

## **Report on activity peaks in Local data**

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## **Introduction**

This short report examines the age at operation in those children who received operations in the first two years of life. Some previous work has been done examining this, particularly using HES to compare the pattern of activity in open-heart surgery in the different UK centres. This is described in Aylin *et al* (2000) {INQ 0030}. A summary of the findings is at section 8.3 of Spiegelhalter *et al* (2000) {INQ 0045}. A reasonable question is whether HES is reliable in finding a peak in activity at 11 months of age in Bristol, and this report examines whether the other local sources confirm the findings from HES.

The data used for this come from three of the local sources – the perfusionists’ logs (CPL), the Patient Administration System (PAS), and the Inquiry’s coded version of the Surgeons’ logs. Each is used to examine open-heart operations.

### **Open operations - Perfusionists’ log**

1 The CPL does not have the exact date of birth recorded until after 24 October 1991. The recording of age is therefore subject to greater error prior to that date. An attempt has been made to obtain the age in exact months from the data recorded in the logs. By definition, those children whose operations are included in the CPL are “open” operations. Most graphs in this report relate to all children in the CPL and do not exclude those children whose operations were not grouped as “open” operations using the coding system.

2 Figure 1 shows the total number of operations by month of age in the whole period from 1984 to 1995. This shows a peak at 11 months, but there are also peaks at the “round numbers” of 3, 6, 9, 12, 18 and 24 months. It is likely that ages could have been rounded to these values, especially those that were close to one year, in the early time period when dates of birth were not recorded. This could result in the peak at 11 months not being seen as clearly.

3 Figure 2 shows the number of operations separately for each calendar year. This shows a series of peaks close to 12 months, but which are not consistent over the whole time period. It is clear that, from these data, the peak at just before or around one year is mainly from 1989 to 1993. Outside these years there is a much more uniform distribution.

4 Figure 3 shows the numbers of those who died on the operating table (the CPL does not record other deaths) at those ages for the whole time period. There does not seem to be a disproportionate rise close to 12 months of age. The scale of figure 3 is the same as that of figure 1 for comparative purposes.

5 Figure 4, with death *rates*, makes this explicit, and shows that the highest rates of death on the operating table were at the very youngest ages. There does not appear to be any higher mortality rate close to 11 or 12 months of age.

6 Figure 5 shows the operations by the operation group used by the reports on analysis of data for the Inquiry. As noted in the previous report describing the Perfusionists' logs (Evans, 2000 {INQ 0029}), a few operations were classified by the coding system in use as closed operations, and these have been excluded from this figure only. The peak at about 11 months in activity is only easily seen where a large number of operations have been performed. These occur in groups 2 (Inter-atrial TGA), 7 (Closure of VSD) and 10 (Aortic, pulmonary and paravalve procedures). This does not necessarily mean that there was not a tendency for a peak at that age in other groups, but the numbers are too small to detect it or to show that there is no peak.

### ***Open operations - Patient Administration system***

7 The PAS contains data from both open and closed heart operations. There are alternative methods of classifying operations as open or closed, but the one that has been used for this report is to take those operations that form one of groups 1 to 11 inclusive, as used by all the reports on the statistical analysis of data for the Inquiry.

Those operations that are not classified into a group or are in groups 12 & 13 (closed operations) have been excluded.

8 Age on admission is available, but can also be calculated from date of operation and date of birth, both of which are recorded reasonably within the PAS database. Age in months has been calculated as  $(12/365)$  of the exact age in days, rounded down to a whole number.

9 Figure 6 is analogous to figure 1, and this shows peaks at 0 and 11 months of age. There are no peaks at 3, 6, 9, 12, 18 or 24 months. These would not be expected when all the data on age are derived from exact dates.

10 Figure 7 shows the data for each of the calendar years for which the PAS data are available. It shows the peak at 11 months most clearly for the years 1990 to 1993. Numbers are smaller in 1994 and 1995, but the distribution of ages is then very flat.

11 Figure 8 shows the number of deaths. These are for deaths up to 30 days after the operation. Although the number of deaths at 11 months is slightly higher, the number of operations is notably higher at this age. Figure 9 shows death *rates* and confirms that this impression is correct with no notably higher death rate at 11 months. The peak at 18 months is based on 3 deaths in 5 operations at that age. This is compatible with chance variation in death rate by age.

12 Figure 10 shows the data split by type of operation. In the individual groups, the larger ones, namely groups 2 (Inter-atrial TGA), 5 (Complete repair of CAVSD) and 7 (Closure of VSD) show peaks at 11 months. The others have too small numbers to show whether there really are larger numbers at 11 months or not.

### ***Surgeons' logs***

13 The Inquiry's coded versions of the Surgeons' Logs (SL) cover the entire period of relevance to the Inquiry. They also cover operations that were done at the BRI as open operations. All operations in the SL are included, except where individual groups of operations are examined as in figure 15, so that those operations

that are not coded within the groups of operations classified as “open” have not been excluded.

14 Age in the SL was written in terms of days, weeks, months or years. The age in months has been derived from these figures, but they are not precise, as they are not based on dates of birth and dates of operation.

15 Figure 11 (analogous to figures 1 and 6) shows peaks at 0, 11, 12 and 24 months. This illustrates the rounding of ages that takes place when inexact ages are recorded. It is clear that there is a relative dearth of operations immediately after one year of age.

16 Figure 12 shows the same data, but by each individual year of the Inquiry. The peak at around 11 or 12 months is most noticeable between 1987 and 1993. The numbers in 1995 are very small and the rounding of ages to one year that is then shown as 12 months occurs in 1994 and 1995.

17 Figure 13 shows the number of deaths, again not showing a disproportionate rise at 11/12 months. Figure 14 makes this explicit, where death rates are shown as a percentage. The highest rates are in children aged under 6 months old, with no notable rise around 12 months.

18 The peak activity around one year of age seen in Figure 15 is shown clearly in groups 2 (Inter-atrial TGA), 5 (Complete repair of CAVSD) and 7 (Closure of VSD). There is a slight peak in group 10 (Aortic, pulmonary and paravalve procedures), at around this age, but with small numbers.

## ***Discussion***

19 These results from three different sources all show the same pattern. This should be the case since they are describing the same children in general, apart from minor discrepancies in coding of open operations. It is also clear that when exact birth dates are not recorded, the age that is recorded tends to be rounded to the nearest 3, 6 or 12 months. This has the effect of making what might be quite a large peak at 11

months to be spread over 11 to 12 months.

20 It is clear that at Bristol there was a tendency, in some years at least, and in some, if not all, types of operation for the age at which they were carried out to be concentrated at 11 months of age. It seems unlikely that there is a sharp cut-off beyond 12 months for any biological reason and some other explanation should be sought. It is also not necessarily clear, from these data alone, whether operations were postponed from the early months of life or brought forward from later.

21 If there is postponement of operations from the youngest ages to rather later, then this of itself is no explanation of any higher rate of death in Bristol, rather the contrary. Death rates are highest at the youngest ages. Postponing the operations to a later date means, either that the operation is done at an age at which the death rate is lower, or that the child dies prior to having an operation. The latter will mean that the death is not counted in the operative mortality at any age. If a child had a delayed (to 11 or 12 months) operation, and as a result had become more ill, then we would expect to see a rise in the mortality rate at that age as well as a rise in the number of operations at that age.

22 The peak in activity at 11 months may not have had any effect on outcome of the operations on the children. It could have had an adverse effect had there been children who died before having an operation, but the data available locally to UBHT are not able to show this. It is possible that careful analysis of the South West Congenital Heart Register (SWCHR) {see INQ 0014} might be able to show this. A complete picture could only be obtained if a similar source to the SWCHR were available for other centres and if the recording of mortality in these registers was of high quality. Professor Murray's report makes it clear that in its current state the SWCHR can not be used for this purpose. Linkage with ONS death records and local sources of hospital activity {see INQ 0014 0022, paragraph 3.58} might enable a conclusion to be drawn as to any deleterious effect of delay in operation.

