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## Lifestyle correlates of overweight and obesity among the population of Ukraine

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**BACKGROUND:** Overweight and obesity are among the greatest health challenges nowadays. This study aimed to investigate correlates of overweight among the population of Ukraine.

**METHODS:** Data from the survey "Health and Well-Being in Transition Societies" (2000) were analyzed. Body mass index (BMI) based on self-reported height and weight was used to estimate the extent of overweight both in continuous and dichotomous form. Binary dependent variable was computed by setting BMI of 25 as the borderline between normal weight and overweight. Education, demographic characteristics, field of activity, level of physical activity, behavioral and eating habits were considered as independent variables.

**RESULTS:** In 2000, 44% of Ukrainian population (39% of men and 49% of women) were overweight. Risk of overweight increased with age: among those below 40 years old, 16% of men and 12% of women were overweight, about 47% of men and 60% of women were overweight in 40+ groups. Among young men (under 40), those con-

suming more fruit (OR=0,31) and more physically active (OR=0,43) were less likely to be overweight. In women over 60, those overweight were more physically active (OR=2,32). In men over 40 and women below 40, prevalence of overweight was lower in smokers than in non-smokers. Eating potatoes, meat and milk was associated with increased BMI in some groups. No consistent associations were found for consumption of fish, butter, oil, sugar, and vegetables, as well as for education.

**CONCLUSION:** In 2000, Ukrainian population did not bear patterns of obesity epidemics found in the West: no associations with either socioeconomic status or foods usually associated with overweight were found. Overweight was more likely related to increased use of traditional foods like dairy products, meat and potatoes. Smoking was related to lower BMI in populations with high prevalence of smoking.

**KEYWORDS:** overweight; obesity; BMI; eating patterns; smoking; alcohol use.

## Поведенческие корреляты избыточной массы тела и ожирения среди населения Украины

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**АКТУАЛЬНОСТЬ:** Избыточный вес (ИВ) и ожирение является одной из наиболее серьезных проблем для здоровья. Цель нашего исследования заключалась в определении поведенческих коррелят ИВ среди населения Украины.

**МЕТОДЫ:** Проанализированы данные опроса "Здоровье и благополучие в переходных обществах" (2000). Для оценки степени избыточности массы тела использовался индекс массы

тела (ИМТ), рассчитанный с использованием сообщенных респондентами массы и роста. Данные проанализированы методами логистической регрессии и генерализованной линейной модели (GLM). Бинарная зависимая переменная сформирована путем установления ИМТ=25 в качестве границы между ИВ и нормальным весом. Независимыми переменными являлись уровень образования, демографические характеристики,

сфера деятельности, уровень физической активности, поведенческие и пищевые привычки.

**РЕЗУЛЬТАТЫ:** В 2000 году у 44% населения Украины (39% мужчин и 49% женщин) был ИВ. Риск ожирения увеличивается с возрастом: среди респондентов моложе 40 лет, 16% мужчин и 12% женщин имели ИВ, в то время как в группе 40+ ИВ присущ около 47% мужчин и 60% женщин. Среди молодых мужчин (до 40 лет) те, кто употребляет больше фруктов ( $OR = 0,31$ ) и физически активны ( $OR = 0,43$ ), были менее склонны к ИВ. Среди женщин старше 60 лет имеющие ИВ чаще занимались физическими упражнениями ( $OR = 2,32$ ). Распространенность ИВ среди мужчин старше 40 лет и женщин моложе 40, которые курят, была ниже, чем среди тех, кто не употребляет табак. Для употребляющих картофель, мясо и молоко характерен повышенный ИМТ. Не было обнару-

жено устойчивых ассоциаций для потребления рыбы, сливочного и растительного масла, сахара, овощей, а также для уровня образования.

**ЗАКЛЮЧЕНИЕ:** В 2000 году в Украине не было обнаружено основных коррелят возникновения ИВ, характерных для стран Запада: не было найдено ассоциации с социально-экономическим статусом или употреблением продуктов, как правило, связанных с избыточным весом. ИВ был с большей вероятностью связан с частым употреблением «традиционных» продуктов питания, таких как молочные продукты, мясо и картофель. Курение связано с низким ИМТ в группах населения с высокой распространенностью курения.

**КЛЮЧЕВЫЕ СЛОВА:** избыточный вес; ожирение; индекс массы тела ИМТ; структура питания; курение; употребления алкоголя.

## Поведінкові кореляти надмірної ваги і ожиріння серед населення України

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**АКТУАЛЬНІСТЬ:** Надмірна вага (НВ) і ожиріння є однією з найбільш серйозних проблем для здоров'я. Це дослідження мало на меті визначити поведінкові кореляти НВ серед населення України.

**МЕТОДИ:** Проаналізовано дані опитування "Здоров'я та благополуччя в перехідних суспільствах" (2000). Для оцінки ступеня надлишкової маси тіла використано індекс маси тіла (ІМТ), розрахований з використанням даних респондентів щодо ваги і зросту. Дані проаналізовано методами логістичної регресії та генералізованої лінійної моделі (GLM). Бінарну залежні змінну обчислено шляхом встановлення  $IMT = 25$  як межу між нормальню вагою та НВ. Основними незалежними змінними були рівень освіти респондентів, демографічні характеристики, сфера діяльності, рівень фізичної активності, поведінкові і харчові звички.

