Nejednakosti u smrtnosti uzrokovane ishemijskom bolesti srca u osoba starijih od 65 godina u razdoblju od 1990. do 2016.

Inequalities in mortality due to ischaemic heart disease among people over 65 years, 1990-2016

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SAŽETAK: *Ciljevi:* Prema podatcima Svjetske zdravstvene organizacije (SZO), ishemijska bolest srca (IBS) najčešći je uzrok smrti diljem svijeta. Cilj je ovog rada bio analizirati nacionalne i međunarodne podatke o smrtnosti zbog IBS-a po regiji, u dobnoj skupini od 65 godina naviše.

Metode: Prema podatcima registriranima u *European Mortality Database* (databazi SZO-a), proveli smo retrospektivnu kvantitativnu analizu smrtnosti od IBS-a na 100 000 stanovnika u određenoj dobnoj skupini u razdoblju između 1990. i 2016., u zapadnoeuropskim (N = 17), istočnoeuropskim (N = 10) zemljama i u zemljama bivšeg Sovjetskog Saveza (N = 15). Proveli smo deskriptivnu statističku analizu, analizu vremenskih serija i Kruskal-Wallisov test.

Rezultati: Dobna stopa smrtnosti od IBS-a na 100 000 stanovnika bila je najniža u zapadnoeuropskim zemljama (muškarci: 1990.: 1391,00, 2016.: 513,00; *žene*: 1990.: 746,91, 2016.: 264,93), a najviša u zemljama bivšega Sovjetskog Saveza (muškarci: 1990.: 3133,51; 2016.: 2204,41; *žene*: 1990.: 2257,45, 2016.: 1566,44). Značajne su razlike pronađene u dobnoj stopi smrtnosti od IBS-a u obaju spolova pri usporedbi zapadnoeuropskih i istočnoeuropskih zemalja te u zemljama bivšega Sovjetskog Saveza (1990., 2004., 2016.: p<0,05). Između 1990. i 2016. godine standardizirana dobna stopa smrtnosti od IBS-a najviše se smanjila u zapadnoeuropskim zemljama (muškarci: −63,12 %, *žene*: −64,53 %), zatim u istočnoeuropskim zemljama (muškarci: −29,93 %, žene: −31,50 %) te u zemljama bivšega Sovjetskog Saveza (muškarci: −29,65 %, žene: −30,61 %).

Zaključci: Dobna stopa smrtnosti od IBS-a na 100 000 stanovnika smanjila se u oba spola u svim istraženim regijama. Mađarska je imala smanjenje niže od istočnoeuropskoga prosjeka; smrtnost od IBS-a smanjila se za 11,57 % u muškaraca i 10,26 % u žena u dobi od 65 i više godina u razdoblju između 1990. i 2016. godine.

SUMMARY: *Aims:* Ischaemic heart disease is the most common cause of death worldwide according to data of the World Health Organization. Our aim was to analyse national and international data regarding ischaemic heart disease mortality per region in the age group 65 years and above.

Methods: We performed a retrospective, quantitative analysis on age-specific, ischaemic heart disease mortality between 1990-2016 per 100,000 population on data derived from the World Health Organisation, European Mortality Database on Western European (N=17), Eastern European (N=10) countries, and countries of the former Soviet Union (N=15). Descriptive statistics, time series analysis and Kruskal-Wallis test were performed.

Results: Age-related, ischaemic heart disease mortality per 100,000 population was the lowest in Western European countries (males: 1990: 1391.00, 2016: 513.00; females: 1990: 746.91, 2016: 264.93), and the highest in former Soviet Union countries (males: 1990: 3133.51; 2016: 2204.41; females: 1990: 2257.45, 2016: 1566.44). Significant differences were found in age-specific, ischaemic heart disease mortality in both sexes between Eastern and Western European countries and former Soviet Union countries (1990, 2004, 2016: p<0.05). Between 1990-2016, age-specific, standardized ischaemic heart disease mortality showed the biggest decrease in Western European countries (males: -63.12%, females: -64.53%) followed by Eastern European (males: -29.93%, females: -31.50%) and former Soviet Union countries (males: -29.65%, females: -30.61%).

Conclusions: Age-specific, ischaemic heart disease mortality decreased in both sexes in all regions analysed. Hungary was found to have seen a decrease lower than the Eastern European average; ischaemic heart disease mortality decreased by 11.57% in males and 10.26% in females aged 65 and over between 1990-2016.

KLJUČNE RIJEČI: ishemijska bolest srca, smrtnost, epidemiologija.

KEYWORDS: ischaemic heart disease, mortality, epidemiology.

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Uvod

Kardiovaskularne bolesti (KVB) vodeći su uzroci smrtnosti i pobola diljem svijeta. Usprkos smanjenju dobno-standardizirane stope smrtnosti u nekoliko svjetskih regija, apsolutni je broj smrti povezanih s KVB-om u porastu, većinom u zemljama srednjeg i niskog dohotka[1,2]. Ova je skupina bolesti vodeći uzrok smrti u Mađarskoj, nakon čega slijede karcinomi[3-5]. Bolesti krvožilnog sustava bile su uzrok smrti u 55 % umrlih žena i 45 % umrlih muškaraca u 2015. godini[6].

Cilj je ovog rada analizirati podatke o smrtnosti osoba starijih od 65 godina zbog ishemijske bolesti srca (IBS) unutar skupine KVB-a. Prema podatcima Svjetske zdravstvene organizacije (SZO), IBS je najčešći registrirani uzrok smrti diljem svijeta[6]. Usprkos činjenici da je dobno-standardizirana smrtnost zbog IBS-a posljednjih godina u padu, uz nju vezani teret bolesti i dalje je vrlo visok te u je porastu i u Mađarskoj i u svijetu[7-10]. IBS je odgovoran za više od pola prilagođenih godina života s dizabilitetom (DALY; prema engl. *Disability-Adjusted Life Years*) uzrokovanih KVB-om[6].

Podatci o smrtnosti uzrokovanoj IBS-om znatno se razlikuju po regiji. Podatci iz različitih zemalja također se znatno razlikuju ovisno o razdoblju[11]. Danas skupina IBS-a sve više zahvaća populaciju srednje životne dobi u zemljama niskog i srednjeg dohotka, prije svega zbog promjena u stilu života, stresa te drugih čimbenika[12]. Iako se zdravstveni status populacije u istočnoj Europi poboljšava, što uključuje i Mađarsku, indikatori kvalitete života niži su u usporedbi sa zemljama zapadne Europe[13,14]. Društvene, političke i ekonomske promjene imale su negativan utjecaj na zdravstveni status u zemljama bivšega Sovjetskog Saveza[11,15].

