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Croatian Adult Health Survey – A Tool for Periodic Cardiovascular Risk Factors Surveillance

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A B S T R A C T

National risk factors surveys present very important tool for gathering population based health related information for policy. Croatian Adult Health Survey (CAHS) is such a tool, intended to collect population-based, representative and authoritative information on cardiovascular risk factors prevalence. The CAHS sample was designed to provide nearly complete coverage (98%) of the Croatian adult population, based on the random selection of the adult member of the household that was selected in the complex sampling scheme. Additionally, seven-step weighting scheme was applied to the dataset, in order to further increase the representativeness of the sample which is consequently considered to be representative for six geographical and administrative regions of Croatia, while it is considered only to be informative for the county-based estimates. The first cycle of the project took place in 2003, with a total of 9,070 respondents. The second project cycle is taking place in 2008. It has now been converted into the follow-up study (re-surveying the 2003 sample) and is being further supplemented with additional questions, qualitative investigation module and an intervention performed by the public health nurses. The CAHS provides not only the basis for health information for policy, but also serves as a platform for a number of ongoing public health collaborations and a valuable public health research resource.

Key words: *Croatian Adult Health Survey, surveillance, risk factor, cardiovascular, health policy, Croatia*

Introduction

One of the main requirements for the optimal performance of the health systems is reliable information on which decisions and policies can be made. Often this type of decisions is based on the morbidity or mortality data, which is generally sufficiently informative as well as relible. However, some health care actions, especially those in disease prevention and health promotion have to be based on the more proximate information and intermediate health outcomes, namely prevalence of various risk factors and health-related behavior patterns including e.g. smoking, dietary patterns and physical (in)activity[1–4].

A large overview of the national risk factor surveys indicated that the methodological background, basic approach as well as the survey composition largely varied across Europe[1]. Not only this, but the number, dynamics and the extent of such surveys that are being carried out across these countries also varies[1], possibly reflecting the financial opportunities and the overall awareness on importance of the risk factors surveillance. Among the 67 surveys that were compared, the authors found substantial differences, often making comparisons between or among countries difficult or impossible[1]. However, the main conclusion of this line of research is that the cardiovascular risk factors have substantial contribution to the overall morbidity and mortality, making them an interesting target for information collection and the development of various health interventions[5].

Setting

Croatia is a country of marked geographic and cultural diversity. It consists of a continental and coastal part, as well as some mountainous regions. Each of these regions is characterized by different cultural habits as well as the complexity of lifestyle patterns, producing a unique mixture within one country. One of the most famous and widely repeated differences is the »unhealthy East« paradigm, suggesting that inhabitants of the conti-

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nental parts of the country (primarily Eastern parts, Slavonia) are more inclined towards fatty diet with less vegetables intake and the overall »unhealthy lifestyle«, than those in the costal parts (Dalmatia). Additionally, the 1991–1995 war has caused substantial changes in the demographic structure and the overall health status of the population, marked by the substantial destruction of the infrastructure and large number of displaced persons[6,7]. One of the first problems within the health system after the war was the lack of information that could be used to create and organize the appropriate health care delivery to the population. This prompted the Ministry of Health and the Croatian Health Insurance Institute to undertake a large project that would collect such information. The first national population based survey was initiated and conveniently entitled »The First Croatian Health Project«. It provided the first post-war population based source of information for health policy, aiming to create a framework for developing a long-term strategy of public health planning, prevention and intervention[8]. The project took place in 1995–1997 and sampled over 10,000 individuals from 30 randomly selected settlements from all counties in Croatia, putting a strong emphasis on the local information dissemination. From this sample, a backwards procedure was employed, selecting a representative sub-sample of the Croatian population aged 18–65 on the basis of a hierarchical, stratified multistage design (N=5,840). Several serum measurements were measured from the blood sample that was taken from each respondent; cholesterol, HDL and LDL, triglycerides and fibrinogen. Additionally, detailed data on general knowledge and attitudes on health issues was collected, further supplemented by the information on smoking, alcohol consumption, dietary pattern, physical activity, family medical history and occupational exposures[8]. The only publicly available publication summarized these results[8] and provided an overview of the general health status in the Croatian population.