**РЕЗУЛЬТАТИ:** У 2000 році 44% населення України (39% чоловіків і 49% жінок) мали НВ. Ризик НВ збільшується з віком: серед респондентів молодіше 40 років 16% чоловіків і 12% жінок мали НВ, у той час як у групі 40 + НВ була притаманна близько 47% чоловіків і 60% жінок. Серед молодих чоловіків (до 40 років) ті,

хто споживає більше фруктів ( $OR = 0,31$ ) і більш фізично активні ( $OR = 0,43$ ), менш склонні до НВ. Жінки старше 60 років з НВ більш фізично активні ( $OR = 2,32$ ). Поширеність НВ серед чоловіків старше 40 років і жінок молодіше 40, які курять, була нижчою, ніж серед некурців. Вживання картоплі, м'яса і молока було пов'язано з підвищеним ІМТ в деяких групах. Не виявлено асоціацій для споживання риби, вершкового масла, олії, цукру, овочів, а також для рівня освіти.

**ВИСНОВОК:** У 2000 році в Україні не було виявлено основних ризиків виникнення ожиріння, характерних для країн Заходу: не було знайдено асоціації з соціально-економічним статусом або вживанням продуктів, як правило, пов'язаних з надмірною вагою. НВ з більшою ймовірністю пов'язана з частим вживанням «традиційних» продуктів харчування, таких як молочні продукти, м'ясо і картопля. Куріння було пов'язано з низьким індексом маси тіла в групах населення з високою поширеністю куріння.

**КЛЮЧОВІ СЛОВА:** надмірна вага; ожиріння; індекс маси тіла ІМТ; структура харчування; куріння; вживання алкоголю.

## INTRODUCTION

The attention to the worldwide epidemic of obesity, called “globesity”, is caused by its being the fifth leading risk factor for global deaths (Haslam & James, 2005). Obesity is associated with increased risk of death from all causes as well as from cancer and cardiovascular diseases (Ma, Flanders, Ward, & Jemal, 2011) and with incidence of type II diabetes, all cancers except esophageal (in females), pancreatic and prostate cancer, all cardiovascular diseases (except congestive heart failure), asthma, gallbladder disease, osteoarthritis and chronic back pain (Guh et al., 2009).

The obesity epidemic is recognized to be a result of changes in energy intake and/or energy expenditure that have led to energy imbalance in a large portion of the population (Crawford & Ball, 2002). Environmental changes lead to obesity through behaviors related to energy intake and expenditure; thus researchers consider determinants of eating patterns, physical activity, and sedentary behaviors instead. However, these may differ by population group, including gender and age groups.

Different dietary regimens can affect body weight, e.g. increased fruit and vegetable intake resulted in greater reduction of weight than limited intake of high-fat, low-nutrient dense foods with controlled physical activity (Epstein et al., 2001). Environmental factors such as food availability on the one hand, and psychosocial factors including eating traditions and beliefs regarding food taste and health impact, on the other, may also contribute to the country-specific eating patterns responsible for lower or higher risk of developing

obesity in a particular population. Apart from traditional patterns, healthy or unhealthy eating practices of a person as well as level of individuals' physical activity could be affected by policy-related factors, such as promotion and availability of high-energy food or implementation of population-based program aimed to change life style. Social and environmental factors considered at four levels including (1) international, (2) national/regional, (3) community/locality, (4) work/school/home (Huang, Drewnosksi, Kumanyika, & Glass, 2009) might have a more profound effect on body weight status than do individuals' characteristics (Wang & Beydoun, 2007). Identifying such factors is needed to inform healthy public policies.

With plenty of studies devoted to predictors of overweight and obesity in other countries, we could not identify such studies among adult population in Ukraine. Just one study among children indicated that excessive BMI was positively associated with the family income and the mother's weight (Friedman et al., 2009). Cross-country comparison of obesity prevalence and weight management practices among adolescents (Kalabiska et al., 2010; Page et al., 2006) classified 7% of Ukrainian compared to 10% of Hungarian adolescents as overweight. BMI was considered as a predictor of mortality in Ukrainian diabetic patients (Khlangot, Tronko, Kravchenko, Kulchinska, & Hu, 2009). Just two studies published internationally considered eating patterns in Ukraine (Biloukh & Utermohlen, 2000; Bilukha & Utermohlen, 2002). Taking into account this lack of evidence we decided to

conduct an exploratory study with secondary analysis of existing data collected in 2000.

With this study we aimed to address several exploratory research questions:

1. How widespread was overweight in 2000 in Ukraine among different age, gender, and occupation groups?
2. Was overweight more or less widespread in groups of Ukrainians characterized by certain health-related behaviors including tobacco smoking and alcohol use?
3. Was overweight positively or negatively associated with the self-reported level of physical activities (namely, physical exercises or sports reported to be done sometimes or never)?
4. Are there any specific eating patterns/food preferences in Ukrainian population associated with higher/lower values of body mass index?

