Dietary Differences Among Women of Polish Descent by Country of Birth and Duration of Residency in the United States

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Objectives: Changes in breast and gastric cancers and coronary artery disease among people of Polish descent after migration to the United States suggest there may be potentially modifiable factors affecting incidence of these diseases. We examined relationships of dietary factors associated with these diseases with stage of migration among Polish women in Chicago.

Design: Women of Polish descent ($N=396$) were selected from Polish women's social organizations. Women completed a modified Health Habits and History Questionnaire.

Setting: The questionnaire was completed either at the participant's home or at a Polish social organization.

Participants: Participants ranged in age from 17–81 years, and included women born in Poland or the United States, who had at least one parent of Polish.

Interventions: Participants were stratified by country of birth and migration period (1935–1979, 1980–1989, 1990–1997).

Main outcome measures: The average daily intake of food groups and nutrients was assessed using multiple linear regression.

Results: We found statistically significant differences by birth country for 19 of 34 nutrients, 4 of 7 food groups, and for 21 nutrients, and 5 food groups among the different migration tertiles.

Conclusions: Women from Poland and more recent migrants had generally more nutritious intakes, compared to US-born women, or earlier migrants.

Applications/Conclusions: There are significant dietary differences among women of Polish descent that vary by duration of US residency and birth country. Women with dietary intakes which place them at higher risk for cancers and cardiovascular disease could be targeted for interventions to lower their disease risk. (*Ethn Dis.* 2004;14:219–226.)

Key Words: Diet, Nutrition, Breast Cancer, Cervical Cancer, Coronary Artery Disease, Polish

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Introduction

Rates of breast and stomach cancer vary by more than 5-fold around the world, with large differences observed for Polish immigrants as they move from Poland to the United States.[1,2] Similar trends can be found among these immigrants with regard to coronary artery disease, implying that environmental factors may be important in the etiologies of these diseases.[3,4] The United States Census of 2000 lists 8,977,444 persons of Polish ancestry, with Illinois second only to New York in having the greatest number of residents of Polish descent. The first wave of immigrants came to the United States for primarily economic reasons between the late 1800s and World War I. The second wave of immigration took place after World War II. Individuals of this second wave were primarily political prisoners, dissidents, and intellectuals from refugee camps all over Europe. This group were largely educated and committed to assimilating into American society. The third wave of immigrants started arriving in the 1980s, after martial law was instituted in Poland during December 1981. Many of these immigrants were skilled professionals, though some, especially illegal immigrants, were not. Many have not assimilated well, and live in low-income housing, mainly in Polish neighborhoods in Chicago, New York, or Detroit.

During the past 40 years, the breast cancer age-standardized mortality rate in women increased 3-fold in Poland, while it has changed little in the United States. Despite these changes in Poland, breast cancer mortality is still 30% greater in the United States. Conversely, gastric cancer rates in Poland are about 3 times higher than in the United States,[5] while the age-standardized mortality rate for ischemic heart disease in Poland is only about 60% of that in the United States.[6] Data for Polish-American disease incidence is generally not separated from data for other Caucasians; however, studies of other immigrant groups, such as the Japanese, have demonstrated that, over time, incidence rates of breast cancer and coronary disease begin to approximate those of the country of migration.[7,8] Determination of dietary and other lifestyle changes by stage of migration in a population undergoing changes in cancer and cardiovascular disease risk may provide important clues as to etiologic factors and the age at which they emerge.

Dietary components implicated as possible causal factors for breast cancer include polyunsaturated fats, linoleic acid, saturated fats, breads, cereals, cakes and desserts, refined sugars, and ethanol.[9–16] Dietary factors which may protect against breast cancer include fiber, monounsaturated fat, olive and seed oils, fruits, vegetables, vitamin A, beta carotene, and vitamin C.[1,12–14] The mechanism by which these factors potentially cause breast cancer might be related to their effects on steroids. Ethanol intake alters estrogen metabolism, while

