

# Inequalities in low birth weight: parental social class, area deprivation, and “lone mother” status

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## Abstract

**Objective**—To describe the extent of socioeconomic inequalities in low birth weight. To assess the relative benefits of measuring socioeconomic status by individual occupation, socioeconomic deprivation status of area of residence, or both, for describing inequalities and targeting resources.

**Design**—Analysis of birth registrations by registration status: joint compared with sole registrants (“lone mothers”), routinely recorded parental occupation (father’s for joint registrants), and census derived enumeration district (ED) deprivation.

**Setting**—England and Wales, 1986–92.

**Subjects**—471 411 births with coded parental occupation (random 10% sample) and birth weight.

**Main outcome measures**—Proportion of low birth weight (<2500 g)

**Results**—34% of births to joint registrants in social classes IV and V, and 45% of births to sole registrants, were in the quintile of most deprived EDs. It was found that 6.8% of births were of low birth weight. Sole registrants were at higher risk (9.3% overall) than joint registrants, across all deprivation quintiles. For joint registrants, the socioeconomic risk gradient was similar by social class or area deprivation, but a greater gradient from 4.7% to 8.7% was found with combined classification.

**Conclusions**—Up to 30% of low birth weight can be seen as being associated with levels of socioeconomic deprivation below that of the most affluent group, as measured in this study. Caution is needed when targeting interventions to high risk groups when using single indicators. For example, the majority of births to lone mothers and to joint registrants in social classes IV and V would be missed by targeting the most deprived quintile. There is a high degree of inequality in low birth weight according to social class, area deprivation and lone mother status. When using routinely recorded birth and census data, all three factors are important to show the true extent of inequalities.

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Low birth weight is an important indicator of reproductive health and general health status of populations. In particular, it is associated with infant mortality and with health in later life.<sup>1 2</sup> A strong relation has been found between socioeconomic status and the risk of low birth

weight.<sup>1 3</sup> In this paper, we aim both to describe the strength of the relation between socioeconomic status and low birth weight in the 1986–92 time period, and to assess the relative benefits of using socioeconomic status based on individual occupation, or based on the socioeconomic deprivation index of the area of residence, or both.

It is important to assess the power of different routinely recorded measures of socioeconomic status to describe this relation for a number of purposes: to monitor inequalities in health, to target interventions and resources to areas and groups with the greatest need, and to be able to control for “socioeconomic confounding” when assessing the effects of specific risk factors on the risk of low birth weight.<sup>4</sup>

Occupation of the father, particularly for reproductive outcomes, can be an inadequate basis for describing socioeconomic status, yet it has proved difficult to replace this with maternal occupation, the only other routinely recorded individual variable.<sup>5 6</sup> Moreover for lone mothers, who form an increasing proportion of the maternal population, and are at high risk of adverse pregnancy outcomes, most cannot be classified by occupation into one of the five traditional social classes.<sup>7</sup> The problems of interpreting occupation data, particularly for women—and especially during childbearing years, when they may temporarily take work that does not reflect their usual occupation—have been discussed elsewhere.<sup>5 8</sup> Classification by deprivation status of the area of residence is therefore an attractive alternative or addition, as it can be applied to all members of the population and may capture aspects of socioeconomic deprivation that individual measures do not.<sup>9 10</sup> However, no direct comparisons between the two measures have previously been made in relation to low birth weight.

## Methods

The data used were ONS (Office for National Statistics) postcoded birth records for England and Wales for the years 1986 to 1992. Parental occupation is recorded for a random 10% of all births. Up until 1985 this occupation was always that of the father (unless the birth was registered to the mother alone). Since 1986 the option has existed to give the mother’s occupation in addition to the father’s, but—although the proportion is decreasing—there remain many joint registrations in which the mother’s occupation is not recorded.