## METHODS

The present analysis is based on the data from the survey “Health and Well-Being in Transition Societies”, conducted in 2000 by the Kyiv International Institute of Sociology (Paniotto, Martsinkiv, Kharchenko, Zakhozha, & Buslayeva, 2004) and dedicated to study interactions between the level of material well-being and the health of households in transition societies. Data were collected through structured interviews with 1635 adults (720 – men, 915 – women,) in 77 settlements (39 cities, 9 towns and 29 villages) of Ukraine. Participants were chosen randomly both from rural and urban areas from all 26 regions (oblasts) of Ukraine.

### Sampling

The main consideration when developing the sample was to ensure that each household had an equal probability of being selected for the interview. For this research, multi-stage sample random at each step of selection was used.

First stage of the sampling included the selection of settlements. The sample was drawn in such a fashion that each oblast was proportionally represented. All citizens in each oblast are officially considered to live in one of three kinds of population points: cities, towns, and villages. The sample was stratified by the type of settlement (Paniotto et al., 2004). Second stage of sampling included the selection of postal districts. Third stage included selection of households and respondents. One respondent from each of selected households was interviewed.

### Measurements

The questionnaire was composed of questions concerning demographics, work sector, behavioral and eating habits, as well as socioeconomic and health status. The data concerning eating patterns, life style and socioeconomic status of respondents were self-reported, as well as their weight and height. More detailed information on sampling, assessment method, etc. can be found in the survey primary outcome paper (Paniotto et al., 2004).

The main dietary components were presented in the questionnaire not individually but grouped in wider general categories, such as meat products, fruits or milk products. Separate question indicated main drink at meals, which also included milk (whole, non-packed) as an alternative choice. Frequency of con-

sumption of each group of products was presented as "often" if consumed four or more times per week, "rare" when products were consumed one- three times per week, or "never". Some variables were described by two characteristics: "often" and "rare" (including absence of consumption during week).

Level of physical activity was defined as any type of physical exercises or sports done by respondent (sometimes) or not done (never).

### Data Analysis

To address our research questions, we considered as potential determinants variables present in the dataset that characterized socio-demographic status (level of education, working status of respondent), unhealthy behaviors (alcohol and tobacco use), and dietary data.

Body mass index (BMI) was considered the main outcome roughly estimating total body fat mass. The BMI was calculated using formula:

$$\text{BMI} = \frac{\text{Weight in Kilograms}}{(\text{Height in Meters})^2}$$

As the BMI rises above 25.0, the risk of obesity-related diseases increases significantly. Thus one of the approaches we used was to consider dichotomized BMI based on overweight status. Binary outcome variable was computed by setting BMI of 25 as the borderline between normal and excess weight. Tests of possible associations were first performed in a bivariate analysis with the Pearson Chi-square test of independence where normal/excess weight was analyzed as binary dependent variable, and all the independent variables as categorical variables. All the associations identified within the bivariate analysis with Pearson Chi-square were then

included in the multivariate logistic regression models to adjust for the potential confounding effects. As both gender and age were found to significantly modify the revealed associations, logistic regression analysis was stratified by gender and age to control for effect modification. We stratified the sample into three age groups: young – people aged up to 40, middle age group – 40–60 year old respondents, and old – those over 60. All p-values are two-sided, and the level of statistical significance was set to be 0.05.

Apart from logistic regression analysis with binary outcome, we performed General Linear Model analysis with BMI as continuous outcome. Analysis was conducted stratified by gender. Independent variables were included in the model consecutively and excluded if no association was found for either gender. After main effects of all the variables significantly associated in bivariate analysis have been tested in the multivariate model, their interactions with age were added in the model. Those interactions that did not show significant associations were excluded as well as main effects that became insignificant after interactions were taken into account. Results are presented as Intercept equal to BMI in those who belong to reference categories of all variables included in the model  $\pm$  b-coefficients corresponding to those categories which showed significant difference for the reference categories.

As multiple comparisons could lead to chance findings, we considered these two regression models and performed them in stratified sample in order to observe whether certain associations are more con-

sistent and reproducible across the socio-demographic groups and types of analysis used.

All data analyses were accomplished with SPSS for Windows.

## RESULTS

Respondents (720 men, 915 women) were 15–92 years old while the average age was 47. Many of young and middle-aged men and women were wage earners; smaller groups were unem-

ployed and self-employed, most of elderly people were pensioners. One in seven respondents had university education. Over half of men and less than 9% of women were smokers; two in three men and three in four women reported to never do physical exercises.

Overall, 44% of study participants were overweight or obese: 39% of men and 49% of women. Younger people were less likely overweight (16% of men and 12% of women below 40 years) than those in older

age groups. Overweight in men and women was found to be associated with different variables. While in both middle and old age men the percentage of those overweight was quite similar and below half, percentage of overweight women increased dramatically with age: 53% had excess weight in middle-age group and 65% in old age. Sample characteristics together with results of bivariate analysis are presented in Table 1.

