	27	40.0 (12- 94)	0.7 (0.3- 2.2)
7	6	13.0 (3- 32)	0.5 (0.2- 2.0)	1	1.3 (0- 7)	0.8 (0.1- Inf)	7	14.3 (4- 35)	0.5 (0.2- 1.8)
8	32	32.3 (8- 79)	1.0 (0.4- 4.0)	0	3.0 (0- 14)	0	32	35.3 (10- 84)	0.9 (0.4- 3.2)
9	14	11.4 (2- 29)	1.2 (0.5- 7.0)	3	1.2 (0- 7)	2.5 (0.4- Inf)	17	12.6 (3- 31)	1.3 (0.5- 5.7)
10	35	12.8 (4- 27)	2.7 (1.3- 8.8)	5	0.5 (0- 3)	10.0 (1.7- Inf)	40	13.3 (4- 27)	3.0 (1.5- 10.0)
11	14	27.9 (7- 66)	0.5 (0.2- 2.0)	3	1.6 (0- 9)	1.9 (0.3- Inf)	17	29.5 (9- 69)	0.6 (0.2- 1.9)
12	25	23.7 (6- 57)	1.1 (0.4- 4.2)	0	2.3 (0- 11)	0	25	26.0 (7- 61)	1.0 (0.4- 3.6)
Centre	**All Ages (0-15 years)**								
UBHT	62	31.8 (16- 54)	1.9 (1.1- 3.9)	7	8.6 (2- 18)	0.8 (0.4- 3.5)	69	40.4 (23- 65)	1.7 (1.1- 3.0)
2	30	36.5 (16- 67)	0.8 (0.4- 1.9)	7	7.5 (1- 17)	0.9 (0.4- 7.0)	37	44.0 (22- 77)	0.8 (0.5- 1.7)
3	44	65.9 (32- 118)	0.7 (0.4- 1.4)	9	12.8 (4- 29)	0.7 (0.3- 2.2)	53	78.7 (42- 133)	0.7 (0.4- 1.3)
4	29	24.5 (10- 45)	1.2 (0.6- 2.9)	5	6.7 (1- 16)	0.7 (0.3- 5.0)	34	31.2 (15- 54)	1.1 (0.6- 2.3)
5	35	36.1 (16- 68)	1.0 (0.5- 2.2)	5	3.8 (0- 11)	1.3 (0.5- Inf)	40	39.9 (19- 72)	1.0 (0.6- 2.1)
6	69	94.2 (45- 170)	0.7 (0.4- 1.5)	17	11.7 (3- 26)	1.5 (0.7- 5.7)	86	105.9 (55- 183)	0.8 (0.5- 1.6)
7	30	46.0 (20- 84)	0.7 (0.4- 1.5)	3	5.2 (1- 14)	0.6 (0.2- 3.0)	33	51.2 (25- 91)	0.6 (0.4- 1.3)
8	85	99.0 (45- 184)	0.9 (0.5- 1.9)	11	13.2 (3- 31)	0.8 (0.4- 3.7)	96	112.2 (57- 198)	0.9 (0.5- 1.7)
9	40	37.6 (16- 71)	1.1 (0.6- 2.5)	7	6.6 (1- 16)	1.1 (0.4- 7.0)	47	44.2 (21- 78)	1.1 (0.6- 2.2)
10	60	36.4 (17- 65)	1.6 (0.9- 3.5)	10	3.1 (0- 8)	3.2 (1.2- Inf)	70	39.5 (20- 68)	1.8 (1.0- 3.5)
11	72	109.0 (51- 201)	0.7 (0.4- 1.4)	14	14.3 (4- 32)	1.0 (0.4- 3.5)	86	123.3 (64- 218)	0.7 (0.4- 1.3)
12	56	64.9 (30- 117)	0.9 (0.5- 1.9)	5	14.5 (5- 30)	0.3 (0.2- 1.0)	61	79.4 (43- 134)	0.8 (0.5- 1.4)

Inf Indicates that the upper end of the 95% interval for the ratio of observed/predicted deaths equals infinity, since the lower end of the 95% interval for predicted deaths equals zero.

