Mortality evidence in reconfiguration of neonatal services in Hywel Dda
Prepared for the Hywel Dda Community Health Council October 2013
(updated January 2014)

Introductory note

This paper represents my attempt to extrapolate the mortality findings in the literature cited by the
Scrutiny Panel in favour of centralization, to the local situation if Hywel Dda Health Board (HB)
proposals were adopted.

It was originally prepared when the intention of the HB was to retain a consultant obstetric service
at Withybush, with a putative throughput of 500-900 births per annum. Since then the HB have
abandoned the idea in favour of closing obstetrics altogether, and replacing it with a freestanding
midwifery unit (FMU). At current Welsh rates (3.5%) that would deliver only about 45 babies per
annum, though it is thought that the HB would hope its usage would be, perhaps, up to 300. On
the assumption that a unit delivering only one baby every eight days would fail I have made new
calculations – one with the assumption of 300, and one with zero births in Pembrokeshire (the
possibility of a significant number of homebirths is ignored for the time being). In addition to the
literature cited, for the new calculations I have used current Welsh data on FMU’s and, in the case of
zero births, a large Dutch study to estimate excess mortality in Pembrokeshire. The new findings
are presented and discussed in Appendix 2.

Definitions and international comparisons

“Low risk” is defined in two different ways in the literature reviewed: first, by birthweight more
than 2500g (which is over 93% of live births) \(^\text{i}\), and second as the lowest 2/3 of predicted mortality
\(^\text{ii}\). These are very different definitions.

“High risk” is correspondingly defined in two different ways, the converse of the above. Furthermore, separate literature looking at “high risk” mortalities refers almost exclusively to
“VLBW” (very low birth weight) infants, defined as less than or equal to 1500g, or “very pre-term”
(born at less than 32 weeks of gestation), which is a third definition.

There is a poorly documented group that might be called “intermediate risk” – those babies
between 1501 and 2500g, or born between 32 weeks and some time before full term. This group
is identified by birthweight in one of the studies \(^\text{ii}\). However it was not defined in other literature
reviewed.

Likewise definitions of perinatal and neonatal mortality vary, creating some difficulties with
international comparisons. Wales had in 2005 a neonatal mortality of about 3.4 per thousand live
births \(^\text{i}\), which at the time was similar to England and Australia (and represented a considerable
improvement over the previous ten years), but considerably less than the USA (4.5) and more than
Sweden (1.5). However the Swedes excluded all births under 1000g and used as the denominator
for their calculations all births rather than just live ones; both of these would decrease the index in
comparison with other nations. More recent data is now available for Wales which in 2011 had a
further reduced index of 2.9 \(^\text{i}\).
Locally, in 2011 the Hywel Dda (and Pembrokeshire) neonatal mortality was 0.8 per thousand which compares favourably with the rest of Wales. It is against that background of relatively good local performance that the HB proposals should be examined. Will they improve our performance?

Summary of my findings

1. The evidence favouring improved survival cited in the Scrutiny Panel report suggests that the gain, if any, from the Hywel Dda proposals would be very small.

2. In low risk cases (birthweight >2500g) which comprise over 93% of all births there would be at best only one life saved every fourteen to seventeen years, and the data from one study suggest that one life may even be lost over a period of approximately seventeen years.

3. In intermediate risk cases (birthweight 1501-2500g) that comprise approximately 5% of all births, the evidence is limited and more work is required to determine its validity. If the crude data of the only study cited with relevant information is accepted at face value, then approximately one life in this group would be saved every eight to nine years.

4. High risk cases (birthweight ≤1500g) are already managed as far as possible by in-utero transfer to a level 3 unit (usually Swansea or Cardiff). This practice would not be affected by the proposals, but if the standard of local resuscitation and stabilisation were to deteriorate following closure of the Withybush Special Care Baby Unit, then mortality in these cases could increase.

5. Any gains, if they exist, are so small that they will be counterbalanced by deaths due to the need for transfer across unacceptably long distances of unpredictable obstetric and neonatal emergencies. The changes would necessitate journeys for mothers and babies in extreme life-threatening situations of up to 46 miles (the distance from St David’s to Carmarthen). Evidence is cited for the deleterious effect of travel on sick neonates, and for an increase in mortality thereof.

