Place of birth and perinatal mortality

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SUMMARY. Analyses of the published results of national surveys and specific studies, as well as of the official stillbirth statistics, consistently point to the conclusion that perinatal mortality is significantly higher in consultant obstetric hospitals than in general practitioner maternity units or at home, even after allowance has been made for the greater proportion of births in hospital at high pre-delivery risk. Unpublished results of the British births 1970 *survey, which have now become available, make possible a direct and authoritative analysis of data on the safest place of birth. Not only does this make the earlier conclusion more certain, but it confounds the doctrine that obstetric intranatal care is particularly beneficial for high pre-delivery risk births. There is no evidence from recent years that the findings of 1970 are not equally valid in the 1980s.*

Introduction

The safe birth of an infant depends on many factors: biological and social characteristics known at the start of pregnancy, medical conditions which develop during pregnancy and how they are treated, medical conditions at the time of delivery and how labour is managed, and neonatal care. Information has been gathered from many sources, notably from the national perinatal surveys of 1958[1,2] and 1970,[3,4] to which obstetricians made a major contribution and which has quantified reliably the association of outcome with the most relevant maternal characteristics and complications of pregnancy and also with infant birthweight and gestational age. The association between outcome and medical care, either antenatal[5] or intranatal, is less well-established. Yet the organization of the maternity service has been based on the assumption that obstetric interventions, particularly in the intranatal period, are beneficial, and that their advantages at least outweigh any possible disadvantages when they are used. This has culminated in the near total hospitalization of births.

Although the 1958 survey was designed 'to provide information of value upon a number of aspects relating to the safety and health of mother and infant, including the possible effects of place of confinement',[1] the data were not in fact analysed to achieve this last objective. This omission was the more regrettable since the crude perinatal mortality rate per 1000 births was found to be 2.5 times as high in consultant hospitals (where 49% of births took place) as in general practitioner units (12% of births) or at home (36% of births) and analyses of the limited data published show that this disparity cannot be explained by a greater number of high pre-delivery risk births in hospitals, arising from selection and transfer policies. Nor can it be explained by an excess of births of low weight or short gestation in hospitals.[6-8] Thus the results of the 1958 survey did not justify the assumption that delivery in hospital, under obstetric management, is on balance advantageous.

Nevertheless, by the time of the 1970 survey the proportion of births taking place in consultant hospitals had increased by one-third to 66%, but the disparity between the perinatal mortality rate there and in general practitioner units or at home had doubled to become fivefold: the perinatal mortality rate in hospital was 27.8 per 1000 against 9.5 for general practitioner beds in consultant units, 5.4 in general practitioner units and 4.3 at home.[3] This disparity was not discussed in the report, though the seriousness of a similar disparity between the perinatal mortality rates for births in social class 1 and unsupported mothers was stressed. Evidence was not presented which might have shown that the excess perinatal mortality rate in hospital was due to greater numbers of high-risk births.[4]

Analysis by intended place of delivery

It is often argued that perinatal mortality rates by place of delivery could only be used to assess the relative safety of intranatal care at each place if they were the results of a randomized controlled trial. Results of such a trial are reliable indicators of the relative safety of treatment only if all or nearly all subjects in each group actually have the type of care to which they have been allocated. A considerable proportion of births originally booked on a non-random basis for delivery in a general practitioner unit or at home are transferred to hospital usually because of diagnosed complications, while some births originally booked for delivery in hospital take place before arrival there.

At no time in the past have deliveries been randomly allocated to different places of birth and there are persuasive reasons, both practical and theoretical,[9,10] why it would not now be possible to do so. Nevertheless, it is argued that the correct method of dealing with results is to mimic the randomized controlled trial and analyse by intended, not actual, place of delivery. Thus it is hoped to avoid the problem of the transfers, for which the perinatal mortality rate is found to be higher than for births booked for hospital and much higher than for births booked for general practitioner units or home.

