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Complete List of Authors:	Kósa, Zsigmond; Department of Methodology for Health Visitors and Public Health, Faculty of Health, University of Debrecen, Moravcsik-Kornyicki, Ágota; Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, ; MTA-DE Public Health Research Group of the Hungarian Academy of Sciences, University of Debrecen, ; WHO Collaborating Centre on Vulnerability and Health, Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, Diószegi, Judit; Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, ; MTA-DE Public Health Research Group of the Hungarian Academy of Sciences, University of Debrecen, Roberts, Bayard; Department of Health Services Research and Policy, London School of Hygiene and Tropical Medicine, Szabó, Zoltán; Institute of Internal Medicine, Faculty of Medicine, University of Debrecen, Sándor, János; Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, Ádány, Róza; Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, ; MTA-DE Public Health Research Group of the Hungarian Academy of Sciences, University of Debrecen, ; WHO Collaborating Centre on Vulnerability and Health, Department of Preventive Medicine, Faculty of Public Health, University of Debrecen,
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Prevalence of metabolic syndrome among Roma: a comparative health examination survey in Hungary

Zsigmond Kósa[1], Ágota Moravcsik-Kornyicki[2,3,4], Judit Diószegi[2,3], Bayard Roberts[5], Zoltán Szabó[6], János Sándor[2], Róza Ádány[2,3,4]

[1] Department of Methodology for Health Visitors and Public Health, Faculty of Health, University of Debrecen, Nyíregyháza, Hungary

[2] Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, Debrecen, Hungary

[3] MTA-DE Public Health Research Group of the Hungarian Academy of Sciences, University of Debrecen, Debrecen, Hungary

[4] WHO Collaborating Centre on Vulnerability and Health, Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, Debrecen, Hungary

[5] Department of Health Services Research and Policy, London School of Hygiene and Tropical Medicine, London, UK

[6] Institute of Internal Medicine, Faculty of Medicine, University of Debrecen, Debrecen, Hungary

Correspondence:

Róza Ádány, Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, Debrecen, Hungary;
MTA-DE Public Health Research Group of the Hungarian Academy of Sciences, University of Debrecen, Debrecen, Hungary;
WHO Collaborating Centre on Vulnerability and Health, Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, Debrecen, Hungary;
26 Kassai Street, Debrecen, Hungary, H-4012
Tel.: +3652417267/77147
Fax.: +3652460195
e-mail adany.roza@sph.unideb.hu

ABSTRACT

Objectives. The objective of our study was to compare the health status of the Roma people with that of the general population in Hungary.

Methods. A health examination survey to define the prevalence of metabolic syndrome and its components was performed in a representative random sample (n=646) of the Roma population aged 20-64 years living in segregated colonies and data were compared to that obtained in a representative random sample (n=1819) of the Hungarian population.

Results. The risks for central obesity, hypertension and raised triglyceride level among Roma adults were not differed from the Hungarian references, while raised fasting plasma glucose or known type 2 diabetes mellitus (OR=2.65, 95%CI 1.90-3.69), reduced HDL cholesterol level or treated lipid disorder (OR=2.15, 95%CI 1.65-2.79) were significantly more frequent in all age groups in the Roma sample. The prevalence of metabolic syndrome (OR=1.37, 95%CI 1.03-1.83) was also significantly higher among Roma than in the general Hungarian population.

Conclusions. Besides tackling the socioeconomic determinants of the poor health of Roma people, specific public health interventions considering increased genetic susceptibility to metabolic disturbances are needed to improve their health status.

KEYWORDS Roma, health examination survey, metabolic syndrome, genetic background

INTRODUCTION

Roma are the largest ethnic minority in Europe with an estimated number between 12 and 15 million[1] Their representation in the population is greatest in Bulgaria, Romania, Slovakia, Hungary, the Czech Republic and Slovenia, but the EU enlargements of 2004 and 2007 has enabled increasing numbers to migrate into and to settle in other countries of the EU. The Roma are concentrated in economically deprived regions, often living in segregated parts (colonies) characterized by severely unfavorable environmental conditions of human habitats.[2] Independently of the country where they live in, the common problems that this population group experiences are poverty, restricted access to education, high level of unemployment and social exclusion.[3]

On the base of the predominantly low socio-economic status of the Roma population and socio-economical status as determinant of health, it is a reasonable assumption that their health status is much worse and their average life expectancy is much shorter than that of the majority population, as is frequently mentioned both in research and public communications.[4,5,6,7]Considering the fact that recording Roma ethnicity is not permitted in any kind of official documentation including medical records, birth and death certificates[8] as well as some major obstacles that hinder or prevent the collection of reliable data on Roma and other minorities,[9] these cannot be considered as evidence proved.