**Table 1. Socio-demographic, lifestyle, and food consumption characteristics of the studied group, by gender: number of respondents, percent overweight, Chi-square p-value, Ukraine, 2000**

	Univariate distributions						Bivariate distributions			
	Men		Women		All		Men		Women	
	N	%	N	%	N	%	% with BMI>25	Sig.	% with BMI>25	Sig.
<b>Education</b>										
Primary	359	49,9	486	53,1	845	51,7	36,2	0,41	48,5	0,94
Special technical	243	33,8	276	30,2	519	31,7	41,0		49,7	
Higher	118	16,4	153	16,7	271	16,6	40,7		49,1	
<b>Main field of activity</b>										
Wages	281	39,0	289	31,6	570	34,9	38,9	<0,05	51,7	<0,05
Pensioner	243	33,8	429	46,9	672	41,1	47,8		63,8	
Unemployed	113	15,7	109	11,9	222	13,6	33,6		33,3	
Other	83	11,5	88	9,6	171	10,5	18,4		8,9	
<b>Age group</b>										
Young <40	310	43,1	325	35,5	635	38,8	15,7	<0,05	12,3	<0,05
Middle age 40-60	199	27,6	249	27,2	448	27,4	46,6		53,4	
Old >60	211	29,3	341	37,3	552	33,8	47,7		65,3	
<b>Beer consumption</b>										
Often	101	14,0	32	3,5	133	8,1	38,4	0,3	37,1	<0,05
Rare	348	48,3	226	24,7	574	35,1	32,7		20,0	
Never	271	37,6	657	71,8	928	56,8	40,6		54,9	
<b>Vodka consumption</b>										
Often	132	18,3	22	2,4	154	9,4	37,8	0,9	41,7	0,53
Rare	437	60,7	478	52,2	915	56,0	39,1		50,5	
Never	151	21,0	415	45,4	566	34,6	37,2		47,8	
<b>Current smoking status</b>										
Non-smoker	329	45,7	835	91,3	1164	71,2	48,2	<0,05	51,0	<0,05
Smoker	391	54,3	80	8,7	471	28,8	30,4		29,0	

**Table 1. Socio-demographic, lifestyle, and food consumption characteristics of the studied group, by gender: number of respondents, percent overweight, Chi-square p-value, Ukraine, 2000 (continued)**

		Univariate distributions						Bivariate distributions			
		Men		Women		All		Men		Women	
		N	%	N	%	N	%	% with BMI>25	Sig.	% with BMI>25	Sig.
<b>Physical activity</b>											
Never	477	66,3	681	74,4	1158	70,8	41,2	0,04	53,2	<0,05	
Sometimes	243	33,8	234	25,6	477	29,2	33,5		36,5		
<b>Main foods consumption:</b>											
Meat											
Rare	481	66,8	694	75,8	1175	71,9	37,5	0,4	50,7	0,06	
Often	239	33,2	221	24,2	460	28,1	40,7		44,1		
Fish											
Never	416	57,8	590	64,5	1006	61,5	36,6	0,2	49,1	0,96	
Sometimes	304	42,2	325	35,5	629	38,5	41,2		48,9		
Butter											
Rare	539	74,9	714	78,0	1253	76,6	39,3	0,45	50	0,25	
Often	181	25,1	201	22,0	382	23,4	36,2		45,7		
Oil											
Often	652	90,6	833	91,0	1485	90,8	39,1	0,35	49,9	0,05	
Rare	68	9,4	82	9,0	150	9,2	33,3		39,6		
Potato											
Often	633	87,9	795	86,9	1428	87,3	37	<0,05	50,5	<0,05	
Rare	87	12,1	120	13,1	207	12,7	51,1		39,7		
Vegetables											
Often	535	74,3	663	72,5	1198	73,3	38,4	0,87	49,9	0,32	
Rare	185	25,7	252	27,5	437	26,7	39		46,4		
Fruits											
Rare	612	85,0	773	84,5	1385	84,7	39,4	0,33	50	0,15	
Often	108	15,0	142	15,5	250	15,3	34,6		38,7		
Sugar											
Often	627	87,1	777	84,9	1404	85,9	36,2	0,6	55,2	0,09	
Rare	93	12,9	138	15,1	231	14,1	39		47,8		
Milk (dairy) products											
Rare	503	69,9	638	69,7	1141	69,8	37,7	0,43	47,5	0,18	
Often	217	30,1	277	30,3	494	30,2	40,7		52,0		
Main drink at meals											
Tea or coffee	576	80,0	741	81,0	1317	80,6	38,2	<0,05	47,5	<0,05	
Water	44	6,1	61	6,7	105	6,4	21,7		38,2		
Milk (whole or non-packed)	40	5,6	50	5,5	90	5,5	43,2		69,2		
Other	60	8,3	63	6,9	123	7,5	50,8		59,7		

Logistic regression analysis for men stratified by age groups is presented in Table 2. More associations were found in younger age group of men (aged below 40). Higher BMI was found in those

who reported high consumption of milk and dairy products ( $OR=1.78$  95% CI 0.94–3.38). Being a self-employed person ( $OR=0.28$  95% CI 0.11–0.73), more physically active ( $OR=0.43$  95% CI

0.23–0.78), consuming more fruit ( $OR=0.31$  95% CI 0.12–0.84) and potatoes were all associated with lower odds of being overweight. Among other age groups of men, the only factor significantly associ-