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fiber may lower circulating levels of estrogen, androstenedione, or testosterone.[10,11,15] Dietary fat might modulate the metabolism, excretion, and production of endogenous estrogen.[16] Foods and micronutrients which may protect against gastric cancer include green, leafy vegetables, citrus and other fruits, onions, garlic, leeks, carotenoids, selenium, and vitamins C and E.[17–19] Foods that may cause gastric cancer are those high in salt and nitrates, preserved foods, including processed and smoked meats, dried, salted, and smoked fish, and pickled foods.[20] Urinary salt concentration is correlated with gastric cancer incidence.[21] Salt may also cause atrophic gastritis, which is associated with gastric cancer.[22] The role of nitrates in causing gastric cancer is thought to be due to their breakdown into carcinogenic N-nitroso compounds.[23] Other suggested etiologies for gastric cancer are *Helicobacter pylori* infection and cigarette smoking.[24,25] For coronary arterial disease, diets high in animal fat, total fat, and saturated fat, and low in antioxidants have been implicated in a causal relationship.[26–28]

Migrant studies have been useful in suggesting specific variables which may affect cancer risk. In an analysis of mortality among foreign-born Americans, standardized mortality rates for stomach cancer were higher for men from Poland than from any other European country.[29] In Chicago, it has been estimated that Polish-born residents have a greater than 2-fold higher incidence of stomach cancer, relative to rates for other European ethnic groups (personal communication, Dorothy Pathak, PhD, March 10, 1996). Studies of migrants from high-risk (Poland) to low-risk countries (United States) have shown that stomach cancer rates among first generation migrants resemble those of the parent country, while second generation migrants tend to have rates closer to those of the host country.[30] The incidence rates of gastric cancer have decreased in the United States since the 1930s, and decreased in most of the world during the last few decades. This decrease in prevalence has been attributed to improved food preservation and dietary changes.[20] Gastric cancer age-standardized mortality rates among women have decreased by more than 100% during the past 40 years in the United States and Poland, though they are still 3 times higher in Poland, compared to the United States. Studies of the effects of migration on relevant dietary variables in Polish women in the United States could provide important clues about the etiologies of chronic diseases.

METHODS

Data for this study were collected from women of Polish ancestry, aged 17–81, and living in the greater Chicago area. Women were primarily recruited from Polish women's social groups. To be eligible, women were either born in Poland, or had at least one parent of Polish descent; therefore, the sample comprised both immigrants and US-born women. The study protocol was approved by the Institutional Review Boards of Northwestern University, and the University of Illinois at Chicago. Dietary intake data were collected using a modified NCI Health Habits and History Questionnaire (HHHQ-DIETSYS Analysis Software, Version 3.4, National Cancer Institute, 1995), a well-established public domain food frequency measure often used in cancer epidemiology. A draft questionnaire that included Polish foods was prepared by a Polish-American registered dietitian. Cookbooks and Chicago Polish restaurant menus were reviewed to identify additional significant foods, and the final questionnaire was reviewed by several Polish Americans familiar with purchasing and cooking food. These reviews indicated that the food frequency questionnaire had face and content validity. The food list was bilingual, although there were separate questionnaires for English- and Polish-speaking participants. Of the 900 questionnaires that were given to participants, 461 were returned. Three hundred ninety-six of these were completed and included in the study, for a a response rate of 44% (396/900).

The original HHHQ instrument included 100 food items, and an additional 28 Polish foods were added, primarily in the meats (including salted and pickled), vegetables, and breads and grains groups. The serving sizes of the original questionnaire were preserved for the modified food frequency. Body mass index (BMI) was calculated from self-reported weight and height for each participant. The DIETSYS food composition database of the HHHQ contained values for all but 24 of the items in the modified questionnaire; values for these foods were added to the DIETSYS database using data from the NDS (Nutrition Data System, Version 2.91, 1997, Nutrition Coordinating Center, University of Minnesota, Minneapolis, Minn). Other data collected from the questionnaire included smoking history, marital status, and languages spoken. The questionnaire also included questions regarding dietary supplements.

After instruction by a bilingual Polish-American public health graduate student, the questionnaire was self-administered. Each questionnaire took approximately 45–60 minutes to complete, either at home, or at the social organization. Questionnaires were reviewed and edited prior to data entry into DIETSYS, with telephone follow up conducted as needed to clarify incomplete questionnaires. All questionnaires were manually edited to code data numerically, and after DIETSYS analysis, nutrient and food component intake data were then entered into SAS (release 8.01 for Windows, 2000, SAS Institute, Cary, NC) for statistical analysis.