In a longitudinal study covering the entire population of Bulgaria between 1992-98 in 2011 Kohler and Preston[10] presented “the first reliable life table measures and cause-specific mortality indicators according to ethnicity and religion” by linking data in the 1992 census to subsequent death records. Although identification of Roma found to be the least reliable among the groups considered and they were most likely to be misclassified resulting in undercounting, their mortality was found to be very high compared to all other ethnic/religious groups according to nearly all major causes of death.

Although many studies have documented high prevalence of communicable diseases,[11,12]fewer have documented non-communicable diseases among the Roma people (see reviewed[13]). Even fewer

studies have compared Roma health status with that of the majority population, and even if comparisons were made they were restricted to one or only a few (hypertension, diabetes) health indicators.[14,15] In addition, the comparative studies were mainly questionnaire-based health interview surveys when self-assessed health status and functional limitations were considered as outcome indicators, and no medical examinations were carried out. The ethnic identification of individuals can also be contested.[16]

The objective of our study was to compare the health status of the Roma people with that of the general population in Hungary. We conducted a study measuring the prevalence of metabolic syndrome and its components which overcomes the limitations with the existing evidence-base on Roma health noted above.

- First, it is a definitive health examination survey from the epidemiological point of view.
- Second, it targets health status of Roma in complexity by investigating the prevalence of metabolic syndrome as well as the prevalence of its components as it was defined by the International Diabetes Federation Consensus Group.[17] Although the definition and clinical interpretation of metabolic syndrome is a subject of intense scientific discussion[18] there is a general agreement that it is the most robust predictor of the increased susceptibility to different non-communicable diseases (cardiovascular diseases, type 2 diabetes, polycystic ovary syndrome, fatty liver, cholesterol gallstones, asthma, sleep disturbances, and some forms of cancer)[19] most of them with high morbidity and mortality burden.
- Third, data are compared with reference data of the majority population in Hungary.
- Fourth, by involving representatives of the Roma population at all stages of the study high level validity has been reached through avoiding the misclassification of the study subjects and low response rate of selected Roma adults.

METHODS

Sampling

A nationwide project surveyed the segregated colonies (SCs) in Hungary. Roma field workers nominated by the Roma non-governmental organizations identified the SCs. 94% of SCs' inhabitants declared themselves to be Roma.[20]

The present investigation utilized this colony-registry in stratified multistep sampling. The study embraced 2 Hungarian counties (Hajdu-Bihar and Szabolcs-Szatmar-Bereg), where Roma colonies are accumulated. To focus the investigation to the highly segregated, closed Roma population, SCs with more than 100 inhabitants were considered as the study base. Of the 64 eligible SCs 40 and 25 households from each SC were randomly selected using the General Practitioners' validated (and corrected, if it was needed) household-lists. The 20-64 years old inhabitants of the resulting 1000 households comprised the final sampling frame, and 1 person from each household has been chosen by a member of the primary health care team using random table.

Roma Health Examination Survey

The participants were invited to the GPs' office where a questionnaire on socio-demographic factors, life-style and self-assessed health status was completed by GPs or practice nurses on the basis of interviewees' answers, and physical examination was carried out. The health status description utilized the former medical records of participants as well. Blood samples for laboratory investigations were taken. Informed consent from the participants was obtained. The data collection started in September 2011, and took 4 months, and it applied the methods of a former study on ~~the~~ metabolic syndrome (Hungarian Metabolic Syndrome Survey, HMSS).[20]

Socio-demographic characteristics (age, gender, level of education), results of physical examination (body weight, height, waist circumference and blood pressure), serum concentrations of triglyceride,

HDL-cholesterol and glucose assessed in fasting blood samples, and the medical history of lipid disorders, hypertension and type 2 diabetes mellitus have been processed in the present investigation.

The consensus definition of the International Diabetes Federation was used to determine the presence of metabolic syndrome.[17] Applied thresholds: central obesity ≥94 cm for men and ≥80 cm for women; serum triglyceride concentration ≥1.7 mmol/l or specific treatment for it; serum HDL cholesterol concentration <1.03 mmol/l for men and <1.29 mmol/l for women or specific treatment for it, systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥85 mmHg or specific treatment for it, fasting plasma glucose level ≥5.6 mmol/l or previously diagnosed type 2 diabetes mellitus.

Reference data set

The SCs' data have been compared to reference values determined by the above mentioned HMSS on a representative sample of the Hungarian population (n= 1819).[20] The present investigation utilized the 1542 complete records of 20-64 years old adults from HMSS as reference dataset.