Centre codes

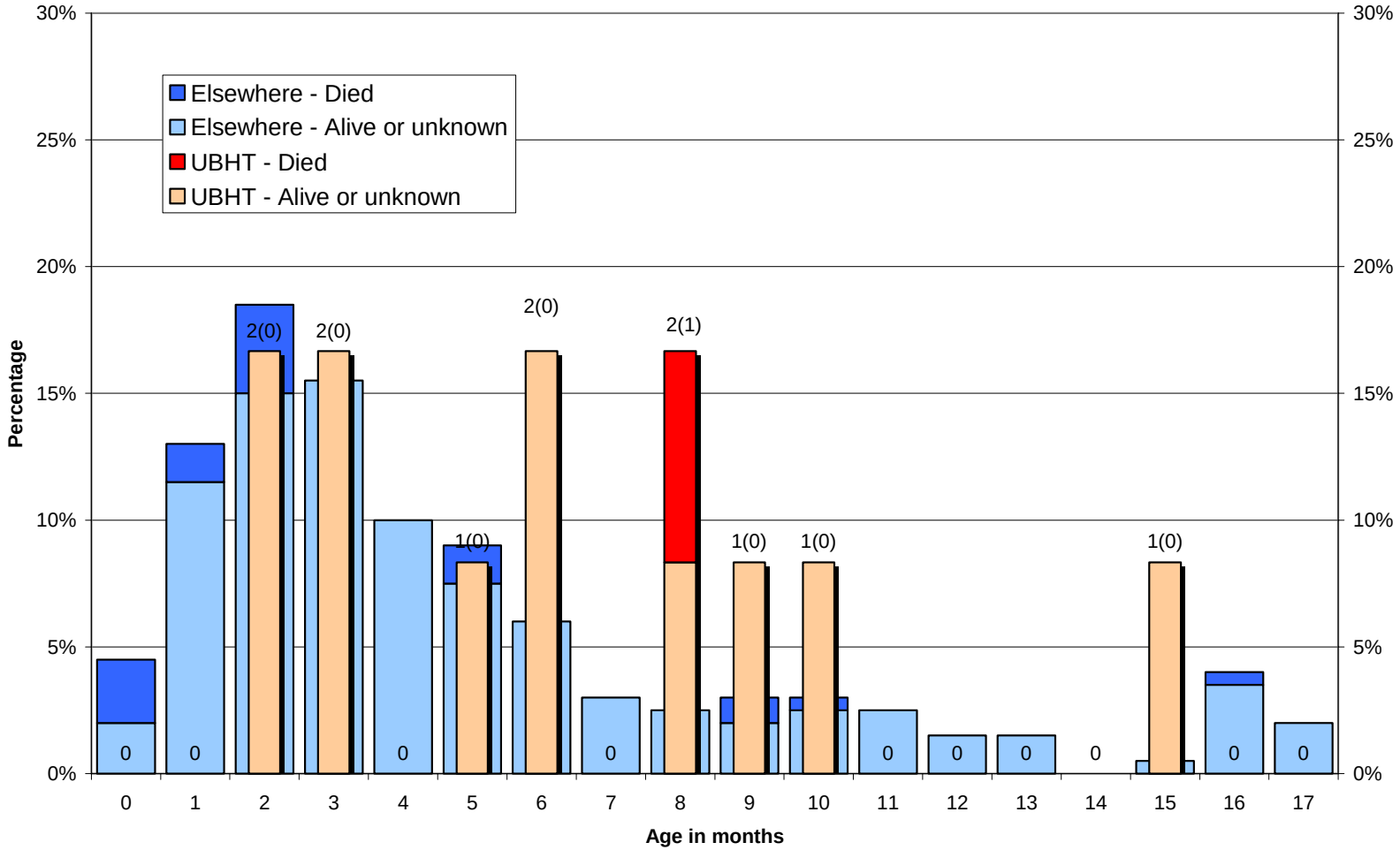
2 Glenfield Hospital Leicester, 3 Killingbeck Hospital, Leeds, 4 The John Radcliffe, 5 Guys Hospital, 6 Royal Liverpool Children's Hospital, 7 Southampton General Hospital, 8 Great Ormond Street Hospital, 9 Freeman Hospital, Newcastle, 10 Harefield Hospital, 11 Birmingham Children's Hospital, 12 Brompton Hospital.

Figure s5.1 Comparison of percentage of AVSD operations including outcome (death, alive or unknown) by age at admission (in months) between UBHT and elsewhere in England during supra-regional funding period (HES 1 April 1991 to 31 March 1994) aged under 18 months