**Table 2. Results of multivariate binary logistic regression analysis of overweight (Body Mass Index >25) in men, stratified by age group: numbers of respondents, adjusted odds ratios and their 95% confidence intervals, Ukraine, 2000**

		age group <40		age group 40–60		age group >60	
		N	AOR (95% CI)	N	AOR (95% CI)	N	AOR (95% CI)
Main field of activity	Wages	159	1	120	1	2	
	Pensioner	7	0,3 (0,0–2,6)	27	0,8 (0,3–2,2)	209	
	Unemployed	73	1,3 (0,7–2,5)	40	0,5 (0,2–1,2)		
	Self-employed, housekeeper	71	0,3 (0,1–0,7)	12	3,7 (0,9–16,0)		
Main drink at meals	Tea or coffee	256	1	155	1	165	1
	Water	20	0,8 (0,2–3,1)	13	0,4 (0,1–1,7)	11	0,3 (0,1–1,4)
	Milk (whole or non-packed)	15	1,1 (0,3–4,1)	12	0,5 (0,1–2,2)	13	1,3 (0,3–5,1)
	Other	19	1,6 (0,5–5)	19	2,3 (0,8–6,8)	22	1,9 (0,7–5,4)
Education	Primary	132	1	90	1	137	1
	Special tech	128	1,0 (0,5–1,8)	71	1,3 (0,6–2,7)	44	1,4 (0,6–3,3)
	Higher	50	0,8 (0,3–1,9)	38	1,1 (0,4–2,9)	30	1,2 (0,5–3,1)
Beer consumption	Often	76	1,2 (0,4–3,1)	22	1,0 (0,3–3,6)	3	0,4 (0,0–5,9)
	Rare	166	1,0 (0,4–2,5)	105	1,2 (0,5–2,6)	77	1,1 (0,6–2,3)
	Never	68	1	72	1	131	1
Vodka consumption	Often	60	1,2 (0,4–3,5)	48	1,5 (0,4–5,0)	24	1,3 (0,4–4,1)
	Rare	195	1,0 (0,4–2,7)	119	1,7 (0,6–4,6)	123	1,3 (0,6–2,8)
	Never	55		32		64	
Physical activity	Sometimes	159	0,4 (0,2–0,8)	47	1,7 (0,8–3,8)	37	1,4 (0,6–3,2)
	Never	151	1	152	1	174	1
Smoking status	Smoker	185	0,6 (0,4–1,2)	131	0,3 (0,2–0,6)	75	0,3 (0,2–0,6)
	Non-smoker	125	1	68	1	136	1
Fish	Never	181	0,9 (0,5–1,6)	106	1,3 (0,6–2,5)	129	1,0 (0,5–1,9)
	Sometimes	129	1	93	1	82	1
Butter	Rare	216	1	145	1	178	1
	Often	94	1,1 (0,5–2,1)	54	1,0 (0,4–2,3)	33	1,0 (0,4–2,6)
Milk (dairy) products	Rare	200	1	150	1	153	1
	Often	110	1,8 (0,9–3,4)	49	1,3 (0,6–2,9)	58	0,9 (0,4–1,9)
Sugar	Rare	34	0,7 (0,3–2,1)	26	0,4 (0,2–1,2)	33	1,0 (0,4–2,4)
	Often	276	1	173	1	178	1
Fruit	Rare	261	1	170	1	181	1
	Often	49	0,3 (0,1–0,8)	29	0,8 (0,3–2,1)	30	1,0 (0,4–2,6)
Vegetables	Rare	72	0,6 (0,3–1,2)	54	0,9 (0,4–2,1)	59	1,5 (0,7–3,2)
	Often	238	1	145	1	152	1
Oil	Rare	32	0,8 (0,3–2,1)	22	1,2 (0,4–3,7)	14	0,5 (0,1–1,7)
	Often	278	1	177	1	197	1
Potato	Rare	32	4,6 (1,9–11,3)	32	2,0 (0,8–5,3)	23	1,1 (0,4–2,8)
	Often	278	1	167	1	188	1
Meat	Rare	189	1	127	1	165	1
	Often	121	1,3 (0,7–2,4)	72	0,9 (0,4–2,1)	46	1,5 (0,7–3,4)

**Table 3. Results of multivariate binary logistic regression analysis of overweight (Body Mass Index >25) in women, stratified by age group: numbers of respondents, adjusted odds ratios and their 95 confidence intervals, Ukraine, 2000**

