Table S1. First 10 eigenvalues for conventional PCA and mPCA (four levels). Estimates of the (standard) errors (SEs) associated with the eigenvalues can be found using Monte Carlo simulation (number of MC replicates = 1000), assuming a multivariate normal distribution for the landmark point data.

Eigenvalue Number	SL PCA	SD	mPCA Level 1 (Smoking)	SD	mPCA Level 2 (Alcohol)	SD	mPCA Level 3 (Sex)	SD	mPCA Level 4 (Subject)	SD
1	28.777	0.665	0.567	0.199	0.453	0.161	13.166	0.105	24.851	0.871
2	14.983	0.326	0.415	0.085	0.249	0.067	0.349	0.041	14.823	0.410
3	12.829	0.288	0.374	0.054	0.235	0.043	0.335	0.026	11.862	0.387
4	9.564	0.185	0.243	0.036	0.184	0.028	0.293	0.019	9.482	0.249
5	9.386	0.185	0.209	0.025	0.135	0.021	0.248	0.014	8.581	0.240
6	8.048	0.186	0.169	0.019	0.103	0.016	0.210	0.011	6.915	0.254
7	4.781	0.096	0.123	0.014	0.090	0.013	0.184	0.009	4.785	0.131
8	4.627	0.095	0.099	0.012	0.072	0.010	0.160	0.007	4.342	0.123
9	3.902	0.089	0.094	0.009	0.057	0.008	0.146	0.006	4.004	0.131
10	3.387	0.074	0.078	0.008	0.053	0.007	0.121	0.005	3.343	0.095

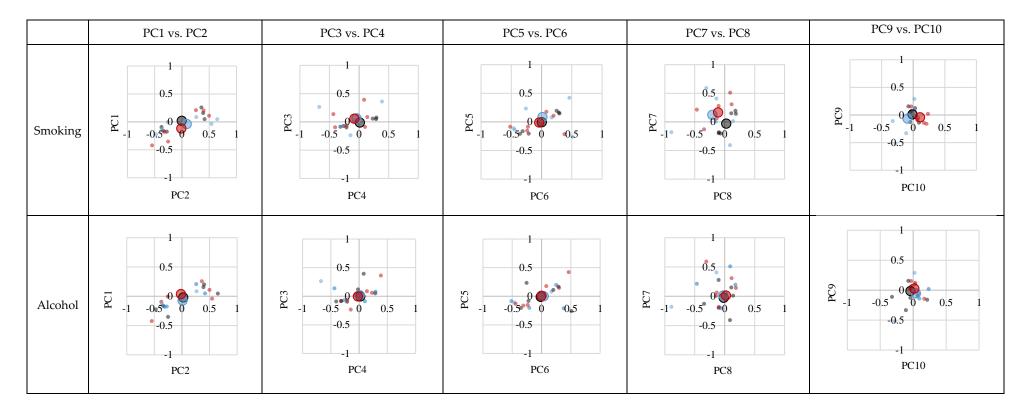


Figure S1: Scatter plots of the standardized component scores for conventional PCA up to PC10. Group centroids (18 groups) are represented as smaller landmarks, and global centroids are represented as larger landmarks. A subtle pattern in the separation of the group means is visible at PC7/8, with the global centroid of individuals whose mothers did not smoke during pregnancy distant to the global centroid of those whose mothers smoked during pregnancy. No other obvious patterns in the separation of the group means is visualised.