Respondents were categorized according to their country of birth and migration period, to create 2 exposure variables. Country of birth was dichotomized into those born in the United States, and those born in Poland, and migration period was divided into an ordinal variable of 4 categories (0-born in the United States; 1-migration between 1935 and 1979; 2-between 1980 and 1989; and 3-between 1990 and 1997). Nutrients and food components were expressed using the density method as daily values per 1,000 kcal, and as a percentage of energy intake for fat, carbohydrates, protein, and sweets. In addition, daily frequencies of various food group intakes were calculated. Means of the continuous nutrient intakes were computed by country of birth, without adjusting for potential confounders, and for each of 4 migration periods, adjusting for age and total calories per day. The adjusted means presented for migration period were calculated using the PROC GLM LSMEANS procedure of SAS (Table 3). Natural log-transformation was employed because many of the observed nutrient distributions did not follow a normal Gaussian distribution.[31] Multiple linear regression models were calculated using the PROC REG procedure of SAS, and these were used to investigate the association of country of birth and year of migration with natural log-transformed nutrient intakes, adjusting for total calories per day and age. In the case of nutrients and food components expressed using the density method, this 'multivariate nutrient density model' retains the familiar nutrient density, and addresses the potential problem of confounding by total energy intake by adding it as another variable.[32]

RESULTS

Of the 396 women who participated in our study, 139 were US-born, and 257 were born in Poland. The Polish-born were more likely to speak Polish at home, and were more likely to have graduated from college, while the US-born women were more likely to be high school graduates. The US-born women, compared to the Polish-born women, had higher BMIs (26.5 vs 25.1, respectively) while the Polish-born women had higher daily energy intake, compared to the US-born women (1613 vs 1538 in kcal/day, respectively) (Table 1).

The Polish-born women had statistically significant higher intakes of calcium, phosphorus, potassium, vitamin A, vitamin C, and cryptoxanthin, and US-born women had a statistically significant increased intake of lycopene (Table 2). The Polish-born women, compared to US-born women, had higher daily intake levels of fruits (1.87 vs 1.20 servings/day, respectively), dairy products (3.45 vs 2.45, respectively), vegetables (2.25 vs 2.00), and cured or smoked meat or fish (.62 vs .38). US-born women, compared to Polish-born women, reported a higher percentage of calories from sweets (13.7% vs 10.2), but had similar fat intake measured either as total fat grams (39.0 vs 39.6), or percentage of energy intake (Table 2).

There were statistically significant trends ($P<.05$) for decreased intake levels associated with duration of residency in the United States for protein, riboflavin, thiamin, vitamin A, alpha carotene, cholesterol, lutein, retinol, as well as decreased consumption of meats and legumes, dairy products, vegetables, cured meat and fish. In addition, a smaller percent of kilocalories was derived from protein, over time (Table 3). There were statistically significant trends ($P<.05$) for increased intake of lycopene, and linoleic acid, associated with longer residence in the United States.

DISCUSSION

It is not unexpected that we find trends toward dietary assimilation over time. Previously, dietary acculturation has been demonstrated among the Chinese immigrants to the United States and other countries.[33,34] In our study, we found considerable differences in foods and nutrients by country of birth, as well as by time since migration. More than 20% of breast cancer risk can be attributed to dietary factors,[35] and recent studies have demonstrated that higher intake levels of fruits, vegetables and vitamin A have been associated with a decreased risk of breast cancer, while increased intake levels of cakes, desserts, and refined sugars appears to increase risk.[14,36] In our study, the US-born women demonstrated dietary changes (increased energy from sweets, and fewer fruits and vegetables) which may place them at higher risk of breast cancer. We also found a higher intake level of linoleic acid among this group, consistent with previous studies that suggest that linoleic acid may be a factor in the etiology of breast cancer.[1,37] The women born in Poland exhibited higher intake levels of vitamins A and C, and beta carotene, as well greater consumption of fruits and vegetables, compared to US-born women. There was also a trend for higher intake levels for some of these among the more recent immigrants, also consistent with previous data suggesting these foods are protective against breast cancer.[38] Folate intake also has been suggested as protective against breast cancer[39]; in our study, folic acid intake was slightly, but significantly, higher among the Polish-born women, but no trend was observed, and we would not expect there to be any clinical impacts from these small amounts.

