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Dietary patterns in pregnancy and associations with socio-demographic and lifestyle factors

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Abstract

Objective—To obtain distinct dietary patterns in the third trimester of pregnancy using principal components analysis (PCA); to determine associations with socio-demographic and lifestyle factors.

Design and methods—A total of 12 053 pregnant women partaking in a population-based cohort study recorded current frequency of food consumption via questionnaire in 1991-1992. Dietary patterns identified using PCA were related to social and demographic characteristics and lifestyle factors.

Results—Five dietary patterns were established and labelled to best describe the types of diet being consumed in pregnancy. The ‘health conscious’ component described a diet based on salad, fruit, rice, pasta, breakfast cereals, fish, eggs, pulses, fruit juices, white meat and non-white bread. The ‘traditional’ component loaded highly on all types of vegetables, red meat and poultry. The ‘processed’ component was associated with high-fat processed foods. The ‘confectionery’ component was characterized by snack foods with high sugar content and the final ‘vegetarian’ component loaded highly on meat substitutes, pulses, nuts and herbal tea and high negative loadings were seen with red meat and poultry. There were strong associations between various socio-demographic variables and all dietary components; in particular, a ‘health conscious’ diet was positively associated with increasing education and age and non-white women. There was a negative association with increased parity, single, non-working women, those who smoked and who were overweight pre-pregnancy. Opposite associations were seen with the ‘processed’ component.

Conclusions—Distinct dietary patterns in pregnancy have been identified. There is clear evidence of social patterning associated with the dietary patterns, these social factors need to be accounted for in future studies using dietary patterns. This study will form the basis for further work investigating pregnancy outcome.

Keywords

dietary patterns; pregnancy; principal components analysis; ALSPAC

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Introduction

The physiological stress of pregnancy demands that nutrient and energy intake is adequate, not only for the woman's health, but in order that the fetus may develop optimally. There is evidence to suggest that inadequate nutrition during pregnancy, leading to impaired fetal growth (Harding, 2001), could have long-term detrimental effects on the developing fetus and lead to an increased risk of cardiovascular disease (Barker and Fall, 1993) and diabetes (Barker *et al.*, 1993). There is also evidence for social patterning of diet across the Westernized world, with diets adhering to dietary guidelines being more likely to be reported in higher social groups or more preferable social situations (Johansson *et al.*, 1999; De Irala-Estevez *et al.*, 2000; Groth *et al.*, 2001; Dynesen *et al.*, 2003; Mishra *et al.*, 2005). It is important to identify particular groups of the population who have poor dietary habits, especially during such a vulnerable time as pregnancy, to enable nutrition education to be targeted.

The method of principal components analysis (PCA) to study dietary patterns is becoming increasingly popular as an alternative to studying the intake of individual food items or groups or a nutrient-specific approach. PCA, a multivariate method allowing the inclusion of many foods in combination, assesses the associations between individual food items and identifies underlying dimensions in the data based on the inter-item correlations, which may allow a more meaningful approach to assessing dietary intake. This method has been widely applied to studies of diet in adult populations investigating specific health outcomes, but to our knowledge only two studies have assessed dietary patterns using PCA during pregnancy (Wolff and Wolff, 1995; Cuco *et al.*, 2006).

We have previously reported on the results of PCA on childhood diet (North and Emmett, 2000; Northstone and Emmett, 2005). We obtained distinct dietary components, which were related to a variety of socio-demographic factors. Clearly identifiable characteristics of mothers were associated with each dietary pattern showing that maternal factors have a substantial influence on early childhood eating patterns. We showed that children of younger mothers with lower levels of education were more likely to consume a diet based on convenience foods and foods high in fat, whereas a 'healthy' diet was positively associated with increased levels of maternal education.

Adult studies have also found significant links between the characteristics of the sample and the dietary patterns identified in their studies (Gex-Fabry *et al.*, 1988; Barker *et al.*, 1990; Gregory *et al.*, 1990; Wichelow and Prevost, 1996; Mishra *et al.*, 2002; Sanchez-Villegas *et al.*, 2003). Of the two previous studies on PCA in pregnancy (Wolff and Wolff, 1995; Cuco *et al.*, 2006), only Cuco *et al.* (2006) investigated associations between the dietary patterns observed and lifestyle factors.

This study aims to identify distinct dietary patterns of women during the third trimester of pregnancy using PCA. It will determine whether socio-demographic characteristics and lifestyle factors of the women are associated with the obtained dietary patterns.