Information on marital status is not routinely available, and the “joint registrations” referred to in this paper are those for which the father’s details are present, whether or not the registrants

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Table 1 Number of births, and percentage of low birth weights (in italics) by area level deprivation quintile, social class and registration status, England and Wales, 1986–1992

Social class, joint registrants	Quintiles					Total*
	1	2	3	4	5	
I	11 231 <i>4.7</i>	8 120 <i>5.2</i>	5 561 <i>5.1</i>	3 522 <i>5.3</i>	2 124 <i>7.8</i>	30 770 <i>5.2</i>
II	29 212 <i>5.0</i>	24 478 <i>5.3</i>	19 112 <i>5.7</i>	14 276 <i>6.1</i>	10 190 <i>7.8</i>	97 658 <i>5.7</i>
III (NM)	10 335 <i>4.8</i>	9 779 <i>5.0</i>	8 476 <i>6.1</i>	6 686 <i>6.3</i>	5 466 <i>8.9</i>	40 848 <i>5.9</i>
III (M)	18 402 <i>5.7</i>	26 941 <i>6.0</i>	31 869 <i>6.7</i>	34 506 <i>7.2</i>	34 613 <i>8.3</i>	146 617 <i>7.0</i>
IV	6 960 <i>6.2</i>	10 724 <i>5.9</i>	14 290 <i>6.8</i>	18 032 <i>7.5</i>	21 604 <i>8.6</i>	71 785 <i>7.3</i>
V	1 289 <i>7.4</i>	2 554 <i>6.3</i>	4 389 <i>7.9</i>	7 321 <i>8.1</i>	12 357 <i>8.7</i>	27 987 <i>8.1</i>
VI	3 517 <i>4.9</i>	2 270 <i>5.5</i>	1 448 <i>5.7</i>	858 <i>7.7</i>	602 <i>7.0</i>	8 853 <i>5.7</i>
VII	680 <i>6.0</i>	791 <i>5.3</i>	867 <i>6.6</i>	994 <i>7.6</i>	1 041 <i>9.2</i>	4 380 <i>7.1</i>
VIII	316 <i>7.0</i>	450 <i>6.2</i>	753 <i>8.0</i>	1 392 <i>7.6</i>	3 627 <i>8.6</i>	6 568 <i>8.1</i>
Total	81 942 <i>5.3</i>	86 107 <i>5.6</i>	86 765 <i>6.4</i>	87 587 <i>7.0</i>	91 624 <i>8.4</i>	435 466 <i>6.6</i>
Lone mothers	1 902 <i>8.0</i>	3 186 <i>8.5</i>	5 333 <i>9.1</i>	9 263 <i>8.8</i>	16 180 <i>10.0</i>	35 945 <i>9.3</i>
Total	83 844 <i>5.3</i>	89 293 <i>5.7</i>	92 098 <i>6.5</i>	96 850 <i>7.2</i>	107 804 <i>8.6</i>	471 411 <i>6.8</i>

\*Includes a sixth deprivation category, areas where deprivation could not be classified, accounting for 0.3% of all births.

are married.<sup>5</sup> Where there is no joint registration this is taken to imply a birth to a “lone mother”. (This group of births to sole registrants overlaps largely with births to lone mothers. However, a mother and father, though not living together, may still register the birth jointly—or the mother may have a domestic partner but one who is not registered as the father.) Of the 4 816 334 birth records for these years, 481 530 had occupation recorded for at least one parent. A total of 471 411 had a coded birth weight: 435 466 with a joint registration, 35 945 to sole registrants.

Using conversion codes supplied by ONS, we derived a parental social class for each record from the parental occupation, using the father’s occupation in a joint registration, and the mother’s otherwise. The main social class categories studied were: I professional occupations; II managerial and technical occupations; III NM non-manual skilled occupations; IIIM manual skilled occupations; IV partly skilled occupations; and V unskilled occupations. Three further groups outside this hierarchy are: VI armed forces; VII inadequately described; and VIII, which includes those not stated, with no previous occupation, non-workers, housewives. (It should be noted that occupation refers to “most recent” occupation. Thus, for example, theoretically the unemployed would only appear in social class VIII if they have never had a job—however, registrants are essentially free to answer this question as they see fit, a leeway that can sometimes add to the problems of interpreting these occupation codes.<sup>6</sup>)