Our results show that Polish-born women and more recent immigrants among the Polish-born women (who have a higher risk of gastric cancer than do US-born women) consumed more cured or smoked meat, foods reported

Table 1. Descriptive characteristics of participants by country of birth

	Total *N*=396	US Born *N*=139	Polish Born *N*=257	*P* value
Age (mean ± SD)	45.3 ± 14.3	49.1 ± 16.5	43.2 ± 12.4	.0003
Language spoken at home (%)				
No English	26.4	1.4	40.0	
Some English	23.6	3.6	34.5	<.0001
Equal English and Polish	10.9	3.6	14.9	
Mostly English	12.4	21.6	7.5	
Only English	26.7	69.8	3.1	
Education (%)				
Less than high school graduate	13.6	8.6	16.3	
High school graduate	32.8	43.9	26.9	.2999
Some college	27.3	27.3	27.2	
College graduate	26.3	20.1	29.6	
Number of years in United States (mean ± SD)			15.5 ± 12.6	
Age at migration (mean ± SD)			27.7 ± 12.3	
Polish parents (%)				
None	1.5	0.0	2.3	
One	11.7	28.3	2.7	<.0001
Both	86.8	71.7	94.9	
Body mass index (mean ± SD)	25.6 ± 5.0	26.5 ± 4.4	25.1 ± 5.2	.0053
Energy intake (mean ± SD)	1587 ± 613	1538 ± 614	1613 ± 612	.2480

to be associated with gastric cancer.[17,20] Paradoxically, Polish-born women appeared to consume more fruits, vegetables, and vitamin A, which should be protective against gastric cancer.[17] A more recent prospective study has suggested that plant food intake (vegetables, citrus, and whole grains) may reduce the risk of gastric cancer in men, but not in women.[40] A small increase in reported protein intake and percent of energy as protein was observed among the Polish women, with a trend toward greater intake among the more recent immigrants, which is consistent with recent studies implicating high protein diets as a cause of stomach cancer.[41]

Our study found conflicting results regarding nutrients associated with coronary artery disease. While saturated fat intake did not differ by country of birth, there was a trend for increased intake among more recent immigrants. Folate, which is often found to be consumed in greater quantities in lower risk populations, was consumed in larger amounts among the Polish-born women, but no trend was observed.[28] Folate intake was still low, compared to recommendations for women.

Findings from this study are useful for epidemiologists and healthcare providers, although some limitations to the data must also be considered. The dietary intake data are self-reported, and there is some loss of accuracy/precision with the portion size categories in semi-quantitative food frequencies.[42] Food frequency responses often overestimate actual intake, perhaps magnifying differences in both dietary protective factors and risks; therefore, these findings (and those from any other study of dietary estimates based on a food frequency questionnaire) need to be conservatively considered. A weakness of our study lies in the fact that there was no corresponding validation study. Without additional dietary and medical history information, interpretation of these subtle trends in dietary intake with migration period must be tempered by their unknown clinical impact on disease risk.

Results from this study show a mixed effect of migration on the dietary patterns of these Polish women, and women of Polish descent. Studies of dietary change and migration can provide useful clues for diet and chronic disease risk research in US populations, often suggesting dietary interventions which may reduce risk. While results from this study may not be generalizable to the dietary changes of all Polish women immigrating to the United States and acculturating to new dietary patterns, they do indicate dietary recommendations for these women to follow in order to reduce their risks of breast and gastric cancers and cardiovascular disease, such as to consume more fruits, vegetables, low fat dairy products, whole grains, and legumes, lean meats, poultry, and fish, while limiting their intakes of salted and cured meats, sweets, and desserts.

Limitations of our study include a low response rate (396/900=44%), meaning the results may not be representative of the population at large. Food frequency questionnaires are subject to measurement error, which may result in misreporting of dietary intake. Some of the cells for our subgroup analyses were relatively small.

