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Supplementary material

Table S1 Description of health behaviours and recommendation relating to pregnancy.

Health behaviour	Question source	Recommendation for health behaviours
Smoked in the three months prior to pregnancy	Influenced by those from the Health Survey for England	NICE guidance recommends all pregnant women avoid smoking at any point in pregnancy[29].
Smoked in first 3 months of pregnancy	Influenced by those from the Health Survey for England	
Smoked from the 4 th month of pregnancy onwards	Influenced by those from the Health Survey for England	
Exposed to secondary tobacco smoke	Influenced by those from the Health Survey for England	
Inactive during pregnancy	General Practice Physical Activity questionnaire[30]	NICE guidance suggests that exercise in uncomplicated pregnancy is unlikely to be harmful[29]. Exercise is recommended as an part of a strategy, including healthy eating, to ensure weight is managed before, during and after pregnancy[31].
Did not take vitamin D during pregnancy	Derived from self-reported vitamin and multivitamin data.	NICE guidance recommends all pregnant women consume vitamin D supplementation of at least 10mcg per day[29].

Table S2: Baseline characteristics of the included maternal cohort

Variable	Category	White British	Pakistani	Total
Age at recruitment	15-24	1392 (40.0)	1160 (29.9)	2552 (34.7)
	25-34	1673 (48.1)	2268 (58.4)	3941 (53.6)
	35+	412 (11.9)	451 (11.7)	863 (11.7)
Parity	0	1695(48.8)	1305 (33.7)	3000 (40.8)
	1	1035 (29.8)	952 (24.5)	1987 (27.0)
	2	437 (12.6)	784 (20.2)	1221 (16.6)
	3+	247 (7.0)	767 (19.8)	1014 (13.8)
	Missing	63 (1.8)	71 (1.8)	134 (1.8)
BMI at booking	<18.5 (Underweight)	89 (2.6)	213 (5.5)	302 (4.1)
	18.5 <=25 (Normal)	1454 (41.8)	1684 (43.4)	3138 (42.7)
	> 25 <=30 (Overweight)	944 (27.1)	1132 (29.2)	2076 (28.2)
	>30 Obese	838 (24.1)	675 (17.4)	1513 (20.6)
	Missing	152 (4.4)	175 (4.5)	327 (4.4)
Born in UK moved young	Born in UK or moved <5 years	3444 (99.2)	1880 (48.5)	5324 (72.4)
	Born abroad moved >=5 years	27 (0.8)	1975 (51.0)	2002 (27.2)
	Missing	6 (0.2)	24 (0.5)	30 (0.4)
Father UK born	No	159 (4.6)	2377 (61.3)	2536 (34.5)
	Yes	3318 (95.4)	1502 (38.7)	4820 (65.5)
Highest level of maternal education	<5 GCSE equivalent	699 (20.1)	977 (25.2)	1676 (22.8)
	>=5 GCSE equivalent	1188 (34.2)	1174 (30.3)	2362 (32.2)
	A level equivalent	653 (18.8)	513 (13.2)	1166 (15.9)
	Higher than A-level	643 (18.5)	1051 (27.1)	1694 (23.0)
	Other	251 (7.2)	109 (2.8)	360 (4.8)
	None/Don't know/ Foreign Unknown	42 (1.1)	48 (1.2)	90 (1.2)
	Missing	2 (0.1)	7 (0.2)	8 (0.1)
Highest level of paternal education	<5 GCSE equivalent	616 (17.8)	569 (14.7)	1185 (16.1)
	>=5 GCSE equivalent	873 (25.1)	951 (24.6)	1824 (24.8)
	A level equivalent	448 (12.9)	349 (9.0)	797 (10.9)
	Higher than A-level	502 (14.4)	1143 (29.4)	1645 (22.3)
	Other	265 (7.6)	73 (1.9)	338 (4.6)
	None/Don't know/ Foreign Unknown	771 (22.2)	783 (20.1)	1554 (21.1)
	Missing	2 (0.1)	11 (0.3)	13 (0.2)
Maternal employment status	Currently employed	2237 (64.4)	941 (24.3)	3178 (43.3)
	Previously employed	909 (26.0)	1001 (25.7)	1910 (25.9)
	Never employed	330 (9.5)	1934 (49.9)	2264 (30.7)
	Missing	1 (0.1)	3 (0.1)	4 (0.1)

