We categorised hospitals into three levels, low, medium and high, according to a weighted calculation[1] of “perinatal intensity” based on admissions at 24 to 25 weeks’ gestation.

First, each individual hospital was assigned an activity ratio according to the number of babies admitted into a neonatal intensive care unit at 24 to 25 weeks’ gestation divided by the number of fetuses alive at maternal admission to hospital at the same gestations (equation 1).

\[
\text{Activity ratio } (p_i) = \frac{\text{Number of babies admitted into NICU}}{\text{Number of foetuses alive at maternal admission to hospital}}
\]

(1)

Using these ratios, the mean activity level across all included hospitals was obtained using formula shown in equation 2, where \( P_w \) is the overall weighted mean, \( p_i \) is the activity ratio in hospital \( i \), and \( w_i \) is the weighting factor for hospital \( i \):

\[
P_w = \frac{\sum p_i w_i}{\sum w_i}
\]

(2)

The weighting factors for individual hospitals were obtained using the formula shown in equation 3.

\[
w_i = \frac{1}{\hat{\sigma}_p^2 + \frac{(\bar{p}(1-p) - \hat{\sigma}_p^2)}{n_i}}
\]

(3)

In this equation, \( \bar{p} \) represents the unweighted mean activity ratio of all hospitals (obtained simply by summation of all the ratios and dividing by the total number of hospitals), and \( \hat{\sigma}_p^2 \) is the estimated standard deviation, which is obtained from the following equation:

\[
\hat{\sigma}_p^2 = \frac{\sum (p_i - \bar{p})^2}{k-1} - \frac{\sum p_i (1-p_i)}{n_i} \frac{n_i}{k}
\]

(4)
Here, again, $\bar{p}$ is the unweighted mean activity ratio, $p_i$ is the activity ratio for hospital $i$, $n_i$ is the number of fetuses alive at maternal admission to hospital in hospital $i$, and $k$ is the total number of hospitals.

Having calculated the mean activity level, 25th and 75th percentiles were obtained for different numbers of fetuses alive at maternal admission to hospital using equation 5:

$$
\text{25th/75th percentiles} = P_w \pm 0.675\left(\sqrt{\frac{\hat{\sigma}_p^2}{n}}\right) \quad (5)
$$

where $n$ is the number of foetuses admitted into hospital and $\hat{\sigma}_p^2$ is defined by equation 4. This enabled individual hospitals to be compared to the percentiles, and consequently permitting allocation to one of the three potential groups created (see figure 1 in the main article).

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References