Table 2. Mean dietary intake (nutrient/1000 kcal) by country of birth*

	United States (*N*=139) Mean ± SD	Poland (*N*=257) Mean ± SD	*P* value†
Nutrients			
Carbohydrate (g)	119 ± 22	117 ± 21	.71
% Kcal from carbohydrate	48 ± 9	47 ± 8.4	.72
% Kcal from sweets	13.7 ± 10	10.2 ± 8.1	<.0001
Total fat (g)	39 ± 9	39.6 ± 8.3	.73
% Kcal from fat	35.1 ± 8	35.7 ± 7.5	.73
Saturated fat (g)	13 ± 4	14.1 ± 3.7	.51
Oleic acid (g)	15 ± 4	14.4 ± 3.4	.35
Linoleic acid (g)	7.2 ± 2.8	6.3 ± 2.3	.001
Protein (g)	42 ± 8	44 ± 8	.007
% Kcal from protein	17 ± 3	17.6 ± 3.1	.007
Vitamin A (IU)	3884 ± 2645	4386 ± 2999	.0007
Vitamin A (RE)	617 ± 296	757 ± 369	<.0001
Vitamin E (α-TE)	5 ± 3	5 ± 2	.89
Thiamin (mg)	0.82 ± 0.27	0.89 ± 0.21	<.0001
Riboflavin (mg)	1.13 ± 0.41	1.25 ± 0.38	<.0001
Niacin (mg)	11.10 ± 3.52	10.5 ± 2.83	.17
Folate (mcg)	149 ± 79	152 ± 60	.04
Vitamin B6/pyridoxine (mg)	0.94 ± 0.39	0.94 ± 0.30	.14
Vitamin C (mg)	54 ± 35	63 ± 33	.0003
Calcium (mg)	466 ± 186	535 ± 229	.001
Phosphorus (mg)	680 ± 161	740 ± 178	>.0001
Magnesium (mg)	243 ± 185	232 ± 179	.51
Potassium (mg)	1497 ± 374	1599 ± 383	<.0001
Iron (mg)	6.97 ± 2	6.82 ± 1.8	.99
Zinc (mg)	6.04 ± 2.3	5.89 ± 1.8	.85
Zinc from animal sources (mg)	3.62 ± 1.10	3.59 ± 1	.95
Food components and antioxidants			
Cholesterol (mg)	134 ± 42	148 ± 50	.06
Dietary fiber (g)	7 ± 3	8 ± 3	.0005
Alpha carotene (mcg)	187 ± 249	225 ± 330	.002
Beta carotene (mcg)	1424 ± 1402	1426 ± 1605	.22
Pro A carotene (mcg)	1704 ± 1588	1755 ± 1803	.10
Retinol (mcg)	367 ± 148	512 ± 262	<.0001
Cryptoxanthin (mcg)	39.27 ± 31.14	47.17 ± 38.74	.02
Lutein (mcg)	672 ± 807	696 ± 846	.01
Lycopene (mcg)	695 ± 412	468 ± 793	<.0001
Food group frequency calculations (servings/day)			
Breads and cereals	2.62 ± 1.28	2.81 ± 1.45	.22
Meats and legumes	1.83 ± 0.95	2.07 ± 1.27	.30
Cured or smoked meat/fish	0.38 ± 0.36	0.62 ± 0.53	.0001
Dairy foods	2.45 ± 1.71	3.45 ± 2.36	<.0001
Fruits and fruit juice	1.20 ± 0.91	1.87 ± 1.21	<.0001
Vegetables	2.00 ± 1.09	.25 ± 0.95	.0001
Fats/oils, sweets and snacks	4.02 ± 2.40	4.20 ± 2.49	.50

* Raw (unadjusted) means are presented.

† *P* values describe the relationship between the continuous natural log-transformed nutrient, food component, or calculation with country of birth after controlling for age and total energy intake.

