

# Preterm birth in Liverpool: What is the effect of socio-economic status?

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## Background

Preterm birth (PTB) is an important public health issue and a contributor to infant mortality. PTB rates are increasing in many developed countries.

There is a social gradient in PTB, and mediators of this effect are potential targets for intervention to reduce health inequalities.

## Aim

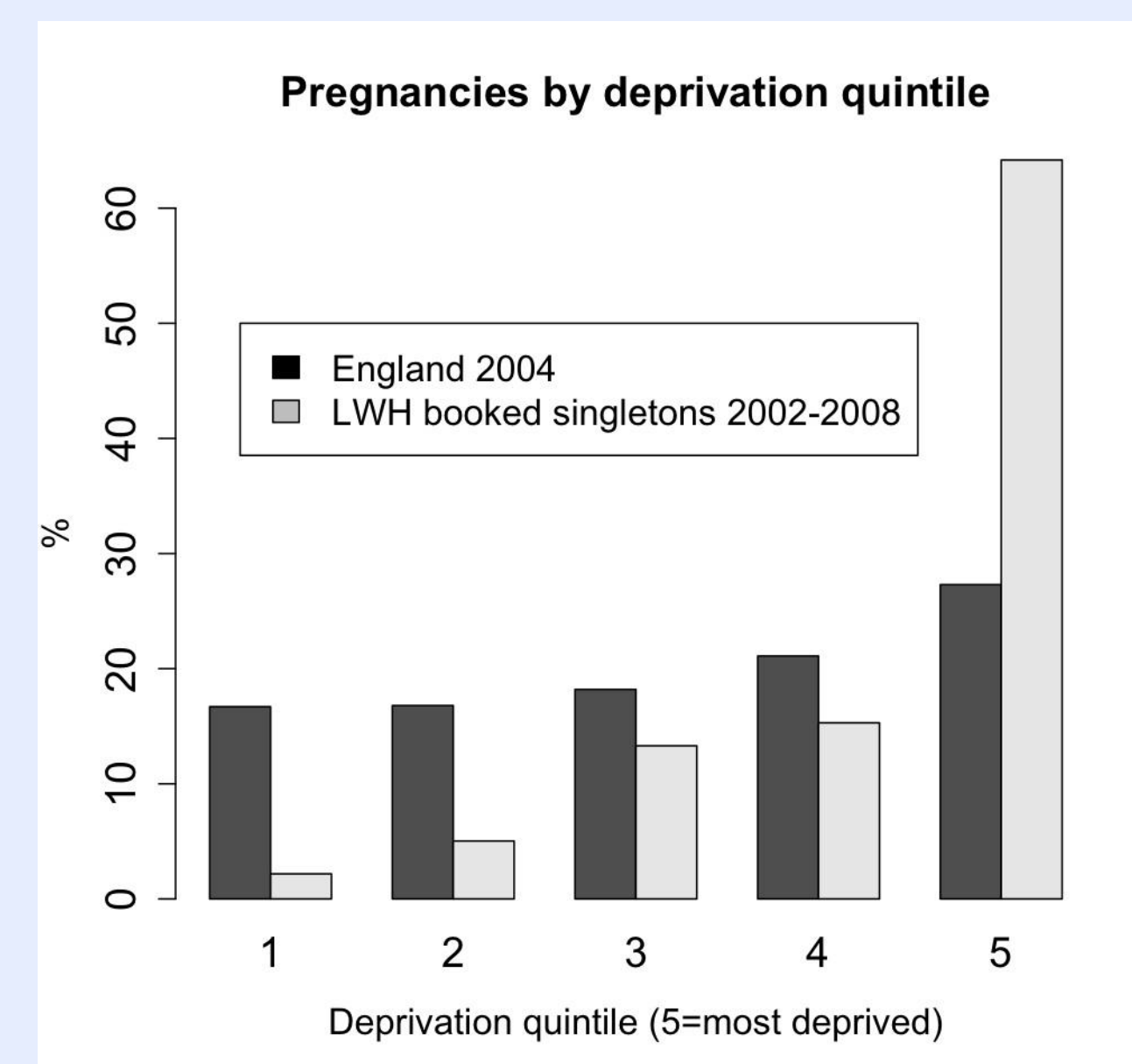
To explore risk factors for preterm birth in the UK's largest maternity unit, with a particular focus on low risk pregnancies and the effect of socioeconomic status (SES).