We also classified each record by an area level deprivation score, based on that proposed by Carstairs,<sup>11</sup> which has a high and well documented association with health, and that correlates well with other indices.<sup>12</sup> The Carstairs scores were calculated for 1991 census Enumeration Districts (EDs, referring to an average of 150 households), from four 1991 census variables (car ownership, unemploy-

#### KEY POINTS

- Risk of low birth weight has a strong socioeconomic gradient, whether measured by social class or area level deprivation.
- Risk of low birth weight is higher among lone mothers than among joint registrants living in similarly deprived areas.
- Area deprivation performs better than individual social class in describing the extent of inequalities in low birth weight.
- Social class, area deprivation and lone mother status combined together most powerfully define high risk groups.

ment, overcrowding, and social class of head of household). EDs were then grouped into GB quintiles of deprivation, with quintile 1 containing the most affluent EDs and quintile 5 the most deprived.

The  $\chi^2$  test for trend was used to assess whether there was a linear relation between low birth weight and socioeconomic status, based on parental social class or area deprivation. A Poisson regression of low birth weight on social class together with a ranking based on (ungrouped) Carstairs scores was conducted in STATA.

#### Results

DISTRIBUTION OF BIRTHS BY REGISTRATION STATUS, OCCUPATION DERIVED SOCIAL CLASS, AND AREA BASED SOCIOECONOMIC DEPRIVATION Births that were not registered jointly with the baby’s father (“lone mothers”) constituted 7.6% of births. Thirty two per cent of these could be allocated to social classes I to V according to the mother’s own occupation. These sole registrants were disproportionately represented in the more deprived quintiles compared with joint registrants, with 45% of births to sole registrants occurring in the most deprived quintile (table 1).

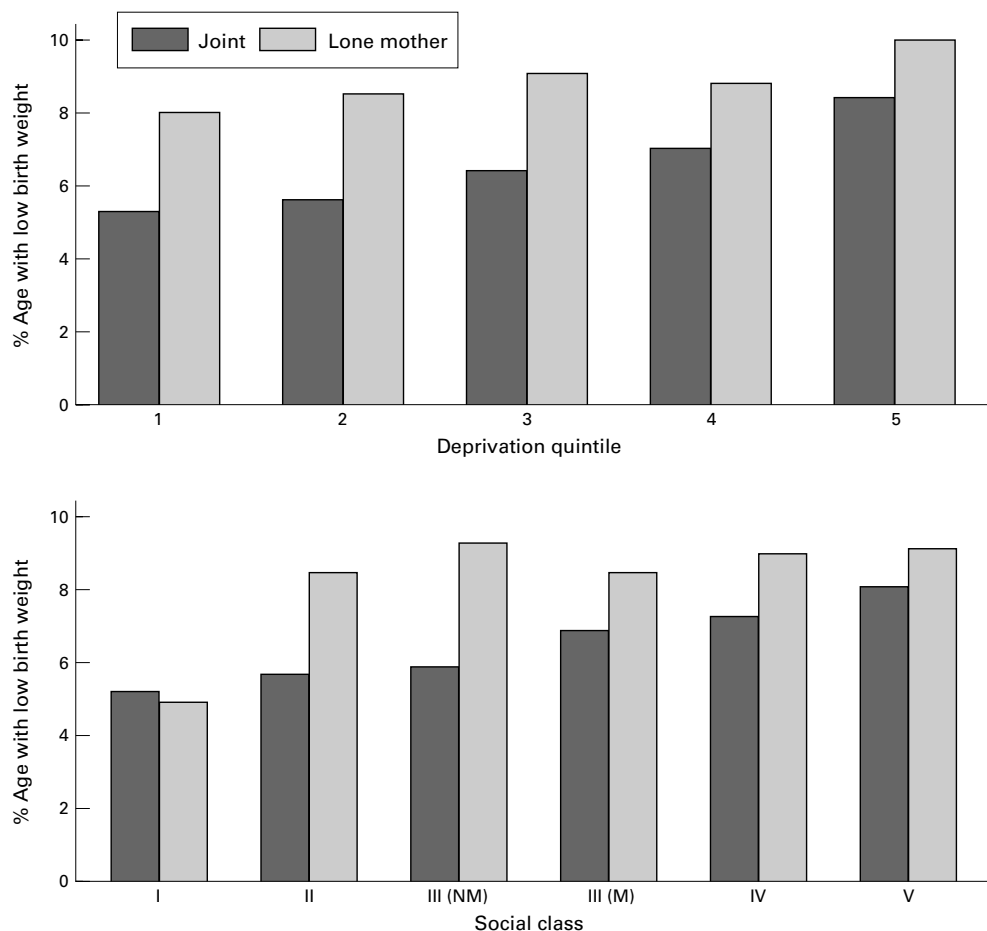
Among joint registrants, 95.5% of births could be assigned to social classes I to V according to the fathers’ occupations (compared with only 44% if mothers’ occupations were used). There was a mix of social classes in each deprivation quintile (table 1), but social classes I and II were more likely to live in the most affluent deprivation quintile, and social classes IV and V were more likely to live in the most deprived quintile (table 1).