		age group <40		age group 40–60		age group >60	
		N	AOR (95%CI)	N	AOR (95%CI)	N	AOR (95%CI)
Main field of activity	Wages	162	1	123	1	4	1
	Pensioner	6	0,8 (0,1–8,4)	86	1,0 (0,5–1,9)	337	0,5 (0,0–7,2)
	Unemployed	75	0,7 (0,4–1,5)	34	0,4 (0,2–0,8)		
	Self-employed, housekeeper	82	0,1 (0,0–0,3)	6	2,4 (0,3–23,3)		
Main drink at meals	Tea or coffee	281	1	199	1	261	1
	Milk (whole or non-packed)	11	6,4 (1,4–30,0)	16	0,7 (0,2–2,5)	23	2,3 (0,8–7,1)
	Other	12	3,2 (0,5–19,9)	24	1,0 (0,4–2,5)	27	3,0 (1,1–8,5)
Education	Primary	137	1	97	1	252	1
	Special technical	116	2,0 (0,9–4,4)	103	0,8 (0,4–1,5)	57	1,9 (1,0–3,7)
	Higher	72	2,0 (0,8–4,9)	49	0,7 (0,3–1,6)	32	1,4 (0,6–3,6)
Beer consumption	Often	23	0,1 (0,0–0,7)	9	0,4 (0,1–2,0)		
	Rare	123	0,4 (0,2–0,8)	77	1,4 (0,7–2,7)	26	0,3 (0,1–0,8)
	Never	179	1	163	1	315	1
Vodka consumption	Often	9	3,6 (0,5–24,5)	9	1,0 (0,2–5,1)	4	0,8 (0,1–8,1)
	Rare	196	1,7 (0,9–3,5)	174	1,3 (0,6–2,5)	108	2,5 (1,4–4,7)
	Never	120	1	66	1	229	1
Physical activity	Sometimes	135	0,7 (0,4–1,5)	47	0,9 (0,4–1,8)	52	2,3 (1,1–5,0)
	Never	190	1	202	1	289	1
Smoking status	Smoker	57	0,4 (0,2–0,9)	20	0,6 (0,2–1,8)	3	1,3 (0,1–25,4)
	Non-smoker	268	1	229	1	338	1
Main products consumed (diet)							
Fish	Never	205	0,9 (0,5–1,8)	148	0,8 (0,5–1,5)	237	0,9 (0,5–1,5)
	Sometimes	120	1	101	1	104	1
Butter	Rare	226	1	185	1	303	1
	Often	99	1,0 (0,5–2,1)	64	1,5 (0,7–3,2)	38	1,6 (0,7–3,7)
Milk (dairy) products	Rare	228	1	162	1	248	1
	Often	97	1,0 (0,5–2,0)	87	1,9 (1,0–4,0)	93	1,1 (0,6–2,0)
Sugar	Rare	37	1,8 (0,7–4,9)	35	1,4 (0,6–3,2)	66	1,3 (0,7–2,6)
	Often	288	1	214	1	275	1
Fruit	Rare	263	1	213	1	297	1
	Often	62	1,1 (0,5–2,4)	36	0,8 (0,3–1,8)	44	0,5 (0,3–1,2)
Vegetables	Rare	81	0,5 (0,2–1,1)	53	0,9 (0,4–1,8)	118	1,3 (0,7–2,2)
	Often	244	1	196	1	223	1
Oil	Rare	31	2,2 (0,7–6,5)	20	1,0 (0,4–2,9)	31	0,5 (0,2–1,1)
	Often	294	1	229	1	310	1
Potatoes	Rare	40	0,5 (0,2–1,6)	36	0,8 (0,3–1,8)	44	0,5 (0,2–0,9)
	Often	285	1	213	1	297	1
Meat	Rare	212	1	188	1	294	1
	Often	113	1,1 (0,6–2,1)	61	0,7 (0,4–1,5)	47	0,6 (0,3–1,3)

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ated with prevalence of overweight was smoking: in men aged 40–60 years prevalence of overweight in smokers was lower than in non-smokers ( $OR=0.31$  95%CI 0.15–0.64), and same was true for men over 60 ( $OR=0.29$  95%CI 0.15–0.56).

Logistic regression analysis for women stratified by age groups is presented in Table 3. Associations found for women were more consistent across age groups than for men. In contrast to men, significant negative association between overweight and smoking was found for women below 40 ( $OR=0.39$  95%CI 0.17–0.92), not those above 40 as for men. In younger women, overweight was positively associated with drinking milk at meals ( $OR=6.44$  95%CI 1.38–30.04), same relationship while non-significant was found for older women. Beer consumption was negatively associated with overweight in most age groups:  $OR=0.41$  (95%CI 0.21–0.79) for women below 40 and  $OR=0.30$  (95%CI 0.12–0.78) for older ones, on the contrary, intake of vodka was positively associated with overweight ( $OR=2.53$  95%CI 1.37–4.66). While in younger women those who reported some physical activity were less likely overweight, in older women there was an association between overweight and physical activity ( $OR=2.32$  95%CI 1.07–5.03). For potatoes, in all age groups we see either non-significant or significant association between overweight and eating potatoes (rarely –  $OR=0.45$  95%CI 0.22–0.94). No consistent associations were found for either age group for fish, butter, oil, sugar, vegetables, and meat.

Results of General Linear Model analysis are shown in Table 4. In-

tercepts corresponding to reference categories of all included variables were very similar for both genders and constituted 26.62 (95%CI 25.74–27.51) for men and 26.64 (25.79–27.49) for women. BMI was significantly lower by about 2 units in younger people than in older ones, for both genders. With age controlled for, association with education and occupation was found non-significant.

Physical exercises reported to be performed ‘sometimes’ compared to ‘never’ were found to correspond 1.5 units lower BMI in men, and 2.2 lower BMI in women but only of younger age. In older group no significant difference was found.

Among the foods whose frequency was collected in the survey, only more frequent eating of meat and dairy products was associated with slightly higher BMI, but only in men.

BMI was slightly higher in both men and women who reported drinking strong alcohol on a monthly-to-weekly basis. Contrary to this, drinking beer monthly-to-weekly compared to ‘never’ was associated with BMI lower by about 2 units, but this was found in only younger women.

Smoking on a daily basis in men was associated with lower BMI by 2 units; however, this was less typical for younger men.

## DISCUSSION

Explorative analysis of data from the survey “Health and Well-being in Transition Societies”, 2000 by age and gender groups showed certain associations pertinent to all and others quite specific for particular demographic groups.

