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The Comparison of Food Eating Models of Mothers and Their Daughters

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Abstract: The aim of the work was to compare models of food eating by mothers and their daughters. The study included 97 pairs of mothers (43.3±6.0 years old) and their daughters (16.0±3.1 years old). Food intake was described by food frequency intake method using the calibrated FFQ questionnaire. Products were aggregated into 15 groups using the factor analysis and the tree diagram. Using the clusters analysis separately for mothers and daughters clusters were separated, that corresponded with characteristic eating models. Significant correlation between the amount of food eaten by mothers and daughters was proven for all 15 groups of products (from 0.25 to 0.57; $p<0.01$). Mothers and daughters had two eating models separated, called moderate (64% of mothers and 65% of daughters) and varying (36% and 35%, respectively). Similar eating models were stated for about 51% of pairs for the moderate model and about 21% of pairs for the varying model. Mothers and daughters with similar eating models differed in intake of only some products, mostly fish and sea fruit, vegetables and juices. In total, a lack of significant differences in the amount of food consumed by mother-daughter pairs was revealed for 67% of products in the varying model and 60% of products in the moderate model. The obtained results indicate on a big similarity of mothers and daughters eating models. It may affect pro-healthy attitudes of girls and finally determine generational influences on people's health.

Key words: Daughters, family environment, eating models, food intake, mothers

Introduction

Family environment is one of the factors influencing choice, frequency and amount of food eaten by people living together in a household (Feunekes *et al*., 1998; Jezewska-Zychowicz, 2004; Neumark-Sztainer *et al*., 2003a, 2003b; Story *et al*., 2002). Different aspects determine it, among which i.a. economic and organizational factors play a significant role. Common shopping, preparing dishes and their eating are conducive to eating similar food by family members. Environmental conditioning may be strengthened by genetic influences. The occurrence of genetic determiners of some products intake frequency were shown in studies carried out on twins by Heitmann *et al.* (1999). Similarity in food intake among monozygotic twins exceeded that among dizygotic twins for intake of flour and grain products and fruit in men and women, intake of milk in men, and intake of vegetables and rice in women (Heitmann *et al.*, 1999). Higher influence of environmental determiners than genetic on food intake was found by Van Den Bree *et al.* (1999). They showed that irrespective of dietary habits environmental factors explained in total 60-85% of the variability in eating patterns. The findings of Van den Bree *et al.* (1999) clearly show that genetic code does not settle the food choice of people.

Family influence on food eating by children was analyzed in many studies. Among other things taken into consideration were: family meal patterns, food availability, health/nutrition attitudes and socio-demographic characteristics, *e.g*. income households, maternal, parents' education and employment (Feunekes *et al*., 1998; Jezewska-Zychowicz, 2004; Story *et al*., 2002; Mosca *et al*., 2006). For Polish youth Jezewska-Zychowicz (2004) showed that correct nutritional habits within family, hospitality and openness to nutritional information were conducive to more proper intake frequency of pro-healthy food, such as milk, dairy products, fruit and raw and boiled vegetables. Moreover, positive eating pattern were also effectively forced by parents. More often consumption of important for health food, such as milk and boiled vegetables, was connected to applying by parents some forms of constraint towards children. The importance of family patterns in eating meals in relation to food intake by 15-year-old American youth was described by Neumark-Sztainer *et al*. (2003a). The frequency of family meals was positively correlated with intake of fruit, vegetables, grains and calcium-rich food, and negatively associated with soft drinks consumption (Neumark-Sztainer *et al*., 2003a). Moreover youth eating at least 7 family meals during a week consumed significantly less snacks in comparison to youth eating less than 7 family meals a week. Authors underlined that their results show strong positive correlation between eating family meals and youth's diets quality.