## Methods

Retrospective cohort study of routinely collected obstetric and neonatal data on 50,486 booked singleton pregnancies at Liverpool Women's Hospital in period 2002-2008. **Outcome measure PTB < 34weeks**

Analysis stratified into a low risk group, with no identifiable major risk factors at booking, and a high risk group of pregnancies complicated by medical disorders. Multiple logistic regression, and generalized additive models used to explore the effect of exposures including area deprivation (IMD), smoking status, BMI, parity and ethnicity.

## High levels of area deprivation in Liverpool

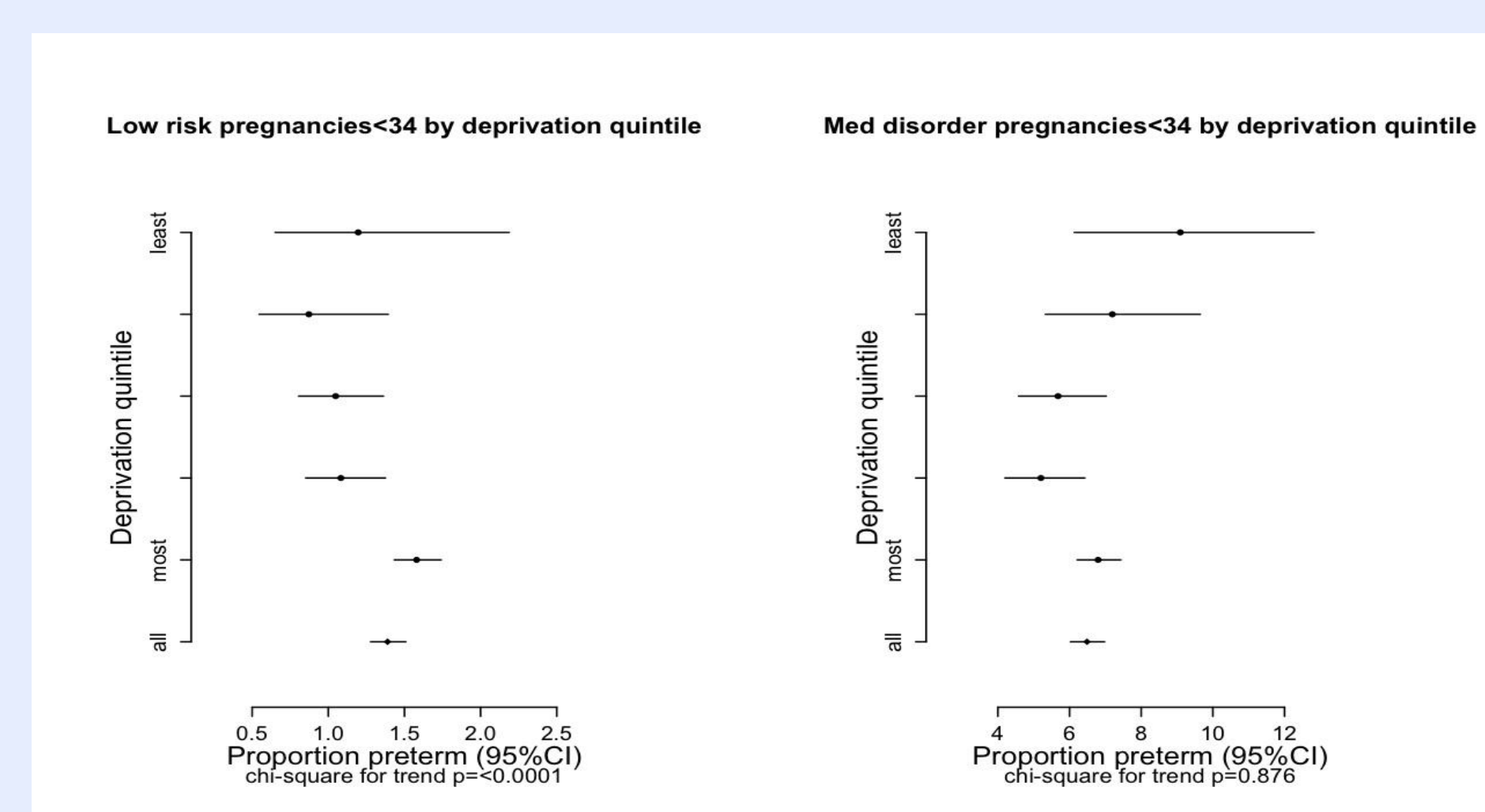


English IMD scores used to allocate each pregnancy to a normative deprivation quintile.