6. Revised calculations following the Health Board’s new intention to close obstetrics altogether at Withybush, show that similar considerations apply. One or more extra neonatal death would occur in Pembrokeshire each year, long before the very best estimate of neonatal lives saved by centralization, which is one every 3.4 years (see Appendix 2).

7. Any possible effects on long-term morbidity or maternal mortality are not documented well enough in the literature to allow for any sensible predictions. However it seems sensible to assume that they would correlate with perinatal and/or neonatal mortality.

8. Therefore any arguments in favour of either of the Health Board’s two proposals should not include a claim of improved mortality and morbidity. Actually, on the basis of the updated calculations, if the Withybush obstetric unit was closed, there would probably be an increase in overall mortality.
Mortality evidence provided in the Scrutiny Panel report

On page 11 of the report is stated: “There is consistent evidence from around the world that the regionalisation of services for low-risk deliveries and the centralisation of high risk deliveries are effective in reducing neonatal deaths (Moster et al 2001; Heller et al 2002; Merlo et al 2005; Hallsworth et al 2007; de Jonge et al, 2009)”.

This statement contradicts that of Professor Marcus Longley who in his 2012 report “The best configuration of hospital services for Wales” stated: “Maternity and Newborn Care Services – There is no evidence of a consistent relationship between outcomes and size of unit and as such no clear conclusions can be established from published research”.

In order to reconcile the two, it may be possible, from the references cited, to calculate an estimate of how many lives might or might not be saved as a result of the proposed reconfiguration.

Assumptions regarding numbers of hospital births at present, and the numbers following proposed reconfiguration

Currently in Hywel Dda there are about 1600 births per annum at Glangwili Hospital, Carmarthen, about 1300 at Withybush Hospital, Haverfordwest, and about 550 at Bronglais Hospital, Aberystwyth. A further 450 births occur outside the area, mostly patients from Llanelli who make the choice to deliver in Swansea because of its proximity (plus the small number, less than 1% of all births, who are transferred there because of high risk, and perhaps a few local mothers who may go into labour while away from home). It is widely believed that following any reconfiguration patients in Llanelli would continue to choose Swansea, so that any increase in numbers in Carmarthen would have to come from Ceredigion and Pembrokeshire. The number of births in Ceredigion is so low that moving births from there would make a continuation of a consultant service unsustainable. So it is believed that no attempt would be made to remove patients from Aberystwyth, at least in the short term. Therefore the extra patients for Carmarthen would have to come from Pembrokeshire.

The number of deliveries in Carmarthen would increase from 1600, ideally to 2500 to fulfil College guidelines and Deanery requirements for training; in practice it is likely to be less than that, perhaps 2400. In order to achieve this 800 patients who formerly would have delivered their babies in Haverfordwest, would deliver in Carmarthen. Thus the numbers would change from 1600 to 2400 in Carmarthen, and 1300 to 500 in Haverfordwest.

An alternative assumption is that, on the basis of the alternative definition of “low risk” provided in one of the Scrutiny Panel’s references, as the lower two thirds of predicted mortality risk, approximately one third of Pembrokeshire patients might be removed to Carmarthen. This would result in Carmarthen increasing its births to about 2000, leaving Haverfordwest with about 900.

The calculations using both assumptions are identical, because both “after” configurations lead to similar hospital groupings as described in the literature.
The studies cited in the Scrutiny Panel report, and their analysis

These come from Norway *, Germany *, Sweden * and Holland *, and in one is assembled data from around the world *. However in only three of the five papers is mortality compared between different categories of hospital (those from Norway, Germany and Sweden). That from Holland compares planned home deliveries with those in hospital, and while (interestingly) it finds no difference in mortality between those groups, it appears not to be relevant to the statement made by the Scrutiny Panel. The other paper was prepared on behalf of the RAND Corporation, a non-profit organisation specialising in research for international comparison. Despite its inclusion by the Scrutiny Panel, again it does not provide relevant comparisons between types and size of unit. It does, however, provide useful background information (see above).