Traditional social roles ascribe women a bigger share in fulfilling family dietary needs. Women have a bigger influence on buying food, preparing meals and how they are eaten (Neumark-Sztainer *et al*., 2003a; Story *et al*., 2002; Narojek, 1993). Feunekes *et al.* (1998) revealed among 15-years-old Dutch youth that intake of food and fats and fatty acids in mother-child family pairs was more strongly correlated than among father-child family pairs. It confirms a strong position of a mother in shaping children's dietary patterns. In total, significant correlation in food intake between family members in the closest kinship was revealed for 76% of products for father-child pairs, 87% of products for mother-child pairs and 94% of products for husband-wife pairs (Feunekes *et al*., 1998).

One of the factors determining the influence of women on family members dietary behaviours are their pro-healthy attitudes. Mosca *et al.* (2006) showed that women who were aware of having higher risk of health loss undertook more prevention actions connected to themselves and their families. According to Van Den Bree *et al.* (1999) women are more susceptible to environmental influences that men. Differentiation connected to sex was particularly clear in the first eating model, that was connected to unhealthy dietary habits, *i.e.* eating food rich in fat, salt and sugar. Environmental factors concerning intake food (yes/no) amounted to 70% among women and 62% among men, and concerning portion size (small/medium/big) 85% among women and 70% among men (Van Den Bree *et al*., 1999). This observation has a huge practical meaning, for it means that bigger susceptibility of women of environmental factors may determine bigger influence of mothers on their daughters' eating behaviours.

The question stated in this work was:

(i) what are characteristic eating models of mothers and their daughters,
(ii) what are similarities and differences in eating food by mother-daughter family pairs.

Materials and Methods

Sample: The study included 97 pairs of mothers and daughters aged 43.3±6.0 years (from 32.7 to 57.0) and 16.0±3.1 years (from 12.0 to 21.0), respectively. Women and girls lived in cities and villages of North-Eastern Poland (Table 1). The sample was chosen using the snowball method. Subjects with dietary troubles, such as anorexia, were excluded from the study. One family pair was rejected because of small credibility of daughter's food interview. Most of mothers and daughters did not apply any diets (77.6% and 85.7% of sample, respectively). Aspiration to maintaining slim body was declared by 15.3% of mothers and 8.2% of daughters. Among analyzed mothers and daughters there were no very thin subjects. The BMI of women amounted from 18.0 to 43.2 (median 24.0), and the Z-score index for the girls' BMI amounted from-1.85 to 3.48 (median-0.17). Most of women had secondary or primary education (45.9% and 32.7% percent of sample, respectively), and most daughters were learning in a lower secondary school (85.7% percent of sample). Average economic situation of family was declared by 83.7% of sample.

Table 1: Sample characteristic

Variables	Mothers	Daughters
Number	97	97
Age (years)		
Me ± QD	43.3±6.0	16.0±3.1
min ÷ max	32.7÷57.0	12.0÷21.0
BMI (kg/m^2)		
Me ± QD	24.0±5.9	19.7±3.2
min ÷ max	18.0÷43.2	14.3÷29.3
Z - score BMI		
Me ± QD	-	-0.17±1.25
min ÷ max	-	-1.85÷3.48
Education level (sample percentage, %)		
Primary school	32.7	85.7
Secondary school	45.9	13.3
High school	20.4	0.0
Size of place of residence (sample percentage, %)		
Country	30.6	
Town <50,000 residents	37.8	
Town 50,001÷100,000 residents	0.0	
City >100,000 residents	30.6	
Family economic situation (sample percentage, %)		
Under average	11.2	
Average	83.7	
Over average	4.1	
Dieting (sample percentage, %)		
No, usually diet without modification	77.6	85.7
Yes, maintenance of slim figure	15.3	8.2
Yes, slimming	1.0	0.0
Yes, others	5.0	5.0

Me-median, QD-quartile deviation

Food intake assessment: Food intake was assessed by the food intake frequency method (Gibson, 1990; Thomas, 2001). Using the calibrated FFQ questionnaire information was gathered on habitual frequency and amount of eating 165 products (Wadolowska, 2005). Eating frequency for products and dishes was described by respondents freely, declaring habitual eating frequency of products and dishes during a day, week, month and year (open questions). The amount of products and dishes was described on the basis of photos from Album of food products with different portion size (Szponar *et al*., 2000). Products and dishes were aggregated into 44 food groups, according to procedure described in earlier paper (Wadolowska, 2005). During creating groups, we took into consideration their origin,

nutrient content, nutritional value, culinary characteristic techniques and features facilitating later separating specific eating patterns and other studies on that area (Hu *et al*., 1999; Kunachowicz *et al*., 1998). Girls had no age subgroups separated, as differences in food eating by younger (12÷15 years) and older girls (16÷21 years) were small and applied mostly to coffee, tea and alcohol drinks.

