Identifying subgroups of mothers most at risk of experiencing baby loss in England using Latent Class Analysis

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Objective: To identify subgroups of mothers most at risk of experiencing baby loss in the extended perinatal period on the basis of their combination of risk factors using Latent Class Analysis

Background

Extended perinatal death rates in England are one of the highest in Europe.

Significant variation exists in rates of still birth and neonatal mortality across the UK.

In order to reduce rates, interventions need to be targeted at women who are most at risk.

Conventional statistical methods do not capture how multiple risk factors interact with each other to influence perinatal outcomes.

Can we identify groups of mothers with combinations of risk factors who are more at risk of experiencing extended perinatal morality?

Methods

Sample

MBRRACE-UK perinatal mortality surveillance data on 620,178 mothers resident in England who gave birth in 2015.

Measures

Outcome: Extended perinatal mortality (stillbirth or neonatal death)

Six risk factors were studied:

- age (<25, 25-34, 35+ years)
- ethnicity (White, Asian, Black, Mixed/other)
- income, education, crime and outdoors environment deprivation measures from Index of Multiple Deprivation domains (most deprived 20%, moderately deprived, least deprived 20%)

Analysis

Latent Class Analysis (LCA) was used to identify subgroups of mothers

Two to nine class models were examined to select the best fitting model

Rates of extended perinatal mortality were compared in 598,187 women with singleton pregnancies

Results

Seven Latent Classes were identified which define groups of mothers on the basis of their combination of risk factors (Table 1). m

The largest group of mothers (28.7%) have similar age and ethnicity profile to overall sample of mothers, and live in areas without extremes of deprivation (Class 1).

The lowest rate of extended mortality in singleton pregnancies is in mothers living in less deprived areas (Figure 1)

The highest rate of extended perinatal mortality is in Ethnic Minority mothers living in more deprived areas (Class 7) . These mothers are 2.42 times more likely to experience mortality than the least at risk group (95% confidence interval: 2.09 to 2.80). This group of mothers are significantly more likely to experience pregnancy ending in extended perinatal death than any other group of women, including other groups living in more deprived areas.

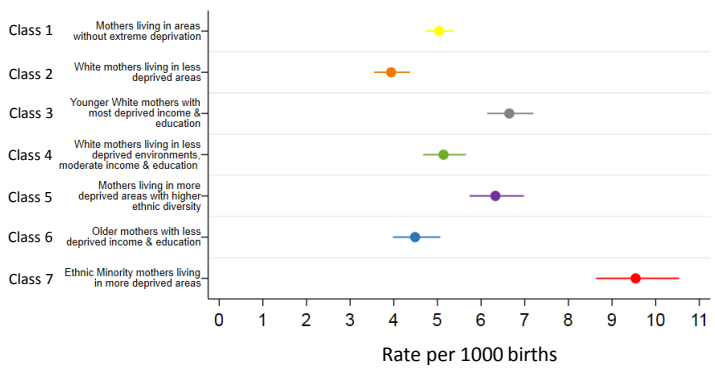
If extended perinatal mortality rates were reduced to the rate in the lowest risk group, there would be around 550 fewer singleton pregnancies ending in death each year, a decrease of 17%

Table 1: Percentage of women in each Latent Class and probability of each risk factor given Latent Class Membership*

	Percentage in class							
	28.7%	16.6%	15.8%	14.1%	8.6%	8.3%	8.0%	100%
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	TOTAL POPULATION
	Item response probabilities							Probability
Age <25 years	0.19	0.10	0.37	0.22	0.15	0.06	0.12	0.19
Age 25-34 years	0.62	0.60	0.52	0.61	0.58	0.57	0.66	0.60
Age 35+ years	0.19	0.30	0.10	0.17	0.26	0.37	0.21	0.21
White	0.77	0.90	0.91	0.95	0.47	0.71	0.00	0.75
Asian	0.12	0.04	0.00	0.01	0.18	0.11	0.60	0.11
Black	0.03	0.01	0.02	0.01	0.17	0.03	0.23	0.05
Mixed/other	0.08	0.05	0.07	0.03	0.17	0.15	0.17	0.09
Most deprived **income**	0.01	0.00	0.80	0.01	0.30	0.00	0.53	0.20
Most deprived **education**	0.08	0.00	0.80	0.04	0.00	0.00	0.60	0.20
Most deprived **crime**	0.11	0.00	0.46	0.01	0.62	0.06	0.45	0.20
Most deprived **outdoors environment**	0.04	0.00	0.16	0.00	0.96	0.41	0.53	0.20
Average **income**	0.93	0.16	0.20	0.93	0.70	0.56	0.47	0.60
Average **education**	0.91	0.44	0.20	0.94	0.74	0.09	0.40	0.60
Average **crime**	0.84	0.28	0.53	0.57	0.38	0.89	0.54	0.60
Average **outdoors environment**	0.91	0.53	0.76	0.33	0.04	0.59	0.47	0.60
Least deprived **income**	0.05	0.83	0.00	0.06	0.00	0.44	0.00	0.20
Least deprived **education**	0.01	0.56	0.00	0.02	0.26	0.91	0.00	0.20
Least deprived **crime**	0.05	0.72	0.01	0.42	0.00	0.05	0.00	0.20
Least deprived **outdoors environment**	0.05	0.47	0.08	0.67	0.00	0.00	0.00	0.20

*Shaded areas show risk factors within subgroups with relative probability more than 20% higher than the overall population of mothers, darker shading highlights where that subgroup/class has the highest proportion of that risk factor in comparison with other subgroups of mothers

Figure 1: Rate of extended perinatal death in singleton mothers



Conclusions

Latent Class Analysis is a useful tool to identify subgroups of women at risk of pregnancy ending in extended perinatal mortality.

The variation in extended perinatal mortality rates between groups may explain some of the variation in rates across England.

Combined with information on cause of death and access to services these findings may help targeting of interventions to reduce extended perinatal mortality rates in the future