### ***Conclusion***

23 There is a definite peak in activity around 11 months of age for children given

open-heart operations at Bristol. This peak is not consistently seen in all time periods. There is no evidence that concentration of operations at this age has made any difference to mortality rates and it is very unlikely that this alone can explain the higher mortality rates seen in Bristol in young children.

Figure1 Perfusionists' log

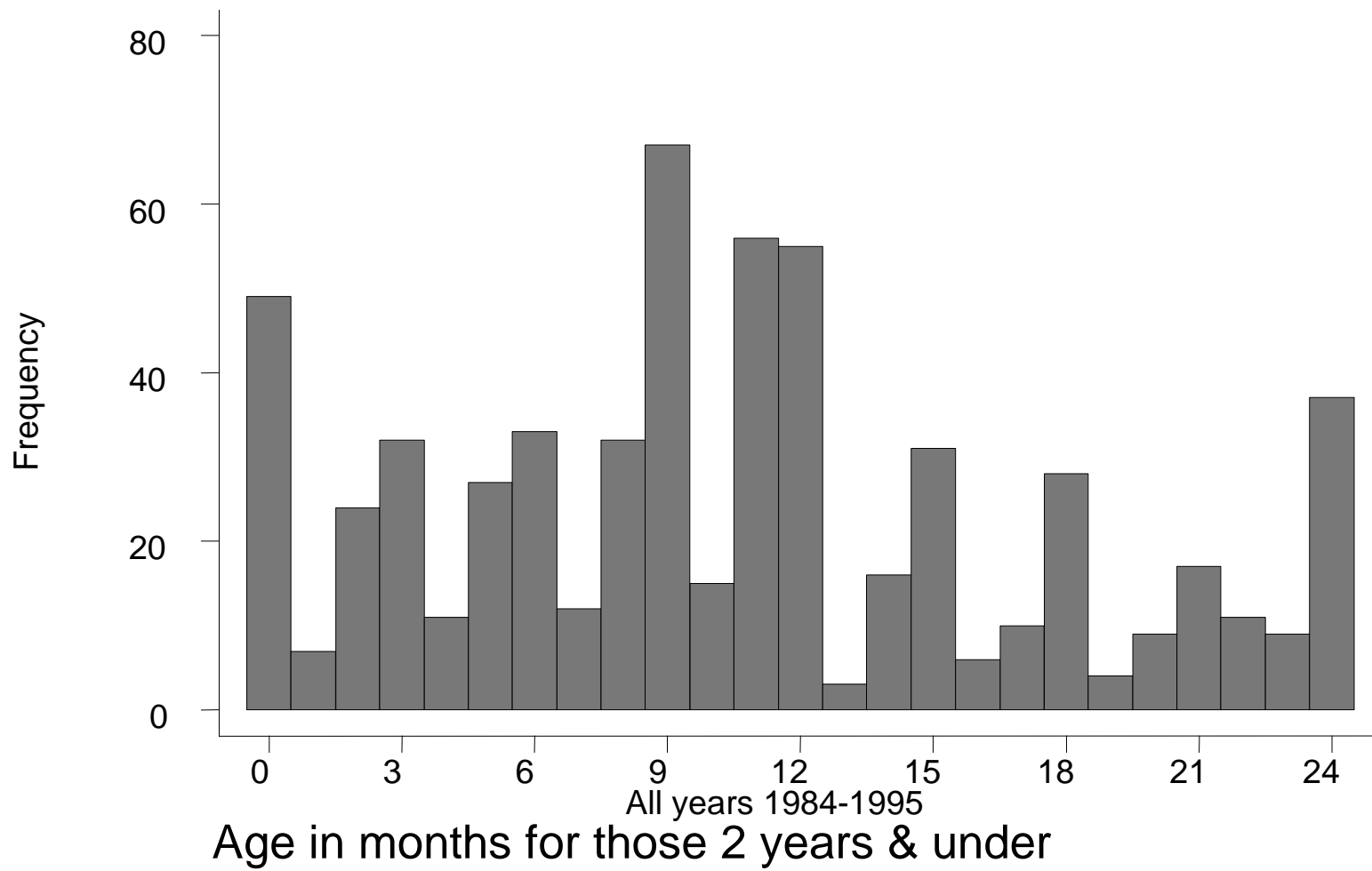
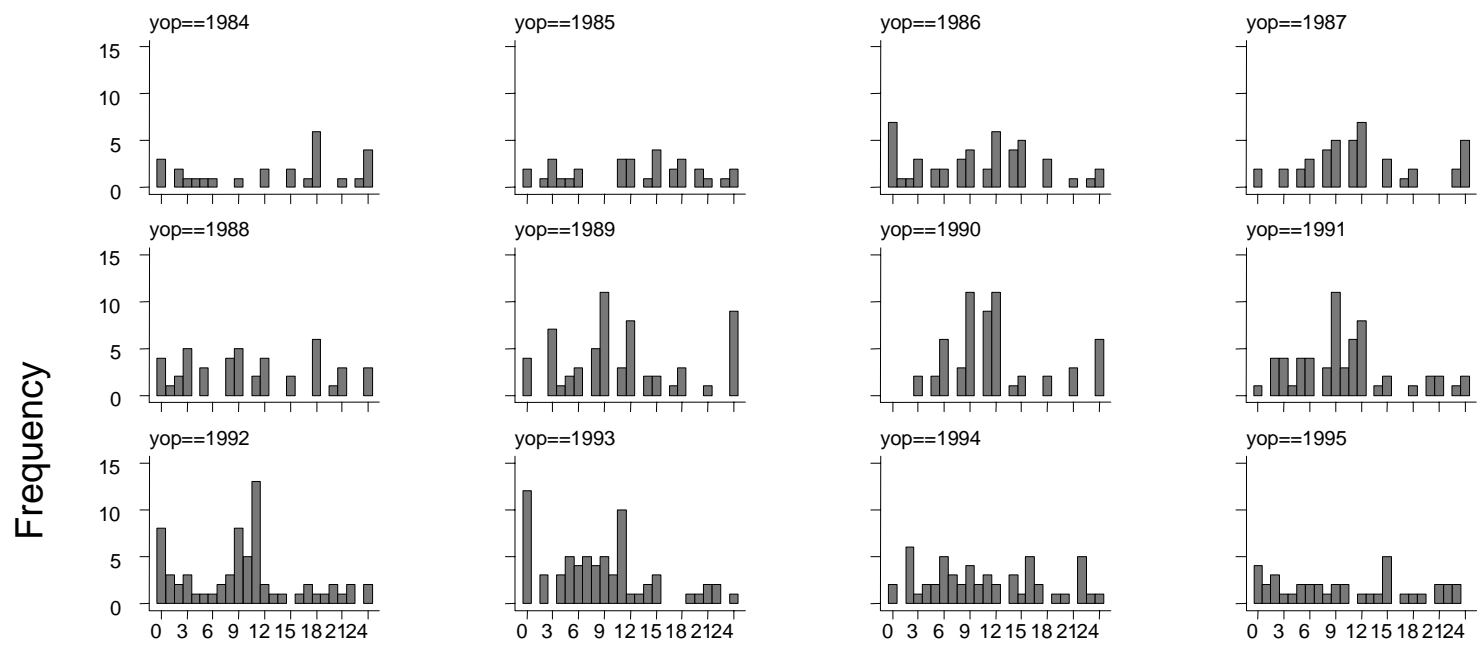