The method would be appropriate if the objective were to compare the total risk of booking for hospital with the total risk of booking for general practitioner unit or home, including the risk of transfer, taking the risks attendant on the different methods of intranatal care at each place as given. But it is not appropriate if the objective is the much more fundamental one of comparing the results of actual care by the different methods. To compare perinatal mortality rates by place of booking is to compare intranatal care in hospital with a mixture of intranatal care — some in hospital (the transfers) and some in general practitioner units and home. Since, however, the perinatal mortality rate by place of booking was found in both the 1958 and 1970 surveys to be still significantly higher in hospital,[1,11] this technique of analysis reinforces the inference from comparing the crude perinatal mortality rates — that intranatal care must be less safe in hospital, unless a sufficiently large excess of high-risk births were originally booked for hospital. Detailed data from the 1970 survey can be analysed to show that this condition was not fulfilled.

The excess of high risk births in hospital and its effect

The number of actual births at each place of delivery was published for each sub-group of the risk factors — maternal age and parity — and hospital births were found to include a rather greater proportion in the higher grades of risk. The reasons why the births took place where they did cannot be determined. Though the number of associated deaths was not published, the data are sufficient to calculate whether each place

Table 1. Perinatal mortality rates per 1000 births, crude and standardized for risk factors.[a]

Risk factor	Hospital	GP unit and home[b]
Crude	27.8	5.4
Standardized for:		
age	27.5	5.7
parity	27.3	5.6
hypertension/toxaemia	27.6	5.5
antenatal prediction score	26.3	6.0
labour prediction score	24.0	8.4
method of delivery	25.8	6.8
birthweight	22.7	10.5

Source: *British births 1970* (volume 1, table 2.19 and volume 2, tables 2.25, 2.31, 4.17, 5.7, 5.8, 5.9, 5.11) and unpublished data.

[a] The method of standardization is described in Appendix 1.

[b] Includes general practitioner beds in consultant hospitals.

would have had more (or fewer) total deaths if the births in each of their sub-groups of risk had had the same specific perinatal mortality rate as the average for all places. The calculation is worked out for parity in Appendix 1 and shows that hospitals actually had more deaths than expected and general practitioner unit and home deliveries had fewer. When these ratios are applied to the overall average perinatal mortality rate, the adjusted or standardized perinatal mortality rates are obtained for each place (Table 1). The hospitals' excess of births at high risk accounted for only a small part of their excess overall perinatal mortality rate. Nor is the higher mortality rate explained by the greater proportion of births in hospital in the higher risk grades of hypertension/toxaemia, the only other single risk factor for which the data were published (Table 1).

To measure the combined effect of several risk factors known in time to influence booking or early transfer, an antenatal prediction score was constructed (Table 2). A score was calculated for every birth in the survey — the higher the score, the greater the risk. Hospital births were found to include a greater proportion of moderate- and high-risk cases, but standardizing the perinatal mortality rates as before shows that this excess explained little more of the disparity between the crude perinatal mortality rates than did the excess of risk on account of single factors (Table 1). This is because, as all enquiries have established, the factors are to a greater or lesser extent interdependent, so that allowing for the risk from one allows for much of the risk from others.

Table 2. Antenatal prediction score: weights given to risk factors.

	Risk		
Factor	Low	Moderate	High
Maternal:			
age	0	1	2
parity	0	1	2
social class	0	1	2
Previous:			
stillbirth			4
neonatal death			4
abortion			4
Caesarian section			4
Hypertension			4
Diabetes			4

Source: *British births 1970* (volume 2).

The survey's analysts went further and constructed a labour prediction score, adding to the antenatal prediction score the conditions occurring during pregnancy and early labour which are 'known to affect perinatal mortality and morbidity adversely and so may influence the management of labour'[4] (Table 3). Thus the labour prediction score represents a comprehensive measurement of pre-delivery risk. Details by place of confinement were not published in the report,[4] but following a private request this material was made available (Golding J, personal communication). Once again, hospital births are found to include a greater proportion of moderate- and high-risk cases, but after standardizing, the gap between the perinatal mortality rates, though reduced, remains wide (Table 1).