Second population based survey employed a different sampling technique. Croatian Health Survey consisted of four different population groups, among which the »open« (=general) population was in the main interest focus[9]. The sampling was based on the stratified multistage sampling in four regions of Croatia. A random sample of health centers was made in each region, from which approximately 10% of the population in the general practitioners (insurance register) records was randomly selected, thus covering approximately 0.1 percent of the entire Croatian population. The selected individuals were then approached and interviewed in their homes by the trained interviewers. Data were collected from February 1997 to February 1999, resulting in the total of 5,048 respondents and the overall response rate of 96%[9]. However, neither the Croatian Health Survey nor the First Croatian Health project were used for publication of more scientific articles or reports that are available in the public domain, resulting in the low amount of population-based information for policy.

Country Profile

Cardiovascular diseases are currently the leading cause of death in Croatia. In 2000 there were 26,712 cardiovascular disease related deaths, while in 2005 there were 26,029 of deaths, accounting for one out of every two deaths in Croatia[10]. Standardized mortality ratio of ischaemic heart disease and cerebrovascular disease in Croatia is among the highest in the region (Table 1).

TABLE 1
STANDARDIZED MORTALITY RATIOS FOR ISCHAEMIC HEART DISEASE AND CEREBROVASCULAR DISEASE (DATA FROM 2004)[10]

Country	Ischaemic heart disease	Cerebrovascular disease
Croatia	154.49	127.79
Austria	115.80	42.80
Czech Republic	163.60	11.82
Slovenia	82.45	72.02
Hungary (2003)	232.66	134.37

Despite these figures, the current Croatian health care system does not put a lot of attention to the primary prevention of cardiovascular and cerebrovascular diseases, but focuses on those who already have symptoms of coronary heart disease or cerebrovascular diseases, encompassing activities in the secondary prevention. Activities in primary prevention, delivered to those who are at the greatest risk on contracting these diseases in the future are not developed as a well-designed preventive-educative system. Furthermore, there was no evidence base for developing policy on reducing the burden of cardiovascular disease and recommending interventions for people with cardiovascular risk factors[11–13].

Croatian Adult Health Survey – Sampling and Coverage

Croatian Adult Health Survey (CAHS) was initiated in 2001, in collaboration of Croatian Ministry of Health, Statistics Canada, Central Bureau of Statistics of Croatia and Andrija Stampar School of Public Health. The field work was carried out during 2003[14–16]. Primary objectives of the CAHS were to provide timely, reliable, cross-sectional estimates in order to support the work around developing a public health information system, enhanced national efforts in health promotion with emphasis on cardiovascular disease prevention, cardiovascular disease risk reduction, clinical prevention and emergency care and to promote healthier lifestyles among the general population with emphasis on smoking prevention and cessation[14]. The sample was designed to cover the adult population of Croatia (aged 18 years or older), who were living in private dwellings (those who were living in

non-conventional dwellings, clientele of institutions, full--time members of the Croatia Armed Forces and residents of certain remote regions were excluded from this survey, as well as the district of Brezovica in the city of Zagreb). The 2003 CAHS covered approximately 98% of the Croatian population aged 18 or older[14]. The sample was designed to provide the representative estimates from six regions of Croatia that were selected and grouped on the basis of the counties (Figure 1).

Furthermore, each stratum (except city of Zagreb) was divided in two sub-strata: town and municipality, in order to obtain sample homogeneity and provide better estimates[14]. According to these premises and taking into account estimated non-responsiveness, sample was designed on the basis of 11,250 households that were accordingly distributed in the higher level regional organization strata.

After identification of the household unit, one adult inhabitant was to be randomly selected and included in the study by using a vector of random numbers and based on the number of eligible persons. The survey was carried out by 238 public health nurses from April 22, 2003 until the end of June[14]. Public health nurses were surveying in the regions where they usually work, ensuring that non-responsiveness would be minimal. In an attempt to further minimize non-responsiveness, an introductory letter signed by the Croatian Minister of Health was presented to each selected household[14]. All these actions contributed to the overall response rate of the CAHS, which was 84.3%, with significant differences among the six defined regions (χ^2=17.31; P<0.001). The highest response was recorded in the Northern region with 92.0% (χ^2=6.97; P=0.008, compared to all other regions in a pooled analysis), while the lowest response rate was in the city of Zagreb with only 76.5% (χ^2=9.08; P=0.003). Furthermore, the entire sample was designed on the basis of town and remaining county, enabling the comparison of the response from these two regions. Overall, the response was higher in remaining parts of counties than in towns (87.5% vs. 82.7%, respectively), but the difference was not significant (χ^2=3.51; P=0.061). The CAHS sample also shows significant deviation from the gender structure of the entire population, based on the 2001 Census of population (χ^2=888.36; P<0.0001). The highest percent of men in the sample was recorded in Southern Dalmatia (33.9%), while the least men respondents were recorded in the city of Zagreb (29.7%), although this difference was not significant (χ^2=8.73; P=0.120). These findings suggest that two sub-population groups that were under-sampled were men and those living in urban areas, while rural population seemed to be more prone to participation in this type of study.