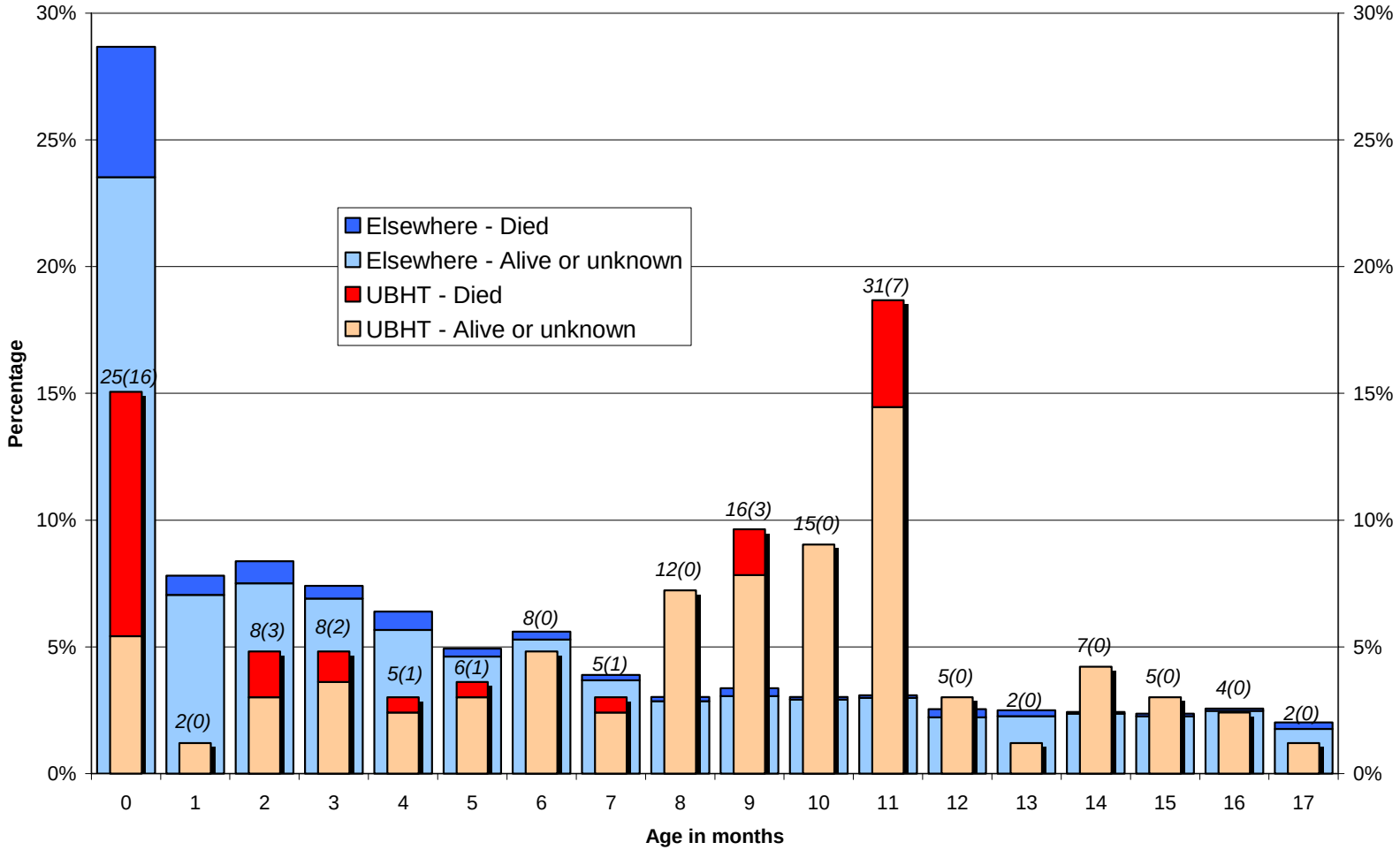
UBHT represented by narrow bars with total number of procedures (deaths in brackets) given in italics

Figure s5.2 Comparison of percentage of AVSD operations including outcome (death, alive or unknown) by age at admission (in months) between UBHT and elsewhere in England post supra-regional funding period (HES 1 April 1994 to 31 Dec 1995) aged under 18 months