Figure 2 Perfusionists' log



Individual calendar years  
 Age in months for those 2 years & under

Figure 3 Perfusionists' log

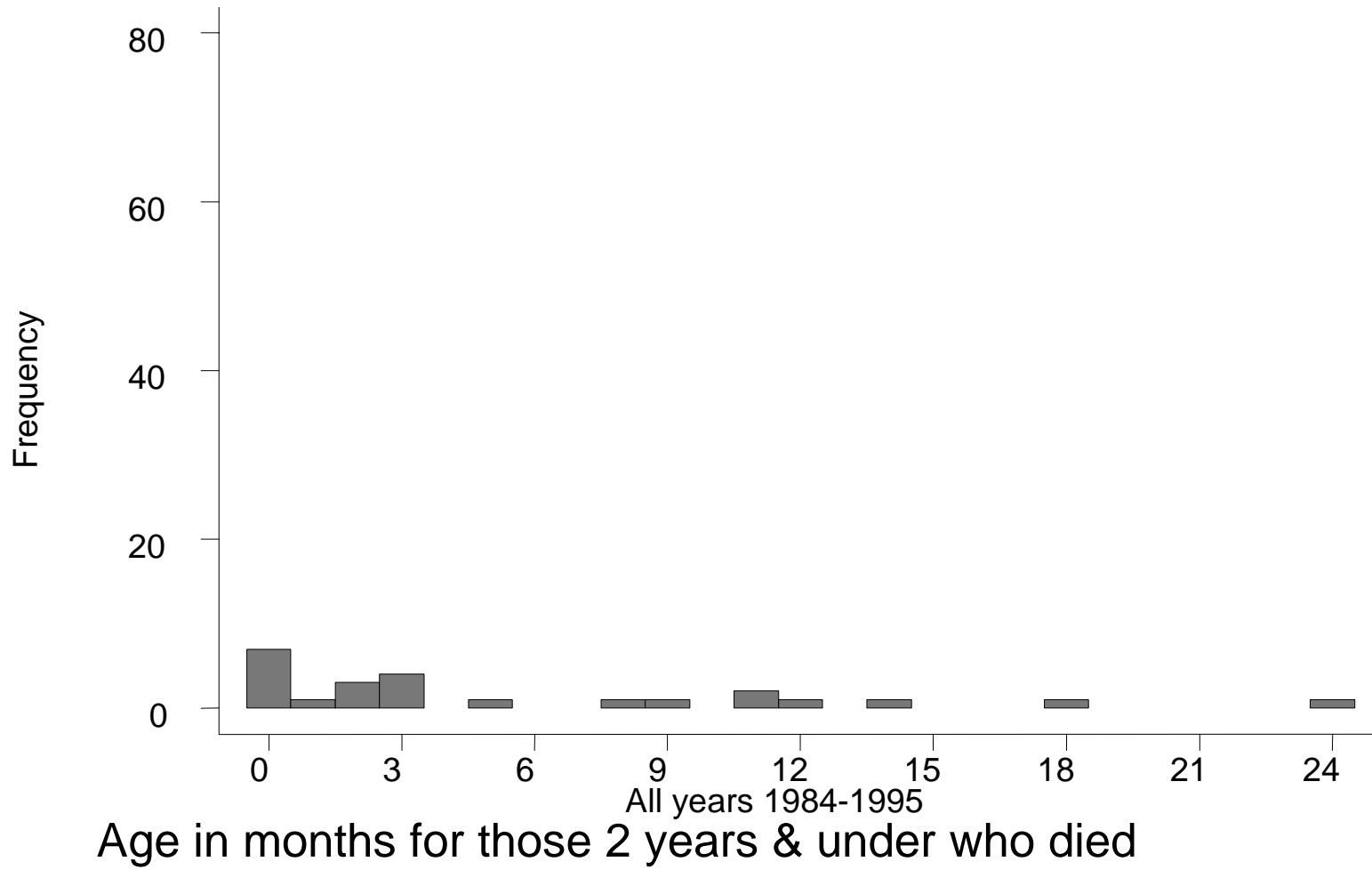