Methods

ALSPAC is an ongoing population-based study designed to investigate the effects of environmental, genetic and other influences on the health and development of children (Golding *et al.*, 2001). Pregnant women resident in the former Avon Health Authority in South West England who were expected to deliver between 1 April 1991 and 31 December 1992 were eligible to participate resulting in a total cohort of 14 541 pregnancies. The primary source of data collection was via self-completion postal questionnaires administered during pregnancy at 8, 18 and 32 weeks gestation. The representative nature of the ALSPAC

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sample has been investigated by comparison with the 1991 National Census data of mothers with infants under 1 year of age who were resident in the county of Avon. The ALSPAC sample had a slightly greater proportion of mothers who were married or cohabiting, who were owner-occupiers and who had a car in the household, there was also a smaller proportion of ethnic minority mothers. Ethical approval for the study was obtained from the ALSPAC ethics committee and the local ethics committees of United Bristol, Southmead and Frenchay Health Care Trusts. More detailed information on the ALSPAC study is available on the website: http://www.alspac.bris.ac.uk

The questionnaire sent to the women at approximately 32 weeks gestation contained a set of questions enquiring about the frequency of consumption of a wide variety of foods and drinks. This questionnaire had been shown to produce mean nutrient intakes for the mothers (Rogers and Emmett, 1998), which were similar to those obtained for women in the British National Diet and Nutritional survey for adults (Gregory *et al.*, 1990; MAFF, 1994).

For 43 food types, the woman was asked to indicate how often she was currently consuming each food type, using the following options: (i) never or rarely; (ii) once in 2 weeks; (iii) 1-3 times a week; (iv) 4-7 times a week; (v) more than once a day. The questionnaire also asked the woman to record how many cups of tea or coffee, the number of glasses of cola and the number of slices of bread she consumed each day on average. The usual type of bread (white or other) she used was also recorded.

In order to apply quantitative meaning to the frequency categories, the data were numerically transformed into times per week as follows: (i) 0; (ii) 0.5; (iii) 2; (iv) 5.5; and (v) 10 times per week. Tea, coffee, cola and bread were measured on a different scale to the other variables; therefore, all data were standardized by subtracting the mean and dividing by the standard deviation for each variable.

A wide variety of socio-demographic and lifestyle factors were investigated to determine any associations with the foods and drinks consumed by the women. The majority of these data were collected in the same questionnaire as the dietary information. Other data were obtained from the other two questionnaires completed during pregnancy. The distributions of the variables considered in the analysis are shown in Table 1, these included for socio-demographic factors, the highest level of education, age, housing tenure, ethnic background, parity, whether the woman currently had a partner and was in paid employment. Finally, a measure of the degree of financial difficulty being experienced was calculated based on a list of five items (food, clothing, heating, rent/mortgage, things for child) which the mother may have had trouble affording (with the options of very difficult, fairly difficult, some difficulty, no difficulty). The score was scaled such that a maximum score of 20 was obtained for those women who found it very difficult to afford all five items, whereas those who had no difficulties had a score of 0. Following three categories were created: no financial difficulty (score of 0), some (1-5) or many (6 or higher). The lifestyle factors considered included whether the mother felt energetic ‘nowadays’, how active she felt compared with other pregnant women of a similar age, whether she smoked, was currently a vegetarian or had been on a diet during this pregnancy. Depression was also assessed based on the Edinburgh Postnatal Depression Scale (EPDS; Cox *et al.*, 1987) and anxiety based on the anxiety sub-scale of the Crown Crisp Experimental Index (CCEI; Crown and Crisp, 1979). Pre-pregnancy body mass index (BMI) was computed from self-report data as (weight (kg)/height (m)^2); a woman was defined as overweight if her BMI was 25 kg/m^2 or more. Finally, a measure of concern regarding the woman’s weight and shape was created based on the responses to six questions ((1) Do you feel you have put on too much weight?; (2) Do you feel uncomfortable seeing your body in the mirror?; (3) Have you had a strong desire to lose weight at any time during this pregnancy?; (4) Do you feel dissatisfied about your shape?; (5) Have you experienced any loss of control over eating during this pregnancy?; and (6) Are you concerned about losing any extra weight you have gained in this pregnancy?). The score was split into the top decile versus the rest. In addition, seasonality was considered as the month of completion of the food questionnaire (divided into four groups equating to the seasons).

Statistical methods

PCA with varimax rotation was performed on the 44 standardized food items. PCA reduces the data by forming linear combinations of the original observed variables; thereby grouping together correlated variables, which in turn identifies any underlying dimensions in the data. The coefficients defining these linear combinations are called ‘factor loadings’ and are the correlations of each food item with that component. The number of components that best represented the data was chosen on the basis of the scree plot (Cattell, 1966) and the interpretability of the factor loadings. Varimax rotation (Gorsuch, 1974; Kline, 1994) was applied; this redistributes the explained variance for the individual components and so achieving a simpler structure, increasing the number of larger and smaller loadings.