APPLICATIONS

Our study indicated that dietary differences occur among women belonging to the same ethnic group, depending on the country of their birth, as well as among immigrants, depending upon when they immigrated to the United States. The findings highlight high risk diets, which may be amenable to intervention, among immigrant Polish women. In particular, women who have emigrated from a country with a diet at low risk for breast cancer and coronary artery disease should be encouraged to

Table 3. Mean adjusted* dietary intake by year of migration from Poland controlling for age and energy intake (nutrient/1000 kcal)

	Period of Migration from Poland				
	US Born (*N*=139)	1935–79 (*N*=81)	1980–89 (*N*=86)	1990–97 (*N*=83)	*P* value†
Nutrients					
Carbohydrate (g)	117	122	114	111	.05
% Kcal from carbohydrate	46.7	48.7	45.6	45	.05
% Kcal from sweets	11.1	6.4	6.3	7.3	.0005
Total fat (g)	38	36	38	40	.09
% Kcal from fat	34.2	32.7	35.1	36.2	.09
Saturated fat (g)	13.1	13.6	13.5	14.3	.05
Oleic acid (g)	14.2	13.0	14.0	14.7	.43
Linoleic acid (g)	6.7	5.9	6.2	5.7	.005
Protein (g)	41	42	44	44	.001
% Kcal from protein	16.5	16.8	17.8	17.8	.001
Vitamin A (IU)	3170	3612	3680	4280	<.0001
Vitamin A (RE)	548	637	660	787	<.0001
Vitamin E (α-TE)	4.8	4.9	5.2	4.5	.46
Thiamin (mg)	0.78	0.87	0.91	0.85	.0006
Riboflavin (mg)	1.05	1.16	1.24	1.21	.0003
Niacin (mg)	10.63	10.35	10.56	9.76	.05
Folate (mcg)	134	147	149	138	.29
Vitamin B6/pyridoxine (mg)	0.87	0.91	0.95	0.88	.34
Vitamin C (mg)	45	58	54	55	.008
Calcium (mg)	426	490	498	497	.005
Phosphorus (mg)	652	710	736	735	<.0001
Magnesium (mg)	191	220	188	188	.74
Potassium (mg)	1431	1624	1566	1532	.02
Iron (mg)	6.67	6.82	6.76	6.42	.41
Zinc (mg)	5.68	5.53	5.96	5.65	.70
Zinc from animal sources (mg)	3.44	3.17	3.52	3.66	.13
Food components or antioxidants					
Cholesterol (mg)	129	121	143	153	.0001
Dietary fiber (g)	6	8	7	7	.15
Alpha carotene (mcg)	96	112	139	167	<.0001
Beta carotene (mcg)	965	1045	1030	1150	.12
Pro A carotene (mcg)	1179	1283	1323	1442	.05
Retinol (mcg)	339	405	428	535	<.0001
Cryptoxanthin (mcg)	28.61	36.95	32.33	34.77	.13
Lutein (mcg)	441	549	525	554	.03
Lycopene (mcg)	597	380	309	236	<.0001
Food group frequency calculations (servings/day)					
Breads and cereals	2.33	2.46	2.56	2.39	.46
Meats and legumes	1.68	1.50	1.84	2.01	.001
Cured or smoked meat/fish	0.40	0.40	0.54	0.68	<.0001
Dairy foods	1.88	2.57	2.69	2.72	.0002
Fruits and fruit juices	1.05	1.70	1.56	1.53	<.0001
Vegetables	1.72	1.97	2.12	2.13	.0002
Fats/oils, sweets and snack foods	3.41	2.98	3.22	3.50	.88

* Adjusted means are presented.
† *P* values describe the relationship between the continuous natural log-transformed nutrient, food component, or calculation with the ordinal variable migration period (US born, and migration period 1935–79, 1980–1989, 1990–1997) after controlling for age and total energy intake.

maintain that diet, and to resist dietary assimilation when it is detrimental. Educational efforts involving alterations in diet should be encouraged among more assimilated groups as well as US-born individuals of Polish descent. In Chicago, there are easy ways to differentiate between these groups, such as geographic patterns (recent immigrants tend to congregate in different areas), and linguistic differences (recent immigrants are more likely to speak Polish than En-

The women born in Poland exhibited higher intake levels of vitamins A and C, and beta carotene, as well greater consumption of fruits and vegetables, compared to US-born women.

glish). Using these differences, educational initiatives can be tailored according to those whose diets we wish to preserve and those whose diets we wish to change.

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