#### LOW BIRTH WEIGHT BY SOCIAL CLASS AND AREA DEPRIVATION

Overall, 6.8% of births were of low birth weight, 6.6% for joint registrants and 9.3% for sole registrants.

The proportion of low birth weight increased among joint registrants from 5.3% in deprivation quintile 1 to 8.4% in deprivation quintile 5, a highly significant trend ( $p=0.0001$ ) (fig 1), and from 5.2% in social class I to 8.1% in social class V ( $p=0.0001$ ) (fig 1). Using mothers’ occupations, where recorded, showed a similar pattern (5.6% to 8.6%,  $p<0.001$ ).

For sole registrants, the proportion of low birth weight increased from 8.0% to 10.0%



Figures 1 Relations between risk of low birth weight and social class, and risk of low birth weight and area level deprivation. Joint registrations (social class based on fathers' occupations) and lone mothers.

between deprivation quintiles 1 to 5 ( $p=0.002$ ) (fig 1). Across social classes the proportion ranged from 4.9% in social class I (but based on only 81 births), then 8.5% in social class II rising to 9.2% in social class V ( $p=0.63$ ) (fig 1). Over two thirds of births to sole registrants, however, occurred in social class VIII, and these were at a slightly higher risk of 9.5%.

Figure 2 shows the combined effects of social class and area deprivation on risk of low birth weight among joint registrants. Within each social class, there was a statistically significant

trend for greater risk of low birth weight to occur in more deprived areas. The most affluent group, defined jointly by social class and area deprivation, had a proportion of low birth weight of 4.7%, compared with the most deprived group jointly defined with a low birth weight proportion of 8.6%—a stronger relation with socioeconomic status than found using either measure alone. This is partly because the combined measure defines smaller and therefore more extreme groups—extreme groups of the same size as the most affluent and most

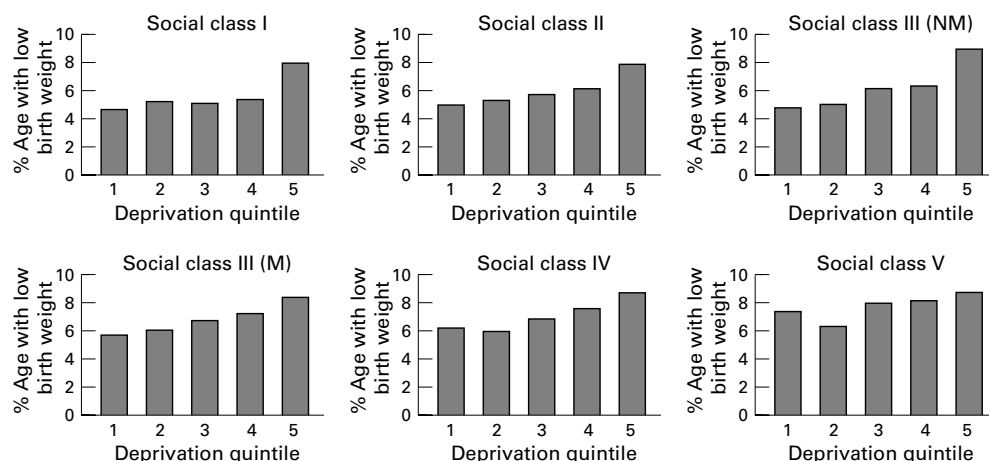


Figure 2 Effect of area level deprivation on risk of low birth weight, within each social class, for joint registrants.