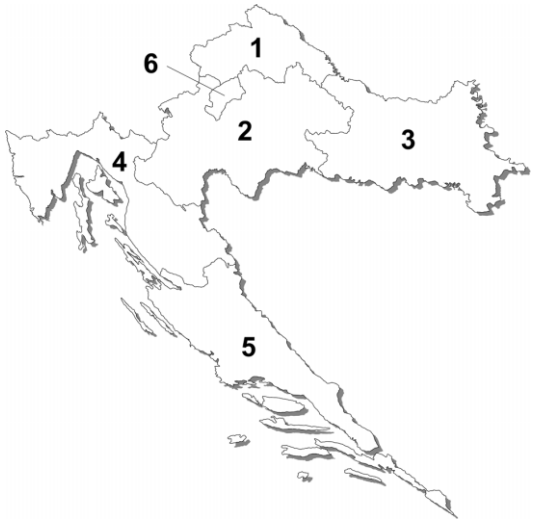

Fig. 1. Geographic representation of the initial regions that were used to define the CAHS sample: 1 – Northern Croatia, 2 – Central Croatia, 3 – Eastern Croatia, 4 – Western Croatia, 5 – Southern Croatia and 6 – The City of Zagreb.

The CAHS sample was designed to provide representative estimates on the regional level, while on the county level it is considered only to be informative (the same goes for even lower geographical level, towns). This is seen especially well in the case of Pozega-Slavonia and Virovitica-Podravina Counties, which had the lowest contribution to the CAHS sample, when this was compared to the percent of the population living in those two counties (both counties had twice less respondents than expected, when the county sample size in CAHS was compared to the county population count based on the Census of population 2001 data). In contrast, two counties that were obviously over-sampled were Koprivnica-Krizevci and Lika-Senj, with Koprivnica-Krizevci sample having 63% of over-sampling, compared to the expected county--based sample size.

The sample breakdown into even lower geographical units, towns, resulted in the formation of 85 units – clusters (Figure 2). Among these, the CAHS cluster samples were representative for gender composition in only 8 units, for age composition (according to four age groups – 18–34, 35–49, 50–64 and 65 and more) in 12, while for both age and gender composition in only three units (clusters for Dubrovnik, Krizevci and Zupanja). Thus, the sample of CAHS is to be used with caution for any geographical unit lower than the six regions defined as the groups of counties. This in turn means that the use for the county or town level the data can be considered only informative, as the samples often show significant deviations even from the age and gender structure of each sub-population.

Finally, a complex, seven-step weighting scheme was applied, further increasing the representativeness of the sample, the method that is usually used in this type of the study designs[17,18]. Weighting scheme was adjusted to reflect estimates for the entire population, meaning that all the estimates from the CAHS sample are calculated for the entire adult population of Croatia[14]. The use of the weighting scheme that also accounts for non-responsiveness puts CAHS in the group of better national surveillance studies, as this was identified as one of the main reasons for low usability and comparability of results

Fig 2. Sampling frame for the CAHS, with circle size being proportional to the sample size for each town.

from different surveys across Europe[1]. The use of the complex sampling frame and the weighting method requires that all the analyses be performed with bootstrap variance estimation, in order for the results to be representative for either the six defined regions or entire Croatia[14,19]. The use of the weighting also requires special variance estimation methods, which is obtained by the coefficient of variation (CV). Values of CV between 0 and 16.5 are considered to be acceptable, between 16.6 and 33.3 marginal, while those over 33.3 are considered unacceptable[14].

Another geographical classification was recently introduced into CAHS, based again on six regions within Croatia, but this time recognizing mountainous parts of the country as the separate region. This classification considers that parts of Primorsko-goranska, Lika-Senj and Karlovac counties form mountainous region, while Northern and Southern Dalmatia are merged into single, coastal region (Figure 3). Although this classification does not follow the county borders any more, it provides hypothetically better basis for any public health study and intervention, as the population of mountainous regions was until now dispersed in three counties, thus disabling the presentation of their health status and problems.