Women were excluded from the PCA if they had more than 10 dietary items missing. If 10 or fewer items were missing, the assumption was made that the woman never consumed the item and it was given a value of 0.

A component score was created for each woman for each of the components identified, calculated by multiplying the factor loadings by the corresponding standardized value for each food and summing across the food items. Each score has a mean of 0 and a higher score indicates closer adherence to that dietary pattern. Foods with loadings above 0.3 on a component were considered to have a strong association with that component and were deemed to be the most informative in describing the dietary patterns. We have chosen to give each component a label; these do not perfectly describe each underlying pattern but aid in the report and discussion of the results.

The PCA was repeated in two randomly selected split-half samples to assess repeatability of the method and the results were highly comparable, both in terms of the factor loadings and the component scores obtained (data not shown).

The component scores were considered as the outcome variables to determine any associations with socio-demographic and lifestyle factors. Initially, analyses of variance or *t*-tests were performed to determine univariable associations between the various factors (as described in Table 1) and the dietary pattern scores (data not presented). In order to determine any independent associations with each dietary pattern score, all factors were examined using the general linear model option; adjusted parameter estimates and 95% confidence intervals are presented.

Results

A total of 12 436 women returned the questionnaire completed at 32 weeks gestation (85.5% of the original sample, many of these had already been lost because of miscarriage), of these, 12 053 (96.9%) subjects had sufficient dietary data available for the PCA (no more than 10 missing items).

Dietary components identified

Five dietary components were chosen to best describe the dietary patterns of the women. A total of 31.3% of the variability was explained by these five components, with the first explaining 10.6% (followed by 8.2, 4.9, 4.0 and 3.6% by the second to fifth, respectively).

Higher order factors contributed less than 3% of the variability and were therefore not considered useful in further explaining any dietary behaviours.

Table 2 shows the factor loadings obtained from the PCA. The first component has been described as ‘health conscious’ because of the high loadings of salad, fruit, rice, pasta, oat and bran-based breakfast cereals, fish, pulses, fruit juices and non-white bread. The second component yielded a dietary pattern high in the consumption of all types of vegetables. There were also relatively high loadings on red meat and poultry. With this in mind, we have labeled this component ‘traditional’, in line with the traditional British ‘meat and two veg’ diet and to enable comparability with the results we have previously reported in the children of this cohort (North and Emmett, 2000; Northstone and Emmett, 2005). The third component has been labeled ‘processed’ as the predominant foods with high loadings were high-fat processed foods, such as meat pies, sausages and burgers, fried foods (e.g. fish, eggs, bacon, etc.), pizza, chips and baked beans. The fourth component was characterized by high intakes of foods with high sugar content such as chocolate, sweets, biscuits, cakes and other puddings and was therefore named ‘confectionery’. Finally, the fifth ‘vegetarian’ component loaded highly on meat substitutes, pulses, nuts and herbal tea, and high negative loadings were seen with red meat and poultry.

Variation with socio-demographic and lifestyle factors

Table 3 presents the results of the multivariable analyses of the dietary patterns and corresponding population characteristics showing adjusted regression coefficients and 95% confidence intervals.

The ‘health conscious’ diet component was negatively associated with decreasing educational level and age, increasing parity, those who were not working in the third trimester, non-white women and those who smoked. There was also a negative association with women who were overweight pre-pregnancy. Higher scores were obtained on the ‘healthy’ component for non-white women and those who described themselves as vegetarian. Women living in council or rented accommodation were less likely to follow this dietary pattern compared to those in owner-occupied housing, whereas those who completed the questionnaire in the summer months (June to August) had higher scores. Education was the most important factor, explaining 10.6% of the variation in the ‘health conscious’ score, followed by maternal age (2.9%) and smoking (1.7%).

Only five factors showed a strong independent association with the ‘traditional’ component; decreasing scores were evident with decreasing age, whereas increasing activity and parity were positively associated. Women who were classed as overweight had higher scores than those who were not. Finally, compared to the winter months (December to February), women who completed questionnaires in all other seasons had lower scores for this pattern. The factor explaining the greatest proportion of variability in the ‘traditional’ score was season (1.1%); all other factors explained less than 0.5% of the variance.