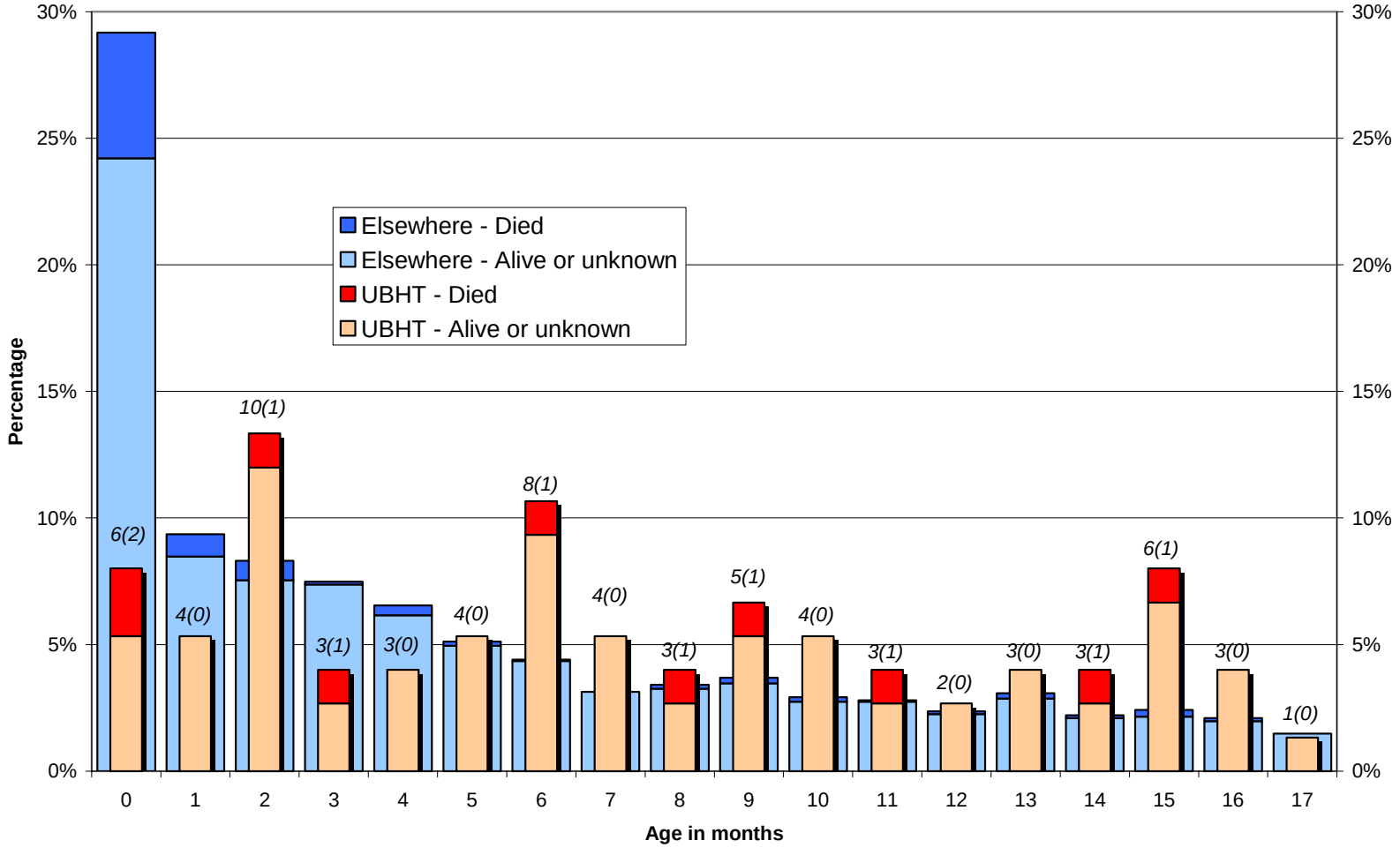
UBHT represented by narrow bars with total number of procedures (deaths in brackets) given in italics

Figure s5.3 Comparison of percentage of open operations including outcome (death, alive or unknown) by age at admission (in months) between UBHT and elsewhere in England during supra-regional funding period (HES 1 April 1991 to 31 March 1994) aged under 18 months



UBHT represented by narrow bars with total number of procedures (deaths in brackets) given in italics

Figure s5.4 Comparison of percentage of open operations including outcome (death, alive or unknown) by age at admission (in months) between UBHT and elsewhere in England post supra-regional funding period (HES 1 April 1994 to 31 Dec 1995) aged under 18 months

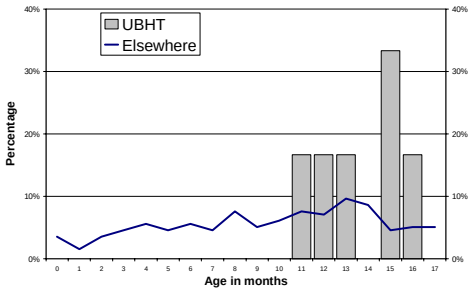


UBHT represented by narrow bars with total number of procedures (deaths in brackets) given in italics

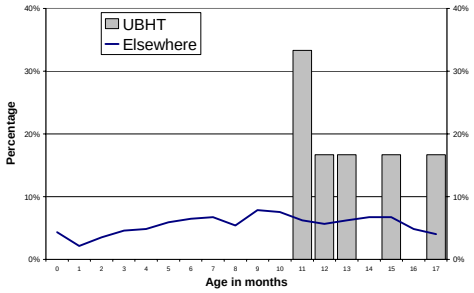
Figure s5.5 Comparison of percentage of spells by age at admission (in months) between UBHT and elsewhere in England during and after supra-regional funding period aged under 18 months by procedure groupings (n = numbers of spells within UBHT)