The published data enabled the perinatal mortality rates to be standardized in respect of two other variables — method of delivery and infant birthweight. Spontaneous cephalic deliveries, at lowest risk, make up 79% of hospital births as against 97% in general practitioner units and home. Even if the bias towards assisted deliveries had been necessitated entirely by the pre-delivery risk status of the hospital births and was not the result of active management, it accounted, like the other risk factors, for only a small part of the excess perinatal mortality rate in hospitals. Hospital births included a greater proportion of low-weight babies. One contribution to the bias was almost certainly the use of induction, for 28% of all births in hospital were induced; but even if this bias was not the result of active management but was entirely due to natural causes, their predicted excess of low-weight births would not have explained most of the hospitals' excess perinatal mortality rate (Table 1).

Table 3. Labour prediction score for singletons: weights given to risk factors.

	Risk		
Factor	Low	Moderate	High
Antenatal prediction score	0	1	2
Previous Caesarean section			4
Hypertension/toxaemia	0	1	2
Antepartum haemorrhage			2
Duration of pregnancy	0	1	2
Duration of first stage	0	1	2
Fetal distress	0	1	2 or 4
Breech presentation			4

Source: *British births 1970* (volume 2).

It would of course be arithmetically impossible for standardization — allowing for the excess proportion in hospital of births at higher risk — to eliminate or reverse the excess crude perinatal mortality rate in hospitals, unless the perinatal mortality rates at specific levels of risk were always or usually lower in hospital. In the 1958 survey this never happened, whether the perinatal mortality rates relate to place of delivery or to place of booking. In the 1970 survey perinatal mortality rates at specific levels of risk were published for only one risk factor — hypertension/toxaemia. These showed that at every level the perinatal mortality rate was highest in hospital. It is virtually certain that the same was true for sub-groups of other factors, given the overall results. The recently released data, summarized in Table 4, confirm that it was true for every labour prediction score.

Table 4. Births and perinatal mortality rates (PNMRs) by labour prediction score (LPS) and place of delivery.

Level of risk	LPS	All births		Percentage at each score		PNMR per 1000 births	
		Number	(%)	Hospital	GP unit and home[a]	Hospital	GP unit and home[a]
Very low	0–1	7488	*45.9*	*58.7*	*41.3*	8.0	3.9*
Low	2	3723	*22.8*	*68.8*	*31.2*	17.9	5.2**
Moderate	3	2273	*13.9*	*76.6*	*23.4*	32.2	3.8***
High	4–6	2417	*14.8*	*84.0*	*16.0*	53.2	15.5**
Very high	7–12	427	*2.6*	*96.5*	*3.5*	162.6	133.3

*$P<0.05$; **$P<0.005$; ***$P<0.001$. Source: *British births 1970* unpublished survey data. [a]Includes general practitioner beds in consultant hospitals.

Using the new material to estimate perinatal mortality rates for comparable risk groups

Specific perinatal mortality rates by labour prediction score provide by far the most direct, informative and practicable instrument for analysing data on the safest place of birth. The labour prediction score covers many kinds of risks; the procedure of allocating scores to births is completely unbiased. It does not matter whether or not the births in hospital with any specific score came to be there as a result of the selective booking or transfers policies. They represent births which at the time of delivery were at a measured degree of risk, from very low to very high, equivalent to the degree of risk of births with the same score, made up by the same factors, which took place in general practitioner units or home. It becomes possible to compare like with like and measure the relative safety of different methods of care applied to deliveries at the same level of risk.

The results are disturbing; they confirm that, as intended, the proportion of births in hospital increased as the labour prediction score increased, the overall score being 'the ultimate indicator of the type of care a mother should receive'.[4] But they cast doubt on the wisdom of that policy. For though the perinatal mortality rate in hospital was twice as high as in general practitioner units and home for births at very low risk, the margin was much wider at low, moderate and high risk. Only in the small group at very high risk was the perinatal mortality rate in hospital not significantly higher than in general practitioner units and home, where there were only 15 births. The perinatal mortality rate for high-risk births in general practitioner units and home (15.5 per 1000) was slightly lower than for low-risk births in hospital (17.9 per 1000). It is important to note that the perinatal mortality rates in general practitioner units and home were hardly different for births at very low, low and moderate risk, which suggests that the methods of intranatal care there succeed in overcoming a range of predicted risks. In contrast, the perinatal mortality rate in hospital multiplied as the labour prediction score increased, which suggests that the methods of intranatal care used in hospital intensify the risks.