Public Health Importance

The direct benefit of the population based risk factor surveillance is obvious, for both public health as well as the overall health care provision. However, CAHS has another set of perhaps less tangible, but also very important benefits. The survey contained 12 question modules (Table 2), meaning that a large number of researchers and stakeholders would be interested in the study results, making them more valuable to the public health experts, as well as all those who are involved in broader scope of health and social welfare. Therefore, the CAHS provides the basis for ongoing research in public health, which has so far been used for a number of research articles and several doctoral theses[13,20,21]. Results of the initial descriptive analysis were published in two different symposia on cardiovascular health and the most interesting ones were further expanded and published in the special issue of journal *Acta Medica Croatica*.

Besides this research potential of the CAHS, it also serves as the hub for networking in public health and for bridging the gap between researchers and public health practitioners. This is seen in a numerous occasions of collaboration between Andrija Stampar School of Public Health and Croatian National Institute of Public Health or County Institutes for Public Health. In this light it should also be noted that there is a post-graduate course at the Zagreb University Medical School that has been submitted to the Postgraduate Board and is currently under evaluation. The course will mainly cover the methodological issues related to performing and analyzing the results from the large population surveys. Other than postgraduate course, there were also several workshops on CAHS, aiming to provide training to individuals who are interested in analysis and interpretation of the results from CAHS. All these activities ensured that CAHS team would develop sufficient capacity for further research and the basis for ongoing surveys delivery. The core CAHS consists from the researchers from Andrija Stampar School of Public Health and Croatian National Institute of Public Health.

Future Directions

Undertaking of the project of this magnitude requires substantial financial and organizational effort. This is the reason why neither this nor majority of other surveys are being carried out on an annual basis[1]. However, pe-

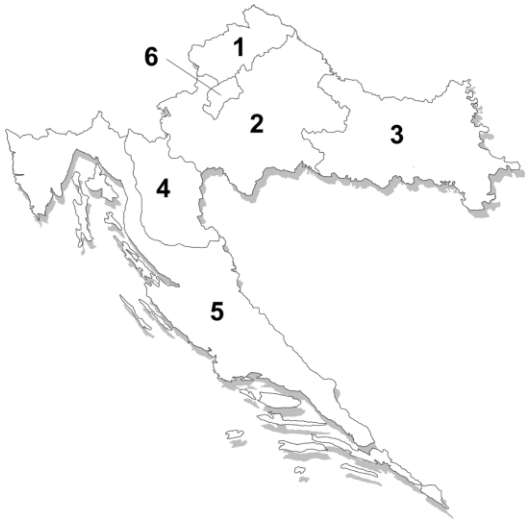

Fig. 3. Geographic representation of the re-organized regions that were used to define the CAHS sample: 1 – Northern Croatia, 2 – Central Croatia, 3 – Eastern Croatia, 4 – Mountainous Croatia, 5 – Coastal Croatia and 6 – The City of Zagreb.

TABLE 2
CROATIAN ADULT HEALTH SURVEY QUESTION MODULES

Module	Description
Household	General information, including household size and age composition, number of rooms, income per household and urbanisation level
Socio-demographic characteristics	Age, gender, marital status, education, occupation and subjective estimation of socio-economic status
SF-36 questionnaire	Widely accepted survey, consisting of several dimensions, namely general health, activity limitations, mental and physical problems
Health care access and utilization	Detailed data on visits to physicians, specialists, dentists, etc; difficulties in accessing health care services, health insurance coverage
Chronic conditions, medication, preventive examination	Data on 21 self-reported disease and medication taking; several questions on preventive examinations and screenign for cancer and other chronic diseases
Smoking	Everyday smoking including the possibility to calculate pack-years estimates, information on quitting attempts, exposure to second hand smoke
Physical activity	Self-reported physical activity estimates, time spent for work and leisure
Dietary habits	A detailed module with a number of questions that enable the creation of the dietary profile; information on breakfast, fat, sugar and caffeine intake, salt, meat, fruit/vegetable consumption
Alcohol consumption	Questions on types and amount of alcohol consumption, binge drinking
Physical measurement	Height, weight and waist circumference, blood pressure and pulse rate