deprived in table 1, but defined solely on their (ungrouped) Carstairs score, resulted in a gradient from 5.1% to 9.2%. Nevertheless, in the Poisson regression of low birth weight on social class and the (ungrouped) Carstairs ranking, social class remained highly significant ( $p < 0.001$ ), with a mean increase in risk of 5.6% associated with a move from each social class to the one below, showing that social class gives added information however finely area deprivation is grouped.

### Discussion

“The experience of the currently most healthy groups suggests what it is possible to achieve.”<sup>13</sup> During the period 1986–92, the proportion of low birth weight in the most affluent group as described by social class and area deprivation was 4.7%, compared with a national average of 6.8%. If the “experience of the currently most healthy groups” with respect to low birth weight could be achieved by all, then up to 30% of low birth weights might be avoided.

Lone mothers (as defined here by being the sole registrant of the birth) had more than double the risk of low birth weight than the most affluent group of joint registrants, and a substantially higher risk than joint registrants in every area deprivation quintile. On a small area basis (for example, wards when targeting resources), the proportion of lone mothers will have little effect on the deprivation index of the ward because lone mothers are under-represented in some of its component measures, yet in 684 wards in England and Wales over 20% of births were to lone mothers. Our results show clearly how necessary it is to take account of this group in tackling inequalities in health.

Individual measures of social class are sometimes argued to be better than area measures, as they avoid the “ecological fallacy” of attributing group characteristics to the individual person. In the context of monitoring inequalities, targeting those in need, and controlling for socioeconomic confounding in research into specific risk factors, we believe that area measures have a positive part to play. Firstly, we have shown that area deprivation performs better than individual social class in describing the extent of inequalities in low birth weight in the population. Using five groups, it classifies a larger proportion of births into the extreme socioeconomic groups than social class (among joint registrants, 6.4% of births were in social class V with a low birth weight proportion of 8.1%, compared with 21% of births in deprivation quintile V with a low birth weight proportion of 8.4%)—and finer discrimination of the extremes of deprivation and affluence could easily be achieved. Secondly, area measures may in fact describe aspects of the experience of deprivation that derive from the person’s environment, rather than their own level of wealth or circumstance.<sup>10 14 15</sup> Finally, individual social class has some specific problems as a measure, being coded for only a 10% sample of births, being insufficient for use with the mother’s occupation,<sup>8</sup> and being almost useless when

applied to lone mothers. Area deprivation is a more widely applicable measure.

Both individual social class and area deprivation can be seen as “blunt instruments” for measuring the aspects of socioeconomic deprivation that impact on health, currently imperfectly known. In fact, individual social class is also a “group” designation that correlates with, but does not classify precisely, the underlying risk factors and social processes. We would suggest on the basis of our results that it can be useful to use the two measures together, particularly for joint registrants, to better reveal the true extent of socioeconomic inequalities.

Our aim in this paper was to assess what could best be done with the routinely recorded birth and census data, easily accessible to all, with regard to describing inequalities. Of course, there are many other aspects of both lone mother status (for example, household composition) and socioeconomic status (for example, individual current unemployment) that might be extremely useful in exploring the situation further, but that are not found in the birth record.

Our results also show that caution is needed when targeting interventions and resources to high risk groups on the basis of single indicators. Most births to lone mothers and to those joint registrants in social classes IV and V occur outside the most deprived areas, yet we have shown a consistently high risk of low birth weight in these groups at all levels of area deprivation. As has been observed,<sup>10 15</sup> health policy must target both people and places.

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