Svrha je ovog rada bila analizirati i usporediti međunarodne i nacionalne podatke o smrtnosti povezane s IBS-om u dobi nakon 65. godine prema regijama.

Podatci i metode

Proveli smo retrospektivnu kvantitativnu dobnu analizu stope smrtnosti od IBS-a na 100 000 stanovnika u dobnoj skupini 65 i više godina. Ta je analiza bila usredotočena na zemlje prema podjeli SZO-a na Europske regije, uključujući sljedeće zapadnoeuropske zemlje (N = 17; Austrija, Belgija, Danska, Finska, Francuska, Njemačka, Grčka, Nizozemska, Irska, Luksemburg, Norveška, Italija, Ujedinjeno Kraljevstvo, Portugal, Švedska, Španjolska, Švicarska), istočnoeuropske zemlje (N = 10; Bugarska, Bosna i Hercegovina, Češka, Hrvatska, Poljska, Mađarska, Rumunjska, Srbija, Slovačka, Slovenija) i zemlje bivšega Sovjetskog Saveza (N = 15; Azerbajdžan, Estonija, Bjelorusija, Gruzija, Kazahstan, Kirgistan, Latvija, Litva, Moldavija, Rusija, Armenija, Estonija, Tadžikistan, Turkmenistan, Ukrajina, Uzbekistan). Zbog raspoloživosti podataka, analizirali smo razdoblje između 1990. i 2016. godine, uz fokus na godine 1990., 2004. i 2016.

Istražili smo promjene u standardiziranoj smrtnosti zbog IBS-a tijekom spomenutog razdoblja te regionalne nejednakosti među navedenim skupinama zemalja.

Podatci su dobiveni iz *European Mortality Database* (databaze SZO-a) prema sljedećem indikatoru u pretrazi na engleskom jeziku: „SDR, ischaemic heart disease, 65+, per 100 000" (*International Classification of Diseases 10*: I20-I25)". Podatci za dane zemlje potječu iz nacionalnih registara.

Introduction

Cardiovascular diseases are leading causes of mortality and morbidity worldwide. Although there has been a decrease in age-standardised mortality rates in several regions of the world, the absolute number of deaths associated with CVDs has been increasing, mainly in middle-income and low-income countries.[1,2] Cardiovascular diseases are leading causes of death in Hungary followed by malignant cancers.[3-5] Diseases of the circulatory system accounted for 55% of mortality among females and 45%- among males in 2015[6].

Our paper intends to analyse mortality data among people aged above 65 years due to ischaemic heart disease (IHD) within CVDs. According to World Health Organization (WHO) data, IHD is the most common cause of mortality registered globally.[6] Despite the fact that age-standardised mortality due to IHD has decreased in recent years, the associated disease burden has remained considerably high and has increased globally and in Hungary as well.[7-10] IHD is responsible for more than half of Disability-Adjusted Life Years (DALY) due to cardiovascular diseases.[6]

Mortality data due to IHD vary considerably per region. Data for different countries also vary markedly with time.[11] Nowadays, IHD has been increasingly affecting middle-aged populations of low- and middle-income countries, mainly due to changes in lifestyle, stress and other factors.[12] Although the health status of the population in Eastern Europe, including Hungary, has been improving, quality of life indicators have remained lower compared to Western European countries.[13,14] Societal, political and economic changes have negatively impacted health status in countries of the former Soviet Union.[11,15]

Our aim was to analyse and compare international and national mortality data associated with IHD above 65 years of age per region.

Data and methods

We performed a retrospective, quantitative analysis on age-specific, ischaemic heart disease mortality per 100,000 population among people aged 65 years and above. Our analysis focused on countries selected from the WHO European Region including the following Western European countries (N=17; Austria, Belgium, Denmark, Finland, France, Germany, Greece, the Netherlands, Ireland, Luxemburg, Norway, Italy, United Kingdom, Portugal, Sweden, Spain, Switzerland), Eastern European countries (N=10; Bulgaria, Bosnia-Herzegovina, Czechia, Croatia, Poland, Hungary, Romania, Serbia, Slovakia, Slovenia), and countries of the former Soviet Union (N=15; Azerbaijan, Estonia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Armenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan). Due to availability of data, we analysed the period between 1990 and 2016 with special focus on the years 1990, 2004 and 2016.

We investigated change through time in standardised mortality due to ischaemic heart disease and regional inequalities among the above groups of countries.

Data were derived from the World Health Organisation, European Mortality Database on the following indicator: „SDR, ischaemic heart disease, 65+, per 100 000" (International classification of diseases 10: I20-I25)". Data for the given countries originate from national registries.

Osim deskriptivne statistike (prosječna vrijednost intervala pouzdanosti; distribucija: standardna devijacija, SD), provedeni su analize vremenskih nizova i matematički statistički testovi (Kruskal-Wallisov test) uz 95 %-tni interval pouzdanosti (p <0,05). Pri testiranju preduvjeta, uvjeti za testiranje normalne razdiobe (Shapiro-Wilkov test) nisu bili zadovoljeni, pa smo odlučili provesti Kruskal-Wallisov test, što je neparametrijski test.

Pri statističkoj analizi primjenjivani su programi MS Excel 2007 i SPSS 22.0.

Rezultati

U 1990. godini smrtnost na 100 000 stanovnika **u muškaraca** u dobi nakon 65. godine bila je u prosjeku 2,2 puta viša u postsovjetskim zemljama (3133,51; SD = 499,33; min. = 2371,15: Tadžikistan; maks. = 4125,20: Estonija) nego u zapadnoeuropskim zemljama (1391,00; SD = 600,15; min. = 604,42: Francuska; maks. = 2379,13: Finska). Dobno specifična smrtnost zbog IBS-a kod muškaraca bila je minimalno viša u istočnoj Europi (1418,98; SD = 765,89; min. = 599,71: Hrvatska; maks. = 2834,57: Češka) nego u zapadnoj Europi u 1990. godini. U 2004. godini, smrtnost uzrokovana IBS-om među muškarcima starijima od 65 godina bila u prosjeku 3,4 puta viša u postsovjetskim državama (3201,42; SD = 840,57; min. = 2063.90: Tadžikistan; maks. = 4947,58: Moldavija) i 1,7 puta viša u istočnoeuropskim zemljama (1491,38; SD = 570,85; min. = 771,77: Slovenija; maks. = 2575,41: Slovačka) u usporedbi sa zapadnoeuropskim zemljama (869,17; SD = 289,32; min. = 441,83: Francuska; maks. = 1506,00: Finska). U 2016. dobno specifična smrtnost na 100 000 stanovnika bila je 4,3 puta viša među muškarcima u postsovjetskim zemljama (2204,41; SD = 908,77; min. = 702,68: Gruzija; maks. = 3513,83: Kirgistan) te 1,9 puta viša u istočnoeuropskim zemljama (994,27; SD = 402,38; min. = 511,85: Slovenija; maks. = 1695,57: Mađarska) nego u zapadnoeuropskim zemljama (513,00; SD = 196,87; min. = 297,20: Nizozemska; maks. = 987,18: Finska). Pronađene su značajne razlike u smrtnosti zbog IBS-a kod muškaraca među istočnim i zapadnim europskim zemljama i zemljama bivšega Sovjetskog Saveza (1990.; 2004.; 2016.: p <0,05) (**slika 1**).