riod undertaking of surveys is the basis for the sufficient information provision that can be used for decision making in health. The information from surveillance studies is valuable even if it is provided on non-representative basis, but in the consecutive, follow-up design (as for example we may see in the second generation of HIV/AIDS surveillance, where repeated surveys of even non-representative samples can be used to deduce the epidemics dynamic and provide information for intervention[22]). Similar approach was applied in the CAHS continuation study that was approved and funded by the Croatian Ministry of Science, Education and Sports. The study design was changed from the cross-sectional into the follow-up study. The study was initiated and started in 2008, aiming to re-survey the same sample and provide cardiovascular risk factor prevalence estimates five years after the initial study. Therefore, the data will now enable the calculation of various estimates that are not available in the cross-sectional studies. The field work will be done by public health (outreach, visiting) nurses, who are now involved in formal way into the delivery of CAHS 2008. The questionnaire was additionally supplemented with several questions, aiming to further increase the usability of the CAHS. Besides this, the 2008 study will provide the basis for the comparison of the health related behavior patterns and their possible change compared to 2003. This will enable the identification of the population sub-groups that changed their health related behavior in response to the various public health actions that took place on both national and regional level between the study cycles. Another development in 2008 survey compared to 2003 is that 2008 survey will contain qualitative investigation component, the approach that is becoming increasingly popular in expanding the usability of the population-based surveys[23].

One way to broaden and increase the usability of the current study strategy could include the creation of the county-based representative sampling schemes. This idea has been suggested by several counties, mainly due to the fact that the health and public health systems are largely organized and run on the county level. The performance of the county based surveys would have to rely on a detailed sample definition that would include a large number of respondents per county and require substantial financial support. The entire CAHS sample, if it was defined to be representative for county-based estimates would have to include well over 25,000 respondents, what would require a lot of organizational effort and substantial financial support. However, by doing this, each county could gain very valuable health information that could be used to design targeted changes in the way that health care is run and provide the basis for well-defined public health intervention programs.

One of the possible future directions for CAHS is linking with other population-based surveys of either commercial or governmental nature. This could be achieved via linking with e.g. several union-based surveys[24], which have a main focus on the expenses and social status of the population. Although the dynamics of these surveys is much faster, it could be interesting to compare the results from the national survey to those obtained by the local surveillance by the union members, in order to obtain reliable information. Finally, one of the best possible scenarios, especially if the preventive medicine and health promotion would be given more weight within health system, is turning the CAHS into the sustainable governmental survey that would be carried out on the regular basis (annually, bi-annually or every five years). Furthermore, a detailed comparative study on CAHS would enable that the results from CAHS can be compared or even

used in a pooled analysis with a number of other similar surveys that take place across Europe[1]. A quick comparion to some of these surveys indicate that CAHS is somehere between all these studies in terms of the sample definition and size, while it provides estimates that are methodologically comparable to some of the better surveys that were analyzed in that study[25]. Additionally, it would be very interesting to perform representative survey of the Croatian island populations, which have been shown to have unusual prevalence of certain diseases and therefore present highly interesting research target[26–31].

In conclusion, national surveillance studies are usually based on the cross-sectional design that is repeated in a periodic manner, but in different samples. Therefore, the future plan for the CAHS is to perform a new cross-sectional study ten years after the initial one, namely in 2013. This study would be similar to the 2003 study, aiming to provide another population-based representative sample that will be used to provide the population based risk factor prevalence estimates.

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HRVATSKA ZDRAVSTVENA ANKETA – SREDSTVO ZA POVREMENO PRAĆENJE UČESTALOSTI KARDIOVASKULARNIH ČIMBENIKA RIZIKA

S A Ž E T A K

Anketna ispitivanja čimbenika rizika su jedno od vrlo važnih sredstava za prikupljanje podataka za odlučivanje i organizaciju zdravstvenog sustava. Hrvatska zdravstvena anketa (HZA) je jedan takav primjer, kojem je cilj prikupljanje populacijskih, reprezentativnih i provjerenih podataka o učestalosti kardiovaskularnih čimbenika rizika. HZA uzorak je definiran tako da reprezentira 98% odrasle populacije Hrvatske, na temelju slučajnog odabira odraslog članak kućanstva koje je bilo odabrano na temelju složenog metodološkog pristupa. Dodatno je na anketi primjenjeno ponderiranje uzorka, koje je dodatno povećavalo reprezentativnost te se HZA smatra kao izvor reprezenativnih podataka za cijelu Hrvatsku ili šest zemljopisnih i administrativnih regija. Prvi krug projekta proveden je 2003. godine, s ukupno 9.070 ispitanika koji su bili uključeni u studiju. Drugi krug projekta provodi se tijekom 2008. godine. Metodološki pristup je promijenjen u kohortnu studiju, u koju su dodana nova pitanja. HZA predstavlja ne samo osnovicu za stvaranje podataka za odlučivanje u zdravstvu nego i kao zajednička platforma za veliki broj javnozdravstvenih istraživanja i važan izvor informacija za istraživanje.