Table S2: Baseline characteristics of the included maternal cohort (continued)

Variable	Category	White British	Pakistani	Total
Marital status	Married and living with a partner	1084 (31.2)	3585 (92.4)	4669 (63.5)
	Not married but living with a partner	1389 (39.9)	18 (0.5)	1407 (19.1)
	Not living with a partner	1001 (28.8)	269 (6.9)	1270 (17.3)
	Missing	3 (0.1)	7 (0.2)	10 (0.1)
Mother in consanguineous relationship	No	3472 (99.9)	1575 (40.6)	5047 (68.6)
	Yes	5 (0.1)	2304 (59.4)	2309 (31.3)
	Missing			
Subjectively poor	No	3230 (92.9)	3561 (91.8)	6791 (92.3)
	Yes	240 (6.9)	296 (7.6)	536 (7.3)
	Missing	7 (0.2)	22 (0.6)	29 (0.4)
In receipt of means tested benefits	No	1318 (37.9)	1802 (46.5)	3120 (42.4)
	Yes	2153 (61.9)	2070 (53.4)	4223 (57.4)
	Missing	6 (0.2)	7 (0.2)	13 (0.2)
Housing tenure	Buying it-mortgage/loan	1652 (47.5)	1745 (45.0)	3397 (46.2)
	Owns outright	125 (3.5)	922 (23.8)	1047 (14.2)
	Rents it	1495 (43.0)	683 (17.6)	2178 (29.6)
	Lives here rent free	186 (5.4)	467 (12.0)	653 (8.9)
	Other	16 (0.5)	55 (1.4)	71 (0.9)
	Missing	3 (0.1)	7 (0.2)	10 (0.2)
IMD 2010 deprivation quintile	1 (Most deprived)	1793 (51.6)	3058(78.8)	4851 (65.9)
	2	744 (21.4)	569 (14.7)	1313 (17.8)
	3	607 (17.4)	222 (5.7)	829 (11.3)
	4	215 (6.2)	19 (0.5)	234 (3.2)
	5 (Least deprived)	117 (3.3)	10 (0.2)	127 (1.7)
	Missing	1 (0.1)	1 (0.1)	2 (0.1)

Table S3 Description of health behaviour variables stratified by ethnic group to be included in latent class analysis

Variable	Response	Total N (N= 9447)	White British (N=3477)	Pakistani (N=3879)	Other (N=1337)
Not taken vitamin D during pregnancy	Yes	1808 (20.8)	697 (20.1)	718 (18.5)	393 (29.4)
	No	6872 (79.1)	2780 (80.0)	3149 (81.2)	943 (70.5)
	Missing	13 (0.1)	0	12	1 (0.1)
Mother exposed to second hand smoke during pregnancy	No	5763 (66.3)	1923 (55.3)	2868 (73.9)	972 (72.7)
	Yes	2895 (33.3)	1546 (44.6)	987 (25.4)	362 (27.1)
	Missing	35 (0.4)	14 (0.4)	24 (0.6)	3 (0.2)
Inactive during pregnancy	No	3588 (41.3)	1993 (57.3)	917 (23.6)	678 (50.7)
	Yes	5076 (58.4)	1470 (42.3)	2953 (76.1)	653 (48.8)
	Missing	29 (0.3)	14 (0.4)	9 (0.2)	6 (0.5)
Smoked in the three months prior to pregnancy	No	6839 (78.7)	2040 (58.7)	3668 (94.6)	1131 (84.6)
	Yes	1840 (21.2)	1435 (41.2)	200 (5.1)	205 (15.3)
	Missing	14 (0.1)	2 (0.1)	11 (0.3)	1 (0.1)
Smoked in the first three months of pregnancy	Yes	7213(83.0)	2290 (65.9)	3730 (96.2)	1193 (89.2)
	No	1466 (16.9)	1185 (34.0)	138 (3.5)	143 (10.7)
	Missing	14 (0.1)	2 (0.1)	11 (0.3)	1 (0.1)
Smoked from the fourth month of pregnancy onwards	No	7407 (85.2)	2436 (70.1)	3750 (96.7)	1221 (91.3)
	Yes	1272 (14.6)	1039 (29.8)	118 (3.0)	115 (8.6)
	Missing	14 (0.2)	2 (0.1)	11 (0.3)	1 (0.1)