Statistical analysis: In further products grouping, as a help in aggregating variables, the factor analysis was used (Hill and Lewicki, 2006; StatSoft, 2000). The tree diagram was used to show connections between groups of products and to determine characteristic groups of products consumed by mothers and daughters. Eventually, further analysis (the cluster analysis) was carried out for 15 aggregated groups of products, creating logical systems (Appendix A).
Food intake was expressed by median and quartile deviation (Me±QD in g/day), as the features distribution was inconsistent with the normal distribution. The amount of eaten food by mothers and daughters was compared using the Kendall Tau correlation coefficient. Using the clusters analysis (the k-means method) separately for mothers and daughters clusters were separated, that corresponded with characteristic eating models (Hill and Lewicki, 2006). The clusters analysis was carried out for 95 pairs of mothers and daughters, because of incomplete data of eating all 165 products for 2 daughters (I do not know answer). Differentiation in food intake by mothers or daughters ranked to particular clusters was verified by the U Mann-Whitney test. Next food intake by mothers and daughters with similar eating models was compared by the Wilcoxon test. The statistical analysis was held using the computer programme STATISTICA PL v.7.1.

Results

Significant correlation between the amount of food consumed by mothers and daughters was revealed for all 15 groups of products (100% of groups), in the range from 0.25 to 0.57 ($p<0.01$; Table 2). Correlation over 0.4 ($p<0.01$) was confirmed for 9 groups of products: other animal fats, fruit, mixed dishes, sweet fruit preserves, vegetable fats, dairy fats, juices, meat products and cereals. Weaker correlation (>0.25, $p<0.01$) was noted for eggs, fish and sea fruit, potatoes, vegetables, dairy products and beans. The total amount of food consumed by mothers and daughters was moderately correlated ($r = 0.46$, $p<0.01$).
Among mothers and daughters two eating models were separated for each group; they were called moderate (64% of mothers sample and 65% of daughters sample) and varying (36% of mothers sample and 35% of daughters sample; Table 3). Mothers with varying eating model in comparison to mothers with moderate eating model consumed in total more food (about 2970 g/day *vs*. about 1770 g/day), including more: meat products, fish and sea fruit, mixed dishes, eggs, dairy fats, beans, vegetables, fruit and juices. Parallel relations were revealed for daughters from both clusters. Daughters with varying eating model consumed about 2700 g of food in total a day, and daughters with moderate eating model about 1790 g/day. Eating models of mothers and daughters did not depend on their age (Table 3).
Similar eating models were stated for about 51% of pairs mother-daughter for the moderate model and about 21% of pairs for the varying model (Table 4). Among those pairs mothers and daughters with moderate food intake consumed on average about 1750 g and 1760 g of total food a day, respectively, and mothers ate more fish and sea fruit, other animal fats, potatoes and vegetables, and daughters more dairy products and juices. Mothers and daughters with varying food intake ate on average about 3300 g and 3150 g of total food a day, respectively, and mothers ate more fish and sea fruit, beans and vegetables, and daughters more cereals and juices. In total, lack of significant differences (i.,e., similarity) in the amount of food consumed by mother-daughter pairs was revealed for 67% of products in the varying model and 60% of products in the moderate model.