Procedure Group 1. Tetralogy of Fallot

1/4/91 to 31/3/94, n=6

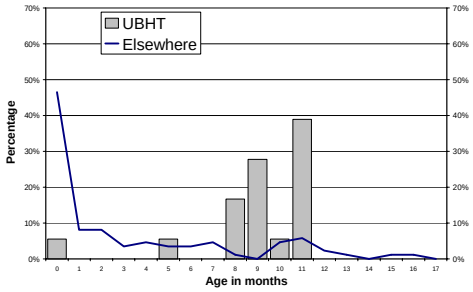


April 94 to December 95, n=6

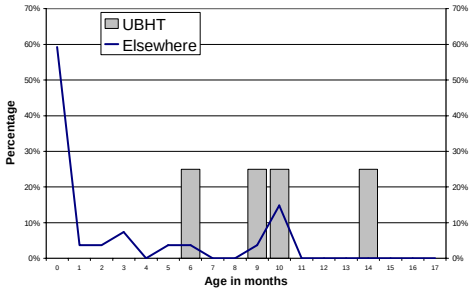


Procedure Group 2. Interatrial TGA

April 1991 to March 1994, n=18

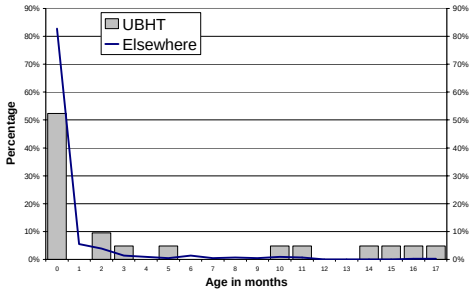


April 94 to December 95, n=4

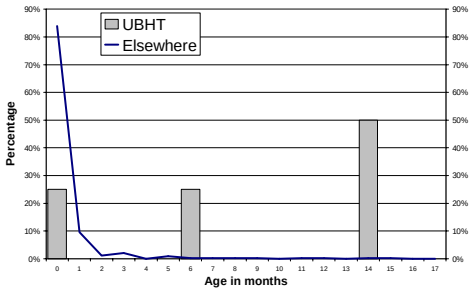


Procedure Group 3. Other TGAs (- switch)

April 1991 to March 1994, n=21

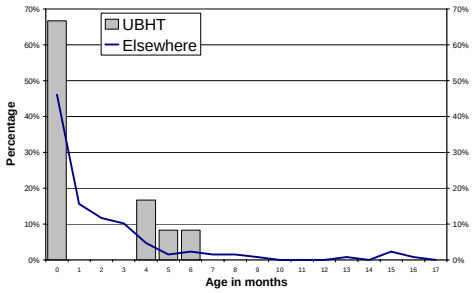


April 94 to December 95, n=4

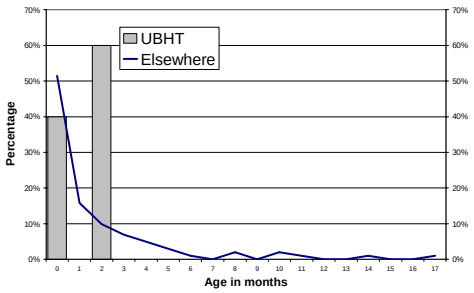


Procedure Group 4. Repair of TAPVD

April 1991 to March 1994, n=12

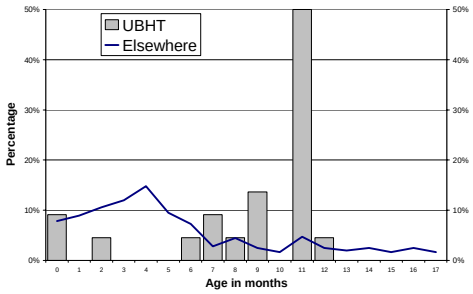


April 94 to December 95, n=5

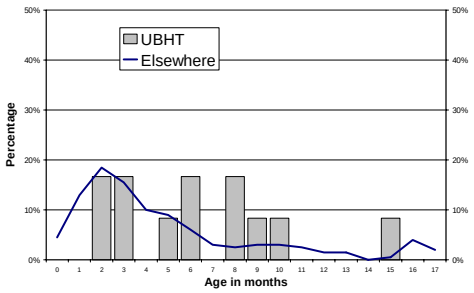


Procedure Group 5. Repair of AVSD (complete not partial)