Decreasing education and age were positively associated with the ‘processed’ dietary component, as were increasing levels of financial difficulty, parity and whether the women lived in council housing. Women who smoked were more likely to score highly on this dietary component, whereas those who were vegetarian or reported themselves as being more active than their peers scored lower. Two percent of the variance in the ‘processed’ component was explained by maternal age, the most important factor, followed by education (0.8%) and parity (0.7%).

Age, housing, ethnicity, parity and energy levels were all independently related to the ‘confectionery’ component, such that younger women had higher scores on this pattern,

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non-whites, those suffering from anxiety, women who did not feel energetic and those in council or rented accommodation were less likely to score highly. Being overweight, dieting during pregnancy and completing the questionnaire in the summer months (June to August) were negatively associated with the ‘confectionery’ component. Maternal age and ethnicity were the most important factors, both explaining 0.4% of the variation in the ‘confectionery’ score.

The ‘vegetarian’ component was, not surprisingly, highly associated with women who reported themselves as being a vegetarian. Other independent associations were seen with education and age, but no linear trends were evident. Women with O levels scored lower on this pattern compared to those with education beyond this level, whereas women aged between 20 and 29 years also had lower scores. Compared to owner-occupiers, women in council or rented accommodation scored higher on this component, as did those who experienced financial difficulties, non-whites and those who did not work in the final trimester of pregnancy. There was a negative relationship with increasing parity, whereas women who felt that their level of activity was the ‘same’ as their peers had lower scores on the ‘vegetarian’ component. The factor explaining the greatest proportion of variability in the ‘vegetarian’ score was whether the mother reported herself as vegetarian (25.0%); all other factors explained less than 0.5% of the variance.

Discussion

This study has identified five distinct dietary patterns obtained from data collected by food frequency questionnaire from women in the third trimester of pregnancy. Clear socio-demographic associations were evident, such that the ‘health-conscious’ component was associated with higher educational levels, owner-occupied housing, fewer financial difficulties and older age, these could be termed the more socially affluent, whereas the ‘processed’ pattern showed associations that were the reverse of these.

Cuco *et al*. (2006) performed PCA on 7-day dietary records recorded by 80 women both before and at several time points (6, 10, 26 and 38 weeks gestation) during pregnancy in Reus, Spain. In the 38th weeks of pregnancy, two dietary patterns were identified, based on 25 food groups. The first component loaded highly on sugars, sweetened beverages, sweet cereals (including breakfast cereals, biscuits and pastries) and whole fat dairy products, with high negative loadings on fish, fruit and vegetables, whereas the second component loaded highly on red meat, eggs, fish, olive oil and vegetables. The authors investigated the associations with smoking, physical activity, BMI and age. Only age was associated with the second dietary component. It is difficult to make comparisons between the dietary patterns we have described and those reported by Cuco *et al*. (2006). The non-reproducibility of the methods of PCA across samples and the subjective decisions that need to be made by the researchers are two criticisms of this method (Martinez *et al*., 1998; Jacques and Tucker, 2001; Trichopoulos and Lagiou, 2001; Hu, 2002) and may explain the differences found. The smaller number of food groups entered into the PCA by Cuco *et al*. (2006), cultural differences in diet between the Spanish and British populations and the different methods of dietary data collection may also explain these differences.

We did find analogous results to those reported in a comparable cohort from the UK. Robinson *et al*. (2004) assessed dietary patterns, using food frequency questionnaires in 6125 women of fertile age (20-34 years) as part of the Southampton Women’s Study. They reported a dietary component defined by high intake of fruit, vegetables, rice and pasta and low intakes of white bread, chips, sugar, processed meats and crisps. This component, based on 49 food groups, is comparable to our ‘health-conscious’ component and similar associations with socio-demographic variables were seen: low scores being associated with lower educational levels and age, smokers and lower levels of activity. In particular, education was the most important determinant of our ‘health conscious’ score, explaining 10.6% of the observed variance and Robinson *et al.*’s ‘prudent’ score, where it explained 19.7% of the variance. Different categories of education were used in these two studies, which may explain the differences in the proportion of variance explained.

Other UK studies have identified patterns that are comparable to those reported here although the order in which they were identified differed. The first component identified by both Gregory *et al.* (1990) and Wichelow and Prevost (1996) had high loadings on foods, which are currently considered to constituent a healthier diet (foods low in fat and high in fibre). These were both similar to our ‘health conscious’ component. In the study of Barker *et al.* (1990), their analogous component was extracted second. The dietary pattern with high loadings on fast and convenience foods and snacks, similar to our ‘processed’ patterns was the final component to be identified by Gregory *et al.* (1990) but was the third (of four) in the analysis of both Barker *et al.* (1990) and Wichelow and Prevost (1996). The third component identified by Gregory *et al.* (1990) was akin to the ‘confectionery’ component reported here being associated with cakes, puddings and biscuits.