Table 2: Kendall Tau correlation (tau K) of mothers-daughters food eating amount (number of pairs 97)

Products	tau K
Other animal fats	0.57*
Fruit	0.49*
Mixed dishes	0.49*
Sweet fruit preserves	0.49*
Vegetable fats	0.46*
Dairy fats	0.45*
Juices	0.44*
Meat products	0.43*
Grainy products	0.41*
Eggs	0.38*
Fish and sea fruit	0.36*
Potatoes	0.33*
Vegetables	0.33*
Dairy products	0.30*
Beans	0.25*
Total food without drinks	0.46*

*p<0.01

Discussion

The amount and type of food eaten by mothers and daughters showed a big similarity. Eating models separated independently for mothers and daughters were similar in assortment and quantity. Mothers and daughters had two types of eating models, that were called moderate and varying. Moderate eating model was twice as represented by mothers and daughters from the same families as the varying eating model. Moderate eating model of mothers or daughters

Table 3: Food intake (g/day) in two clusters of mothers and daughters in total

	Mothers N=97					Daughters N=95				
	VM N=35		MM N=62		Multi-plicity	VM N=33		MM N=62		Multi-plicity
Food item	Me	QD	Me	QD	MM=100	Me	QD	Me	QD	MM=100
Beans	18.7	20.6	9.2	7.9	2.0*	13.6	16.8	10.4	12.3	1.3
Cereals	184.0	134.2	182.2	114.1	1.0	231.4	82.6	161.9	126.0	1.4*
Dairy fats	37.3	40.9	15.4	35.9	2.4*	38.5	44.8	18.3	32.5	2.1*
Dairy products	347.6	430.9	184.3	191.3	1.9*	315.1	415.8	202.3	173.4	1.6
Eggs	21.4	21.4	14.3	14.3	1.5*	28.6	28.6	14.3	10.4	2.0*
Fish and sea fruit	33.2	20.5	14.7	17.1	2.3*	25.6	22.5	20.3	23.9	1.3
Fruit	588.4	795.3	202.9	164.5	2.9*	407.0	442.0	226.9	213.1	1.8*
Juices	275.7	404.8	70.7	99.8	3.9*	141.9	235.3	78.7	145.2	1.8*
Meat products	203.8	140.9	131.7	68.2	1.5*	197.9	140.3	136.3	72.3	1.5*
Mixed dishes	120.9	106.3	64.0	39.4	1.9*	105.1	82.1	64.6	43.4	1.6*
Other animal fats	1.5	5.0	1.4	5.0	1.1	1.6	5.1	1.3	4.3	1.2*
Potatoes	178.3	151.2	165.2	62.0	1.1	209.0	147.0	156.7	70.9	1.3*
Sweet fruit preserves	94.3	236.0	53.1	128.8	1.8	108.5	215.3	44.3	144.7	2.4*
Vegetable fats	18.7	16.9	21.2	33.3	0.9	24.9	40.8	19.1	23.7	1.3
Vegetables	474.9	185.7	238.1	122.6	2.0*	362.8	208.0	260.9	208.9	1.4*
Total food without drinks	2971.9	888.4	1769.6	699.7	1.7*	2699.3	1138.2	1792.7	722.6	1.5*
Age, years	43.1	5.96	43.4	6.75	1.0	16.0	1.99	16.2	4.01	1.0

VM-varying eating model, MM-moderate eating model, Me-median, QD-quartile deviation, *p<0.05 of the U Mann-Whitney test

Table 4: Comparison of compatibility of mother-daughter eating models

Classification compatible/incompatible	Number	Sample (%)
Incompatible models of food intake	27	28.4
Compatible models of food intake		
Varying	20	21.1
Moderate	48	50.5
Total	95	100.0

characterized with average food intake and no distinctive features. Mothers and daughters with varying eating model consumed from 1.5 time to 1.7 time more total food than subjects with moderate model. Bigger food intake concerned most groups of products with vegetable and animal origin, which indicates on desirable differentiation of their diets. In total similar eating models were stated for about 72% of family pairs. It is an evidence of similarity in mothers and daughters nutrition, concerning assortment.