The Norwegian study (Moster et al 2001) categorized hospitals into those with ≤100, 101-500, 501-1000, 1001-2000, 2001-3000, and >3000 births per annum, and studied neonatal mortality (death before 28 days). The data in their tables enables a prediction of mortality before and after reconfiguration (but for low risk cases only). Their mortality for 2001-3000 births was used as a reference point because that is the range that would be provided in Carmarthen after reconfiguration.

The German study (Heller et al 2002) categorized hospitals into very small, small, intermediate and large (≤500, 501-1000, 1001-1500, and >1500 births per annum respectively), and studied perinatal mortality (death before 7 days). Their data is used in a similar way.

The Swedish authors categorized hospitals into “no neonatal facility”, “county hospital with some neonatal facility”, “county hospital with neonatal facility” and “regional”. Using the data from their tables, the average number of low risk births per annum in each category per hospital was respectively 398, 1031, 1578 and 2454. However the ranges of these were enormous (respectively 7-88, 452-2290, 441-3649 and 2466-3733), making it difficult to match our own hospitals with any particular category. The assumptions made are described (see below) and if anything I have been somewhat unkind to Withybush in its present configuration.
## Results

"Low risk" births

### Table 1. Excess deaths by unit size: low risk. * matched with hospitals on same line.

<table>
<thead>
<tr>
<th>Study and unit definition</th>
<th>Unit size (# birth p.a.)</th>
<th>Total births</th>
<th>% of all births</th>
<th>Total deaths</th>
<th>Deaths / 1000</th>
<th>Excess deaths cf. reference unit (3)</th>
<th>Excess deaths / 10y by unit size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moster et al (Norway) 2001 birthweight &gt; 2500g 1987-1996 neonatal deaths (&lt; 28d)</td>
<td>1 501-1000</td>
<td>79383</td>
<td>-</td>
<td>127</td>
<td>1.60</td>
<td>35.4</td>
<td>500 2.2</td>
</tr>
<tr>
<td></td>
<td>2 1001-2000</td>
<td>152960</td>
<td>-</td>
<td>192</td>
<td>1.26</td>
<td>15.5</td>
<td>1300 1.3</td>
</tr>
<tr>
<td>reference: 3</td>
<td>2001-3000</td>
<td>64999</td>
<td>-</td>
<td>75</td>
<td>1.15</td>
<td>0</td>
<td>1600 1.6</td>
</tr>
<tr>
<td>(no data on higher risk cases)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heller et al (Hesse State, Germany) 2002 birthweight &gt; 2500g 1990-1999 perinatal deaths (&lt;7d)</td>
<td>1 501-1000</td>
<td>221751</td>
<td>44.9%</td>
<td>137</td>
<td>0.32</td>
<td>61.0</td>
<td>500 1.3</td>
</tr>
<tr>
<td></td>
<td>2 1001-1500</td>
<td>152586</td>
<td>30.9%</td>
<td>76</td>
<td>0.26</td>
<td>24.0</td>
<td>1300 1.9</td>
</tr>
<tr>
<td>reference: 3</td>
<td>&gt; 1500</td>
<td>85490</td>
<td>17.3%</td>
<td>29</td>
<td>0.18</td>
<td>0</td>
<td>1600 0.0</td>
</tr>
<tr>
<td>total births in units 1-3:</td>
<td>494008</td>
<td>93.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merlo et al (Sweden) 2005 births in lowest 2/3 of mortality prediction 1990-1995 neonatal deaths (&lt; 28d)</td>
<td>No neonat: Av 398</td>
<td>19902</td>
<td>3.7%</td>
<td>20</td>
<td>1.00</td>
<td>10.1</td>
<td>500 1.7*</td>
</tr>
<tr>
<td></td>
<td>County, ‘some neonat’: Av 1031</td>
<td>67046</td>
<td>12.3%</td>
<td>42</td>
<td>0.63</td>
<td>8.5</td>
<td>1300 1.1*</td>
</tr>
<tr>
<td>reference: --- neonat: Av 1578</td>
<td>276078</td>
<td>50.8%</td>
<td>138</td>
<td>0.50</td>
<td>0</td>
<td>1600 0.0</td>
<td></td>
</tr>
<tr>
<td>total births in above 3:</td>
<td>543218</td>
<td>66.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Table 1 the data are taken from the descriptions and data in the studies referred to. Deaths / 1000 are given for national comparisons – that in Wales for neonatal deaths (<28 days) is 2.9 – for a comment on this, see main text (“background” section). The excess deaths in ten years for each size of unit (500, 1300 and 1600) correspond to sizes that might exist in the 'before' and 'after' scenarios in Pembrokeshire and Carmarthenshire, and are calculated from the excess deaths in the corresponding categories of hospital, with reference to the likely throughput of Carmarthen as a result of the proposals (2000-2400 births per year).

