Perinatal outcomes and related factors: social class differences within and between geographical areas

DIANA ELBOURNE,¹ COLIN PRITCHARD² AND MARJORIE DAUNCEY³

From the National Perinatal Epidemiology Unit,¹ Radcliffe Infirmary, Oxford, OX2 6HE; Medical Research Council Medical Sociology Unit,² Glasgow; and Department of Medical Computing and Statistics,³ University of Wales College of Medicine, Cardiff*

SUMMARY This paper makes use of the opportunity provided by comparable obstetric data bases to examine area and social class variations in perinatal outcome and associated factors in areas smaller than those usually reported. Analyses are based on singleton births to primiparous residents in the catchment areas of the Aberdeen Maternity and Neonatal Database (n = 4948) and the Cardiff Births Survey (n = 11893) between 1976 and 1981. The factors considered relate to the obstetric population (height, age, and smoking), obstetric practice (induction and assisted delivery), and perinatal outcome (curtailed gestation, low birthweight, and perinatal death). Our analysis confirms the existence of both area and social class differences and suggests that, except in the case of teenage pregnancy and smoking, the association observed between those factors and area and social class are largely independent of each other.

There exists a large body of research¹ demonstrating the variety of relationships between the circumstances in which people live and aspects of human reproduction. Most of this has shown that the chance of adverse perinatal outcomes and their associated risk factors are consistently higher for babies born to women in working class compared with middle class families, and are also higher for babies born to mothers whose usual place of residence is in the north or west compared with the south or east of Britain.

The authors of the Decennial Supplement for the years 1970–72 considered both class and regional mortality together. They concluded that “although social class does explain some of the differences in infant mortality between the regions, marked differences remain unaccounted for”.²

The broad objectives of this paper are to explore their conclusion further, focussing instead on perinatal mortality. Variations in the incidence of factors associated with perinatal death¹ are also considered. For each of these variables (death and risk factors) a series of four interrelated questions are posed. The first pair of questions relates to comparisons between geographical areas and asks:

- 1 Is there a difference in the overall incidence of the variable in question between the areas considered?
- 2 Are differences repeated throughout the social class distribution?

The second pair of questions relates to comparisons between social classes and asks:

- 3 Is there a relationship between the variable in question and social class?
- 4 Is this relationship similar for the different areas being compared?

Materials and methods

DATA BASES

The National Perinatal Epidemiology Unit Aberdeen/ Cardiff/Oxford Collaborative Project was created to provide a common framework for research between three well established perinatal data bases. The present study is based on the two data bases in Aberdeen and in Cardiff.

The Aberdeen Maternity and Neonatal Data Bank (AMNDB)³ was established in 1948 and in recent years covers all births to residents of Aberdeen City and District.

The Cardiff Births Survey (CBS)⁴ was established nearly 20 years later, in 1965. From 1974 it has covered births to residents of an area which, until the 1982 National Health Service reorganisation, was the South Glamorgan Area Health Authority, an obstetric population nearly three times the size of AMNDB.

The study period is 1976 to 1981. This is mainly because of the availability of comparable data over this time. The obstetric populations are described in terms of parity and multiplicity (table 1). Because of

*Present address: Social, paediatric and obstetric research unit, Glasgow

the small numbers of multiple births, and problems of their data interpretation—particularly for birthweight—further analysis is restricted to singleton births. To avoid the possibility of double-counting, multiparous women are also excluded. Hence all subsequent analysis is based on singleton births to primiparous residents of the Aberdeen and Cardiff data base catchment areas between 1976 and 1981.

VARIABLES

In both the AMNDB and the CBS, social class of married women is based on the Registrar General's 1970 classification derived from the occupation of the woman's husband. Classes I and II, and IV and V are aggregated to provide large enough subgroups for the analysis. Classes III manual and non-manual are also aggregated as it is not possible to separate them in the CBS. Women who were not married at the time of delivery are considered as a separate category. In addition to the categories of classes I to V and 'not married', there is a residual group including women married to students and members of the armed forces, others and those for whom there was inadequate information to permit classification. The social class distributions in the AMNDB and the CBS are shown in table 2. They clearly differ, the AMNDB having proportionally more women described as classes IV and V than the CBS.