64% of women delivering at LWH from most deprived area quintile, compared to 27% in England in 2004.

Barchart of proportion of pregnancies by deprivation quintile

## Social gradient in PTB rate in low risk group



OR for PTB in most deprived quintile 1.62 (CI 1.3 to 2.02) in the low risk group. Not significant in high risk group. Overall 1.4% <34weeks in low risk group versus 6.6% in high risk group.

Proportion of preterm births by deprivation quintile – low and high risk groups

## Low and high risk groups by deprivation quintile

LOW RISK					
Deprivation quintile	1	2	3	4	5
N	836	1948	5247	6097	25254
Preterm<34 (%)	10 (1.2)	17 (0.9)	55 (1)	66 (1.1)	399 (1.6)
age<20	4 (0.5)	23 (1.2)	65 (1.2)	152 (2.5)	1500 (5.9)
age 20-29	145 (17.3)	408 (20.9)	1494 (28.5)	2266 (37.2)	14004 (55.5)
age>30	687 (82.2)	1517 (77.9)	3688 (70.3)	3679 (60.3)	9750 (38.6)
Nulliparous (%)	352 (42.3)	864 (44.5)	2450 (46.8)	2960 (48.8)	11690 (46.4)
Spontaneous delivery (%)	486 (58.1)	1223 (62.8)	3400 (64.8)	3947 (64.7)	17030 (67.4)
Caesarean section (%)	213 (25.5)	475 (24.4)	1248 (23.8)	1348 (22.1)	4827 (19.1)
White (%)	779 (93.2)	1817 (93.3)	4797 (91.4)	5427 (89)	21369 (84.6)
Asian (%)	19 (2.3)	46 (2.4)	147 (2.8)	233 (3.8)	824 (3.3)
Black (%)	2 (0.2)	9 (0.5)	40 (0.8)	113 (1.9)	1163 (4.6)
BMI (%)					
Normal	428 (58.9)	974 (58.9)	2508 (55.3)	2870 (54.5)	11332 (51.7)
Underweight	6 (0.8)	26 (1.6)	106 (2.3)	90 (1.7)	701 (3.2)
Overweight	212 (29.2)	464 (28.1)	1326 (29.3)	1560 (29.6)	5940 (27.1)
Obese	81 (11.1)	190 (11.5)	593 (13.1)	750 (14.2)	3956 (18)
Smoking status (%)					
non-smoker	788 (94.7)	1784 (92.4)	4682 (89.6)	5105 (84.3)	16467 (65.5)
<10	36 (4.3)	122 (6.3)	447 (8.6)	728 (12)	6444 (25.6)
>10	8 (1)	25 (1.3)	94 (1.8)	224 (3.7)	2230 (8.9)