Data analysis

The SC specific and the HMSS derived datasets were ~~have been~~ joined. The final SC-HMSS database contained anonymized records. The prevalence of metabolic syndrome and that of its components were calculated for different strata (age groups in both genders of the samples investigated). The prevalences of the metabolic syndrome and that of its components were estimated for different strata (age groups in both genders of the samples investigated) and their 95% confidence intervals were computed using the normal distribution. The chi square test was used for the comparison of prevalences between both ethnicities and males and females, respectively. ~~The statistical evaluation of observed proportions has been carried out by their 95% confidence interval computed using the normal distribution and by chi square test. The association of risk factors of age, gender, education and ethnicity on the different health outcomes was analyzed using multiple logistic regression models.~~ Stata 10.1 was used for the ~~applied in~~ statistical analys~~e~~is.

RESULTS

Because of some non-collaborative GPs, the data collection was impossible in 3 SCs. Therefore, the sample contained 925 persons. The informed consent was signed, the questionnaire was completed, and the physical examination was undertaken by 725 adults. The records with any missing metabolic syndrome related data was excluded from the analysis. Finally, 646 SC-records were analyzed.

There were remarkable demographic differences between SC and Hungarian reference samples (table 1). The male proportion was much lower in studied SCs (39.16%) than in representative Hungarian sample (47.47%). The age distribution of SC sample was shifted towards the younger age groups, and strongly deviated from the Hungarian reference distribution. The level of education was considerably lower among SC inhabitants than the national reference. Both in the general Hungarian and the Roma populations the prevalence of the raised fasting plasma glucose concentration or formerly diagnosed diabetes mellitus, as well as that of the raised triglyceride level or treated lipid disorder were significantly more frequent among males, while the frequency of central obesity was higher among females. In the general population the prevalence of hypertension was higher among males, but the same difference can not be detected in the Roma group (table 2 A and B).

The central obesity ($p<0.001$) and the hypertension ($p<0.001$) were less frequent among SC inhabitants in both genders. Contrary, the reduced HDL cholesterol level ($p=0.029$) and the higher fasting blood glucose concentration ($p<0.001$) were significantly more frequent in the SC sample. The raised triglyceride level was similar in the studied samples ($p=0.084$). Altogether, the observed prevalence data of metabolic syndrome in SC (36.38%) and control Hungarian (34.96%) samples were not deviated from each other ($p=0.525$). (table 2 C, D and E)

The age specific prevalence estimates show that the central obesity and the hypertension were less frequent only among older CS inhabitants. On the other hand, the reduced HDL cholesterol levels and higher fasting blood glucose concentrations were manifested in almost every age group (figure 1).

In multivariate model, the age proved to be significant risk factor for metabolic syndrome (OR=1.06, 95%CI 1.05-1.07) and for every of its components (table 3). Apart from the decreased HDL cholesterol level, all the studied outcomes were significantly influenced by gender: the central obesity was more frequent among women; other components and the metabolic syndrome (OR=0.75, 95%CI 0.62-0.91) were associated with the male gender. The studied outcomes were independent of the education. Raised fasting plasma glucose or known type 2 diabetes mellitus (OR=2.65, 95%CI 1.90-3.69), reduced HDL cholesterol level or treated lipid disorder (OR=2.15, 95%CI 1.65-2.79), and consequently, the metabolic syndrome (OR=1.37, 95%CI 1.03-1.83) were more frequent among SCs' inhabitants.

DISCUSSION

Roma, the largest minority population of Europe shows an accumulation in the Central, Eastern and Southern (CES) European countries, so the problems related to this low educated, typically unemployed, marginalized population living in deep poverty were considered as regional challenges of CES countries. The opening of borders in the process of previous and ongoing EU expansion has enabled increasing numbers of Roma to settle in other parts of the EU and has focused attention on the need to address Roma exclusion not only at national, but also international level and has highlighted Roma problems as common European challenges.[21,22] Recent changes to Canada's immigration legislation (Bill C-31) clearly show that the Roma problems do not respect even the continental borders.

Over the past decades, a series of national and international policy initiatives have been designed to improve the situation of the Roma, and EU-wide policy networks focusing on education, employment, housing and health have also been established to support Roma inclusion.[21,23] Unfortunately, there has been limited assessment of actual outputs and results of the projects benefiting Roma inclusion and improving Roma health.[24] Additionally, new concern has been raised that the current economic crisis may disproportionately affect vulnerable communities, including the Roma.[25]

Epidemiological studies on health of the Roma people were focused almost exclusively on communicable diseases and reproductive health before the turn of millennium,[26] and research has only recently extended to the field of non-communicable diseases and their risk factors. These studies are limited in number, and have severe uncertainties on the identification of Roma ethnicity and are restricted to one or a few indicators. Most of these studies can not be really conclusive, because no comparison was made with the overall population. Some others which make comparison report contradictory findings: some studies show no difference between Roma and non-Roma populations in the cardiovascular disease (CVD) occurrence,[27] while others report increased prevalence of various CVD risks among Roma.[11,12,13,14]

A comparative study of the CVD risk profile for a sample of 430 adult Roma living in rural Croatia compared with those for the general Croatian population was recently published.[28] The findings indicated that the Roma population bear a high CVD risk load related to smoking and high glucose level; and a higher prevalence of CVD risks in women and the higher body mass index in younger age group (18-34 years) characteristic for the Roma population were in contrast to the findings in the general population of Croatia. However, although the components were targeted in the study, the prevalence of metabolic syndrome was not defined.