All the variables that are used for the following analyses have been selected because previous research has demonstrated an association with social class¹ and because they have been collected comparably in the two data bases. They can be divided into three broad and interrelated groups.

Obstetric population Each of the variables, short stature, smoking, and extremes of maternal age, have been consistently associated with both social class and perinatal outcome. In this study, short stature refers to

Table 2 Social class distribution, 1976–81

	AMNDB		CBS	
	No.	%	No.	%
Class I and II	907	18.2	2296	19.3
III	1853	37.1	4755	40.0
IV and V	1127	22.6	1539	12.9
Not married	910	18.2	2441	20.5
Miscellaneous	192	3.9	862	7.3
Total	4989	100	11893	100

women whose height is 154 cm or less. Smoking during pregnancy is treated as a dichotomous (yes/no) variable. Extremes of maternal age are defined as ages of 19 years or less (teenage) and 30 or more.

Obstetric practice Area variations in obstetric practice may relate both to the population served and to particular local policies. Two aspects of practice which may be considered as a response to perceptions of increased risk are discussed—the induction of labour (including elective caesarean section) and assisted delivery (operative and instrumental).

Pregnancy outcome Both area and social class differences in pregnancy outcome have been widely reported. Outcomes considered here are preterm delivery (<37 completed weeks' gestation); low birthweight (<2500g); and perinatal death (stillbirths and first week deaths).

STATISTICAL METHODS

In order to make the requisite comparisons, the tables show the estimated relative risks⁵ of selected adverse factors associated with social class and place of residence. In general, an estimated relative risk greater than unity indicates a worse situation in lower compared with higher social classes, or in the AMNDB compared with the CBS. Because some of these comparisons involve relatively small sample sizes, the 95% confidence intervals⁶ are also quoted. Therefore a difference is considered statistically significant at the 5% level only if this interval does not include unity.

Results

AREA COMPARISONS

Obstetric populations (fig 1 and table 3)

Overall, comparisons between the areas show a higher proportion of women of short stature (fig 1a) and of women who smoke cigarettes in pregnancy (fig 1d) in the AMNDB than in the CBS, but a lower proportion of women aged over 29 years (fig 1c). There was no statistically significant difference in the rate of teenage pregnancies (fig 1b).

Table 1 Obstetric population 1976–81

	AMNDB	CBS
<i>Singleton pregnancies</i>		
Primiparae	4989	11893
Multiparae	5525	17130
Unknown parity	0	25
All	10514	29048
<i>Multiple pregnancies</i>		
Primiparae	48	105
Multiparae	56	194
Unknown parity	0	1
All	104	300
Total	10618	29348

Table 3 Area comparisons: obstetric population

	Social class											
	I & II		III		IV & V		Unmarried		Miscellaneous		All	
N	A 907	C 2296	A 1853	C 4755	A 1127	C 1539	A 910	C 2441	A 192	C 862	A 4989	C 11893
≤154cm, %	130 14.3	252 11.0	364 19.6	715 15.0	278 24.7	301 19.6	208 22.9	433 17.7	47 24.5	147 17.0	1027 20.5	1848 15.5
RR	1.31*		1.31*		1.26*		1.29*		1.44*		1.38*	
95% CI	1.07-1.59		1.16-1.47		1.09-1.46		1.11-1.50		1.07-1.93		1.21-1.39	
< 20 years %	42 4.6	43 1.9	282 15.2	614 12.9	302 26.8	457 29.7	522 57.4	1440 59.0	30 15.6	194 22.5	1178 23.6	2748 23.1
RR	2.47*		1.18*		0.90		0.97		0.69*		1.01	
95% CI	1.65-3.71		1.03-1.34		0.80-1.02		0.91-1.04		0.49-0.98		0.96-1.07	
> 29 years %	160 17.6	549 23.9	117 6.3	461 9.7	57 5.1	88 5.7	24 2.6	63 2.6	31 16.2	69 8.0	389 7.8	1230 10.3
RR	0.74*		0.65*		0.89		1.02		2.02*		0.78*	
95% CI	0.63-0.86		0.54-0.79		0.64-1.22		0.64-1.63		1.35-3.00		0.70-0.87	
Smokers %	254 28.0	422 18.4	841 45.4	1639 34.5	624 55.4	727 47.2	620 68.1	1459 59.8	81 42.2	250 29.0	2420 48.5	4497 37.8
RR	1.52*		1.32*		1.17*		1.14*		1.46*		1.25*	
95% CI	1.33-1.75		1.23-1.41		1.09-1.26		1.08-1.21		1.18-1.79		1.21-1.30	