Despite our results being similar to those previously reported in the UK, we cannot accurately determine, based on this data alone, whether the patterns we have derived have been adapted by the women because of their pregnancies, following nutritional recommendations. Further dietary data has been collected from this cohort of women postnatally and we plan to make comparisons between these time points.

There is concern over the use of food frequency questionnaires to assess dietary intake (Byers, 2001), especially when they lack portion size information, thus potentially biasing estimation of food intake. However, in this study we have not used the dietary information obtained to estimate nutrient intake, so portion sizes are not relevant. Further, a number of studies have compared the results of PCA using food frequency questionnaires with those using weighed dietary records (Hu *et al.*, 1999; Togo *et al.*, 2003; Khani *et al.*, 2004; McNaughton *et al.*, 2005); each has found the resulting factor loadings and scores to be comparable.

This study has identified five distinct dietary patterns in pregnant women, which are consistent with those identified in the resulting children when they were 3, 4 and 7 years of age (North and Emmett, 2000; Northstone and Emmett, 2005). At these time points, the consistent dietary types identified were labeled ‘junk’, ‘health conscious’ and ‘traditional’ and were comparable to the ‘processed’, ‘health conscious’ and ‘traditional’ patterns reported here, both in terms of those foods which loaded highly and the size of the loadings. Similar associations were also identified with the socio-demographic variables investigated. We intend to marry these studies to determine the impact of mother’s food choice on her child’s intake. The distinct dietary patterns identified in this population of pregnant women showed clear associations with socio-demographic attributes of the women; in particular, the more healthy aspects of diet were associated with the more socially affluent women. Further analysis is required to investigate any associations of these dietary patterns during pregnancy with birth outcome and later child health to determine whether there is a need for nutrition education to be targeted at specific subpopulations.

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Table 1

Distributions of socio-demographic and lifestyle factors of pregnant women

	n (%)
Maternal education [a]	
>O level	3682 (29.9)
O level	4267 (34.7)
<O level	4360 (35.4)
Age (years)	
30+	498 (4.0)
25-29	2218 (17.9)
20-24	4821 (39.0)
<20	4837 (39.1)
Housing tenure	
Owner/occupied	9014 (75.4)
Council/housing association	1731 (14.5)
Rented/other	1206 (10.1)
Has partner	
Yes	11 495 (97.5)
No	289 (2.5)
Worked third trimester	
Yes	6245 (50.4)
No	6142 (49.6)
Financial difficulties	
None	4308 (35.9)
Some	4558 (38.0)
Many	3125 (26.1)
Ethnicity	
White	11 915 (97.4)
Non-white	321 (2.6)
Parity	
0	5356 (45.1)
1	4196 (35.3)
2+	2334 (19.6)
Feels energetic	
No	5211 (46.9)
Yes	5893 (53.1)
Active compared to others	
Less active	3490 (29.4)
Same	7134 (60.1)
More active	1247 (10.5)
Smoked third trimester	
No	9650 (80.1)

	n *(%)*
Yes	2403 (19.9)
Currently vegetarian	
No	11 457 (94.7)
Yes	645 (5.3)
Depressed	
No	10 122 (84.8)
Yes	1812 (15.2)
Anxious	
No	10 387 (83.9)
Yes	2000 (16.1)
Overweight [b]	
No	9479 (80.9)
Yes	2233 (19.1)
Dieted during pregnancy	
No	11 667 (97.2)
Yes	331 (2.8)
Weight/shape score	
Rest	8971 (89.6)
Top decile	1046 (10.4)
Season	
December-February	1927 (15.6)
March-May	3727 (30.2)
June-August	3615 (29.3)
September-November	3072 (24.9)

[a] O level equivalent to full time education up to age 16 years.

[b] Overweight defined as ≥25 kg/m^2.