Until now only a single report[29] tried to estimate the prevalence of metabolic syndrome among Roma and concluded that it is high. The small sample size (N=77), as well as the method used for sampling (Roma people who visited the GPs with different complaints were included) excludes the possibility to get scientifically acceptable estimates. The reported 50.6% prevalence can be interpreted as an overestimate.

In our present study the sample frame and size was almost identical with those we previously used in a comparative health interview survey[30] and data obtained in the Roma sample have been compared to reference values determined in the HMMS.[20] The prevalence of every components of metabolic syndrome showed continuous elevation by age in the Hungarian reference population. Similar pattern was observed for Roma only among 20 to 54 years old adults, but further elevation was not observable in the 55-59 and 60-64 yrs age groups, values were unchanged (HDL cholesterol) or slightly decreased (blood pressure, fasting serum glucose, triglyceride), while the prevalence of central obesity became even significantly lower for the 55-59 yrs group of Roma people. The analysis of data with age-group stratification clearly shows that the significantly lower prevalence of elevated blood pressure or treated hypertension, as well as that of central obesity is the effect of their decreased prevalence in the older age groups and not a characteristic of the whole Roma population; it is reasonable to suppose that the decrease is a consequence of the deaths of people with risk factors combined before reaching age of 55. Considering the sex-composition of the Roma sample it can be suggested that mainly the men are affected.

The fact that the prevalence of elevated fasting glucose level and that of decreased HDL cholesterol concentration is higher in all age groups of Roma strongly suggest that genetic background exists behind these phenomena. A current review summarizing recently published reports on the genetic architecture of lipid metabolism reports 52 genes responsible for HDL cholesterol level.[31] In a large scale epidemiological study (Tehran Lipid and Glucose Study) the estimates of age and gender adjusted heritability for abdominal obesity, low HDL cholesterol, high triglyceride, high fasting blood glucose and high blood pressure were 22, 40, 34, 38 and 23%, respectively ($p<0.05$), i.e. the contribution of genetic factors was highest to the development of low HDL cholesterol (40%) and high fasting blood glucose (38%) levels.[32] Concerning genetic determinants of carbohydrate metabolism recent genome-wide association studies have identified and replicated 75 susceptibility loci associated with type 2 diabetes and related metabolic traits (see reviewed in[33]). Studies convincingly support the hypothesis on the strong influence of the gene-environment interactions in the development of type 2 diabetes[34] and also demonstrate interactions of gene variants with measures of dietary intake and exercise.[35,36] Although it is generally accepted that in case of metabolic syndrome life-style changes are the most adequate therapeutic interventions[37,38] and presently there is insufficient support for clinical application of gene-based prediction models in metabolic syndrome, there is direction and encouraging progress in a rapidly moving field that is beginning to show clinical relevance.[39] It has to be accepted that careful clinical trial programs are needed to determine which HDL raising therapeutic interventions may indeed exert protective effect.[40]

The most obvious limitation of the current health examination survey of Roma people was that it was not representative of the overall Hungarian Roma population. Those Roma who have assimilated with the majority population were excluded, and consequently the survey captured the characteristics of the most disadvantaged part of the Roma population. However, identification of the needs of this group is the most important from a policy perspective. It is also important to note that the random sample representative for the general Hungarian population of the Hungarian Metabolic Syndrome Survey have included some people who are Roma, so it is possible that their inclusion was slightly dilute the true difference between the populations.

Our results show that metabolic syndrome strongly contribute to the development of the poor health status of the Roma population. Among the components of metabolic syndrome decreased HDL-C and elevated fasting blood glucose levels with genetic predisposition are the most prominent findings, which gives specific importance to the screening for these blood components on a regular basis.

Human Participant Protection

The study has been approved by the Ethical Committee of the Hungarian National Scientific Council on Health (8907-O/2011-EKU, 285/PI/11).

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Conflicts of interest: None declared.

Contributors

R. Ádány had the original idea for the comparative Roma Health Examination Survey, participated in the questionnaire and sampling design, interpreted the results and wrote the article. Z. Kósa and Á. Moravcsik-Kornyicki participated in the questionnaire and sampling design, performed the sampling and interpreted the results. Z. Szabó specified the diagnostic criteria and methods used to detect the metabolic syndrome's components. J. Sándor planned the sampling, performed the statistical analysis and interpreted the results. J. Diószegi and B. Roberts contributed to the writing of the manuscript.