A detailed explanation of the derivation of the numbers in the Tables is given in Appendix 1.
Table 2. Predicted gains of reconfiguration: low risk births

<table>
<thead>
<tr>
<th>Excess deaths / 10y in &quot;before&quot; and &quot;after&quot; configurations (using two assumptions, see text)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Norway study 2001 (neonatal mortality - &lt;28 days)</td>
</tr>
<tr>
<td>Glangwili</td>
</tr>
<tr>
<td>Withybush</td>
</tr>
<tr>
<td>total</td>
</tr>
<tr>
<td>gain of reconfiguration:</td>
</tr>
<tr>
<td>= -1.1 to 0.7 deaths / 10y (&lt;= 1 life saved in about 14 years)</td>
</tr>
<tr>
<td>Germany study 2002 (perinatal mortality - &lt;7 days)</td>
</tr>
<tr>
<td>Glangwili</td>
</tr>
<tr>
<td>Withybush</td>
</tr>
<tr>
<td>total</td>
</tr>
<tr>
<td>gain of reconfiguration:</td>
</tr>
<tr>
<td>= -0.4 to 0.6 deaths / 10y (&lt;= 1 life saved in about 17 years)</td>
</tr>
<tr>
<td>Sweden study 2005 (neonatal mortality - &lt;28 days)</td>
</tr>
<tr>
<td>Glangwili</td>
</tr>
<tr>
<td>Withybush</td>
</tr>
<tr>
<td>total</td>
</tr>
<tr>
<td>gain of reconfiguration:</td>
</tr>
<tr>
<td>= -0.6 to -2.0 deaths / 10y (&gt;= 1 life lost in about 17 years)</td>
</tr>
</tbody>
</table>

In Table 2 the gain of reconfiguration is calculated as the number of perinatal / neonatal lives that would be saved in ten years. The result is a trade-off between no excess deaths in the ‘after’ scenario in Carmarthen (by reference to equivalent unit sizes in the quoted studies) and increased excess deaths in Haverfordwest due to having to run a unit dealing with as few as 500 births per year (results are also shown for the alternative configuration of 900 in Withybush and 2000 in Glangwili).

It is clear that the gains (if any) are tiny – depending on which study and which assumption is used for the prediction, at best one perinatal or neonatal life is saved every 14 to 17 years; and the figures from the Swedish study suggest that lives may even be lost (though admittedly this is stretching the available data a bit far).

In the case of the Swedish study, our numbers are difficult to match with hospital categories owing to their definitions. The calculation has been made assuming that a 500-900 birth unit matches...
with the Swedish ‘no neonatal care’ hospital, a 1300 birth unit with ’county hospital with some
neonatal facilities’ and a 1600 birth unit with ‘county hospital with neonatal facilities’ (the type of
hospital used for reference, so excess deaths = 0). This is perhaps being a little unkind to our
current Withybush unit which has been widely reported as functioning similarly to a ‘level 2’ unit,
but despite allocating some excess deaths to it the data suggest no survival gain whatsoever, or
even loss (see above).

Higher risk births

Table 3. Excess deaths by unit size: Intermediate risk or top 1/3 mortality prediction