The separated in the present work eating models, called moderate and varying, have a point of reference in models or food patterns revealed by other authors. In our previous work among students there were separated 3 models with different nutritive value called low nutrition (51% of sample), with vegetable fats domination (26% of sample) and dairy-vegetable-fruit (24% of sample) (Wadolowska *et al*., 2004), and among older people from Olsztyn region similarly 3 models called low nutritive (47% of sample), dairy (25% of sample) and meat-vegetable-fruit (28% of sample) (Slowinska and Wadolowska, 2004). In the SENECA research among older people from Europe, the most numerous groups were: among women-modest eaters (68% of sample) and lean and green eaters (20% of sample), and among men-small eaters (60% of sample), gourmands (17% of sample) and milk drinkers (16% of sample) (Schroll *et al*., 1996). In the cited works and present studies moderate eating model or model with low nutritive value had the most examined people, which stated from 47% to 68% of a sample. It follows that moderate eating model or model with low nutritive value represent the most typical eating habit of the studied societies.

The quantitive similarity in eating food by mothers and daughters is confirmed by high or average correlation obtained for all groups of products. Slightly smaller similarity range between food eaten by mothers and daughters was proven by Feunekes *et al.* (1998) among 15-year-old Dutch youth of both sexes. Among pairs of mother-child a significant correlation in eating food concerned 87% of products (Feunekes *et al*., 1998). The highest correlation for mothers and children (from 0.46 to 0.56) was stated for butter/margarine added to boiled vegetables, bacon, pizza, soups, mince meat, fish sticks, cheeses, French fries, fried sausage (Feunekes *et al*., 1998). In own research the biggest similarity in the amount of food consumed by mothers and daughters was stated for fruit and sweet fruit preserves, and a bit smaller for fats, mixed dishes and cereals. It shows a big influence of mothers' food patterns on their daughters food intake and a possibility to transmit both positive and negative nutrition features on younger generation.

The stated relations in food eating of mothers and daughters does not have a regional character, typical only for Polish families. The impact of attitudes and eating habits of parents on children's eating in European and American families was shown *i.a*. Neumark-Sztainer *et al*. (2003a) for American youth, Feunekes *et al.* (1998) for Dutch youth, and Jezewska-

Table 5: Food eating (g/day) in two clusters of mothers and daughters with similar eating models

	Varying eating model					Moderate eating model				
	Mothers N=20		Daughters N=20			Mothers N = 48		Daughters N =48		
Food item	Me	QD	Me	QD	Multiplicity daughters=100	Me	QD	Me	QD	Multiplicity daughters=100
Beans	19.1	28.2	9.6	15.4	2.0*	9.0	10.4	5.3	9.4	1.7
Cereals	228.7	92.0	281.6	100.3	0.8*	174.2	103.3	195.7	153.1	0.9
Dairy fats	41.1	32.5	50.1	68.2	0.8	18.0	35.2	15.6	31.9	1.2
Dairy products	340.2	378.6	243.7	577.1	1.4	176.6	158.1	208.6	296.5	0.8*
Eggs	28.6	30.7	17.9	20.7	1.6	12.1	7.1	9.0	10.2	1.3
Fish and sea fruit	35.3	26.6	17.8	17.6	2.0*	14.7	16.3	7.3	18.5	2.0*
Fruit	623.6	684.3	456.1	815.9	1.4	191.8	162.6	203.9	124.3	0.9
Juices	230.6	410.1	438.1	518.5	0.5*	52.6	83.7	117.6	168.8	0.4*
Meat products	214.4	144.8	223.8	58.1	1.0	123.3	73.1	112.3	83.5	1.1
Mixed dishes	146.8	120.6	170.4	132.6	0.9	61.5	37.9	57.3	48.4	1.1
Other animal fats	1.7	5.0	1.1	7.4	1.5	1.4	4.6	0.3	1.9	4.7*
Potatoes	238.5	236.8	217.6	155.1	1.1	162.6	56.0	145.5	84.5	1.1*
Sweet fruit preserves	114.2	210.9	132.4	252.9	0.9	50.3	132.2	36.0	108.2	1.4
Vegetable fats	16.8	25.5	15.5	40.6	1.1	17.0	32.4	17.6	35.4	1.0
Vegetables	432.2	150.9	304.7	175.1	1.4*	234.7	126.6	161.0	142.1	1.5*
Total food without drinks	3296.5	842.8	3154.1	1113.2	1.0	1749.8	595.7	1760.5	598.9	1.0