Keypoints

• This study shows that the prevalence of metabolic syndrome (MS) is significantly higher among Roma than in the general population in Hungary due to the much higher frequency of raised fasting plasma glucose (or known type 2 diabetes mellitus) and that of reduced HDL cholesterol level (or treated lipid disorder).

• Reduced HDL cholesterol and the higher fasting blood glucose concentrations were significantly more frequent in all age groups of the Roma sample in both genders, which may indicate a genetic background.

• These findings suggest that besides tackling the socioeconomic determinants of the poor health of Roma people, specific public health interventions considering increased susceptibility to disturbances both in carbohydrate and lipid metabolisms are needed to improve their health status.

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Table 1
Socio-demographical characteristics of study samples representative for segregated Roma colonies and for Hungarian adult population.

Socio-demographical factors		Segregated Roma sample (N=646)	Representative Hungarian sample (N=1542)
Age groups (years)	20-24	68 (10.53%)	93 (6.03%)
	25-29	59 (9.13%)	157 (10.18%)
	30-34	79 (12.23%)	161 (10.44%)
	35-39	101 (15.63%)	155 (10.05%)
	40-44	117 (18.11%)	171 (11.09%)
	45-49	72 (11.15%)	185 (12%)
	50-54	66 (10.22%)	237 (15.37%)
	55-59	47 (7.28%)	210 (13.62%)
	60-64	37 (5.73%)	173 (11.22%)
Sex	Female	393 (60.84%)	810 (52.53%)
	Male	253 (39.16%)	732 (47.47%)
Education	Less than primary	250 (38.7%)	31 (2.01%)
	Primary	304 (47.06%)	266 (17.25%)
	Vocational	75 (11.61%)	504 (32.68%)
	High school	15 (2.32%)	521 (33.79%)
	University	1 (0.15%)	204 (13.23%)
	Missing	1 (0.15%)	16 (1.04%)

Table 2
Ethicity- and gender-specific prevalence of metabolic syndrome and its components among 20-64 years old Hungarians (A) and inhabitants of segregated Roma colonies (B), compared with each other (C, D, E).

Metabolic syndrome components	A. Representative Hungarian sample by gender			B. Segregated Roma sample by gender			C. Studied sample by ethnicity			D. Segregated Roma vs. Representative Hungarian males	E. Segregated Roma vs. Representative Hungarian females
	Females (N=810)	Males (N=732)	p	Females (N=393)	Males (N=253)	p	Segregated Roma sample (N=646)	Representative Hungarian sample (N=1542)	p	p	p
Central obesity	76.17% [73.25-79.09]	62.43% [58.94-65.92]	0.013	66.16% [61.5-70.81]	52.17% [46.05-58.30]	0.076	60.68% [56.91-64.45]	69.65% [67.35-71.94]	<0.001	0.004	<0.001
Raised blood pressure or treated hypertension	44.32% [40.92-47.72]	53.01% [49.41-56.60]	0.045	38.68% [33.89-43.47]	43.08% [37.01-49.15]	0.469	40.40% [36.62-44.19]	48.44% [45.95-50.94]	<0.001	0.007	0.063
Raised fasting plasma glucose concentration or formerly diagnosed diabetes mellitus	10.49% [8.39-12.59]	21.17% [18.23-24.12]	<0.001	21.88% [17.82-25.95]	35.18% [29.32-41.03]	0.005	27.09% [23.66-30.52]	15.56% [13.75-17.37]	<0.001	<0.001	<0.001
Raised triglyceride level or treated lipid disorder	31.36% [28.18-34.54]	44.95% [41.36-48.53]	<0.001	28.24% [23.82-32.67]	42.69% [36.62-48.75]	0.008	33.90% [30.25-37.55]	37.81% [35.39-40.23]	0.084	0.533	0.271
Reduced HDL cholesterol level or treated lipid disorder	34.2% [30.95-37.45]	38.11% [34.61-41.62]	0.273	55.73% [50.84-60.61]	51.38% [45.26-57.51]	0.554	54.02% [50.18-57.87]	36.06% [33.66-38.45]	0.029	<0.001	<0.001
Metabolic syndrome	32.72% [29.5-35.93]	37.43% [33.94-40.92]	0.179	34.86% [30.17-39.55]	38.74% [32.76-44.71]	0.496	36.38% [32.67-40.09]	34.95% [32.57-37.33]	0.525	0.712	0.460

Table 3 Socio-demographical risk factors of metabolic syndrome and its components by multivariate logistic regression model for 20-64 years old adults in Hungary (odds ratios and 95% confidence intervals).