Shown below in table S4 are the relationship between covariables and latent class group membership for White British women. For the first class of White British women '*Smoke exposed and inactive*' (WB1)', risk of membership was higher compared to those women in the (WB3) '*Mostly healthy but inactive*' group if mothers were living on their own or living with a partner compared to being married, were either renting or living here rent free compared to buying their home with a mortgage, living in an area of highest deprivation, being aged less than 21 years compared to 21-35 years old, were obese compared to a normal weight at pregnancy booking. Risk of membership of this latent class group was shown to be lower in mothers that were over 35 years of age compared to those aged 21-35 years.

Membership of the second latent class group (WB2) '*Most unhealthy*' was more likely if women were unmarried, living with or without a partner. Additionally women in the WB2 group were more likely to have lower socio-economic indicators including having a higher likelihood of lower levels of educational qualifications than A level or equivalent or don't know their highest level of education, more likely to be previously or never employed rather than currently working, were living in the area of highest deprivation compared to those living in the median level of deprivation and report being subjectively poor rather than not subjectively poor.

Few covariates were shown to have a statistically significant association with membership of the (WB4) '*Smoke exposed and inactive*' class with the exception of membership being more likely if women were unmarried, were aged less than 21 years compared to 21-35 years and were obese compared to normal weight and less likely for those renting their homes rather compared to those who were buying their home with a mortgage.

Table S4 Mutually adjusted relationship between White British mothers latent class grouping and covariates

	Non smoke exposed smokers (1)	Unhealthiest (2)	Mostly healthy but inactive(3)	Smoke exposed and inactive (4)
Characteristic	RRR (95% CI)	RRR (95% CI)	Reference	RRR (95% CI)
Mothers age				
Less than 21 years	1.01 (0.53-1.89)	1.40 (1.10-1.77)**	1.00 (ref)	1.31 (1.02-1.70)*
21-35	1.00 (ref)	1.00 (ref)		1.00 (ref)
>35	0.75 (0.33-1.70)	0.74 (0.53-1.06)		0.64 (0.45-0.91)*
Booking BMI				
Underweight	1.04 (0.21-5.03)	1.17 (0.66-2.08)	1.00 (ref)	0.66 (0.31-1.42)
Normal	1.00 (ref)	1.00 (ref)		1.00 (ref)
Overweight	1.10 (0.61-1.97)	1.12 (0.89-1.40)		1.13 (0.89-1.43)
Obese	1.11 (0.60-2.04)	1.06 (0.83-1.34)		1.34 (1.05-1.71)*
Mother born in the UK or moved to UK<5 years of age	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Moved to UK >=5 years of age	1.18 (0.16-8.73)	0.35 (0.01-1.29)		0.51 (0.15-1.76)
Father born abroad yes vs no	0.62 (0.24-1.62)	0.91 (0.57-1.45)		0.92 (0.56-1.49)
Number of previous children				
0	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
1	0.78 (0.41-1.51)	0.88 (0.68-1.13)		0.86 (0.67-1.11)
2	1.04 (0.45-2.41)	0.97 (0.69-1.36)		0.91 (0.64-1.30)
3+	1.51 (0.54-4.21)	1.06 (0.69-1.63)		0.94 (0.58-1.53)
Marital status				
Married and living with a partner	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Not married but living with a partner	1.62 (0.86-3.05)	2.10 (1.61-2.75)***		1.31 (1.02-1.68)*
Not living with a partner	1.42 (0.64-3.16)	2.69 (1.97-3.67) ***		1.55 (1.12-2.13)**

Table S4 Mutually adjusted relationship between White British mothers latent class grouping and covariates (continued)