U 1990. godini dobno specifična smrtnost na 100 000 stanovnika **u žena** bila je u prosjeku 3 puta viša u postsovjetskim zemljama (2257,45 SD = 375,40; min. = 1623,20: Kirgistan; maks. = 2821,50: Turkmenistan) i 1,27 puta viša u istočnoeuropskim zemljama (948,61; SD = 550,69; min. = 279,80: Hrvatska; maks. = 1723.63: Češka) u usporedbi sa zapadnoeuropskim zemljama (746,91; SD = 320,64; min. = 320,38: Francuska; maks. = 1289.87: Finska). U 2004. godini dobno specifična smrtnost među ženama bila 4,53 puta viša u postsovjetskim zemljama (2202,12; SD = 666,07; min. = 1352,07: Tadžikistan; maks. = 3819,84: Moldavija) i 2,15 puta viša u istočnoj Europi (1045,03; SD = 436,95; min. = 476,90: Slovenija; maks. = 1416,01: Mađarska) nego u zapadnoj Europi (486,30; SD = 176,98; min. = 205,76: Francuska; maks. = 812,92: Finska). U 2016. standardizirane stope smrtnosti u žena bile su 5,91 puta više među muškarcima u postsovjetskim državama (1566,44; SD = 790,25; min. = 455,37: Gruzija; maks. = 2766,81: Kirgistan) te 2,45 puta više u istočnoj Europi (649,77; SD = 295,80; min. = 233,09: Slovenija; maks. = 1118,89: Mađarska) nego u zapadnoj Europi (264,93; SD = 105,98; min. = 148,14: Nizozemska; maks. = 482,83: Austrija). Pronađene su značajne razlike u smrtnosti zbog IBS-a u žena u dobi nakon 65. godine među istočnim i zapadnim europskim zemljama i zemljama bivšega Sovjetskog Saveza (1990.; 2004.; 2016.: p <0,05) (**slika 2**).

Besides descriptive statistics (mean confidence interval; distribution: standard deviation, SD) time-series analysis, and mathematical statistics tests (Kruskal-Wallis test) were performed at 95% confidence interval (CI) (p<0.05). Upon testing preconditions the requirements for normality testing (Shapiro-Wilk test) were not fulfilled, thus we decided to perform a Kruskal-Wallis, non-parametric test.

MS Excel 2007 SPSS 22.0 programmes were used for analyses.

Results

In 1990, age-specific mortality per 100,000 population **among males** above age 65 years was an average 2.2 times higher in post-Soviet countries (3133.51; SD=499.33; min=2371.15: Tajikistan; max=4125.20: Estonia) than in Western European countries (1391.00; SD=600.15; min=604.42: France; max=2379.13: Finland). Age-specific mortality due to IHD among males was minimally higher in Eastern Europe (1418.98; SD=765.89; min=599.71: Croatia; max=2834.57: Czechia) than in Western Europe in 1990. In 2004, mortality caused by IHD among males older than 65 years was an average 3.7 times higher in post-Soviet states (3201.42; SD=840.57; min=2063.90: Tajikistan; max=4947.58: Moldova) and 1.7 times higher in Eastern European countries (1491.38; SD=570.85; min=771.77: Slovenia; max=2575.41: Slovakia) compared to Western European countries (869.17; SD=289.32; min=441.83: France; max=1506.00: Finland). In 2016, age-specific mortality per 100,000 population was 4.3 times higher among males in post-Soviet countries (2204.41; SD=908.77; min.=702.68: Georgia; max.=3513.83: Kyrgyzstan), and 1.9 times higher in Eastern European countries (994.27; SD=402.38; min.=511.85: Slovenia; max.=1695.57: Hungary) than in Western European countries (513.00; SD=196.87; min.=297.20: Netherlands; max.=987.18: Finland). Significant differences were found with regard to mortality due to IHD among males between Eastern-, Western European countries and countries of the former Soviet Union (1990; 2004; 2016: p<0.05). (**Figure 1**)

In 1990, Age-specific mortality **among females** was three times higher on average in post-Soviet states (2257.45 SD=375.40; min=1623.20: Kyrgyzstan; max=2821.50: Turkmenistan), 1.27 times higher in Eastern European countries (948.61; SD=550.69; min=279.80:Croatia; max=1723.63: Czechia) compared to Western European countries (746.91; SD=320.64; min=320.38: France; max=1289.87: Finland). In 2004, age-specific mortality among females was 4.53 times higher in post-Soviet states (2202.12; SD=666.07; min=1352.07: Tajikistan; max=3819.84: Moldova), and 2.15 times higher in Eastern Europe (1045.03; SD= 436.95; min=476.90: Slovenia; max=1416.01: Hungary) than in Western Europe (486.30; SD=176.98; min=205.76: France; max=812.92: Finland). In 2016, standardised mortality rates among females were 5.91 times higher in post-Soviet states (1566.44; SD=790.25; min=455.37: Georgia; max=2766.81: Kyrgyzstan), 2.45 times higher in Eastern Europe (649.77; SD=295.80; min=233.09: Slovenia; max=1118.89: Hungary) than in Western Europe (264.93; SD=105.98; min=148.14: Netherlands; max=482.83: Austria). Significant differences were found with regard to mortality due to IHD among females above age 65 years between Eastern-, Western European countries and countries of the former Soviet Union (1990; 2004; 2016: p<0.05). (**Figure 2**)