	Age (year)	Sex (female/ male)	Education*				Ethnicity (Roma/ Hungarian)
			primary	vocational	high school	university	
Central obesity	1.06 [1.05-1.07]	1.93 [1.59-2.36]	1.36 [0.98-1.90]	1.44 [0.98-2.14]	1.45 [0.96-2.20]	1.06 [0.66-1.71]	0.84 [0.63-1.12]
Raised blood pressure or treated hypertension	1.09 [1.08-1.10]	0.62 [0.51-0.76]	1.09 [0.78-1.53]	1.02 [0.69-1.53]	0.85 [0.56-1.30]	1.01 [0.62-1.64]	0.94 [0.70-1.26]
Raised fasting plasma glucose concentration or known type 2 diabetes mellitus	1.07 [1.06-1.08]	0.40 [0.31-0.51]	1.31 [0.91-1.90]	1.03 [0.66-1.62]	0.72 [0.44-1.19]	0.59 [0.32-1.12]	2.65 [1.90-3.69]
Raised triglyceride level or treated lipid disorder	1.05 [1.04-1.06]	0.52 [0.43-0.62]	1.21 [0.87-1.68]	1.36 [0.93-2.00]	1.27 [0.85-1.90]	1.35 [0.85-2.16]	1.22 [0.93-1.62]
Reduced HDL cholesterol level or treated lipid disorder	1.02 [1.02-1.03]	0.93 [0.78-1.11]	0.96 [0.70-1.30]	0.96 [0.67-1.38]	0.80 [0.55-1.17]	0.82 [0.52-1.27]	2.15 [1.65-2.79]
Metabolic syndrome	1.07 [1.06-1.08]	0.75 [0.62-0.91]	1.04 [0.75-1.44]	0.99 [0.67-1.46]	0.89 [0.60-1.34]	0.87 [0.54-1.41]	1.37 [1.03-1.83]