Table S2. Frequencies and mean smoking levels (smoking, $1^{\rm st}$ trimester)

Grouping	Sex	Smoking Levels	Mid Interval Value (m)	Frequency (f)	Mean (cigarettes/day)	Standard Deviation (cigarettes/day)
		1–4 cigs/day	2.5	14		(* g , , ,)
		5–9 cigs/day	7	<5		
		10–14 cigs/day	12	<5		
	Male	15–19 cigs/day	17	<5	7.10	7.16
	-1-2-1-2	20–24 cigs/day	22	<5	7.10	
		25–29 cigs/day	27.5	<5	1	
Smoking 1st		30+ cigs/day	30	<5*	1	
trimester only		1–4 cigs/day	<5	7		
No alcohol		5–9 cigs/day	7	7	-	
		10–14 cigs/day	12	<5	1	
	Female	15–19 cigs/day	17	<5	7.19	5.35
	Temale	20–24 cigs/day	22	<5	7.17	3.33
		25–29 cigs/day	27.5	<5*		
			30	<5*	-	
		30+ cigs/day	2.5	8		
		1–4 cigs/day			-	
		5–9 cigs/day	7	<5 	-	
	3.6.1	10–14 cigs/day	12	<5		
	Male	15–19 cigs/day	17	<5	5.5	4.27
Smoking 1st		20–24 cigs/day	22	<5*		
trimester only		25–29 cigs/day	27.5	<5*	-	
Alcohol 1st		30+ cigs/day	30	<5*		
trimester only	Female	1–4 cigs/day	2.5	5		
, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		5–9 cigs/day	7	6	9.26	6.28
		10–14 cigs/day	12	5		
		15–19 cigs/day	17	<5		
		20-24 cigs/day	22	<5*		
		25-29 cigs/day	27.5	<5		
		30+ cigs/day	30	<5*		
	Male	1–4 cigs/day	2.5	19	7.24	6.30
		5–9 cigs/day	7	12		
		10–14 cigs/day	12	6		
		15–19 cigs/day	17	<5*		
		20–24 cigs/day	22	<5		
Smoking 1st		25–29 cigs/day	27.5	<5		
trimester only		30+ cigs/day	30	<5*		
Alcohol 1st and	Female	1–4 cigs/day	2.5	22		6.74
2 nd trimester		5–9 cigs/day	7	7	-	
		10–14 cigs/day	12	8	7.77	
		15–19 cigs/day	17	<5		
		20–24 cigs/day	22	<5		
		25–29 cigs/day	27.5	<5*	1	
		30+ cigs/day	30	<5	1	
		1–4 cigs/day	2.5	16		
		5–9 cigs/day	7	13	1	
			12	23	1	ć 27.
	Mala	10–14 cigs/day			10.49	
	Male	15–19 cigs/day	17 22	12	10.48	6.27
		20–24 cigs/day	l	<5	-	
Smoking 1st		25–29 cigs/day	27.5	<5	-	
and 2 nd		30+ cigs/day	30	<5		
trimesters		1–4 cigs/day	2.5	17	-	
No alcohol		5–9 cigs/day	7	18	-	
	_	10–14 cigs/day	12	14		
	Female	15–19 cigs/day	17	14	10.88	6.90
		20–24 cigs/day	22	7		
		25–29 cigs/day	27.5	<5		
		30+ cigs/day	30	<5*		
Smoking 1st	<u> </u>	1–4 cigs/day	2.5	<5		
and 2 nd		5–9 cigs/day	7	9		7.06
trimesters	Male	10–14 cigs/day	12	<5	10.70	
Alcohol 1st		15–19 cigs/day	17	<5		
trimester only	1	20–24 cigs/day	22	<5		

		25–29 cigs/day	27.5	<5*		
		30+ cigs/day	30	<5		
		1–4 cigs/day	2.5	<5		5.73
		5–9 cigs/day	7	14		
		10-14 cigs/day	12	8		
	Female	15–19 cigs/day	17	6	11.19	
		20–24 cigs/day	22	<5		
		25–29 cigs/day	27.5	<5*		
		30+ cigs/day	30	<5*		
		1–4 cigs/day	2.5	31		6.81
	Male	5–9 cigs/day	7	20	10.54	
		10–14 cigs/day	12	37		
		15–19 cigs/day	17	13		
Smoking 1st		20–24 cigs/day	22	10		
and 2nd		25–29 cigs/day	27.5	<5		
trimesters		30+ cigs/day	30	<5*		
Alcohol 1st and		1–4 cigs/day	2.5	28		
2 nd trimesters		5–9 cigs/day	7	34	11.26 7	
2 trimesters		10–14 cigs/day	12	20		
	Female	15–19 cigs/day	17	18		7.64
		20–24 cigs/day	22	13		
		25–29 cigs/day	27.5	7		
		30+ cigs/day	30	<5		

^{*}This many contain zero.