	Non smoke exposed smokers (1)	Unhealthiest (2)	Mostly healthy but inactive(3)	Smoke exposed and inactive (4)
Highest level maternal education				
<5 GCSE	1.19 (0.52-2.70)	2.35 (1.70-3.25)***		1.24 (0.86-1.79)
>5 GCSE	0.93 (0.48-1.81)	1.54 (1.18-2.00)**		1.25 (0.95-1.65)
A level equivalent	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Degree level	0.61 (0.26-1.45)	0.48 (0.32-0.72)***		0.84 (0.60-1.18)
Other	0.62 (0.20-1.96)	0.89 (0.59-1.36)		1.05 (0.70-1.57)
Don't know	2.68 (0.40-17.9)	3.45 (1.32-9.02)*		1.06 (0.29-3.88)
Highest level paternal education				
<5 GCSE	1.38 (0.52-3.66)	1.46 (1.02-2.08)*		1.15 (0.79-1.68)
>5 GCSE	1.22 (0.51-2.93)	0.90 (0.65-1.24)		1.02 (0.74-1.40)
A level equivalent	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Degree level	1.46 (0.54-4.00)	0.87 (0.56-1.35)		0.76 (0.51-1.13)
Other	1.22 (0.37-4.05)	1.23 (0.79-1.90)		1.14 (0.74-1.75)
Don't know	1.66 (0.66-4.15)	1.37 (0.97-1.93)		1.08 (0.75-1.54)
In receipt of means tested benefits				
No	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Yes	0.74 (0.38-1.45)	0.83 (0.64-1.06)		0.84 (0.64-1.11)
Mother employed				
Currently employed	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Previously employed	0.75 (0.38-1.48)	1.33 (1.04-1.71)*		0.88 (0.67-1.17)
Never Employed	0.97 (0.35-2.69)	1.51 (1.02-2.22)*		1.39 (0.89-2.15)
Housing tenure				
Mortgage	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Owns outright	0.45 (0.05-3.99)	0.83 (0.64-1.06)		1.08 (0.63-1.85)
Rents it	1.85 (1.01-3.39)*	1.51 (0.91-2.48)		1.43 (1.11-1.83)**
Lives here rent free	1.59 (0.39-6.41)	1.91 (1.51-2.42)***		1.84 (1.09-3.12)*
Other	6.33 (0.35-114.1)	2.88 (1.80-4.59)***		5.22 (0.94-28.8)

Table S4 Mutually adjusted relationship between White British mothers latent class grouping and covariates (continued)

IMD quintile membership				
1 (most deprived)	1.79 (0.82-3.91)	1.61 (1.22-2.12)***		1.53 (1.15-2.03)**
2	1.45 (0.61-3.42)	1.13 (0.83-1.54)		1.19 (0.87-1.62)
3	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
4	2.19 (0.77-6.27)	0.74 (0.44-1.23)		1.04 (0.66-1.65)
5 (Least deprived)	0.93 (0.17-5.13)	0.45 (0.21-0.97)*		0.61 (0.32-1.19)
Subjective poverty				
Yes vs No	1.17 (0.43-3.16)	1.58 (1.09-2.27)*		1.18 (0.77-1.81)

Exponentiated coefficients; 95% confidence intervals in brackets* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results for the Pakistani women are shown below in table S5. Compared to those in the reference category (P3) '*Mostly healthy but inactive*' group, membership of the '*Inactive Smokers*' group (P1), was higher if women were living with a partner rather than being married or were aged less than 21 years rather than being aged 21-35. Pakistani mothers were less likely to be in the class '*Inactive smokers*' (P1) if they had moved to the UK aged five years of age or greater rather than be born in or have moved to the UK at a younger age, be in a consanguineous relationship and were likely to never have worked.

Membership of the second class '*Smoke exposed and inactive*' group (P2) were less likely to have moved to the UK aged five years of age or greater rather than be born or have moved to the UK at a younger age, less likely to be multiparous compared to nulliparous and less likely to be either previously or never employed compared to currently employed.

Table S5 Mutually adjusted relationship between Pakistani mothers latent class grouping and covariates