* less than primary education serves as reference category

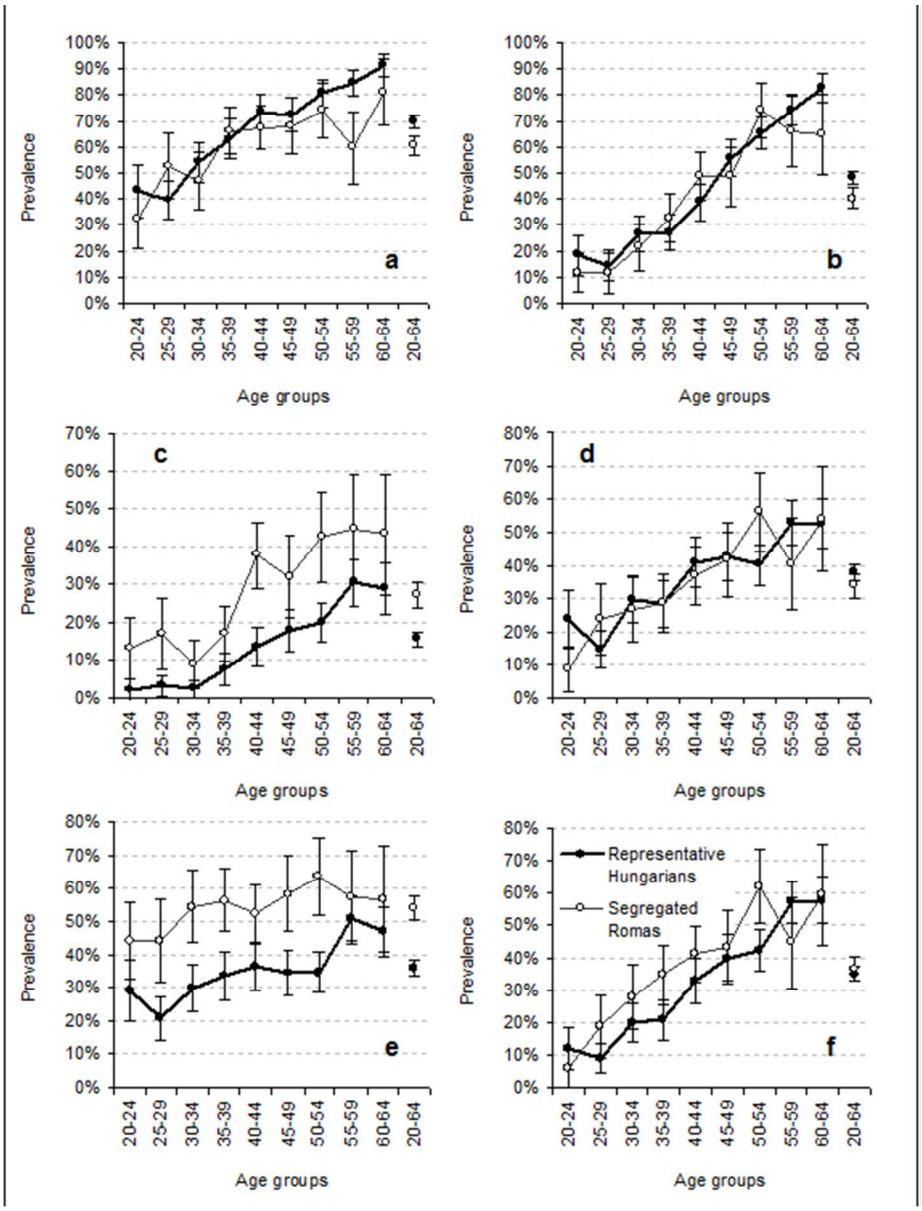
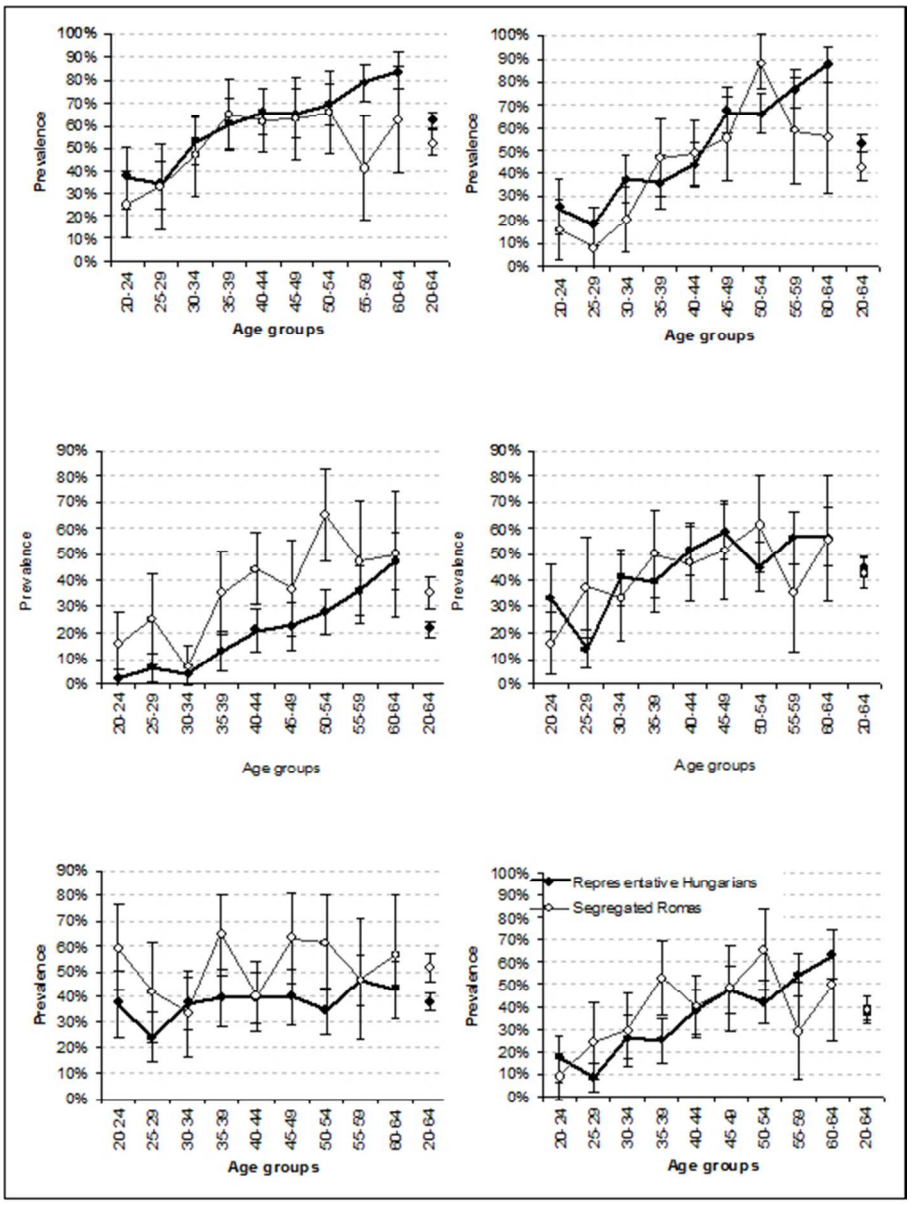
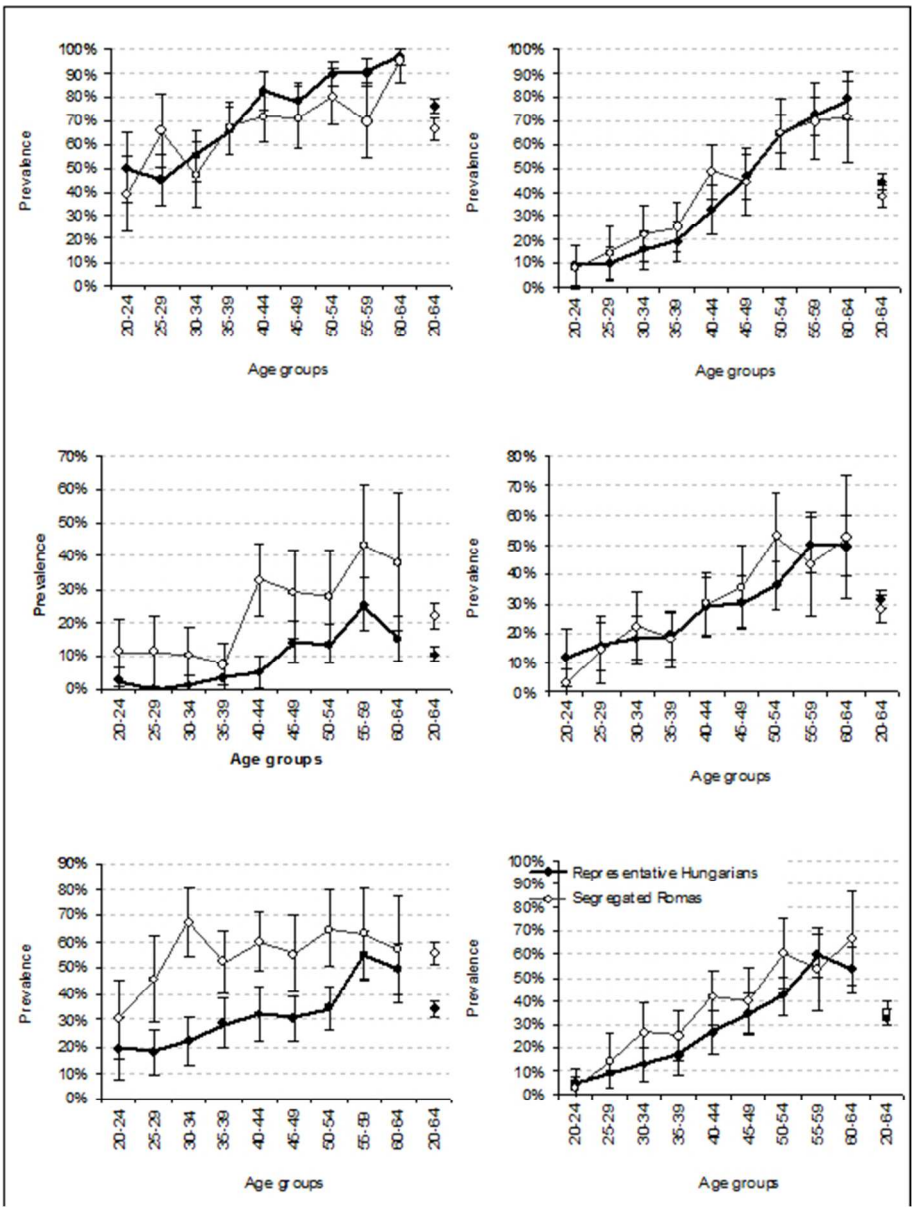