Figure 4 Perfusionists' log 1984-1995

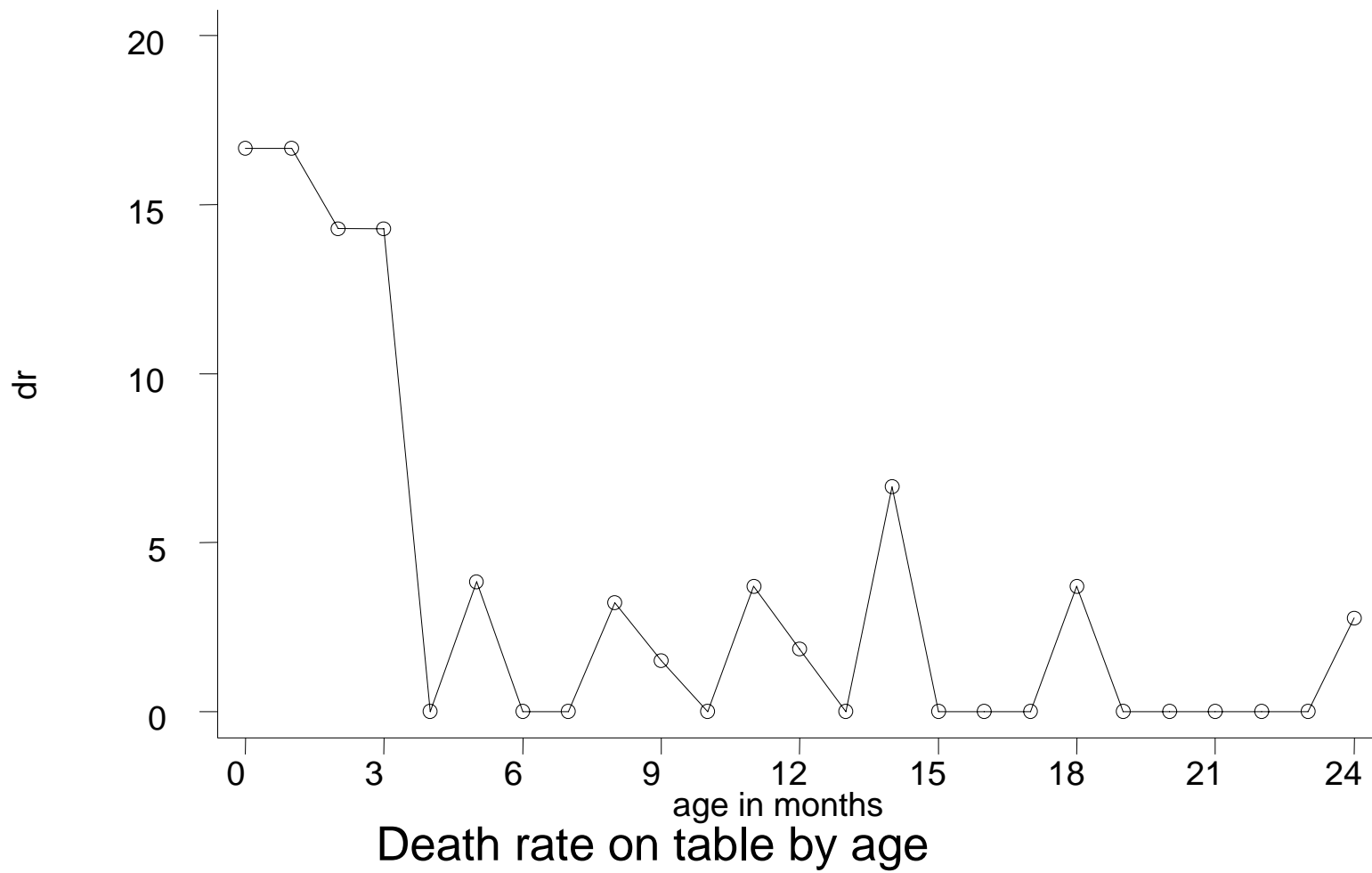


Figure 5 Perfusionists' log 1984-1995

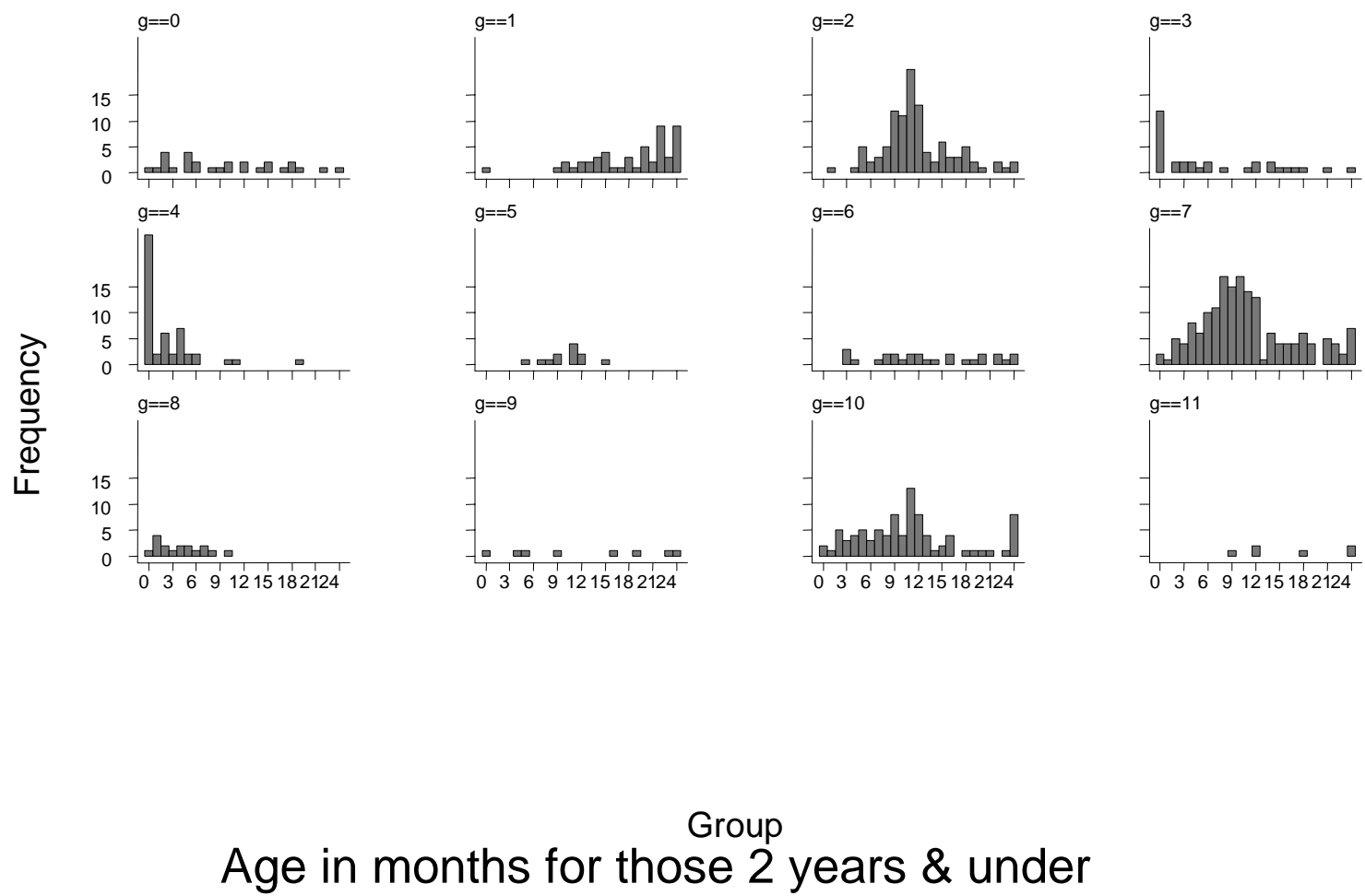


Figure 6 Patient Administration System- open operations only