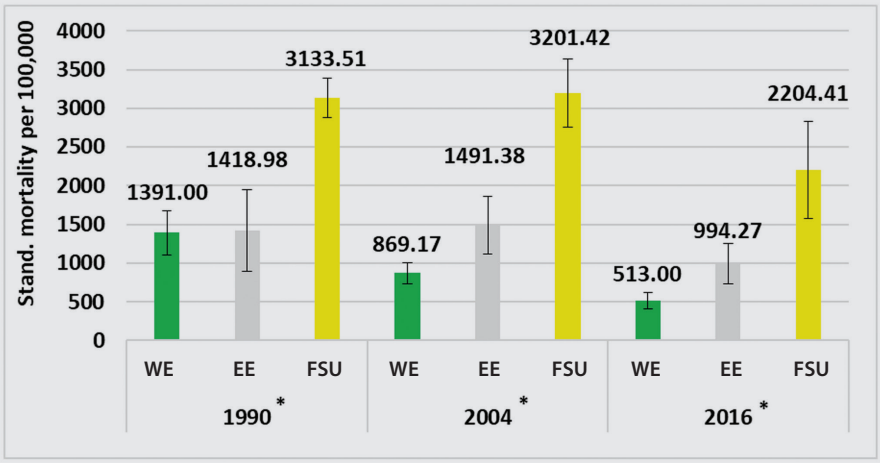

FIGURE 1. Standardised mortality due to ischaemic heart disease among males aged above 65 years in1990, 2004 and 2016 (95% CI) [*: p < 0.05, Kruskal-Wallis test].
WE = Western European countries; EE = Eastern European countries; FSU = former Soviet Union countries

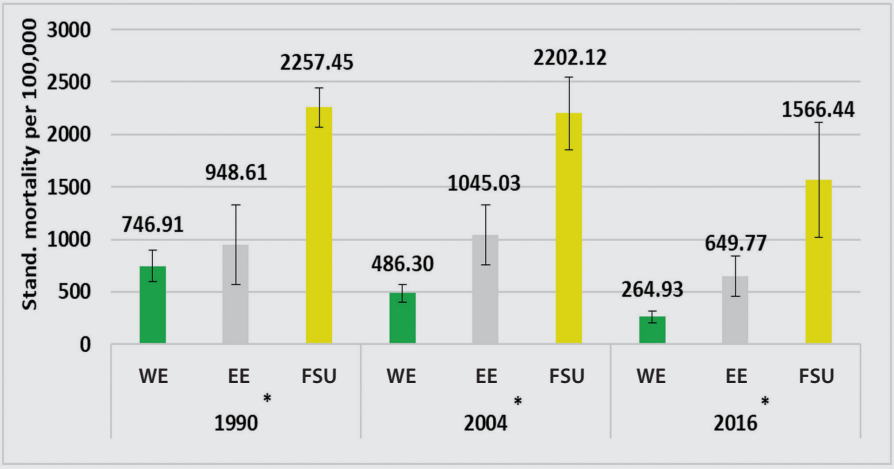

FIGURE 2. Standardised mortality due to ischaemic heart disease among females aged above 65 years in 1990, 2004 and 2016 (95% CI) [*: p < 0.05, Kruskal-Wallis test].
WE = Western European countries; EE = Eastern European countries; FSU = former Soviet Union countries

Između 1990. i 2016. dobno standardizirana smrtnost zbog IBS-a kod **muškaraca** i **žena** najviše se smanjila u zapadnoeuropskim zemljama (muškarci: −63,12 %; žene: −64,53 %), zatim u istočnoeuropskim zemljama (muškarci: −29,93 %, žene: −31,50 %) te u zemljama bivšega Sovjetskog Saveza (muškarci: −29,65 %; žene: −30,61 %). Glede zapadnoeuropskih zemalja, dobno specifična smrtnost zbog IBS-a kontinuirano se smanjivala uz minimalne fluktuacije od 1990. do kraja istraženog razdoblja. U istočnoeuropskim zemljama najveća je stopa smrtnosti za oba spola pronađena u 1997. godini te je između 1990. i 1997. došlo do porasta smrtnosti (muškarci: +36,27 %; žene: +40,65 %), a u razdoblju između 1997. i 2016. došlo je do kontinuiranog sniženja s malim fluktuacijama (muškarci: −48,58 %; žene: −51,30 %). U postsovjetskim zemljama dobno specifična smrtnost zbog IBS-a bila najviša u 1996. u žena, a u 2003. u muškaraca. U žena je standardizirana smrtnost porasla za ukupno 11,58 % između 1990. i 1996., a između 1996. i 2016. došlo je do ukupnog smanjenja s malim fluktuacijama (−37,81 %). Glede standardizirane smrtnosti u muškaraca, u

Between 1990 and 2016 age-standardised mortality due to IHD among **males** and **females** decreased most markedly in Western European countries (males: -63.12%; females: -64.53%) followed by the Eastern European countries we examined (males: -29.93%, females: -31.50%), and countries of the former Soviet Union (males: -29.65%; females: -30.61). Regarding Western European countries, age-specific mortality due to IHD showed a continuous decline with minimal fluctuation from 1990 until the end of the period under examination. In the case of Eastern European countries, we found the highest rates in both sexes in 1997 and saw an increase between 1990 and 1997 (males: +36.27%; females: +40.65%), and a continuous decrease between 1997 and 2016 with minor fluctuations (males: -48.58%; females: -51.30%). In post-Soviet countries, age-specific mortality due to IHD was the highest in 1996 among females, and in 2003 among males. Among women, standardised mortality increased by 11.58% in total between 1990 and 1996 and showed an overall decrease with minor fluctuations between 1996 and 2016 (-37.81%). With re-

razdoblju između 1990. i 2003. došlo je do povišenja od 12,5 %, popraćena sniženjem između 2003. i 2016. (–37,46%) s blagim fluktuacijama (**slika 3**).

gard to standardised mortality in males, the period between 1990 and 2003 witnessed a 12.5% increase, followed by a decrease between 2003 and 2016 (-37.46%) with slight fluctuations (**Figure 3**).