Figure 1
Age specific prevalence (with 95% confidence interval) of central obesity (a), raised blood pressure or treated hypertension (b), raised fasting serum glucose concentrations or formerly diagnosed type 2 diabetes mellitus (c), raised serum triglyceride levels or treated lipid disorders (d), reduced serum HDL cholesterol levels or treated lipid disorders (e), and metabolic syndrome (f) in 20-64 years old adults' samples representative for the population of Hungary and for the inhabitants of segregated Roma colonies.



Ad Figure 1 Age specific prevalence (with 95% confidence interval) of central obesity (a), raised blood pressure or treated hypertension (b), raised fasting serum glucose concentrations or formerly diagnosed type 2 diabetes mellitus (c), raised serum triglyceride levels or treated lipid disorders (d), reduced serum HDL cholesterol concentration or treated lipid disorders (e), and metabolic syndrome (f) in 20-64 years old males' samples representative for Hungary and for segregated Roma colonies in Hajdu-Bihar and Szabolcs-Szatmar-Bereg counties.



Ad Figure 1 Age specific prevalence (with 95% confidence interval) of central obesity (a), raised blood pressure or treated hypertension (b), raised fasting serum glucose concentrations or formerly diagnosed type 2 diabetes mellitus (c), raised serum triglyceride levels or treated lipid disorders (d), reduced serum HDL cholesterol concentration or treated lipid disorders (e), and metabolic syndrome (f) in 20-64 years old females' samples representative for Hungary and for segregated Roma colonies in Hajdu-Bihar and Szabolcs-Szatmar-Bereg counties.