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Table 2

Factor loadings of various food items in the five principal dietary components identified in pregnant women based on a food frequency questionnaire

Food item (variance explained)	*Health conscious (10.6%)*	*Traditional (8.2%)*	*Processed (4.9%)*	*Confectionery (4.0%)*	*Vegetarian (3.6%)*
White bread	**-0.535**	0.075	**0.367**	0.080	-0.018
Non-white bread	**0.615**	-0.049	-0.323	-0.057	0.032
Bran-based cereal	**0.365**	0.092	-0.126	-0.004	0.009
Oat-based cereal	**0.297**	0.113	-0.039	0.050	0.140
Other breakfast cereal	-0.110	-0.015	0.139	0.221	-0.082
Biscuits	0.108	0.023	-0.007	**0.603**	-0.108
Crispbreads/crackers	0.218	0.088	-0.010	0.052	0.156
Puddings	0.265	0.064	0.124	**0.389**	-0.112
Cakes/buns	0.202	0.004	0.086	**0.559**	-0.080
Poultry	0.270	0.223	0.121	0.023	**-0.535**
Red meat	0.147	0.219	0.166	0.101	**-0.596**
Meat pies	-0.105	0.032	**0.538**	0.087	-0.118
Offal	0.087	0.091	0.248	-0.066	0.087
Sausages, burgers	-0.091	-0.062	**0.565**	0.029	-0.169
Fried foods (e.g. fish, eggs, bacon)	-0.094	0.001	**0.574**	0.164	-0.009
Pizza	0.233	-0.105	**0.349**	0.104	0.105
Fish	**0.457**	0.155	0.133	-0.075	-0.018
Eggs	0.278	0.090	**0.403**	-0.027	-0.016
Cheese	**0.443**	0.078	0.053	0.122	0.026
Meat substitutes (soya, tofu, etc.)	0.180	0.066	0.124	-0.028	**0.577**
Pulses	**0.356**	0.146	0.006	-0.055	**0.565**
Nuts	0.278	0.116	0.051	0.052	**0.531**
Chips	-0.255	-0.057	**0.561**	0.235	-0.036
Roast potatoes	-0.271	0.225	**0.388**	0.154	-0.165
Potatoes (not chips)	0.254	**0.321**	0.104	0.070	-0.219
Pasta	**0.578**	0.045	0.136	-0.070	0.121
Rice	**0.543**	0.078	0.125	-0.120	0.063
Baked beans	0.004	0.049	**0.413**	0.081	0.045
Leafy green vegetables	0.045	**0.809**	0.011	-0.015	0.041

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Food item (variance explained)	*Health conscious (10.6%)*	*Traditional (8.2%)*	*Processed (4.9%)*	*Confectionery (4.0%)*	*Vegetarian (3.6%)*
Other green vegetables	0.147	**0.799**	-0.043	-0.004	0.054
Carrots	0.178	**0.704**	-0.020	0.023	0.008
Other root vegetables	0.084	**0.606**	0.018	0.003	0.106
Peas	0.174	**0.352**	0.190	0.063	-0.104
Salad	**0.420**	0.212	-0.078	-0.022	0.100
Fresh fruit	**0.518**	0.182	-0.229	0.090	0.005
Fruit juice	**0.488**	0.079	-0.090	0.085	0.057
Cola	-0.209	-0.081	0.221	0.142	0.051
Tea	-0.100	0.078	0.156	0.029	-0.037
Coffee	-0.161	0.053	0.105	0.002	-0.037
Herbal tea	0.186	0.068	-0.085	-0.057	**0.302**
Sweets	-0.098	0.071	0.069	**0.514**	0.061
Chocolate	0.000	0.022	0.036	**0.717**	0.058
Chocolate bars	-0.085	-0.020	0.096	**0.749**	0.021
Crisps	-0.101	-0.041	0.292	**0.381**	0.004

Loadings above 0.3 are shown in bold.

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Table 3

Independent predictors of maternal dietary pattern scores according to various socio-demographic and lifestyle factors, adjusted[a] parameter estimates and 95% CIs