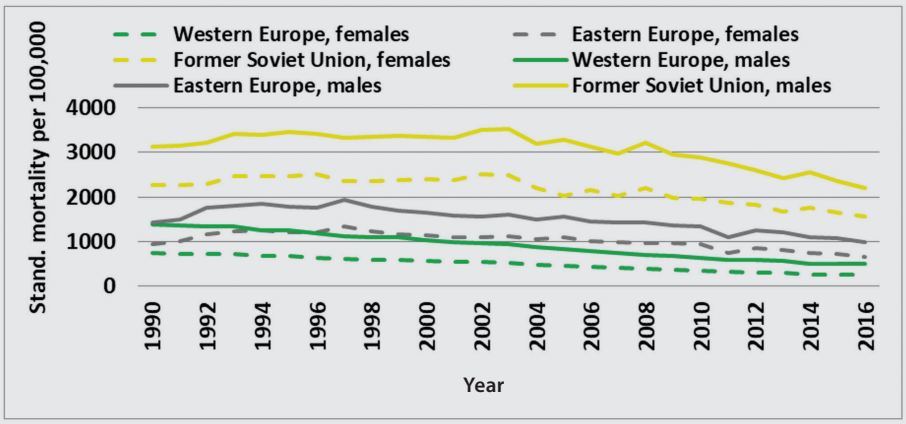

FIGURE 3. Age-standardised mortality due to ischaemic heart disease among people aged above 65 years between 1990 and 2016.

Slika 4 pokazuje postotak promjene u dobno specifičnoj smrtnosti zbog IBS-a u **muškaraca**. Azerbajdžan, Estonija, Bjelorusija, Francuska, Irska, Kazahstan, Rusija, Španjolska, Srbija, Slovačka, Tadžikistan, Turkmenistan i Ukrajina nisu uključene zbog nedostatka podataka. Tijekom cijeloga istraženog razdoblja dobno specifična smrtnost u muškaraca se smanjila u prosjeku za 39,91 % u svakoj zemlji. Dvadeset zemalja objavilo je podatke koji su bolji od prosjeka, a u 10 je država smanjenje smrtnosti bilo manje od prosjeka. U toj, drugoj skupini, šest je postsovjetskih zemalja, a ostale su četiri istočnoeuropske zemlje. Smrtnost zbog IBS-a u muškaraca starijih od 65 smanjila se u svim istraženim zemljama između 1990. i 2016. godine, osim u Hrvatskoj (+97,89 %), Kirgistanu (+46,46 %), Bosni i Hercegovini (+14,61 %) i Moldaviji (+1,04 %). U usporedbi s početnom godinom, u muškaraca su do 2016. godine najpozitivnije promjene uočene u Danskoj (–82,02 %), Gruziji (–78,19 %) i Nizozemskoj (–77,04 %). Najmanja promjena u muškaraca nakon 65. godine života ustanovljena je u Mađarskoj (–11,57 %), Rusiji (–12,69 %) i Poljskoj (–27,39 %).

U **žena**, slično, kao i u muškaraca, kanili smo prikazati postotak promjene u dobno specifičnoj smrtnosti zbog IBS-a u istraženim zemljama. Neke zemlje nisu uključene u graf zbog nedostatka raspoloživih podataka (Azerbajdžan, Bjelorusija, Francuska, Irska, Kazahstan, Rusija, Španjolska, Srbija, Slovačka, Tadžikistan, Turkmenistan, Ukrajina). Na temelju raspoloživih podataka, stope smrtnosti zbog IBS-a u žena nakon 65. godine života poboljšale su se u prosjeku za 37,68 % u svakoj zemlji. Dvadeset jedna zemlja imala je promjenu bolju od prosjeka, a devet zemalja imalo je promjenu ispod prosjeka. U toj, drugoj skupini pet je zemalja bilo iz istočne Europe, a četiri su bile postsovjetske zemlje.

Smrtnost zbog IBS-a u žena starijih od 65 godina smanjila se između 1990. i 2016., osim u Hrvatskoj (+202,27 %), Kirgistanu (+70,45 %) i Bosni i Hercegovini (+38,79 %). U usporedbi s

Figure 4 shows percentage change in age-specific mortality due to IHD in **males.** Azerbaijan, Estonia, Belarus, France, Ireland, Kazakhstan, Russia, Spain, Serbia, Slovakia, Tajikistan, Turkmenistan and Ukraine are not represented due to lack of data. During the entire period investigated age-specific mortality among males decreased on average by 39.91% in each country. 20 countries were found to have reported better than average data and in 10 countries decrease was smaller than average. Out of the latter group, six were post-Soviet and four were Eastern European countries. Mortality due to IHD among males over 65 years of age showed a decrease in all countries examined during the period between 1990 and 2016 except for Croatia (+97.89%), Kyrgyzstan (+46.46%), Bosnia-Herzegovina (+14.61%) and Moldova (+1.04%). Compared to the base year, by 2016, most favourable changes were registered in Denmark (-82.02%), Georgia (-78.19%) and the Netherlands (-77.04%) among males. The smallest change was witnessed in Hungary (-11.57%) followed by Russia (-12.69%) and Poland (-27.39%) among males above age 65 years.

With regard to **females,** similar to males, we intended to present percentage change in age-specific, mortality due to IHD for countries selected for examination. Some countries are missing from the graph due to lack of available data (Azerbaijan, Belarus, France, Ireland, Kazakhstan, Russia, Spain, Serbia, Slovakia, Tajikistan, Turkmenistan, Ukraine). Based on data available, mortality rates due to IHD among females aged above 65 years improved with 37.68% on average in each country. 21 countries witnessed better than average and nine countries less than average change. Out of the latter group, five were Eastern European countries and four were former Soviet countries.

Among females age above 65 years, mortality due to IHD decreased between 1990 and 2016 except for Croatia (+202.27%), Kyrgyzstan (+70.45%) and Bosnia-Herzegovina (+38.79%). Compared to the base year, the most favourable change by 2016 was

početnom godinom u žena je najpozitivnija promjena do 2016. pronađena u Danskoj (–83,82 %), a zatim u Gruziji (–81,15 %) i Nizozemskoj (–76,81 %). Smanjenje smrtnosti zbog IBS-a u žena starijih od 65 godina bilo je najmanje u Moldaviji (–2,24 %), Mađarskoj (–10,26 %) i Poljskoj (–13,62 %) (**slika 5**).

found to have been reported Denmark (-83.82%) followed by Georgia (-81.15%) and the Netherlands (-76.81%) among women. Mortality due to IHD decreased the least in Moldova (-2.24%), Hungary (-10.26%), and Poland (-13.62%) among females older than 65 years. (**Figure 5**)