* p<0.05

For both height and smoking these area differences were observed within all of the social class categories. The pattern is less clear for maternal age. Among those for whom it was possible to assign a social class, the area difference in the likelihood of being an older mother is maintained, but this difference is not evident for unmarried mothers and is reversed for the 'miscellaneous' category. The only exception to the lack of area difference in teenage pregnancies is their markedly higher proportion in social classes I, II and III in the AMNDB.

Obstetric practice (fig 2 and table 4)

There was a threefold relative risk of a non-spontaneous onset of labour in the AMNDB

compared with the CBS (fig 2a), although there were no significant differences in the rate of assisted delivery between the areas (fig 2b). These area comparisons were substantially the same throughout the social class distribution. The only exception was area differences in the induction rate among the unmarried category. This was due to the relatively high proportion of labours with spontaneous onset in the CBS, rather than a high rate of induction among this group in the AMNDB.

Outcome (fig 3 and table 5)

There was a significantly higher preterm delivery rate in the AMNDB compared with the CBS (fig 3a) but no significant differences between the areas in terms of

Table 4 Area comparisons: obstetric practice

	Social class											
	I & II		III		IV & V		Unmarried		Miscellaneous		All	
N	A 907	C 2296	A 1853	C 4755	A 1127	C 1539	A 910	C 2441	A 192	C 862	A 4989	C 11893
Induction %	388 42.8	357 15.6	795 42.9	644 13.5	450 39.2	207 13.5	325 35.7	197 8.1	73 38.0	114 13.2	2031 40.7	1519 12.8
RR	2.75*		3.17*		2.97*		4.43*		2.88*		3.17*	
95% CI	2.44-3.10		2.90-3.46		2.59-3.40		3.81-5.13		2.23-3.71		3.00-3.36	
Assisted delivery %	424 46.7	1137 49.5	839 45.3	2241 47.1	471 41.8	696 45.2	346 38.0	888 36.8	84 43.8	376 43.6	2164 43.4	5338 44.9
RR	0.94		0.96		0.92		1.05		1.00		0.97	
95% CI	0.87-1.02		0.91-1.02		0.85-1.01		0.95-1.15		0.84-1.20		0.93-1.00	

* p<0.05

Fig 1

rates of low birthweight or perinatal death. Again, these area patterns were reflected throughout the social class distribution.

In summary, for the majority of the variables considered there are area differences. These area differences are in general maintained throughout the social class distribution.

SOCIAL CLASS COMPARISONS

Obstetric population (fig 1 and table 6)

All these variables exhibit the 'usual' class relationship, ie, women in social classes IV and V tend to be shorter (fig 1a), more likely to smoke cigarettes (fig 1d), and be younger (fig 1b and fig 1c) than women in social classes I and II. There are area differences in

Fig 2

this relationship for teenage pregnancies and smoking only. In both cases the relative risk is higher in the CBS than the AMNDB. These differences are almost totally due to an increased likelihood of teenage pregnancies or smoking in social classes I and II in the AMNDB compared with the CBS.

Obstetric practice (fig 2 and table 7)

Overall, there are no significant social class differences in the rates of induction or assisted delivery. This pattern is replicated in both areas.