MEDICAL DISORDERS					
Deprivation quintile	1	2	3	4	5
N	253	556	1391	1538	6590
Preterm<34 (%)	23 (9.1)	40 (7.2)	79 (5.7)	80 (5.2)	448 (6.8)
age<20	6 (2.4)	9 (1.6)	18 (1.3)	22 (1.4)	227 (3.4)
age 20-29	43 (17)	91 (16.4)	309 (22.2)	459 (29.8)	3378 (51.3)
age>30	204 (80.6)	456 (82)	1064 (76.5)	1057 (68.7)	2985 (45.3)
Nulliparous (%)	110 (43.7)	238 (43.1)	610 (44.1)	693 (45.4)	2627 (40)
Spontaneous delivery (%)	65 (25.7)	170 (30.6)	486 (34.9)	568 (36.9)	2567 (39)
Caesarean section (%)	101 (39.9)	206 (37.1)	480 (34.5)	500 (32.5)	1816 (27.6)
White (%)	238 (94.1)	524 (94.2)	1288 (92.6)	1372 (89.2)	5780 (87.7)
Asian (%)	2 (0.8)	14 (2.5)	31 (2.2)	60 (3.9)	210 (3.2)
Black (%)	3 (1.2)	1 (0.2)	13 (0.9)	24 (1.6)	241 (3.7)
BMI (%)					
Normal	114 (55.6)	244 (53.6)	583 (48.8)	619 (46.5)	2689 (47.2)
Underweight	1 (0.5)	7 (1.5)	33 (2.8)	30 (2.3)	239 (4.2)
Overweight	46 (22.4)	130 (28.6)	327 (27.4)	375 (28.2)	1397 (24.5)
Obese	44 (21.5)	74 (16.3)	252 (21.1)	308 (23.1)	1369 (24)
Smoking status (%)					
non-smoker	239 (95.2)	506 (92.3)	1227 (88.9)	1269 (83.1)	4223 (64.4)
<10	8 (3.2)	37 (6.8)	123 (8.9)	193 (12.6)	1623 (24.7)
>10	4 (1.6)	5 (0.9)	30 (2.2)	65 (4.3)	715 (10.9)

## Independent Risk factors for preterm birth

	Low risk group				Medical disorders group			
	OR for PTB<34	Lower CI	Upper CI	P value	OR for PTB<34	Lower CI	Upper CI	P value
Deprivation score	1.007	1.002	1.013	0.006	1.005	1.000	1.010	0.037
smoker<10	1.870	1.479	2.357	0.000	1.077	0.841	1.369	0.549
smoker>10	2.058	1.462	2.843	0.000	1.917	1.422	2.553	0.000
Underweight	1.795	1.128	2.722	0.009	1.505	0.953	2.283	0.066
Overweight	0.743	0.578	0.947	0.018	1.079	0.863	1.342	0.501
Obese	0.823	0.611	1.092	0.189	0.903	0.706	1.147	0.408
Ethnicity - asian	0.999	0.510	1.753	0.998	0.776	0.394	1.371	0.420
Ethnicity- black	0.595	0.269	1.131	0.152	1.663	1.013	2.596	0.033
Ethnicity - mixed	1.878	0.889	3.464	0.066	0.977	0.296	2.380	0.965
Not specified	1.405	0.781	2.318	0.218	1.475	0.809	2.480	0.170
Ethnicity - other	0.402	0.124	0.951	0.072	1.154	0.582	2.058	0.654
Nulliparity	1.181	0.955	1.459	0.124	1.411	1.163	1.711	0.000
Age<20	1.340	0.876	1.980	0.158	0.743	0.386	1.305	0.336
Age>30	1.327	1.065	1.655	0.012	1.227	1.003	1.503	0.047

## Smoking important mediator of deprivation effect

	OR for PTB	Lower CI	Upper CI
Deprivation effect	1.62	1.3	2.02
Deprivation + age	1.56	1.24	1.97
Deprivation + smoking	1.42	1.13	1.79
Deprivation + BMI	1.69	1.31	2.18
Deprivation + ethnicity	1.67	1.34	2.09
All factors	1.46	1.1	1.94

Smoking aside, adjusting for the other factors in the table doesn't majorly reduce the relative effect of deprivation.

The mediating effect of age and BMI are a consequence of how they are distributed according to deprivation and how they effect PTB.

For instance underweight and overweight operate in different directions, and are socially graded.

## Social gradient in risk factors for PTB and obstetric outcomes such as C-section

Age under 20, underweight, overweight and obesity, and smoking more common with increasing area deprivation. Women from more deprived areas less likely to have C-section (age adjusted OR 0.89 95% CI 0.84 to 0.94), and more likely to have a spontaneous delivery.

## Conclusions

In a low risk population with no identifiable risk factors for PTB at booking, social deprivation emerges as an important risk factor.

The effect of deprivation is mediated by factors such as smoking, BMI and age, all of which are socially graded.

We recommend that obstetric units produce PTB rates stratified by risk status and SES to allow meaningful comparison of outcomes.

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