	Health conscious	*Traditional*	*Processed*	*Confectionery*	*Vegetarian*
Education [b]					
> O level	0.00	0.00	0.00	0.00	0.00
O level	-0.47 (-0.51, -0.42)	0.02 (-0.03, 0.08)	0.17 (0.12, 0.21)	0.05 (0.00, 0.09)	-0.06 (-0.11, -0.02)
<O level	-0.79 (-0.84, -0.74)	0.00 (-0.06, 0.06)	0.19 (0.14, 0.25)	0.02 (-0.04, 0.09)	0.08 (0.03, 0.13)
F (*P*)	464.63 (<0.0001)	0.46 (0.633)	48.29 (<0.0001)	3.85 (0.134)	21.38 (<0.0001)
Age (years)					
30+	0.00	0.00	0.00	0.00	0.00
25-29	-0.26 (-0.30, -0.21)	-0.08 (-0.13, -0.03)	0.20 (0.15, 0.24)	0.10 (0.05, 0.15)	-0.07 (-0.11, -0.03)
20-24	-0.42 (-0.48, -0.36)	-0.10 (-0.17, -0.03)	0.35 (0.28, 0.41)	0.14 (0.07, 0.21)	-0.09 (-0.15, -0.03)
<20	-0.51 (-0.63, -0.39)	-0.12 (-0.25, 0.02)	0.60 (0.48, 0.73)	0.36 (0.23, 0.50)	0.10 (-0.02, 0.22)
F (*P*)	77.22 (<0.0001)	4.07 (0.007)	124.79 (<0.0001)	31.89 (<0.0001)	15.36 (<0.0001)
Housing tenure					
Owner/occupied	0.00	0.00	0.00	0.00	0.00
Council/housing association	-0.19 (-0.25, -0.12)	-0.08 (-0.16, -0.01)	0.24 (0.17, 0.31)	-0.15 (-0.23, 0.07)	0.12 (0.06, 0.19)
Rented/other	-0.06 (-0.12, 0.01)	-0.01 (-0.08, 0.07)	0.06 (-0.01, 0.13)	-0.09 (-0.17, -0.02)	0.14 (0.07, 0.21)
F (*P*)	15.26 (<0.0001)	2.05 (0.129)	34.38 (<0.0001)	15.33 (<0.0001)	17.15 (<0.0001)
Has partner					
Yes	0.00	0.00	0.00	0.00	0.00
No	-0.16 (-0.29, 0.03)	-0.01 (-0.16, 0.14)	-0.15 (-0.29, -0.01)	-0.05 (-0.20, 0.10)	0.08 (-0.06, 0.21)
t (*P*)	6.17 (0.013)	0.01 (0.932)	3.58 (0.031)	0.39 (0.524)	0.91 (0.253)
Worked third trimester					
Yes	0.00	0.00	0.00	0.00	0.00
No	-0.10 (-0.14, -0.06)	-0.03 (-0.08, 0.02)	-0.05 (-0.10, -0.01)	0.01 (-0.04, 0.06)	0.05 (0.01, 0.09)
t (*P*)	20.62 (<0.0001)	1.14 (0.286)	4.11 (0.021)	0.05 (0.822)	3.86 (0.019)
Financial difficulties					
None	0.00	0.00	0.00	0.00	0.00
Some	-0.01 (-0.06, 0.03)	0.01 (-0.06, 0.06)	0.11 (0.07, 0.16)	-0.02 (-0.07, 0.03)	0.06 (0.01, 0.10)

	Health conscious	*Traditional*	*Processed*	*Confectionery*	*Vegetarian*
Many	-0.06 (-0.11, -0.01)	0.01 (-0.05, 0.06)	0.20 (0.14, 0.25)	-0.01 (-0.07, 0.05)	0.15 (0.10, 0.21)
F (*P*)	2.71 (0.067)	0.02 (0.984)	39.23 (<0.0001)	0.49 (0.773)	22.57 (<0.0001)
Ethnicity					
White	0.00	0.00	0.00	0.00	0.00
Non-white	0.27 (0.13, 0.41)	-0.06 (-0.22, 0.10)	0.16 (0.01, 0.30)	-0.79 (-0.65, -0.33)	0.18 (0.04, 0.32)
t (*P*)	14.68 (<0.0001)	0.54 (0.464)	3.33 (0.037<0.0001)	33.02 (<0.0001)	4.60 (0.010)
Parity					
0	0.00	0.00	0.00	0.00	0.00
1	-0.10 (-0.14, -0.05)	0.10 (0.05, 0.16)	0.16 (0.11, 0.21)	0.04 (-0.02, 0.09)	-0.10 (-0.14, -0.05)
2+	-0.21 (-0.27, -0.15)	0.19 (0.12, 0.25)	0.21 (0.14, 0.27)	-0.04 (-0.11, 0.04)	-0.04 (-0.10, 0.02)
F (*P*)	23.71 (<0.0001)	14.61 (<0.0001)	42.48 (<0.0001)	5.05 (0.071)	11.84 (<0.0001)
Feels energetic					
No	0.00	0.00	0.00	0.00	0.00
Yes	0.05 (0.01, 0.09)	0.06 (0.01, 0.10)	-0.04 (-0.08, 0.01)	-0.09 (-0.14, -0.04)	0.02 (-0.02, 0.06)
t (*P*)	6.03 (0.014)	5.35 (0.021)	2.16 (0.094)	12.81 (<0.0001)	0.75 (0.301)
Active compared to others					
Less active	0.00	0.00	0.00	0.00	0.00
Same	0.00 (-0.06, 0.06)	0.06 (-0.01, 0.14)	0.01 (-0.07, 0.07)	0.09 (-0.07, 0.08)	-0.07 (-0.13, -0.01)
More active	0.11 (0.04, 0.18)	0.14 (0.05, 0.22)	-0.07 (-0.15, 0.00)	0.00 (-0.08, 0.08)	0.02 (-0.05, 0.09)
t (*P*)	12.87 (<0.0001)	6.37 (0.002)	7.58 (0.007)	0.14 (0.930)	12.12 (<0.0001)
Smoked third trimester					
No	0.00	0.00	0.00	0.00	0.00
Yes	-0.30 (-0.35, -0.25)	0.04 (-0.03, 0.10)	0.20 (0.14, 0.25)	-0.04 (-0.10, 0.02)	0.00 (-0.04, 0.10)
t (*P*)	131.59 (<0.0001)	1.32 (0.251)	37.77 (<0.0001)	1.74 (0.177)	0.84 (0.294)
Currently vegetarian					
No	0.00	0.00	0.00	0.00	0.00
Yes	0.27 (0.19, 0.35)	0.06 (-0.03, 0.16)	-0.18 (-0.27, -0.10)	-0.05 (-0.14, 0.05)	2.18 (2.10, 2.26)
t (*P*)	41.48 (<0.0001)	1.72 (0.190)	13.01 (<0.0001)	0.79 (0.363)	1823.4 (<0.0001)
Depressed					
No	0.00	0.00	0.00	0.00	0.00
Yes	-0.02 (-0.08, 0.05)	-0.05 (-0.12, 0.03)	-0.02 (-0.009, 0.05)	-0.04 (-0.12, 0.03)	0.02 (-0.04, 0.08)