Table S3. Frequencies and mean smoking levels (smoking, 2^{nd} trimester).

Grouping	Sex	Smoking Levels	Mid Interval Value (m)	Frequency (f)	Mean (cigarettes/day)	Standard Deviation (cigarettes/day)
		1–4 cigs/day	2.5	19		
		5–9 cigs/day	7	17	1	
		10-14 cigs/day	12	13	10.47	7.40
	Male	15-19 cigs/day	17	10		
		20-24 cigs/day	22	6		
Smoking 1st		25–29 cigs/day	27.5	<5		
and 2 nd		30+ cigs/day	30	<5		
trimesters		1–4 cigs/day	2.5	13		
No alcohol		5–9 cigs/day	7	16	1	
		10–14 cigs/day	12	19	1	
	Female	15-19 cigs/day	17	16	11.47	6.34
		20–24 cigs/day	22	7	1	
		25–29 cigs/day	27.5	<5	1	
		30+ cigs/day	30	<5*	1	
		1–4 cigs/day	2.5	8		5.94
	Male	5–9 cigs/day	7	6	8.48	
		10–14 cigs/day	12	6		
		15–19 cigs/day	17	<5		
		20–24 cigs/day	22	<5		
Smoking 1st		25–29 cigs/day	27.5	<5*		
and 2 nd		30+ cigs/day	30	<5*		
trimesters	Female	1–4 cigs/day	2.5	9	9.56	6.33
Alcohol 1st		5–9 cigs/day	7	12		
trimester only		10–14 cigs/day	12	6		
		15–19 cigs/day	17	<5		
		20–24 cigs/day	22	<5		
		25–29 cigs/day	27.5	<5*		
		30+ cigs/day	30	<5*		
		1–4 cigs/day	2.5	34		
		5–9 cigs/day	7	28	9.66	6.56
		10–14 cigs/day	12	28		
	Male	15–19 cigs/day	17	14		
Smoking 1st		20–24 cigs/day	22	9	1	
and 2 nd		25–29 cigs/day	27.5	<5	1	
trimesters		30+ cigs/day	30	<5	1	
Alcohol 1st		1–4 cigs/day	2.5	31		
and 2 nd	Female	5–9 cigs/day	7	32	10.81	
trimesters		10-14 cigs/day	12	23		
		15–19 cigs/day	17	15		7.46
		20–24 cigs/day	22	14		
		25–29 cigs/day	27.5	5		
		30+ cigs/day	30	<5		

^{*}This many contain zero.

 $\textbf{Table S4.} \ \ Frequencies \ and \ mean \ alcohol \ levels \ (alcohol, \ 1^{st} \ trimester)^{1}.$