<table>
<thead>
<tr>
<th>Study and unit definition</th>
<th>Unit size (# birth p.a.)</th>
<th>Total births</th>
<th>% of all births</th>
<th>Total deaths</th>
<th>Deaths / 1000</th>
<th>Excess deaths cf. reference unit (3)</th>
<th>≡ excess deaths / 10y by unit size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heller et al (Hesse State, Germany) 2002 birthweight 1501-2500g 1990-1999 perinatal deaths (&lt;7d)</td>
<td>1 501-1000</td>
<td>9622</td>
<td>1.95%</td>
<td>30</td>
<td>3.12</td>
<td>6.0</td>
<td>500 0.2</td>
</tr>
<tr>
<td>2 1001-1500</td>
<td>9609</td>
<td>1.95%</td>
<td>43</td>
<td>4.47</td>
<td>19.0</td>
<td>1300 1.4</td>
<td></td>
</tr>
<tr>
<td>Reference: 3</td>
<td>&gt; 1500</td>
<td>8009</td>
<td>1.62%</td>
<td>20</td>
<td>2.50</td>
<td>0</td>
<td>1600 0.0</td>
</tr>
<tr>
<td>Total births in units 1-3</td>
<td>494008</td>
<td>5.51%</td>
<td>93</td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Merlo et al (Sweden) births in highest 1/3 of mortality risk prediction, 1990-1995 neonatal deaths (<28/d) | | |
|-------------------------------------------------------------|----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|
| No neonat: Av 398 | 8584 | 1.58% | 24 | 2.80 | -24.3 | 500 | -4.7 |
| County, ‘some neonat’: Av 1031 | 31168 | 5.74% | 101 | 3.24 | -74.5 | 1300 | -10.3 |
| Reference — neonat: Av 1578 | 140440 | 25.85% | 791 | 5.63 | 0 | 1600 | 0.0 |
| Total births in above 3 | 543218 | 33.17% | 916 | 1.69 | |

Table 3 is similar to Table 1.

In the German study the smallest hospitals apparently performed better than the intermediate-sized
ones, but not as well as the largest ones. In the Swedish study performance appeared to get worse
with each increase in size of unit.

Presumably there are variations in case mix and referral pattern that explain the findings. The
German authors did not attempt to make an adjustment. The Swedish authors did, and produced a
chart showing a “flattening” of the variation between units; however they did not publish adjusted
mortalities from which predictions might have been calculated.
Table 4 depicts the predicted excess mortalities for ‘intermediate risk’ cases in similar format to Table 2 using the data at face value. Whether lives are predicted to be saved or lost depends on a) how much better one unit is than the other(s) and b) the number of patients passing through it. The overall performance may go up or down. In fact the German data predict that 1.2 lives may be saved in ten years, i.e one life every 8.3 years, whereas the Swedish data suggest that 5.6 lives may actually be lost in the same period.

This information must be treated with extreme caution and it is not intended to suggest that the new configuration would actually lose lives. The evidence perhaps suggests that in the 5% of patients with “intermediate” risk, at best one life may be saved in eight to nine years, and that in the top third of mortality risk of all births reconfiguration would offer no benefit in terms of survival.

Table 4. Predicted excess deaths: intermediate risk / top third of predicted mortality

<table>
<thead>
<tr>
<th>Excess deaths / 10y in &quot;before&quot; and &quot;after&quot; configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>Germany study 2002 (perinatal mortality - &lt;7 days)</td>
</tr>
<tr>
<td>Glangwili</td>
</tr>
<tr>
<td>Withybus</td>
</tr>
<tr>
<td>total</td>
</tr>
<tr>
<td>gain of reconfiguration:</td>
</tr>
<tr>
<td>Sweden study 2005 (neonatal mortality - &lt;28 days)</td>
</tr>
<tr>
<td>Glangwili</td>
</tr>
<tr>
<td>Withybus</td>
</tr>
<tr>
<td>total</td>
</tr>
<tr>
<td>gain of reconfiguration:</td>
</tr>
</tbody>
</table>
Other studies

Besides those cited in the "Background" section near the beginning of this paper, one of the largest published meta-analyses of neonatal care studies has been looked at. It is cited by the Imperial College group in their BMJ article on managed clinical networks, and looks at very low birthweight and very pre-term babies. This shows clearly that the use of level 3 centres for this group (about 1% of all births) improves survival by about 60%. This finding is widely accepted so that current practice uses level 3 units for all predicted to be in this risk group, this would not be altered by the Health Board proposals.