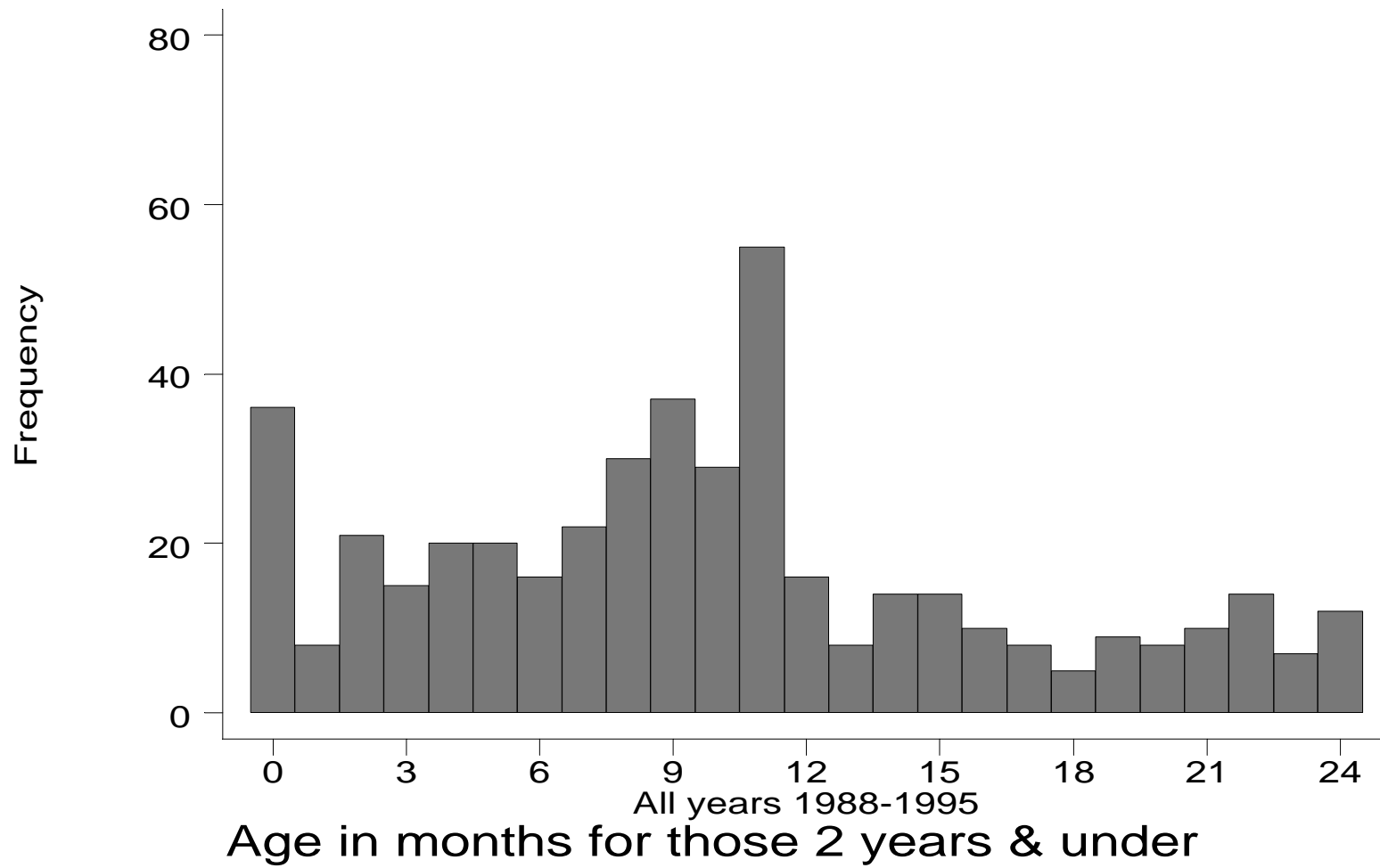


Figure 7 Patient Administration System- open operations only

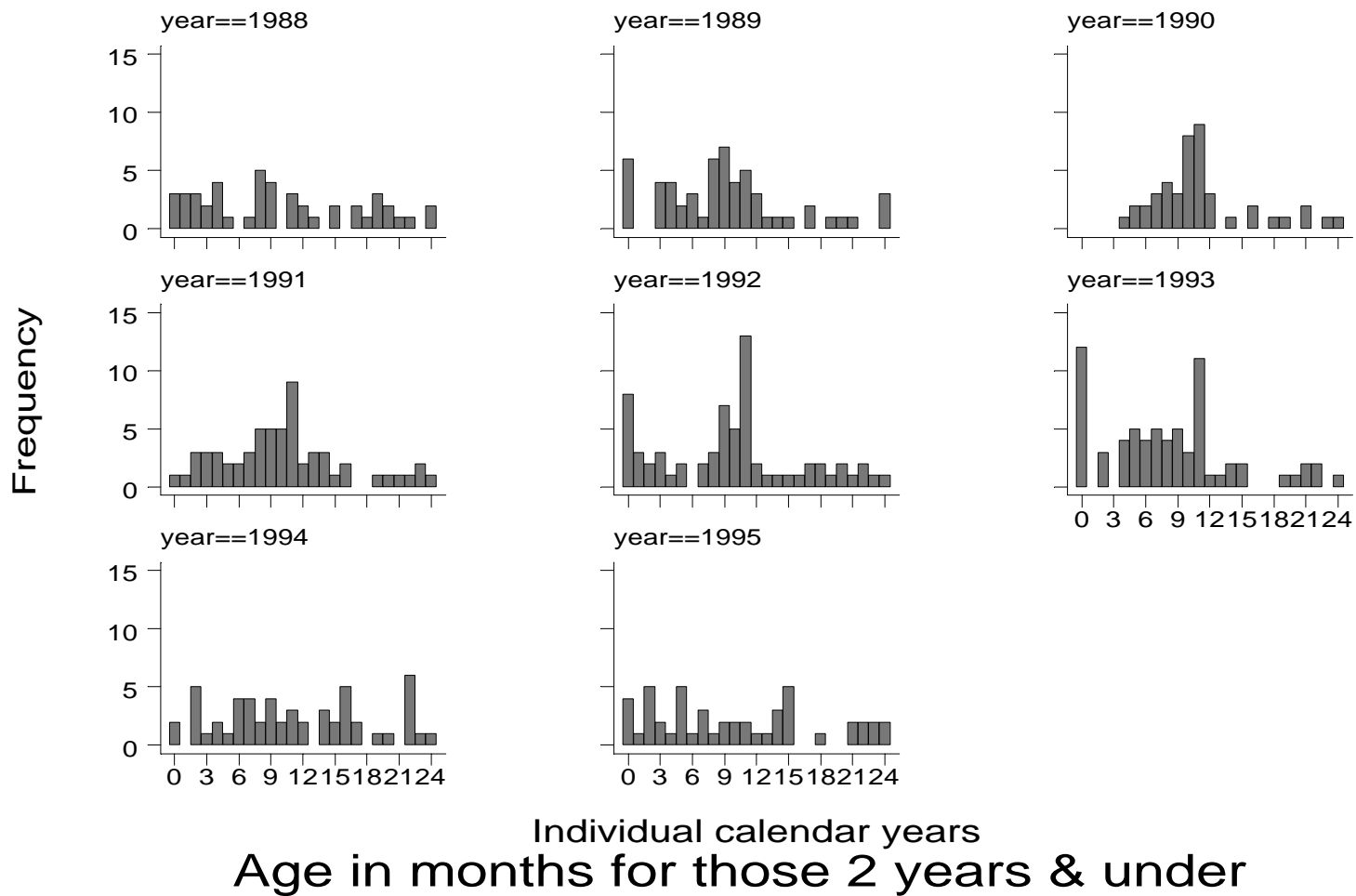