Grouping	Sex	Alcohol Levels ²	Mid Interval Value [per week] (m)	Frequency (f)	Mean (glasses/week)	Standard Deviation (glasses/week)
No smoking Alcohol 1st	Male	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	195 17 <5 <5 <5*	0.82	2.91
trimester only	Female	<pre><1 glass/week 1-2 glasses/week 1-2 glasses/day 3-9 glasses/day 10+ glasses/day</pre>	<5 <5 10.5 42 70	243 30 <5 <5*	0.68	0.90
No smoking Alcohol 1st	Male	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	491 192 17 <5 <5	1.17	3.40
Alcohol I st and 2 nd trimesters	Female	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	<5 <5 10.5 42 70	550 209 15 <5 <5*	1.02	2.04
Smoking 1st trimester only	Male	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	10 <5 <5 <5* <5*	2.07	3.46
Alcohol 1st trimester only	Female	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	14 <5 <5 <5 <5* <5*	1.24	2.22
Smoking 1st trimester only	Male	<pre><1 glass/week 1-2 glasses/week 1-2 glasses/day 3-9 glasses/day 10+ glasses/day</pre>	0.5 1.5 10.5 42 70	23 17 <5 <5* <5*	1.16	1.56
Alcohol 1st and 2nd trimester	Female	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	25 16 <5 <5 <5*	2.26	6.40
Smoking 1st and 2nd trimesters	Male	10+ glasses/day <1 glass/week 1-2 glasses/week 1-2 glasses/day 3-9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	19 <5 <5* <5* <5*	0.67	0.38
trimesters Alcohol 1st trimester only	Female	10+ glasses/day <1 glass/week 1-2 glasses/week 1-2 glasses/day 3-9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	28 7 <5* <5*	0.70	0.40
Smoking 1st and 2nd trimesters	Male	10. glasses/day <1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	63 46 <5 <5 <5*	1.97	5.63
Alcohol 1st and 2nd trimesters	Female	<1 glass/week 1–2 glasses/week 1–2 glasses/day 3–9 glasses/day 10+ glasses/day	0.5 1.5 10.5 42 70	75 34 10 <5 <5*	2.29	5.81

 1 Where alcohol had been categorised per day, the midpoint of the grouping was multiplied by 7 to estimate alcohol intake per week. Where alcohol intake was recorded as <1 glass/week, this was taken as 0.5 glasses/week.

 2 The mothers were asked to take "glass" to mean "a pub measure of spirits, half a pint of lager or cider, a glass of wine etc"

*This may include zero.

Table S5. Frequencies and mean alcohol levels (alcohol, 2nd trimester)¹.

Grouping	Sex	Alcohol Levels ²	Mid Interval Value (m)	Frequency (f)	Mean (glasses/week)	Standard Deviation (glasses/week)
		<1 glass/week	0.5	466		
		1–2 glasses/week	1.5	216		
	Male	1–2 glasses/day	10.5	18	1.22	3.42
No smoking		3–9 glasses/day	42	<5		
Alcohol 1st		10+ glasses/day	70	<5		
and 2 nd		<1 glass/week	0.5	524		
trimesters		1-2 glasses/week	1.5	234		2.87
	Female	1–2 glasses/day	10.5	16	1.10	
		3–9 glasses/day	42	<5*		
		10+ glasses/day	70	<5		
	Male	<1 glass/week	0.5	27	0.84	0.47
		1–2 glasses/week	1.5	14		
Smoking 1st		1–2 glasses/day	10.5	<5*		
trimester		3-9 glasses/day	42	<5*		
only		10+ glasses/day	70	<5*		
Alcohol 1st	Female	<1 glass/week	0.5	29	1.25	2.07
and 2nd		1-2 glasses/week	1.5	13		
trimester		1-2 glasses/day	10.5	<5		
		3-9 glasses/day	42	<5*		
		10+ glasses/day	70	<5*		
		<1 glass/week	0.5	70	1.20	1.83
		1-2 glasses/week	1.5	41		
Smoking 1st	Male	1-2 glasses/day	10.5	<5		
and 2 nd		3-9 glasses/day	42	<5*		
trimesters		10+ glasses/day	70	<5*		
Alcohol 1st		<1 glass/week	0.5	81		
and 2 nd	Female	1–2 glasses/week	1.5	34	1.28	2.15
trimesters		1–2 glasses/day	10.5	6		
		3–9 glasses/day	42	<5*		
		10+ glasses/day	70	<5*		

 1 Where alcohol had been categorised per day, the midpoint of the grouping was multiplied by 7 to estimate alcohol intake per week. Where alcohol intake was recorded as <1 glass/week, this was taken as 0.5 glasses/week.

² The mothers were asked to take "glass" to mean "a pub measure of spirits, half a pint of lager or cider, a glass of wine etc".

^{*}This may contain zero.