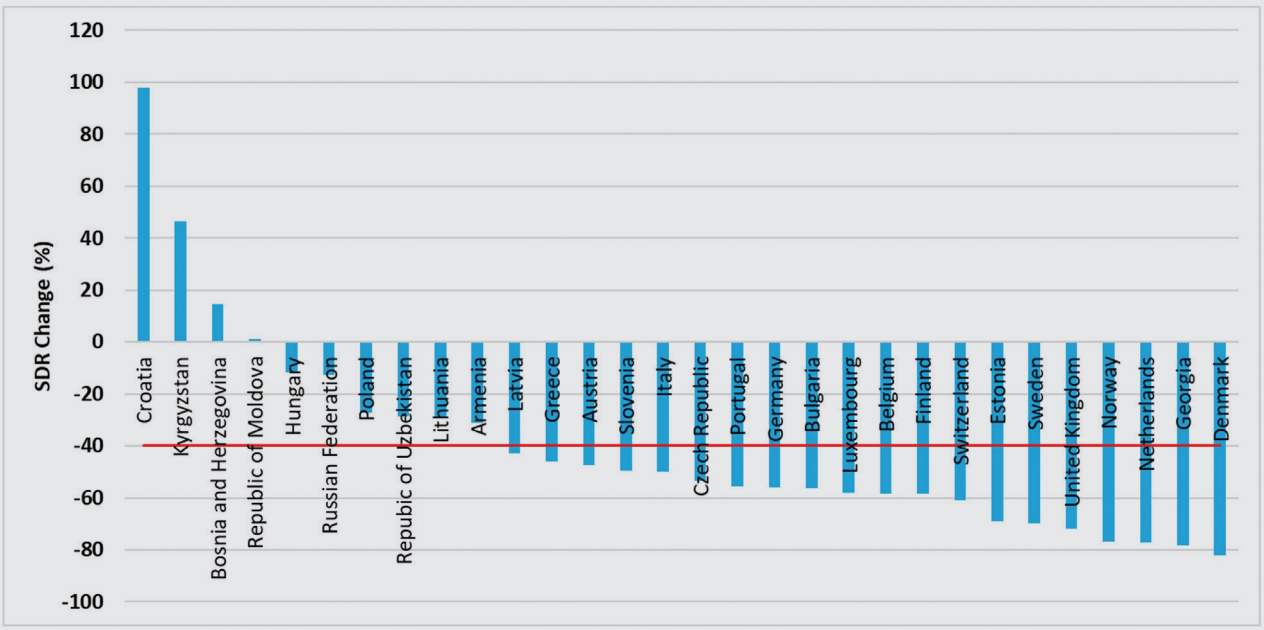

FIGURE 4. Changes in standardised mortality due to ischaemic heart disease among males aged above 65 years per country between 1990 and 2016.

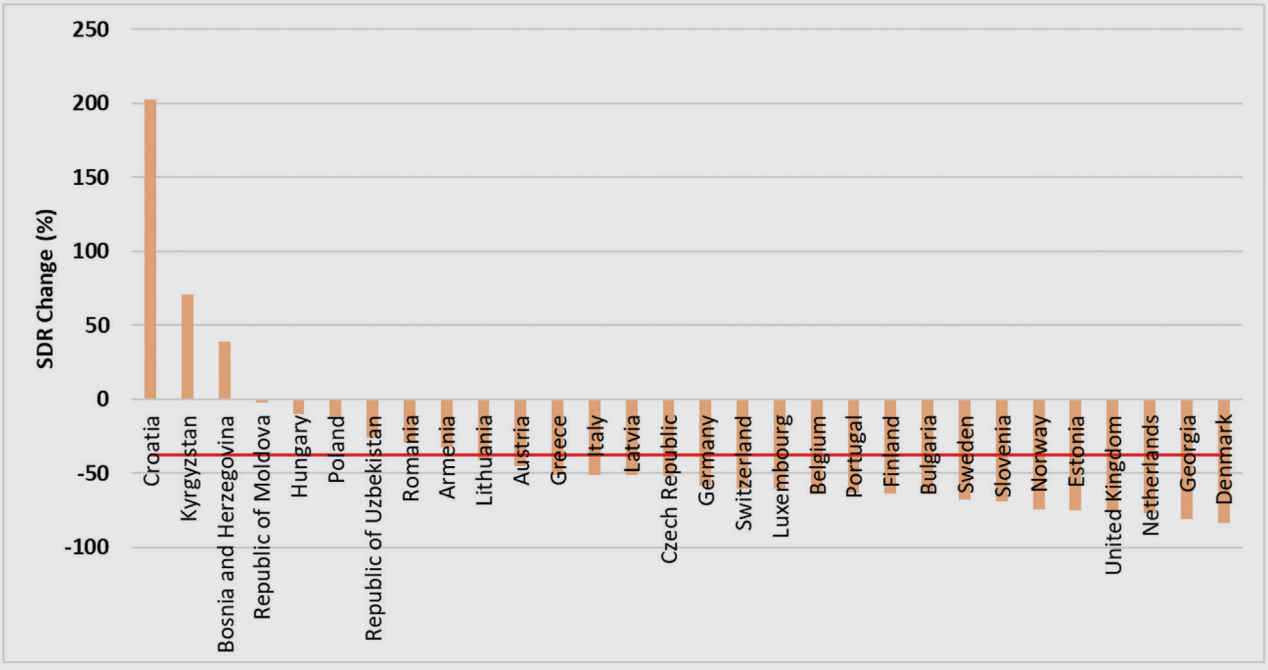

FIGURE 5. Changes in standardised mortality due to ischaemic heart disease among females aged above 65 years per country between 1990 and 2016.

Rasprava

U ovom smo istraživanju proučili smrtnost zbog IBS-a u populaciji nakon 65. godine života u zemljama istočne i zapadne Europe te u postsovjetskim državama unutar Europske regije SZO-a.