The factor not considered

This is increased mortality due to excess travel. The Neonatal expert on the Scrutiny Panel, Professor Neena Modi, with her colleagues at Imperial College has been a pioneer in introducing 'managed clinical networks' in England and published extensively. In a paper on this topic she refers to the evidence that shows an increased morbidity and mortality attributable to travel - the main disorder that develops being intraventricular haemorrhage that may be fatal. The aim of managed clinical networks is to facilitate earlier transfer of mothers at high risk - to reduce the need for transfer of seriously ill newborn babies. In other words the aim is to increase "in-utero" and decrease "ex-utero" travel.

However well such a network may function, there will always be unpredictable obstetric and neonatal emergencies that occur in low-risk patients - 'low risk' does not mean 'zero risk'. In Pembrokeshire there is a natural concern that such unpredictable emergencies cannot safely travel the distances - up to 46 miles from Pembrokeshire (St David's), and 33 miles from Withybush Hospital - to a unit at Glangwili Hospital. Additionally some of these cases will fall into the category requiring level 3 care and require direct transfer to Swansea rather than Carmarthen - a journey taking only about 15 minutes longer by road, and probably not significantly longer if air transport is used. This suggests that Swansea may be preferred for the desperately urgent cases rather than Carmarthen, decreasing the usefulness of the proposed new unit. In any case it is easy to surmise that there will be a few cases that would have been saved at Withybush Hospital with the current configuration, that will not reach either Carmarthen or Swansea to be saved, in the new configuration.

(see Appendix 2 for updated thinking on this).

Conclusion

The evidence cited in the Scrutiny Panel report suggests that survival gain of the Hywel Dda Health Board's neonatal configuration proposal is very small, to the extent that it will be counterbalanced or even over-balanced by unpredictable emergencies having to travel up to 46 miles as a result of centralising neonatal services to Carmarthen.

Peter Milewski, October 2013
(updated January 2014)
Appendix 1: Derivation of numbers for the tables

Derivation of the numbers in Table 1

Moster et al.:

- The #births per annum, total births and neonatal deaths are taken from Table 1 in the Moster paper.
- Deaths / 1000 is calculated as total deaths / total births x 1000 for each unit size.
- Excess deaths for the two unit sizes 501-1000 and 1001-2000 is calculated as total deaths – (total deaths / total births for unit size 2001-3000 [the reference unit] x total births).
- Excess deaths / 10 years for unit size 500 is calculated as (excess deaths / total births for unit size 501-1000) x 500 x 10, yielding the predicted total excess deaths over a ten year period.
- The same calculation is made for unit sizes 1300 and 1600, but using the excess deaths and total births for unit size 1001-2000.

Heller et al.:

- The data is taken from Table 3 in the Heller paper.
- For each unit size (501-1000, 1001-1500 and >1500) the values in the two relevant rows under the sections “normal birthweight ≥2500 g” and “normal birthweight born at term” are summed.
- Calculations of the other columns are as above, with the addition of multiplication of the predicted excess deaths by the percentage of total births (that information being available in this study). The excess deaths / 10 years for unit size 1600 uses the numbers for unit size > 1500. That is the reference size and the result is therefore zero.

Merlo et al.:

- The data are taken from the “No. deliveries” and “Observed No. Deaths” columns of the “Low-risk deliveries” section of Table 2.
- The calculations are made in a similar way as above, accounting again for the percentage of cases of the total.
- For calculation of predicted excess deaths / 10 years for a 500 delivery unit, the values for “County hospital without neonatal care” were used, for a 1300 delivery unit, those for “County hospital with some neonatal care”, and for a 1600 delivery unit, “County hospital with neonatal care”.
- The reference category for calculating excess deaths was taken as “County hospital with neonatal care”.

Derivation of the numbers in Table 2

The excess deaths / 10 years for each unit size in the “before” and “after” columns are taken from the corresponding values in the right hand column of Table 1. In the case of the range of unit size 2000-2400 (Carmarthen after reconfiguration) this is within the reference range for each study, and the values are therefore zero.

Tables 3 and 4

The same calculations are made for the “intermediate risk” and “top third of predicted mortality” groups as for the “low risk” cases in Tables 1 and 2.
Appendix 2 (January 2014): Recalculating for 300 and zero births

Note: the calculations are performed in exactly the same manner as in the tables above, based purely on the data provided in the references cited. No account is taken of any effect of excess travel on mortality. I attempt to deal with this in each section in this Appendix.