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Like in many other countries, women in Ukraine were found to be more likely overweight, especially in older age groups. Obesity is more prevalent in women worldwide due to biological (higher ability to deposit fat tissue than men) and social factors (James, Leach, Kalamara, & Shayeghi, 2001).

However, this gender disparity could be partly accounted for by sedentary lifestyles (Blanck et al., 2007): little exercise, but much TV-watching (Rosmond & Björntorp, 1999).

Another finding in our study common for men and women was that proportion of people with excessive weight increased with age. This is in line with the results of other researchers (McTigue, Hess, & Ziouras, 2006; Ogden et al., 2006).

Much attention is traditionally given to socioeconomic factors including education, income, unemployment, problems at work when employed, dissatisfaction with work as determinants of excess body weight (Rosmond & Björntorp, 1999; Wardle, Waller, & Jarvis, 2002). However, association with socioeconomic status is inconsistent. In traditional societies, representatives of higher SES are more likely to be overweight, while in modern societies the opposite is true for adult women but mixed patterns are typical for other age/sex groups (Sobal, 1991) or, as was seen later, an “increasing proportion of positive associations and a decreasing proportion of negative associations occurs as one moves from countries with high levels of socioeconomic development to countries with medium and low levels of development” (McLaren, 2007), that is in less developed countries more studies show that

**Table 4. Results of General Linear Model analysis in different age groups, stratified by gender, Intercept equal to BMI of reference groups with values set to 0, Ukraine, 2000**

Interaction terms	Variables	Values	Men			Women				
			N	B	95% CI	N	B	95% CI		
Intercept				26,62	25,74	27,51		26,64	25,79	27,49
Age before and after 45										
15-44			369	-2,20	-3,27	-1,13	471	-2,08	-2,91	-1,26
45+			361	0,00	,	,	549	0,00	,	,
All age groups										
Frequency of alcoholic drinks use										
Daily or nearly daily			26	1,25	-0,25	2,75	6	-1,08	-5,16	2,99
Once a week			109	1,08	0,14	2,01	18	1,27	-1,08	3,61
2 - 3 times a month			123	0,87	-0,04	1,77	70	1,98	0,74	3,22
About once a month or less frequently			318	0,77	0,04	1,51	478	1,35	0,69	2,00
Never			154	0,00	,	,	448	0,00	,	,
Tobacco use										
Yes			373	-1,97	-2,70	-1,23	70	-1,50	-4,19	1,20
Sometimes			23	0,51	-1,65	2,67	19	-2,46	-9,51	4,59
No			334	0,00	,	,	931	0,00	,	,
Frequency of meat consumption										
Rare			488	-0,82	-1,37	-0,27	758	0,18	-0,52	0,88
Frequently			242	0,00	,	,	262	0,00	,	,
Frequency of milk products consumption										
Rare			510	-0,61	-1,16	-0,06	703	-0,46	-1,10	0,18
Frequently			220	0,00	,	,	317	0,00	,	,
Age 15-44										
How often are you physically active?										
Sometimes			181	-1,53	-2,23	-0,82	173	-2,19	-3,11	-1,26
Never			189	0,00	,	,	299	0,00	,	,
Tobacco use										
Yes			214	1,78	0,73	2,82	57	1,87	-1,13	4,87
Sometimes			15	-1,31	-4,22	1,61	18	1,14	-6,27	8,55
No			143	0,00	,	,	398	0,00	,	,
Frequency of beer consumption										
Daily or nearly daily			15	0,11	-1,82	2,04	4	-3,22	-8,01	1,57
Once a week			69	0,04	-1,11	1,20	30	-2,36	-4,23	-0,48
2 - 3 times a month			75	0,94	-0,19	2,06	43	-2,26	-3,83	-0,69
About once a month or less frequently			126	0,04	-0,95	1,02	140	-1,85	-2,83	-0,87
Never			87	0,00	,	,	255	0,00	,	,

higher SES is associated with heavier bodies and in more developed countries more populations show inverse relationship between body mass and SES. In our study, no association between educational attainment and overweight was found in any age or gender groups. This absence of correlates found in either traditional or modern societies might mean that Ukraine in 2000 was genuinely 'in transition'

between the two. Later uptake of obesity epidemic was also seen in other Eastern European countries (Webber et al., 2012).

Smoking was found to be significantly related to lower body mass, and these associations were more prominent in those demographic groups with higher smoking prevalence – older men and younger women. This finding is in line with many earlier observations showing

that smokers are more likely to have lower body mass than non-smokers (Fehily, Phillips, & Yarnell, 1984; Jacobs & Göttenborg, 1981; Shimokata, Muller, & Andres, 1989), which is associated with the duration of smoking more than with its intensity (Albanes, Jones, Micozzi, & Mattson, 1987); however, the new thing in our study is that the association with smoking was found predominantly

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in groups with high smoking prevalence where variance of BMI created by other factors becomes less visible.