Outcomes (fig 3 and table 8)

Again, the social class relationships go in the expected directions, lower class mothers being more likely to

deliver preterm and have smaller babies. Although there is a raised relative risk of perinatal death for classes IV and V, this does not reach statistical significance. These social class differences do not vary significantly between the areas.

In summary, social class gradients are as expected. In general the size of the relative risk does not vary significantly between locations.

Discussion

The intention of this paper was primarily to provide a descriptive contribution to the literature on regional and social class variations in perinatal outcome. National perinatal mortality statistics have repeatedly shown large differences in mortality in different areas of the country and by social class. Because of the way in which such statistics are gathered and reported and because of the focus on perinatal death, studies of area differences have tended to be based on large areas. We

Fig 3

Table 5 Area comparison: outcomes

	Social class											
	I & II		III		IV & V		Unmarried		Miscellaneous		All	
N	A 907	C 2296	A 1853	C 4755	A 1127	C 1539	A 910	C 2441	A 192	C 862	A 4989	C 11893
< 37 weeks	49	95	109	223	92	87	84	195	15	39	349	639
%	5.4	4.1	5.9	4.7	8.2	5.7	9.2	8.0	7.8	4.5	7.0	5.4
RR	1.31		1.25*		1.44*		1.16		1.73		1.29*	
95% CI	0.93-1.83		1.00-1.56		1.09-1.91		0.91-1.48		0.97-3.06		1.14-1.47	
< 2500g	55	106	133	323	113	135	97	242	16	66	414	872
%	6.1	4.6	7.2	6.8	10.0	8.8	10.7	9.9	8.3	7.7	8.3	7.3
RR	1.31		1.06		1.14		1.08		1.09		1.11	
95% CI	0.96-1.80		0.88-1.29		0.90-1.45		0.86-1.34		0.64-1.84		0.99-1.25	
PND	10	29	28	56	14	32	14	54	3	17	69	188
Per 1000	11.0	12.6	15.1	11.8	12.4	20.8	15.4	22.1	15.6	19.7	13.8	15.8
PR	0.87		1.28		0.60		0.70		0.79		0.87	
95% CI	0.43-1.78		0.81-2.01		0.32-1.11		0.39-1.24		0.24-2.67		0.66-1.14	

* p < 0.05

Table 6 Social class gradients: obstetric population

N	Aberdeen		Cardiff		Overall
	IV & V	I & II	IV & V	I & II	
1127	907	1539	2296		
≤ 154cm	278	130	301	252	
%	24.7	14.3	19.6	11.0	
RR	1.72*		1.78*		1.8*
95% CI	1.43-2.07		1.53-2.08		1.6-2.0
< 20 years	302	42	457	43	
%	26.8	4.6	29.7	1.9	
RR	5.79*		15.86*		10.1*
95% CI	4.46-7.50		12.78-19.68		8.6-11.9
> 29 years	57	160	88	549	
%	5.1	17.6	5.7	23.9	
RR	0.29*		0.24*		0.3*
95% CI	0.22-0.38		0.20-0.29		0.2-0.3
Smokers	624	254	727	422	
%	55.4	28.0	47.2	18.4	
RR	1.98*		2.57*		2.3*
95% CI	1.78-2.20		2.33-2.83		2.1-2.5

* p < 0.05

have made use of the opportunity provided by the comparable data bases of the CBS and the AMNDB to examine smaller regions and factors which national studies have shown to be associated with perinatal mortality. This study has confirmed the well-known existence of such social class and area differences.