The pathological states where obstetric intervention is lifesaving were outnumbered by states where it is not. Problems can certainly occur in general practitioner units and home, where the level of intervention is low, but they must occur more frequently in hospital where intervention is regular practice, otherwise the statistical results would be the reverse of what they are. Unless some other factor can be found to explain these results from the obstetricians' own analysis of survey data, they must be interpreted as meaning that most infants do not benefit from active obstetric management and most of those already at higher risk benefit least.

What could the other factor be? It has been suggested that hospital deliveries include an excess of cases where the fetus is already dead or moribund following transfers from general practitioner units or home. But this factor could not account for the excess perinatal mortality rate in hospitals, for their mortality rate for live births was by itself more than twice the perinatal mortality rate for all births, live and still, in general practitioner units and home. In 1970 the proportion of stillbirths owing to congenital malformation was only 3% greater in hospital than in general practitioner units and home, so this factor would explain hardly any of the excess perinatal mortality rate.[12]

Also unlikely is the suggestion that a greater number of hospital births are at high risk on account of factors additional to those included in the labour prediction score but totally independent of them, as they have to be if they were to account for the disparities in the perinatal mortality rate unexplained by the labour-prediction score. There may well be risk factors as yet unidentified and unquantified; for example, the paternal contribution. But, precisely because they are unidentified, there can be no evidence that these factors exist in excess among hospital births. Doctors would be unlikely to direct low-risk pregnancies to hospital because their clinical judgement foresaw danger from some other factor not recognized as being associated with high risk. Yet such unrecognized factors would have to be sufficiently powerful and prevalent in such excess among hospital births that they would account for twice as much of the total disparity in perinatal mortality rates as was accounted for by all the factors in the labour prediction score. The hypothesis does not stand close examination.

Breathing difficulties

Perinatal outcome was also measured in relation to breathing difficulties which were more often suffered by, and proved fatal to, infants born in hospital, despite the fact that a much greater proportion of them were transferred to special care baby units (Table 5).[3,13] Rates of respiratory depression and mortality were found to be higher when the various interventions included in

Table 5. Infants with breathing difficulties.

	Hospital	GP unit and home[a]
Live births (actual)	10 965	5170
Infants with breathing difficulties per 100 live births	9.3	3.3***
Deaths associated with breathing difficulties per 1000 live births	9.4	1.9***
Transfers to SCBUs per 100 infants with breathing difficulties surviving after six hours	62.0	26.2***

***$P<0.001$. Source: *British births 1970* (volume 1, tables 2.19, 6.21, 6.24, and page 179). [a] Includes general practitioner beds in consultant hospitals. SCBU = Special care baby unit.

active management were used than when they were not. It has to be remembered that these intervention methods had not been systematically evaluated before their practice became widespread to confirm that they were of benefit in the circumstances where they were actually being used. No evidence was offered in the survey report to support the claim that intervention was only resorted to in order to avert a worse outcome: indeed half the inductions were carried out in births at low predicted risk. That they failed to avert a worse outcome is witnessed by the fact that cases with the same labour prediction score which were treated by the low intervention methods of general practitioner units and home suffered much lower mortality.

More recent experience

Thus the result of the 1970 survey, far from verifying the assumption that delivery in hospital under active obstetric management is beneficial, contradicted this. The national surveys of 1958 and 1970 covered large random samples of the births in these years. There has since been no comparable large-scale study by which obstetric practice after 1970 might be evaluated. However, the conclusions from the earlier surveys are confirmed in the results of smaller studies using data of the later 1970s where outcome following spontaneous delivery is favourable compared with outcome following specific interventions in populations carefully matched for pre-delivery risk.[14-16] Similar findings from 1981 data are also reported from Holland.[17] Until 1981, the last year for which official data for England and Wales have been published,[18] the stillbirth rates for all births and at specific levels of the risk factors maternal age and parity, continued to be, as before, significantly higher in hospital than in general practitioner units and home combined.