April 1991 to March 1994, n=22

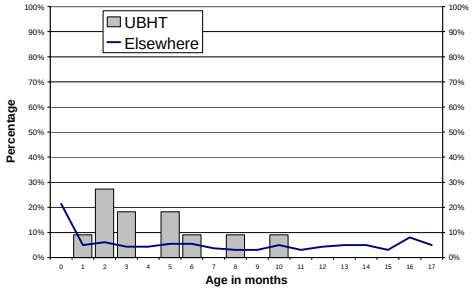


April 94 to December 95, n=12

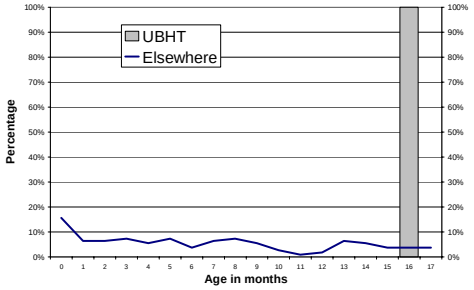


Procedure Group 6. Closure of secundum and sinus venosus ASDS

April 1991 to March 1994, n=11

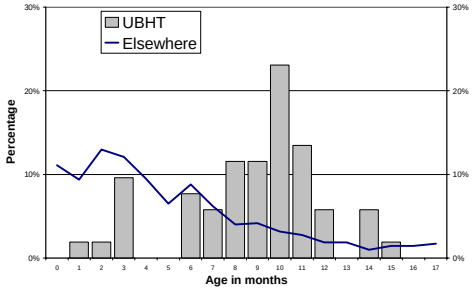


April 94 to December 95, n=1

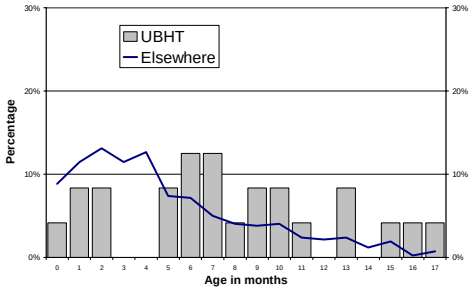


Procedure Group 7. Closure of VSD

April 1991 to March 1994, n=52

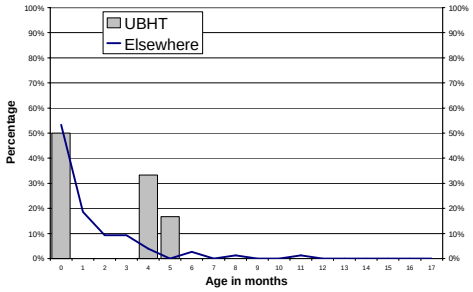


April 94 to December 95, n=24

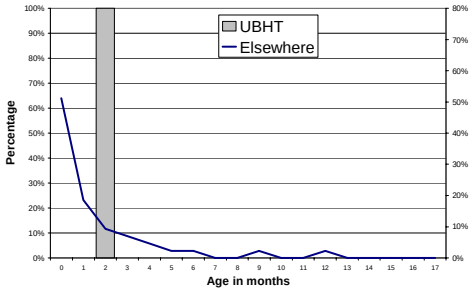


Procedure Group 8. Truncus arteriosus

April 1991 to March 1994, n=6

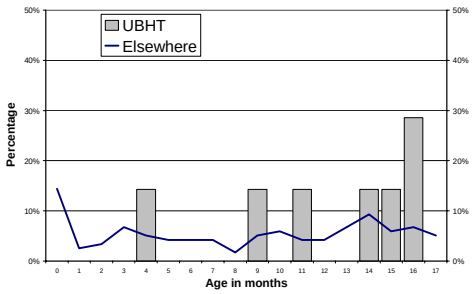


April 94 to December 95, n=2

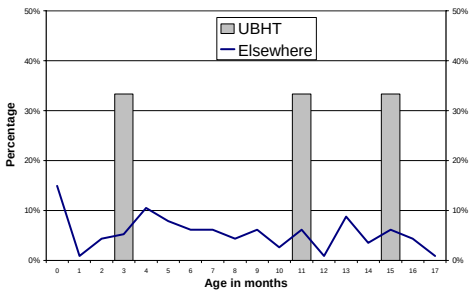


Procedure Group 9. Fontan type operations

April 1991 to March 1994, n=7

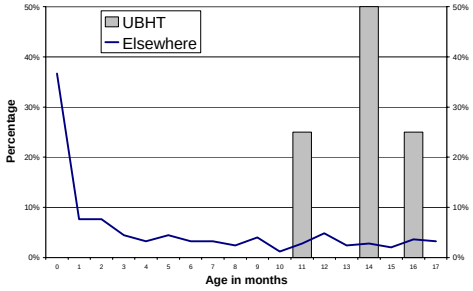