	Inactive smokers (1)	Smoke exposed and inactive (2)	Mostly healthy but inactive(3)
Characteristic	RRR (95% CI)	RRR (95% CI)	ref
Mothers age			
Less than 21 years	1.67* (1.04-2.66)	1.01 (0.76-1.33)	
21-35	1.00 (ref)	1.00 (ref)	1.00 (ref)
>35	1.46 (0.81-2.65)	0.88 (0.60-1.31)	
Booking BMI			
Underweight	0.69 (0.27-1.71)	1.14 (0.72-1.83)	
Normal	1.00 (ref)	1.00 (ref)	1.00 (ref)
Overweight	1.17 (0.76-1.81)	1.08 (0.84-1.41)	
Obese	1.06 (0.63-1.80)	1.11 (0.80-1.52)	
Mother born in the UK or moved to UK <5 years of age	1.00 (ref)	1.00 (ref)	1.00 (ref)
Moved to UK ≥5 years of age	0.16 (0.09-0.28) ***	0.63 (0.48-0.84)***	
Father born in UK Yes vs No	1.40 (0.93-2.12)	1.37 (1.08-1.75)*	1.00 (ref)
Mother in consanguineous relationship Yes vs No	0.58 (0.39-0.87)**	0.89 (0.71-1.13)	1.00 (ref)
Number of previous children			
0	1.00 (ref)	1.00 (ref)	1.00 (ref)
1	0.70 (0.40-1.21)	0.70 (0.51-0.96)*	
2	1.00 (0.54-1.83)	0.68 (0.47-0.98)*	
3+	0.68 (0.32-1.45)	0.66 (0.43-1.00)	
Marital status			
Married and living with a partner	1.00 (ref)	1.00 (ref)	1.00 (ref)
Not married but living with a partner	2.39 (0.62-9.24)	0.85 (0.18-4.02)	
Not living with a partner	1.88* (1.12-3.14)	0.88 (0.56-1.36)	
Highest level maternal education			
<5 GCSE	1.95 (1.05-3.63)*	1.07 (0.72-1.58)	
>5 GCSE	1.69 (0.99-2.88)	1.03 (0.72-1.47)	
A level equivalent	1.00 (ref)	1.00 (ref)	1.00 (ref)
Degree level	0.56 (0.29-1.07)	1.02 (0.72-1.47)	
Other	0.95 (0.34-2.62)	1.18 (0.62-2.26)	
Don't know/Other/Foreign	2.00 (0.39-10.1)	0.77 (0.23-2.54)	
Unknown			

Table S5 Mutually adjusted relationship between Pakistani mothers latent class grouping and covariates (continued)

	Inactive smokers (1)	Smoked exposed and inactive (2)	Mostly healthy but inactive(3)
Characteristic	RRR (95% CI)	RRR (95% CI)	ref
Highest level paternal education			
<5 GCSE	0.74 (0.36-1.52)	1.06 (0.68-1.66)	1.00 (ref)
>5 GCSE	0.72 (0.38-1.38)	1.01 (0.68-1.52)	
A level equivalent	1.00 (ref)	1.00 (ref)	
Degree level	0.66 (0.35-1.27)	0.76 (0.50-1.13)	
Other	0.20 (0.03-1.49)	1.05 (0.48-2.29)	
Don't know	0.69 (0.35-1.38)	0.85 (0.54-1.31)	
In receipt of Means tested benefits			
No	1.00 (ref)	1.00 (ref)	1.00 (ref)
Yes	1.07 (0.68-1.68)	0.87 (0.67-1.14)	
Mother employed			
Currently employed	1.00 (ref)	1.00 (ref)	1.00 (ref)
Previously employed	0.88* (0.56-1.39)	0.79 (0.58-1.07)	
Never employed	0.45*** (0.25-0.80)	0.70 (0.50-0.97)*	
Household tenure			
Mortgage	1.00 (ref)	1.00 (ref)	1.00 (ref)
Owens outright	0.64 (0.38-1.10)	0.94 (0.70-1.25)	
Rents it	1.60 (0.97-2.62)	1.27 (0.93-1.75)	
Lives here rent free	1.04 (0.59-1.84)	1.12 (0.79-1.59)	
Other	-	0.94 (0.37-2.37)	
IMD quintile membership			
1 (most deprived)	0.60 (0.31-1.16)	1.27 (0.76-2.14)	1.00 (ref)
2	0.72 (0.34-1.52)	1.32 (0.75-2.34)	
3	1.00 (ref)	1.00 (ref)	
4	2.60 (0.41-16.40)	2.09 (0.46-9.44)	
5 (Least deprived)	1.45 (0.15-13.70)	0.73 (0.06-8.43)	
Subjective poverty			
Yes vs No	1.38 (0.75-2.53)	1.15 (0.76-1.72)	