Within several demographic groups, use of milk and dairy products was found to be associated with higher body mass index. Studies considering relationship between dairy products and body mass from the point of view of calcium intake either have shown body mass and adiposity decrease (Van Loan, 2009) in adults (Mirmiran, Esmaillzadeh, & Azizi, 2004; Shahar et al., 2010) and children (Kelishadi et al., 2009) or no change in body mass (Gunther et al., 2005) while studies revealing inverse relationship being mostly cross-sectional or retrospective. A systematic review of randomized trials of the impact of dairy products on body weight has shown that most found no effect while some have shown weight gain, which is likely to be explained by increased energy intake (Barr, 2003). Some studies indicate that BMI change is dependent on the type of dairy products consumed (Rosell, Håkansson, & Wolk, 2006). Obviously, if respondents in our study reported consumption of whole milk at meals where others consumed water or tea, this meant higher energy intake, which is translated in weight gain. Consumption of fatty dairy products as a factor of overweight and consequent chronic diseases was addressed in neighbouring Poland (Zatonski, McMichael, & Powles, 1998). On the other hand, consumption of whole milk might be a marker of specific lifestyle, or living in a countryside, owning a cow or living in proximity to places where someone owns a cow. This might comprise a wide range of other factors affecting BMI.

The revealed associations with physical activity illustrate the pattern we hypothesized to find. In younger age groups of those more physically active have lower BMI, and in older age groups those overweight are more likely to start exercising. Besides this interpretation, many studies show that physical activity can possibly lead to weight gain (Fogelholm & Kukkonen-Harjula, 2000), as BMI is actually not a specific measure of adiposity, and physically active people with increased muscular mass may have increased BMI as well (Schroeder, 2007).

The association between vodka consumption and BMI revealed in women might be explained either by additional alcohol-related energy intake or by certain eating patterns linked to vodka consumption. Association between alcohol use and increased BMI (Cournot et al., 2004) in women was also found in France. In contrast, BMI was found to be negatively related to wine consumption, while beer and strong liquor did not show any significant relationships to the BMI (Rosmond & Björntorp, 1999). In the USA (Williamson et al., 1987) alcohol use was shown to have no association with the BMI in men while the association was inverse in women.

The revealed association with eating potatoes was somewhat contradictory: for young men, the association was inverse while in most groups of women it was positive: the more potatoes consumed the higher was BMI. However, other studies find similar patterns: adults whose diets include more white potatoes have higher BMIs while overweight boys were found to consume less total vegetables (2.5 servings) as well as less white potatoes (1.2 servings) than other

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boys (Lin & Morrison, 2002). Moreover, the mean annual change in BMI was found to be much higher for subjects in the so-called 'meat-and-potatoes cluster' than in 'healthy food cluster' (Newby et al., 2003), and this pattern is expected to be quite widespread in Ukraine. Nutrition of Ukrainian workers was found to be rich in calories due to bread, potato, pure carbohydrates and some products of animal origin, mostly fats (Pripitina, 1975).

Some of the revealed associations point to certain lifestyle patterns, especially among women. For example, slim women are more likely to be self-employed and to drink beer, which is hardly to be causal as beer provides extra calories. Overweight women were more likely to have lower than university education and to admit drinking vodka.

Absence of associations found for most foods can be due to either non-sensitive way of measurement of their consumption, or the fact that they do not clearly belong to those lifestyle patterns associated with BMI revealed for women. Some of the typical associations like the one that risk of being overweight or obese was positively associated with soft drink and sugar consumption (Vartanian, Schwartz, & Brownell, 2007), was not found in our analysis.

Furthermore, a factor known to be a cause for obesity may reveal no association with the body mass index due to absence of sufficient variance in the studied group. It is necessary to take into account that in the Soviet times and partly thereafter nutrition of the population was rather uniform with centralized distribution of meat, sausage, and butter. Other quite

uniform pattern for Ukrainian rural population would contain much potato and some vegetables. All the abovementioned peculiarities of the data would lead statistical tests to show no association between the eating patterns and BMI.

Results of the present study should be treated with certain caution due to cross-sectional nature of the data that made impossible to establish the sequence of events and causality of certain relationships found between variables. Self-reported height and weight of the participants might be a source of bias especially in older age groups where overweight status can be underestimated (Kuczmarski, Kuczmarski, & Najjar, 2001).

Implications for further research include but are not limited to longitudinal observation of how trajectories of eating patterns specific for Ukraine and risk factors including overweight are related to each other over time. Another research question which deserves further consideration is whether the ideas of 'healthy eating' is a factor that plays a role in food choices by Ukrainian dwellers.

## CONCLUSIONS

1. In 2000, 44% of representative sample of Ukrainian population were overweight or obese: 39% of men and 49% of women. Younger people were less likely overweight (16% of men and 12% of women below 40 years) than those in older age groups (47% of men over 40, 53% of women over 40 and 65% of women over 60 years old). No disparity by education or occupation group was found.

2. Smokers were less likely overweight; however, this association was seen only in groups with rela-

tively high smoking prevalence – in men over 40 and women below 40 years old. Beer users, especially women, were less likely to be overweight, strong alcohol users had on average larger body mass index; however, this reflects lifestyle and eating patterns rather than causal effects.

3. Men and women who reported practicing physical exercises at least sometimes had BMI 1.5–2.0 units lower than those never doing exercises; however, this was seen only among those below 45 years old. Above that age, overweight women more likely reported doing exercises.

4. More frequent consumption of potatoes, meat and milk in some demographic groups was associated with high BMI, and eating fruit—with lower. The expectable association with using sugar or soft drinks was not found in Ukraine in 2000.

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