Moreover, we have demonstrated that, for these two regions and in respect of the variables considered here, the social class differences are similar in the CBS and AMNDB and the area differences are relatively consistent for each of the social classes. In this sense,

Table 7 Social class gradients: obstetric practice

N	Aberdeen		Cardiff		Overall
	IV & V	I & II	IV & V	I & II	
1127	907	1539	2296		
Induction	450	388	207	357	
%	39.2	42.8	13.5	15.6	
RR	0.93		0.87		0.90
95% CI	0.84-1.04		0.74-1.01		0.83-1.00
Assisted delivery	471	424	696	1137	
%	41.8	46.7	45.2	49.5	
RR	0.89		0.91		0.91
95% CI	0.81-1.00		0.85-1.00		0.86-1.00

Table 8 Social class gradients: outcome

N	Aberdeen		Cardiff		Overall
	IV & V	I & II	IV & V	I & II	
1127	907	1539	2296		
Preterm delivery	92	49	87	95	
%	8.2	5.4	5.7	4.1	
RR	1.51*		1.37*		1.4*
95% CI	1.08-2.11		1.03-1.81		1.2-1.8
LBWT	113	55	135	106	
%	10.0	6.1	8.8	4.6	
RR	1.65*		1.90*		1.8*
95% CI	1.22-2.24		1.49-2.42		1.5-2.2
PND	14	10	32	29	
Per 1000	12.4	11.0	20.8	12.6	
RR	1.13		1.65		1.48
95% CI	0.50-2.52		1.00-2.69		0.97-2.25

social class and area may be seen as independently associated with these variables.

These findings for perinatal mortality and associated factors correspond to those reported for infant and adult mortality in the Decennial Supplement² for larger areas.

A priori, the independence of area and social class "effects" is surprising. As Illsley has pointed out,⁷ it would seem reasonable to expect that, for example, the living conditions and styles of life of social classes I and II would vary less by region than those of social classes IV and V. Similarly, because of the occupational basis of the social class classification, it might be expected that the "effects" of social class would vary according to the different local occupational and industrial systems—although, clearly, such an expectation would be modified by the 'indirect' classification of women according to their husbands' occupations.¹

Area and social class differences are not amenable to simple or unambiguous interpretation. Classification by area may indicate factors as diverse as environmental pollution, resource allocation, and cultural milieux. As this paper has shown, in the case of induction, area differences also indicate differences in obstetric practice. In the present study, the comparison has been made between Scottish and Welsh areas, between oil-rich Aberdeen and South Glamorgan with its higher than average unemployment. Whether social class as defined here has any sociological or economic meaning is unclear. Furthermore, the classification of women by their husbands' occupations adds to the problems of interpretation.⁸ However, empirically, this classification has consistently been shown to be a good discriminator of perinatal outcome.

Social class differences may reflect relative prosperity and differences in the material conditions of life. As this paper has shown in the cases of smoking and the age at which family building starts, social class differences may also reflect different patterns of behaviour. It is interesting to note that it is in these 'behavioural' variables that there is some evidence that area and social class differences interact in such a way that area differences are greater for people in the 'higher' than in the 'lower' social classes.

Because of the difficulties associated with the interpretation of area and social class differences, the implications of their independent association with the variables considered here are obscure. All that this study has been able to suggest is that, whatever the relevant characteristics of social class are, their net effects are similar in Aberdeen and Cardiff and that, whatever the relevant characteristics of the areas are, their net effects are similar for the different social classes. Caution must be exercised in any

extrapolation of the results from this perhaps untypical comparison to comparisons between other areas in the United Kingdom.

The strategy of the comparative study of social class patterns in obstetric outcomes in relatively small areas brings difficulties with it. One such difficulty is illustrated by the findings reported in this paper. AMNDB mothers are more likely than those in the CBS to be of short stature and to smoke. Consistent with this pattern, babies born in Aberdeen were significantly more likely to weigh 2500 g or less. However, in terms of perinatal deaths, the mortality rates in Aberdeen are similar to those in Cardiff, if anything, being slightly lower.

It may be that these figures reflect real differences in the association between the risk factors and perinatal death in the two locations. Even over a six year period, however, the numbers of deaths occurring in Cardiff and Aberdeen are insufficient for any meaningful comparison of the social class patterns in mortality to be made. Although the strategy of the comparative study of social class patterns in relatively small areas has much to recommend it, it will always be the case that such studies will be, at best, suggestive of the factors that contribute to the social patterning of relatively infrequent outcomes.

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