Figure 8 Patient Administration System- open operations only

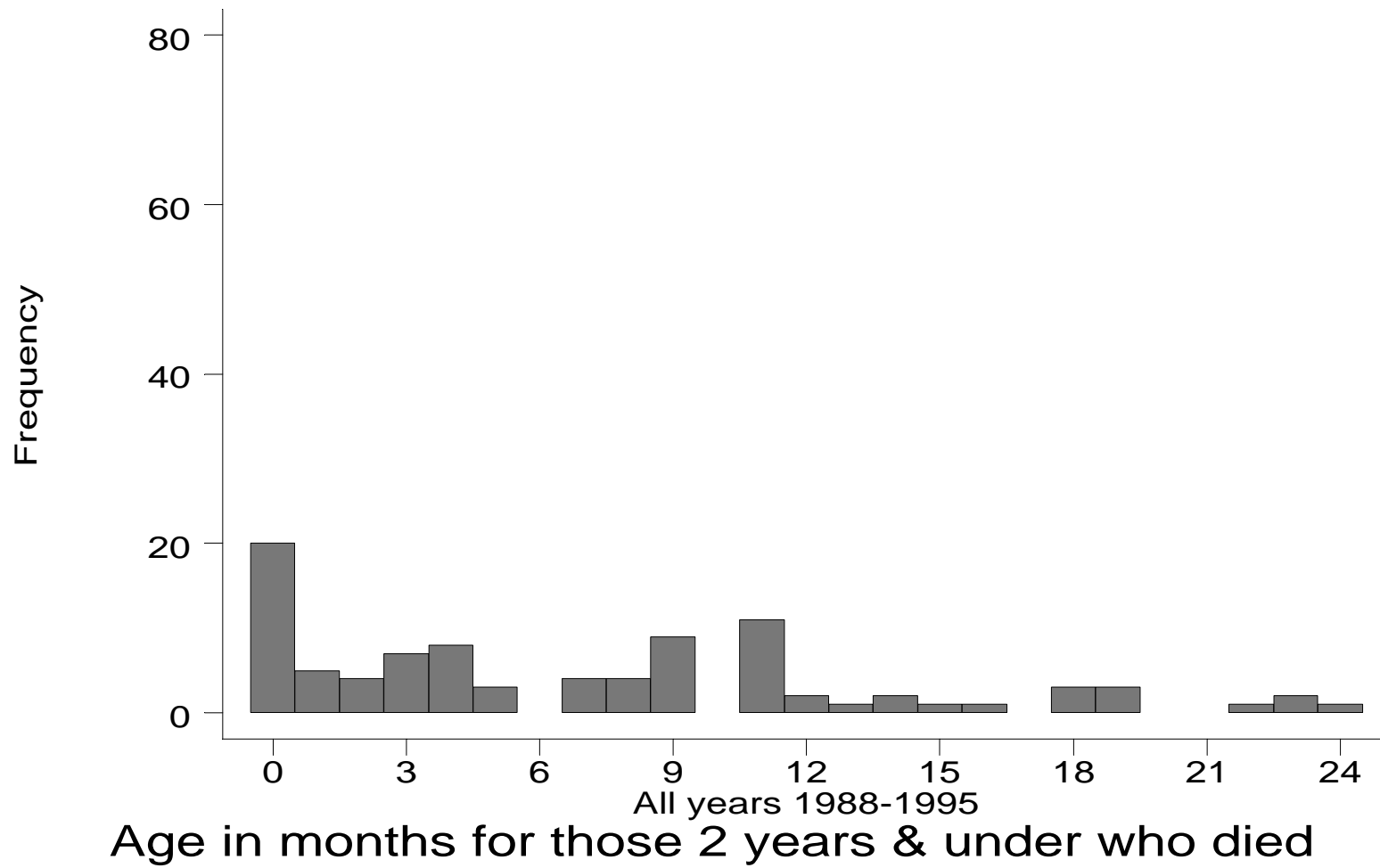


Figure 9 PAS 1988 -1995

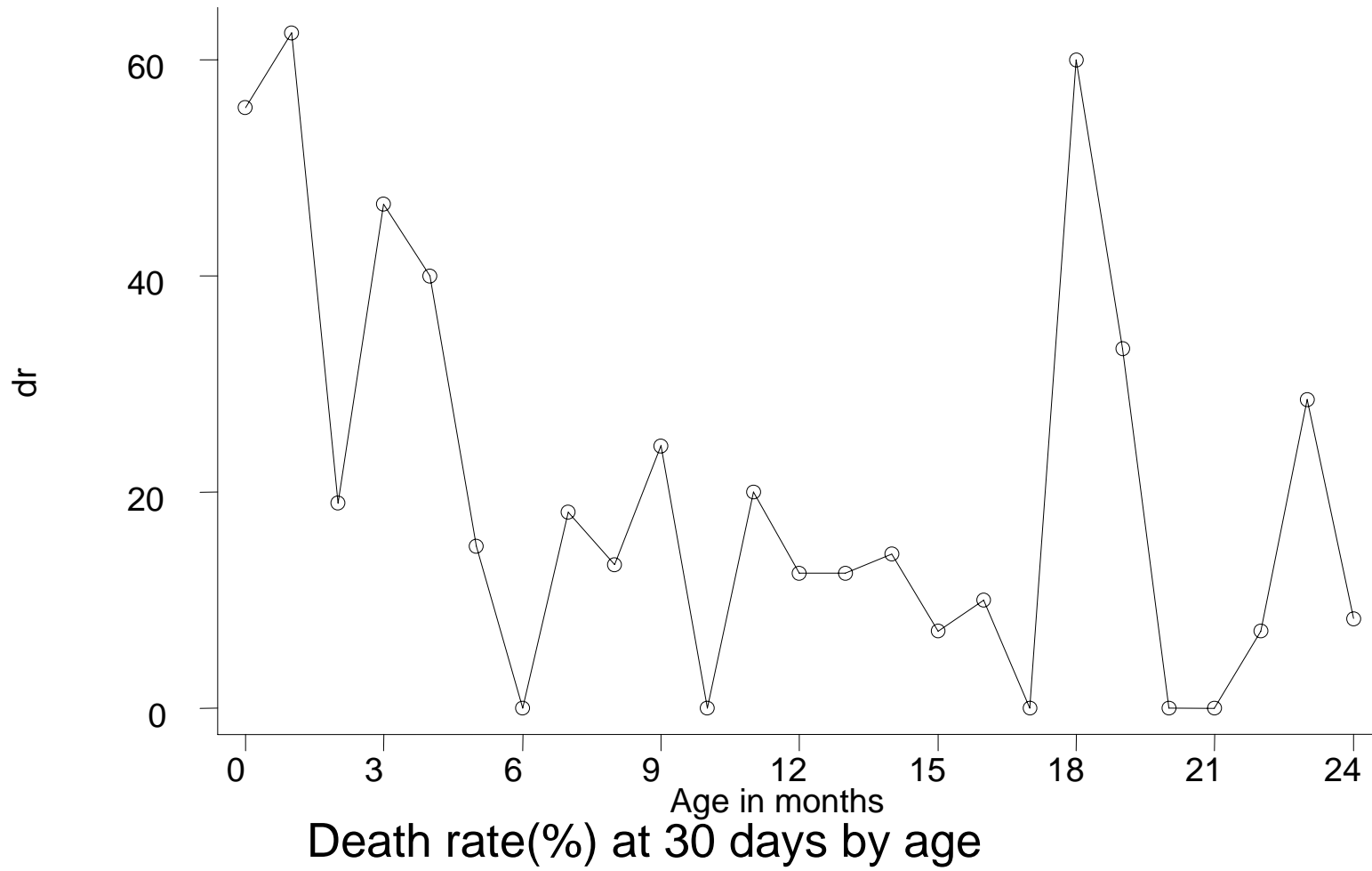
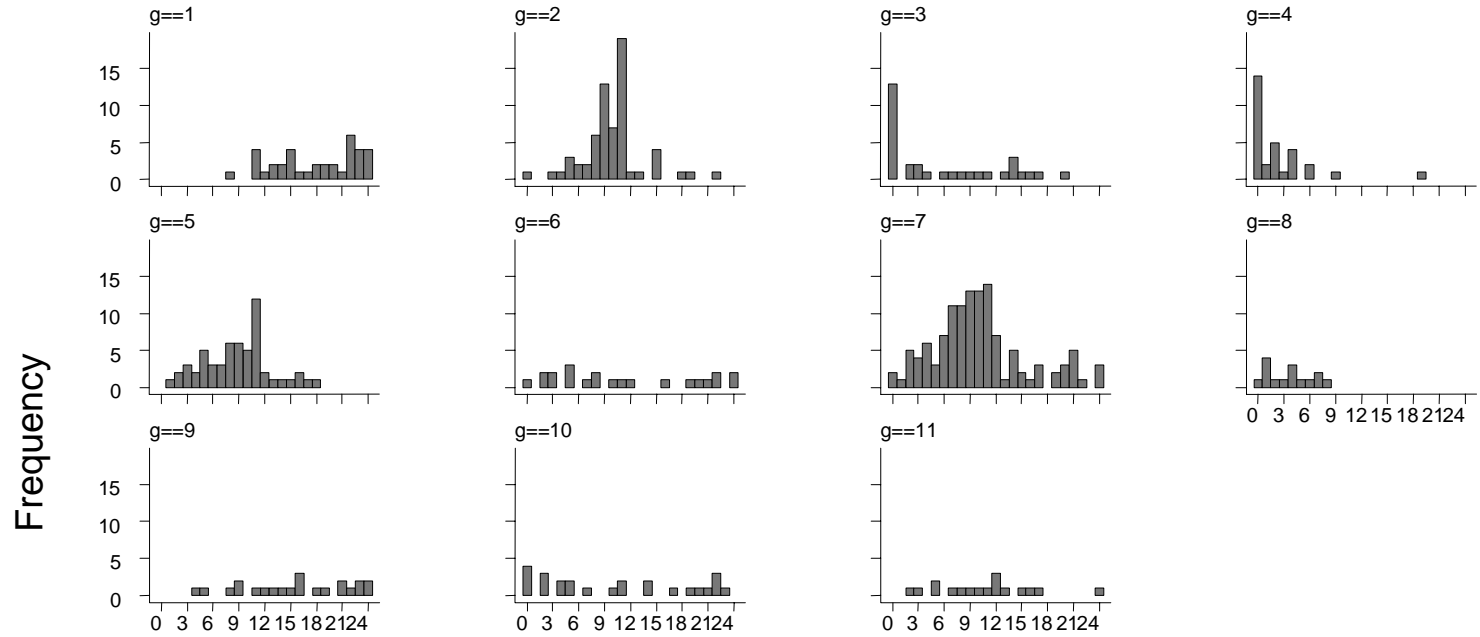