April 94 to December 95, n=3

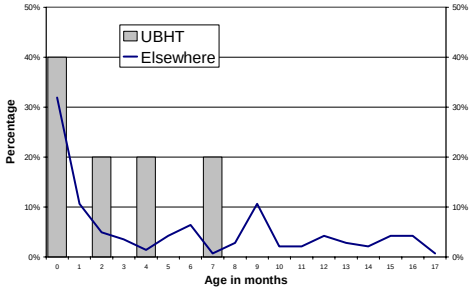


Procedure Group 10. Aortic, pulmonary valve and paravalve procedures

April 1991 to March 1994, n=4

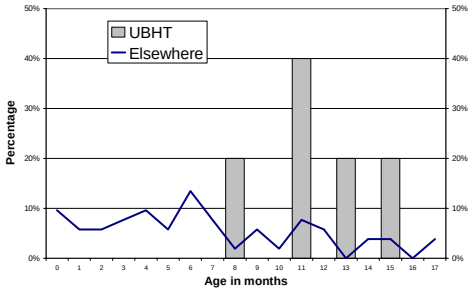


April 94 to December 95, n=5

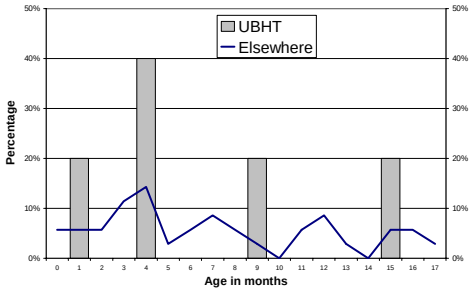


Procedure Group 11. Mitral valve procedures

April 1991 to March 1994, n=5

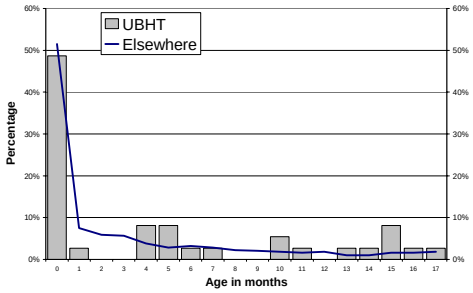


April 94 to December 95, n=5

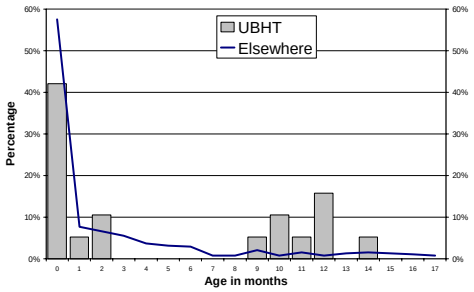


Procedure Group 12. Closed shunts

April 1991 to March 1994, n=37

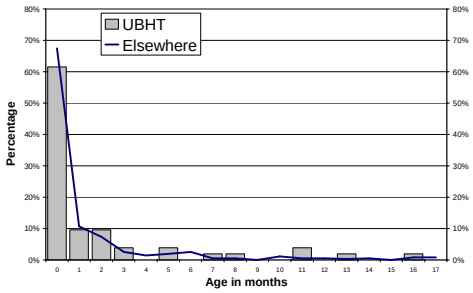


April 94 to December 95, n=19

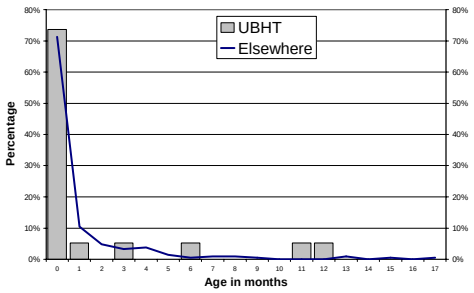


Procedure Group 13. Coarctation procedures

April 1991 to March 1994, n=52

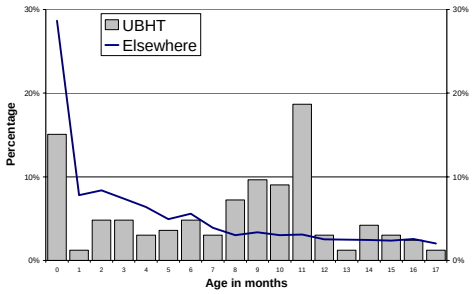


April 94 to December 95, n=19

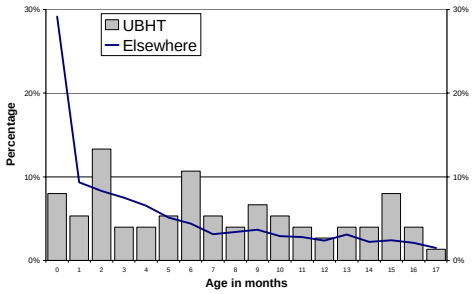