U prošlih je 25 godina došlo do smanjenja standardizirane smrtnosti zbog IBS-a diljem svijeta, no i dalje postoje značajne regionalne nejednakosti. Izvješća iz zemalja s visokim dohotkom pokazuju najpozitivniju promjenu[2,12,16]. Prema našoj analizi, dobno specifična smrtnost zbog IBS-a u populaciji nakon 65. godine bila je najniža u zapadnoeuropskim zemljama, i u muškaraca i u žena, a bila je najviša u zemljama bivšega Sovjetskog Saveza. Usprkos tomu, uspoređivanjem istočnoeuropskih i postsovjetskih zemalja uočena je samo minimalna promjena glede prosječnih standardiziranih stopa smrtnosti između 1990. i 2016. U analiziranom razdoblju stope smrtnosti u muškaraca porasle su u dvjema istočnoeuropskim zemljama (Hrvatska, Bosna i Hercegovina) te u dvjema zemljama bivšega Sovjetskog Saveza (Kirgistan, Moldavija). Što se tiče žena, u dvjema istočnoeuropskim zemljama (Hrvatska, Bosna i Hercegovina) i u jednoj zemlji bivšega Sovjetskog Saveza (Kirgistan) zabilježen je porast dobno standardizirane stope smrtnosti. Smatramo da bi takav nagli porast, kakav vidimo u Hrvatskoj, mogao biti uzrokovan varijacijama u izvješćivanju o smrtnosti i uz to vezanih pravila i odgovornosti. To podupire i činjenica da se smrtnost zbog IBS-a u Hrvatskoj znatno smanjila između 1995. i 2011[17]. Nepovoljne podatke za Bosnu i Hercegovinu već su objavili drugi autori. Kardiovaskularni čimbenici rizika, posljedice stresa i ekonomsko stanje u državi potencijalni su pozadinski uzroci visokih stopa smrtnosti[18]. Gore navedeni porast u Kirgistanu također se slaže s prethodno objavljenim rezultatima[11].

U razdoblju između 1990. i 2016. smrtnost od IBS-a u osoba u dobi nakon 65 godina u Mađarskoj se smanjila manje od istočnoeuropskoga prosjeka; pad među muškarcima bio je 11,57 %, a u žena 10,26 %.

Uspoređujući podatke iz Mađarske s podatcima iz zemalja Višegradske skupine, uočili smo da je 1990. smrtnost zbog IBS-a u osoba nakon 65 godina bila viša u Češkoj nego u Mađarskoj. U 2016. godini dobno specifična smrtnost bila je viša u Mađarskoj nego u Češkoj. Ova je analiza pokazala da su se u razdoblju između 1990. i 2016. stope smrtnosti u obaju spolova mnogo zamjetnije snizile u Češkoj nego u Mađarskoj. U Poljskoj dobno specifična smrtnost uzrokovana IBS-om bila je mnogo niža i 1990. i 2016. godine nego u Mađarskoj. O Slovačkoj nema raspoloživih podataka za godine 1990. i 2016. Između 1990. i 2016., tamo gdje su podatci raspoloživi, dobno specifična smrtnost uzrokovana IBS-om u populaciji nakon 65 godina za oba spola bila je viša u Slovačkoj nego u Mađarskoj. Što se tiče zastupljenosti rizičnih čimbenika, u zemljama Višegradske skupine, prema podatcima SZO-a, u 2015. Mađarska i Poljska imale su gotovo istu učestalost pušenja u muškaraca, dok je nešto veća zastupljenost pušenja registrirana u žena u Mađarskoj. U Češkoj Republici zastupljenost pušenja bila je viša u obaju spolova nego u Mađarskoj. Što se tiče Slovačke, zastupljenost pušenja u muškaraca bila je viša nego u Mađarskoj[19]. Zastupljenost pretilosti bila je viša u obaju spolova u Mađarskoj nego u Poljskoj ili Slovačkoj, a u Češkoj je u žena bila viša nego u Mađarskoj[20]. Što se pak tiče pridržavanja terapije statinima, možemo prikazati neke podatke iz Mađarske: prema istraživanju koje su proveli Jánosi *i sur.*,

Discussion

In our study, we examined mortality due to IHD in the population aged above 65 years in Eastern-, Western European countries and post-Soviet states within the WHO European Region.

The past 25 years have seen a decrease in standardised mortality due to IHD worldwide nonetheless, marked regional inequalities have persisted. High-income countries have reported the most positive change[2,12,16]. According to our analysis, age-specific mortality due to IHD in the population older than 65 years was the lowest in Western European countries in both males and females and the highest in countries of the former Soviet Union. Nevertheless, upon comparing Eastern European and post-Soviet countries only minimal change was observable between 1990 and 2016 with regard to average standardised mortality rates. During the period analysed, male mortality rates increased in two Eastern European countries (Croatia, Bosnia-Herzegovina) and two former Soviet states (Kyrgyzstan, Moldova). Regarding females, two Eastern European countries (Croatia, Bosnia-Herzegovina) and one post-Soviet country (Kyrgyzstan) were found to have had an increase in age-standardised mortality. We suspect that the sharp increase in this respect, as found in Croatia, may have been due to variations in fulfilling reporting obligations. The above is supported by the fact that mortality due to IHD reportedly dropped considerably between 1995 and 2011 in Croatia[17]. Unfavourable data with regard to Bosnia-Herzegovina have also been published by other researchers. Cardiovascular risk factors, the effects of stress and the economic situation of the country are suspected to be in the background of high mortality rates.[18] The increase in Kyrgyzstan as described above is in line with other findings[11].

During the period between 1990 and 2016, mortality due to IHD among people aged above 65 years decreased less than the Eastern European average in Hungary; decrease among males was 11.57% and 10.26% among females.

Comparing data for Hungary with those of Visegrad countries, we found that in 1990 mortality due to IHD among people aged older than 65 years higher in Czechia than in Hungary. In 2016, age-specific mortality was higher in Hungary than in Czechia. Our analysis revealed that during the period between 1990 and 2016, mortality rates decreased much more markedly in both sexes in Czechia than in our country. In Poland, age-specific mortality due to ischaemic heart disease was considerably lower both in 1990 and in 2016 than in Hungary. There were no data available on Slovakia for the years 1990 and 2016. Between 1990 and 2016, in the years with available data, age-specific mortality due to ischaemic heart disease in the population above 65 years was higher in both sexes in Slovakia than in our country. Regarding risk factor prevalence, in Visegrad countries, according to WHO data, in 2015, Hungary and Poland nearly exactly the same prevalence rates of smoking in males and a slightly higher prevalence in females, in Hungary. In the Czech Republic, the prevalence of smoking was higher in both sexes than in our country. With regard to Slovakia, smoking prevalence was higher among men compared to Hungary[19]. The prevalence of obesity was higher in both sexes in Hungary than in Poland or Slovakia. In Czechia it was higher among women than in our country.[20] Regarding statin adherence, we can hereby present some Hungarian research data: according to Jánosi *et al.* 54.4% of

54,4 % bolesnika dobro se pridržavalo terapije statinima tijekom prve godine nakon što su doživjeli infarkt miokarda[21]. J. Tomcsányi je istražio pridržavanje terapije statinima među bolesnicima koji su doživjeli infarkt miokarda te je zabilježio stopu pridržavanja liječenja od 70 %[22]. Raniji rezultati koje su objavili Kiss *i sur.* pokazali su nižu postojanost glede terapije statinima u usporedbi s drugim zemljama[23].