300 births (low risk)

The Norwegian data would predict 1.3 excess deaths per ten years in Pembrokeshire instead of 2.2 for 500 births, and 4 for 900. This rather contrived calculation is based on the figures that show better results for over a thousand births. The fewer the patients under a thousand, the fewer the excess deaths, as depicted in the tables above. 300 births results in an improved prediction of 1.6 lives saved every ten years.

Similarly the German data shows a predicted improvement, to 0.6 excess deaths per ten years instead of 0.4 for 500 and -0.2 for 900 (i.e. an increase in deaths).

Likewise, the Swedish data shows a gain of 0.1 fewer deaths in ten years, compared with -0.9 and -2.9 (i.e. increases in deaths) for 500 and 900 births respectively.

These “improvements” are based on the admittedly rather contrived notion that once the number of births reaches a zone where the research shows higher mortality (i.e. fewer than 1000) then the fewer births there are within that zone, the “better” because there will be fewer excess deaths.

Whether these are real or imagined “improvements”, they are small, corresponding to an extra survivor every 7.8, 17 and 100 years respectively.

So we need to answer the question “if these 300 births are started in a freestanding midwifery unit (FMU) without obstetric help, then would more babies die than with immediate local obstetric help?”

That is very difficult to answer but in my document on FMUs I have shown that the Welsh FMU mortality is well over two deaths per thousand worse than the English one (actually it is 3.6 vs 0.85 which is 2.75).

Is it valid to assume that some of those deaths would not have occurred had the labour started in an obstetric unit? Well, let us say that one of those 2.75 babies would have survived. In that case that would be one extra death approximately every three years for a 300-birth unit.

- It is not difficult to see that, using the above assumption, the single extra death has occurred much sooner than any extra life saved on the basis of the data in the studies cited, and I have deliberately been conservative in my estimation. Perhaps actually two rather than one baby might have been saved.
Zero births

Of course this is the ideal from the point of view of the size of the obstetric unit, because there are in theory no excess deaths in Pembrokeshire, every mother having gone to Carmarthen. The calculations yield respectively 2.9, 1.1 and 1.6 lives saved every ten years with this arrangement, or in other words one life saved every 3.4 to 9.1 years.

Now we have to consider the factor of unpredictable disasters affecting the mother and/or child. About all we have to go on is a large Dutch study (cited by Ruth Howells, whom I thank for the information) demonstrating an increase in mortality with drive times of more than twenty minutes. The drive time from Withybush to Glangwili Hospital is certainly more than that, and disutility studies within the last few years have indicated that no community in Pembrokeshire is even within 30 minutes’ drive of Glangwili.

This study demonstrated an odds ratio of 1.17 for total mortality (of babies) and 1.27 for adverse outcomes (for example hypoxia or admission to intensive care). That is to say, there were approximately 1.17 times or 17% more deaths in the “over-20 minute” group compared with the rest. Extrapolating that to the Welsh situation, the current (2009-2012) overall stillbirth rate for Wales is 4.5 per thousand, and neonatal mortality 2.7, giving a total mortality in the first 28 days of 7.2 (not accounting for the small effect of the different denominators). So in Pembrokeshire’s 1300 births per year at Welsh rates there would be a total mortality of 9.36 each year (actually Pembrokeshire’s figures show only 4.7 total deaths). Taking both figures, a 17% increase would represent between 0.8 and 1.54 deaths each year.

• Again, it is not difficult to see that on the above basis an extra death or two will have occurred in Pembrokeshire long before any life is saved with the proposed new arrangement.

• We currently do not have data for morbidity in Wales, in particular long-term sequelae of neonatal complications; whatever the true figures are, they too would increase, on the above basis by a factor of 1.27, or 27%.

• It is not feasible to try to make similar calculations with regard to maternal mortality, but it seems likely that it would go hand in hand with morbidity and mortality of the baby.

1 The calculations in this paragraph are a correction of my original version in which I erroneously added to neonatal deaths perinatal ones (which actually includes the first week of neonatal deaths) rather than stillbirths. The conclusion from the calculations is unchanged.
References


xv Travel time from home to hospital and adverse perinatal outcomes … in the Netherlands. BJOG Dec 2010. DOI: 10.1111/j.1471-0528.2010.02816