Figure 10 Patient Administration System - open operations only



By operation group  
Age in months for those 2 years & under

Figure 11 Surgeons' logs - all operations

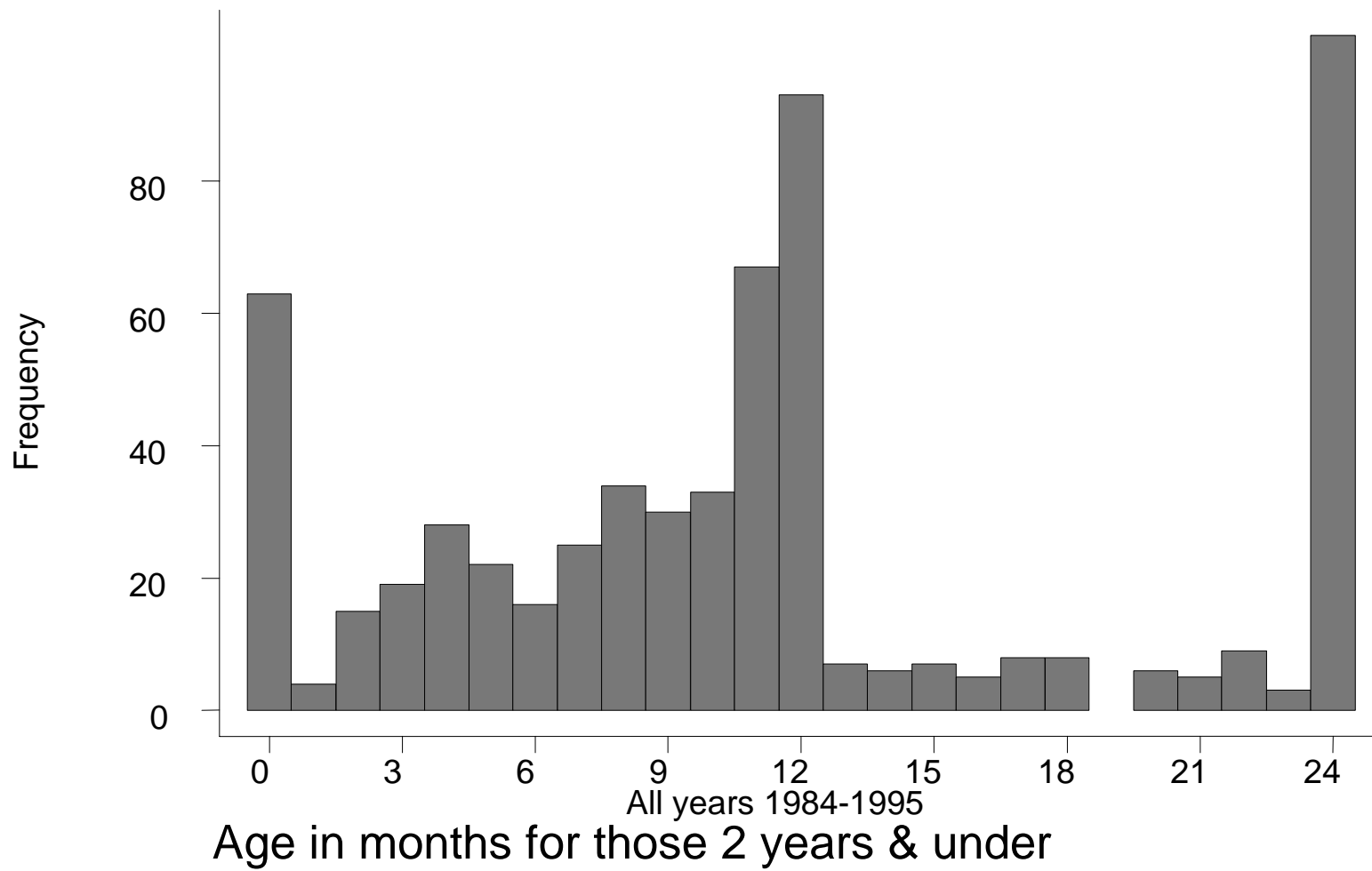
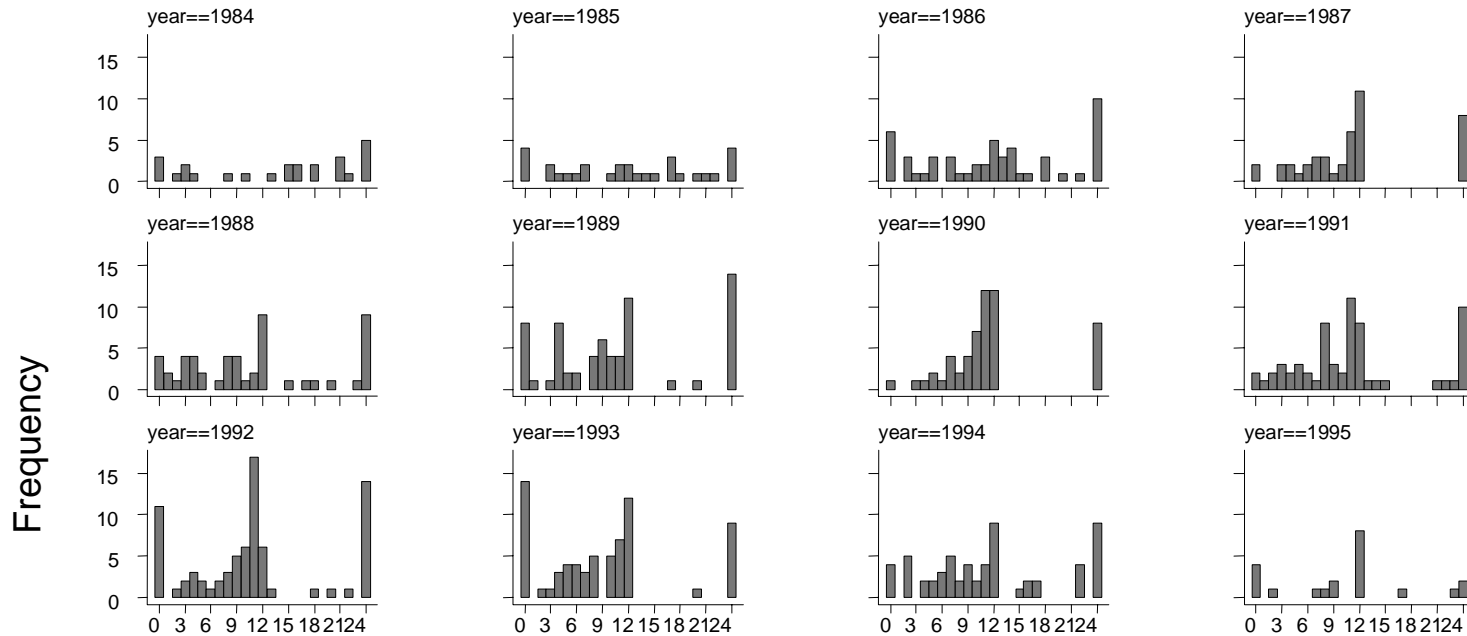