Open procedures

April 1991 to March 1994, n=166

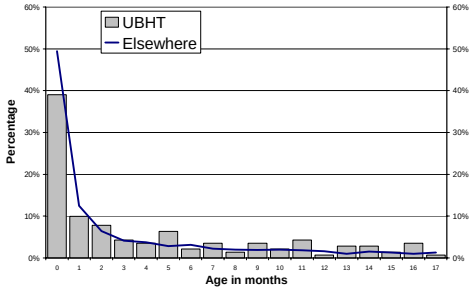


April 94 to December 95, n=75



Closed procedures

April 1991 to March 1994, n=141



April 94 to December 95, n=69

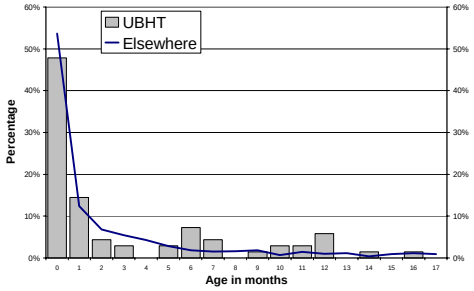
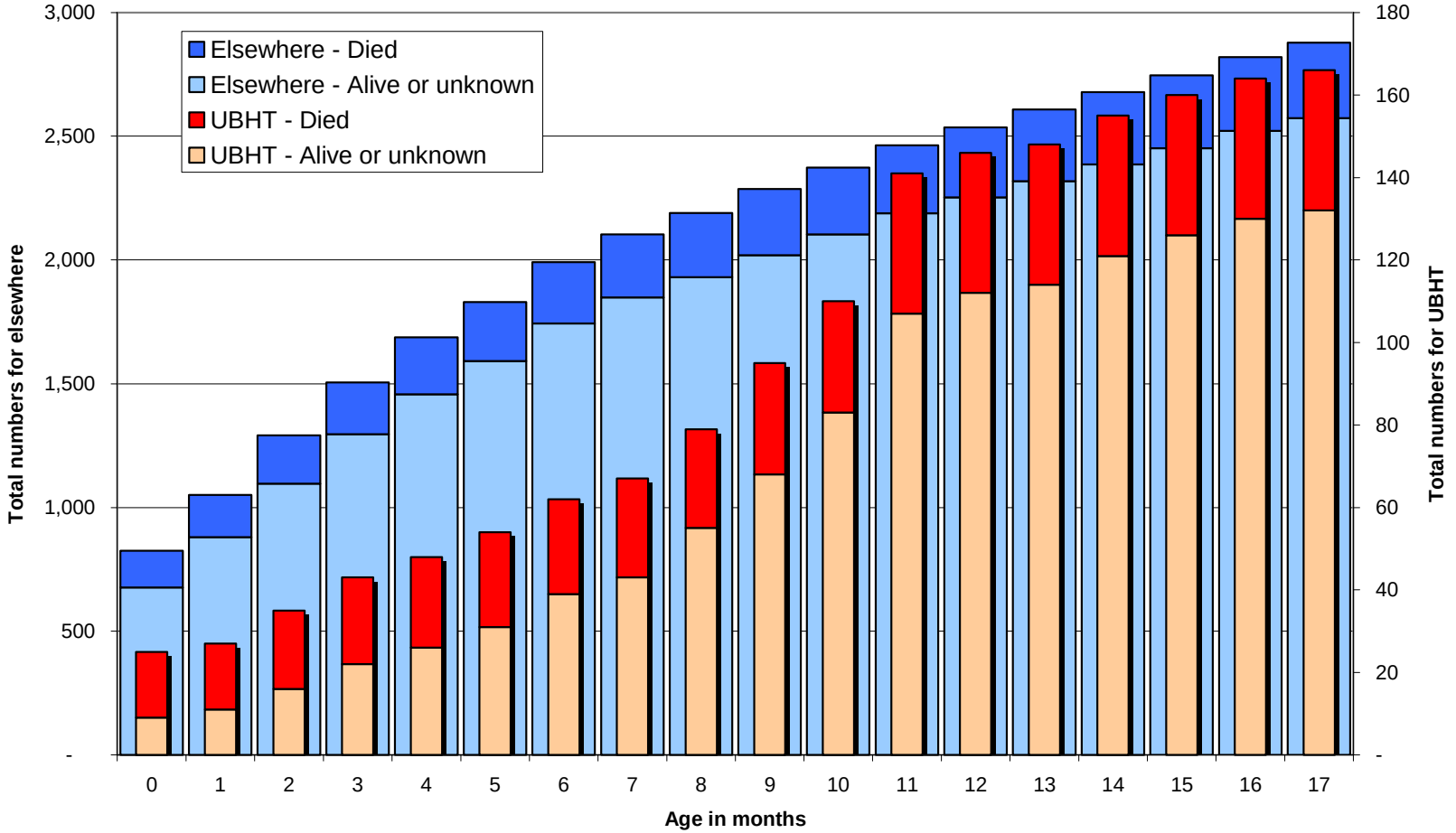


Figure s5.6 Cumulative numbers of open operations including outcome (death, alive or unknown) by age at admission (in months) between UBHT and elsewhere in England during supra-regional funding period (HES 1 April 1991 to 31 March 1994) aged under 18 months



UBHT represented by narrow bars

Figure s5.7 Comparison of percentage of open operations including outcome (death, alive or unknown) by age at admission (in months) between UBHT and individual centres <u>during</u> supra-regional funding period (HES 1 April 1991 to 31 March 1994) aged under 18 months