Since 1970 the proportion of births in hospital, and hence subject to active obstetric management, has continued to increase, while the national perinatal mortality rate has continued to fall. But the years when the proportional increases in hospitalization were greatest were the years when the proportional decreases in the perinatal mortality rate were least, and vice versa. Analysis of the official data for 1969–81, the period when they are available, confirms that the correlation between the trends is significantly negative, which implies that if hospitalization had increased less the perinatal mortality rate would have decreased more. There is, therefore, no reason to suppose that the relationships between obstetric interventions and outcome, discovered in the 1970 survey, no longer obtain.

Also since 1970 there have been many changes in obstetric practice. New types of intervention, for example, ultrasound scanning, electronic fetal monitoring and epidural anaesthesia, have been introduced and have become widely used, often without prior evaluation of their benefit in the relevant circumstances. The use of interventions like Caesarian section has increased, likewise without evaluation, but since 1978 the use of induction and forceps has decreased, allegedly in response to the research findings of the present author.[19] Formerly unquestioned rules of management, such as the position for delivery, have been relaxed, probably in response to consumer pressure.

The National Birthday Trust Fund, working through obstetricians and others concerned, forfeited the opportunity to evaluate the elements of contemporary obstetric practice when it carried out another survey in 1984, this time concentrating only on enumerating the facilities — manpower, equipment and services — at each place of birth but not linking these facilities with perinatal outcome.[20] Therefore it cannot be established whether or not these facilities are advantageous. Based on previous evidence, which has not yet been contradicted, the use of at least some of them must certainly have been disadvantageous. There is now a danger that the results of the survey will be used as justification for further concentrating births in the places which have the most facilities, almost certainly large obstetric hospitals, instead of allowing births to take place in general practitioner units or with normal care at home, where they can be shown to be safer but where the provision of facilities is modest.

Appendix 1. To show how perinatal mortality rates (PNMRs) are standardized to allow for different proportions of births in each place, when the specific PNMRs in each place are not known — the indirect method of standarization — using data from the *British births 1970* survey (volume 2, table 5.9). The parity-specific PNMRs for the survey population and the number of births in each parity group at each place are known.

		Hospital		GP unit and home	
Parity	Survey PNMRs (per 1000)	No. of births	No. of expected deaths	No. of births	No. of expected deaths
A	B	C	$\frac{B \times C}{1000}$	D	$\frac{B \times D}{1000}$
0	21.3	4249	90.5	1325	28.2
1	18.0	3018	54.3	1966	35.4
2	21.7	1663	36.1	1070	23.2
3	19.1	922	17.6	541	10.3
4 plus	34.1	1304	44.5	284	9.7
All parities	21.4		243.0		106.8
			Actual deaths 310		*Actual deaths* 28

Standardized PNMR (per 1000): survey PNMR x $\frac{\text{actual deaths}}{\text{expected deaths}}$

$21.4 \times \frac{310}{243.0} = 27.3$ $\quad$ $21.4 \times \frac{28}{106.8} = 5.6$

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Childhood asthma and puberty

It is common practice for a physician to comfort the parents of an asthmatic patient with the assurance that most children 'grow out' of their illness by puberty. This favourable prognosis has become generally accepted despite the sceptics who believe, as Levison and colleagues, that they merely outgrow their paediatricians. This study was undertaken to clarify the relation between clinical asthma and puberty.

Thirty eight, chronic, perennial asthmatic children were prospectively examined every six months for a mean 8.9 years to clarify the relation between clinical asthma and puberty. Improvement in the disease occurred independent of puberty but the rate of improvement was appreciably greater during puberty. This led to speculation that improvement in childhood asthma could be associated with an immunological process capable of receiving a powerful stimulus from hormones active during puberty.

In addition, children whose illness improved before any sign of puberty had developed could be confidently predicted to 'grow out' of their disease. Conversely, if no improvement was seen by the onset of puberty, a much more guarded prognosis was needed.

Source: Balfour Lynn L. Childhood asthma and puberty. *Arch Dis Child* 1985; **60:** 231-235.