Figure 12 Surgeons' logs - all operations



Individual calendar years  
Age in months for those 2 years & under

Figure 13 Surgeons' logs - all operations

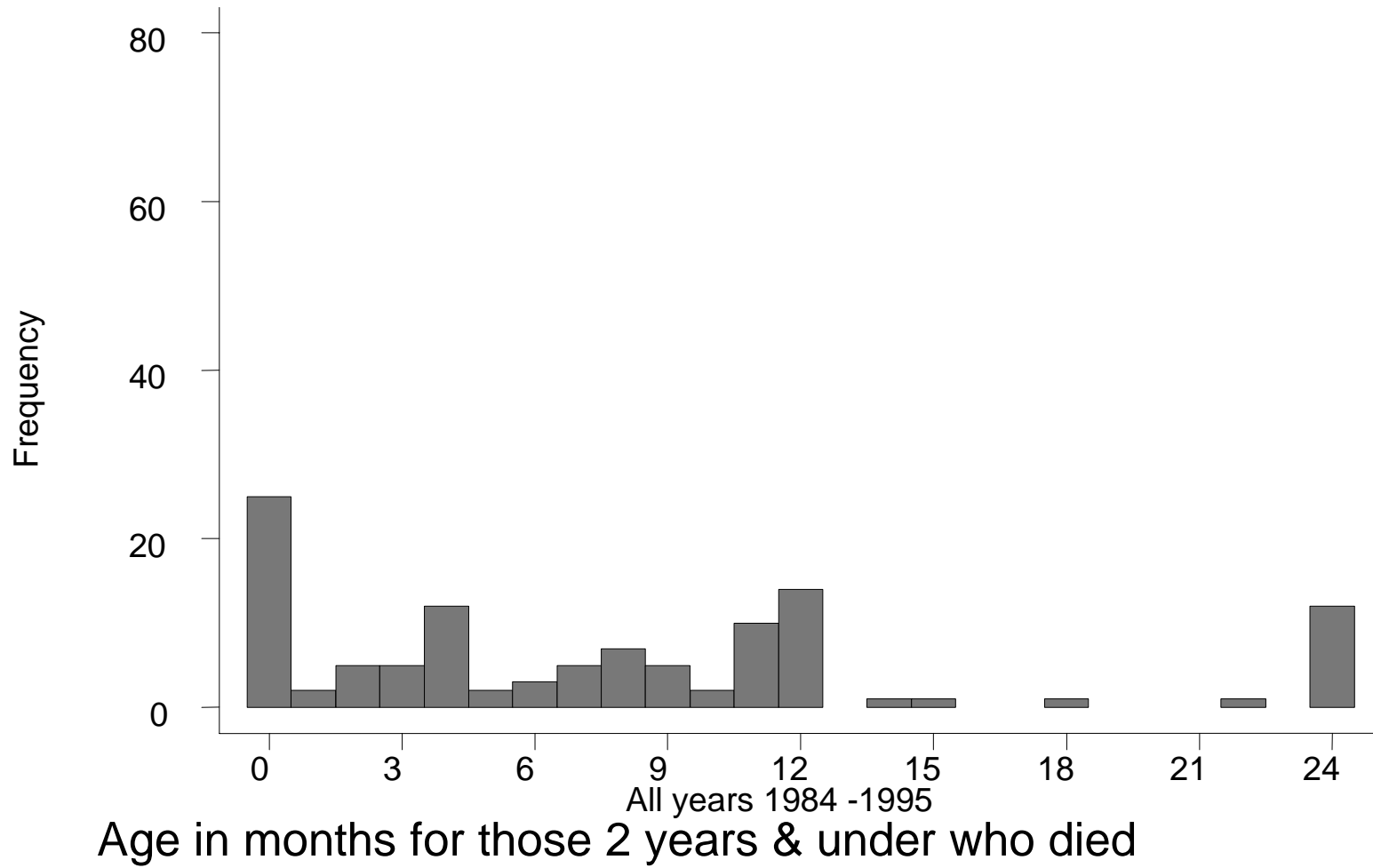


Figure 14 SL 1984 - 1995

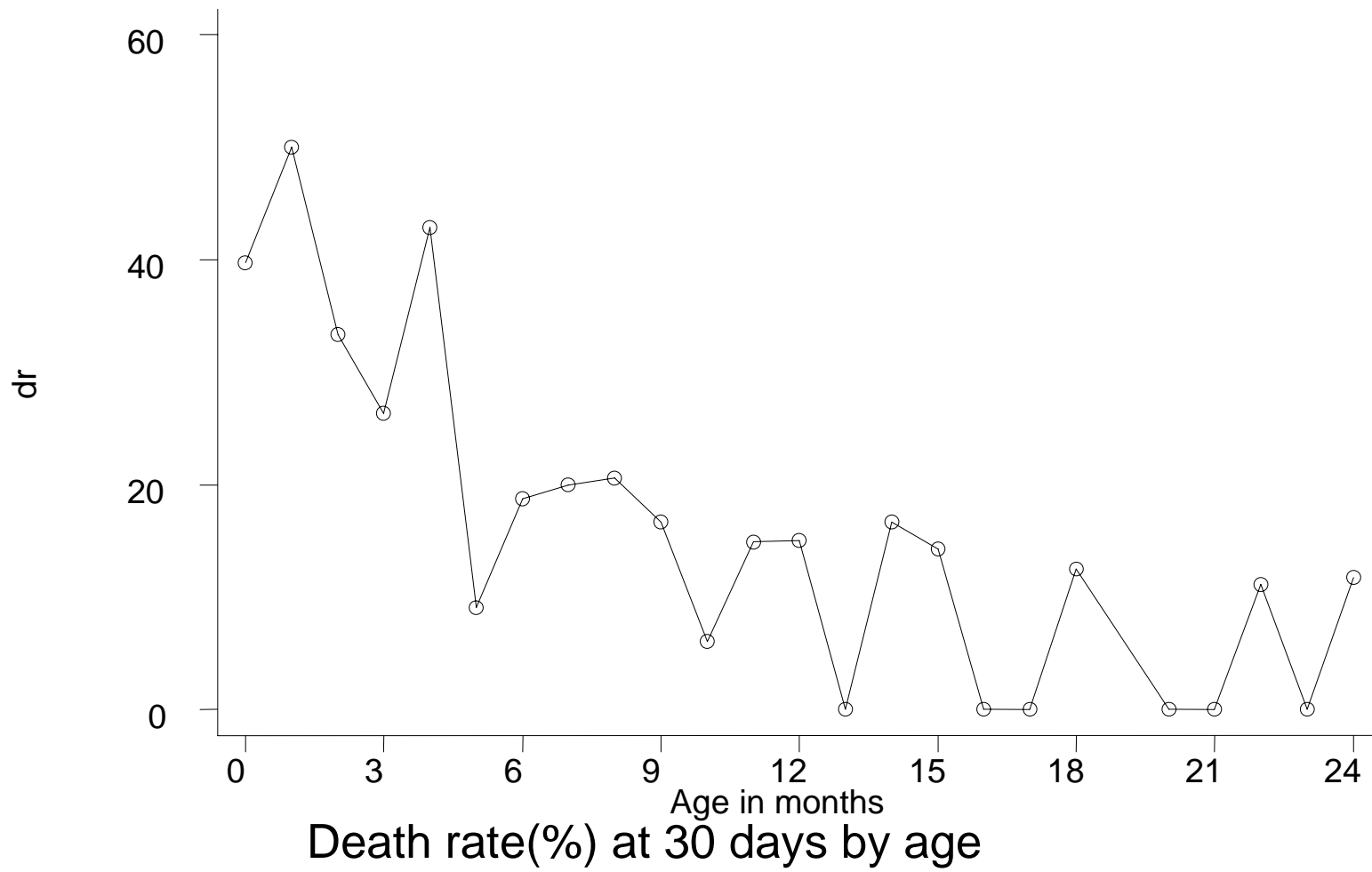
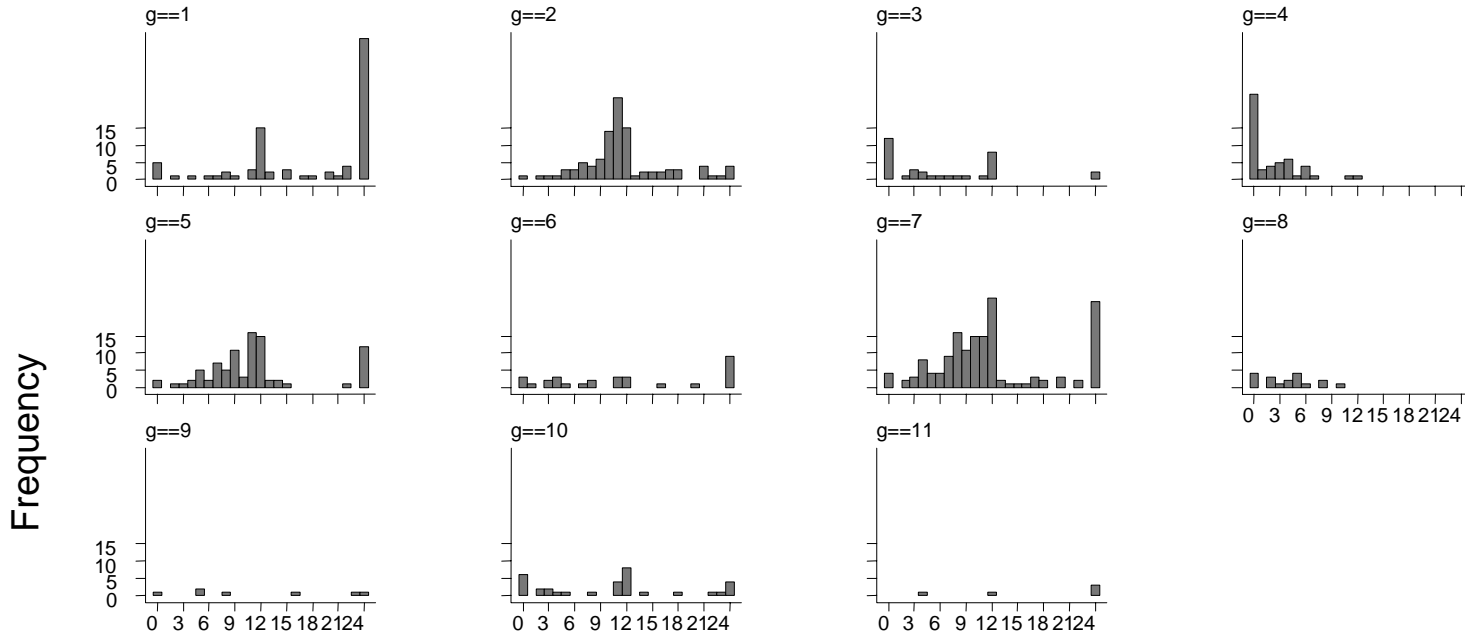


Figure 15 Surgeons' logs - only operations coded as open



By operation group  
Age in months for those 2 years & under