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	Health conscious	***Traditional***	***Processed***	***Confectionery***	***Vegetarian***
t (*P*)	0.26 (0.608)	1.51 (0.219)	0.22 (0.592)	1.10 (0.282)	0.27 (0.537<0.0001)
Anxious					
No	0.00	0.00	0.00	0.00	0.00
Yes	-0.04 (-0.10, 0.02)	0.01 (-0.07, 0.07)	0.05 (-0.02, 0.11)	0.16 (0.09, 0.23)	0.03 (-0.04, 0.09)
t (*P*)	1.57 (0.210)	0.01 (0.963)	1.68 (0.139)	18.48 (<0.0001)	0.45 (0.423)
Overweight [c]					
No	0.00	0.00	0.00	0.00	0.00
Yes	-0.21 (-0.26, -0.16)	0.07 (0.02, 0.13)	0.02 (-0.03, 0.06)	-0.12 (-0.18, -0.07)	-0.04 (-0.09, 0.01)
t (*P*)	77.29 (<0.0001)	6.74 (0.009)	0.27 (0.554)	18.64 (<0.0001)	2.14 (0.080)
Dieted during pregnancy					
No	0.00	0.00	0.00	0.00	0.00
Yes	0.07 (-0.04, 0.18)	0.13 (0.00, 0.25)	-0.06 (-0.18, 0.05)	-0.31 (-0.44, -0.18)	0.04 (-0.07, 0.15)
t (*P*)	1.77 (0.184)	4.00 (0.046)	0.82 (0.302)	21.28 (<0.0001)	0.35 (0.479)
Weight/shape score					
Rest	0.00	0.00	0.00	0.00	0.00
Top decile	0.02 (-0.05, 0.08)	0.13 (-0.06, 0.09)	0.04 (-0.02, 0.11)	-0.11 (-0.18, -0.04)	-0.01 (-0.07, 0.06)
t (*P*)	0.26 (0.013)	0.11 (0.740)	1.26 (0.201)	7.83 (0.004)	0.01 (0.902)
Season					
December-February	0.00	0.00	0.00	0.00	0.00
March-May	0.11 (0.05, 0.16)	-0.11 (-0.17, -0.04)	0.00 (-0.06, 0.06)	-0.07 (-0.14, 0.01)	-0.01 (-0.07, 0.06)
June-August	0.16 (0.10, 0.21)	-0.12 (-0.19, -0.05)	0.03 (-0.04, 0.09)	-0.09 (-0.16, -0.03)	-0.04 (-0.10, 0.02)
September-November	0.04 (-0.02, 0.10)	-0.29 (-0.35, -0.22)	-0.03 (-0.09, 0.03)	-0.01 (-0.08, 0.06)	-0.07 (-0.12, -0.01)
t (*P*)	12.02 (<0.0001)	27.77 (<0.0001)	3.01 (0.271)	11.49 (0.007)	5.58 (0.047)

CI, confidence interval.

[a]Adjusted for all other factors in the table.

[b]O level equivalent to full time education up to age 16 years.

[c]Overweight define as BMI ≥25 kg/m^2.