Me-median, QD-quartile deviation, *p<0.05 of the Wilcoxon test

Zychowicz (2004) for Polish youth. It should be underlined that both negative and pro-healthy dietary patterns were transferred. This finding suggests a need to influence parents attitudes to prevent nutritional faults among children and their negative health consequences. Relations between similar eating habits of mothers and their daughters and bone density status was proven during a 5-year observation by Fisher *et al*. (2004). Girls that consumed calcium in the amount corresponding with recommendations, drank milk more often than girls eating calcium in amounts lower than recommended. Moreover, girls with proper calcium intake and frequent milk intake had mothers that also drank milk more often (Fisher *et al*., 2004). Consuming milk by mothers was significantly correlated with the frequency of drinking milk by daughters (beta = 0.37; p<0.0001). Bone mineral density of girls with proper calcium intake was significantly higher than for girls that consumed not enough calcium (BMD 0.85 vs. 0.83 g/cm^3, respectively; p<0.001). Results obtained by Fisher *et al*. (2004) prove that there is a similarity in eating dairy products by mothers and daughters, which influenced the girls' bone mineral status. Such chain of relations suggests occurrence of transferring eating habits in female line from mother to daughter, and that may affect pro-healthy attitudes of girls and finally determine generational influences on people's health.

Conclusion: Similar eating models were stated for about 72% of family pairs. Moderate eating models were over twice more often represented by mothers and daughters from the same families than varying eating models. The number of products consumption of which was similar in mother-daughter pairs was bigger then the number of products consumption of which was different. Mothers and daughters with similar eating models differed in intake of only some products, mostly fish and sea fruit, vegetables and juices. In total, a lack of significant differences in the amount of food consumed by mother-daughter pairs was revealed for 67% of products in the varying model and 60% of products in the moderate model. A meaningful range of similarity in eating food by mothers and daughters suggests occurrence of transferring eating habits in female line from mother to daughter. It may affect pro-healthy attitudes of girls and finally determine generational influences on people's health.

Appendix A: Food grouping used in the cluster analyses: (1) Beans: runner bean, green peas, kidney bean, pea, lentil, broad beans; (2) Cereals: wheat bread, rye bread, wheat-rye bread, toast bread, rolls, butter bagels and rolls, French bagels, yeast rolls, pasta, rice, small-grains cereals, wheat wholemeal bread, rye wholemeal bread, with grains, pumpernickel, graham rolls, buckwheat, ready-to-eat cereals (for example muesli, corn cereals); (3) Dairy fats: butter, cream; (4) Dairy products: milk, milk soups, milk beverages, yoghurt, kefir, buttermilk, white cheese, flavoured and natural cheese, hard and processed cheese, cheese for spreading; (5) Eggs; (6) Fish and sea fruit: smoked fish, marinated fish, in oil, in cream, from cans, fried, boiled, sea fruit; (7) Fruit: apples, pears, plums, strawberries, cherries, bananas, oranges, grapefruits, kiwi, peaches, wine grapes, currants, berries; (8) Juices: apple, orange, grapefruit, currant, multi-fruit, other fruit juices, carrot juice, vegetable-fruit juices; (9) Meat products: different sausages, mince meat, poultry and pork-beef ham, liver, black pudding, meat pies, bacon, pork meat, beef, veal, poultry such as hen, chicken, turkey, duck; (10) Mixed dishes: mixed dishes with additives, hot-dogs, pizza, dumplings, pancakes, dumplings; (11) Other animal

fats: lard, fat from dishes; (12) Potatoes: potatoes, potato dumplings, French fries, potato pancakes and pies; (13) Sweet fruit preserves: stewed fruit, jam, plum jam; (14) Vegetable fats: cup margarine, margarine in bar, oil, mayonnaise, dressings; (15) Vegetables: broccoli, Brussels sprouts, cabbage and sauerkraut, cauliflower, carrot, paprika, different lettuces, leeks, tomatoes, tomato juice, red beets, onion, fresh cucumbers and gherkin, celeriac, maize, radish, mixed vegetable salads.

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