Moguće je da rezultate ove analize iskrivljuje činjenica da 12 zemalja, uključujući Bjelorusiju i Ukrajinu, nije moglo biti uključeno u analizu usporedbe zemalja za godine 1990. i 2016. zbog nedostatka statističkih podataka.

Na indikatore smrtnosti znatno utječe društveni, politički i ekonomski stres. Niži socioekonomski status korelira s nepovoljnim indikatorima zdravstvenoga statusa[24,25]. Nakon 1990. zemlje istočne Europe i postsovjetske države doživjele su znatne društvene promjene. Nakon 2004. većina se istočnoeuropskih zemalja pridružila Europskoj uniji[26,27].

Povećanje očekivanoga životnog vijeka, starenje populacije u društvu, nedovoljno pridržavanje smjernica utemeljenih na dokazima, problemi vezani uz uvođenje i potpomaganje preventivnih mjera i pandemija bolesti COVID-19 sve su čimbenici koji su pridonijeli vrlo visokom teretu bolesti povezanim s KVB-om[28-30]. Smrtnost i pobol povezani sa KVB-om ovise o zastupljenosti rizičnih čimbenika koji imaju ulogu u razvoju tih bolesti. Što se tiče DALY-ja, pušenje je i dalje najvažniji rizični čimbenik, a programi za prestanak pušenja imaju ključnu ulogu[31-33]. U 2015. godini, prema podatcima SZO-a[19], zastupljenost pušenja u Mađarskoj u muškaraca starijih od 15 godina bila je 32 %, a kod žena 24,8%. Što se pak tiče razvoja IBS-a, pretilost je također jedan od glavnih rizičnih čimbenika[34-36]. Godine 1990. godine zastupljenost pretilosti u Mađarskoj bila je 16,9 %, a u 2016. 26,4 % u populaciji nakon 18. godine života[20]. Povećanje prihoda dovodi do viših stopa konzumacije hrane među ljudima s nižim prihodima pa stoga do veće zastupljenosti pretilosti u tim skupinama i, posljedično tomu, većeg rizika od KVB-a. U vezi s prevencijom pretilosti, strategije na razini populacije mogu se pokazati korisnima, primjerice uvođenje poreza na javnozdravstvene proizvode i prehrambeno-zdravstvene regulacije vezane uz pružanje opskrbe pripremljenim jelom i pićem na masovnoj razini[37,38].

Uz veći naglasak na primarnu prevenciju, pozitivna promjena u stopi smrtnosti također je posljedica razvoja zdravstvenog sustava, uključujući napretke u terapijskim i dijagnostičkim modalitetima i uspostavljanje centara invazivne kardiologije[39-41]. Između 1993. i 2007. stopa smrtnosti vezana uz akutni infarkt miokarda smanjila se s 15 000 na 8400. Godine 2007. godine stoga je smrtnost zbog akutnog infarkta miokarda iznosila 47 % smrtnosti iz 1993. na 100 000 stanovnika u 1993. godini. Napredci na tom polju posljedica su izrazito učinkovitih farmaceutskih proizvoda te napretka u liječenju i intervencijama pri hitnom zbrinjavanju[42]. Potrebne su daljnje mjere kako bi se poboljšale statističke mjere smrtnosti, ciljajući na smanjenje čimbenika kardiovaskularnih rizika i poticanje zdravog načina života[12,43-45]. Smjernice Europskoga kardiološkog društva iz 2021. uključuju najnovije protokole za procjenu kardiovaskularnog rizika, koji sadržavaju detalje o individualnim strategijama za smanjenje rizika i ciljne terapijske vrijednosti. Smjernice navode promoviranje i pospješivanje zdravog načina života koji će se održavati tijekom čitavog života kao najvažniji preventivni čimbenik. Smjernice također ističu procjenu psihosocijalnoga stresa, važnost

patients showed good statin adherence one year after suffering a myocardial infarction[21]. J. Tomcsányi investigated statin adherence among patients having had an acute myocardial infarction and found an average 70% adherence rate[22]. Earlier findings published by Kiss *et al.* revealed lower persistence with regard to statin therapy in comparison with other countries[23].

The results of our analyses may have been distorted by the fact that 12 countries, including Belarus and Ukraine, could not be included in the analysis comparing countries regarding the years 1990 and 2016 due to lack of statistical data.

Mortality indices are greatly impacted by societal-, political- and economic stress. Lower socio-economic status correlates with unfavourable health status indices.[24,25] After 1990, Eastern European countries and post-Soviet states have witnessed significant societal changes. After 2004 the majority of Eastern European countries joined the European Union.[26,27]

Increasing in life expectancy, the aging of the society, the inadequate adherence to evidence-based guidelines, issues arising during the implementation and facilitation of preventive measures and the COVID epidemic have all contributed to the very high disease burden associated with cardiovascular diseases[28-30]. The morbidity and mortality associated with cardiovascular diseases depend on the prevalence of risk factors that play a role in their development. Regarding DALY, smoking has continued to be the most important risk factor, smoking cessation programmes play a crucial role[31-33]. In 2015, the prevalence of smoking in Hungary among males aged older than 15 years was 32%, and 24.8% among females according to WHO data[19]. Concerning the development of IHD, obesity is also one of the main risk factors[34-36]. In 1990, the prevalence of obesity in Hungary was 16.9%, in 2016 it was 26.4% in the population above age 18.[20] Rising incomes result in higher food consumption levels among people with lower incomes as well resulting in higher prevalence of obesity in these groups and consequently, a higher risk of CVDs. Regarding the prevention of obesity, population-level strategies e.g. the introduction of the public health product tax and food-health regulations concerning mass catering may prove beneficial.[37,38]

Besides a bigger emphasis devoted to primary prevention, the favourable change in mortality statistics are also due to development of the healthcare system including advances in therapeutic and diagnostic modalities and the establishment of cardiac-catheter centres.[39-41] Between 1993 and 2007, the mortality rates associated with acute myocardial infarction decreased from 15,000 to 8,400. In 2007, mortality due to acute myocardial infarction accounted for 47% of all-cause mortality in 1993 per 100,000 population. Improvement in this respect is due to highly effective pharmacoceuticals in addition to advancement in medical intervention and emergency care therapies.[42] Further measures are necessary to improve mortality statistics targeting the reduction of cardiovascular risk factors and the promotion and facilitation of healthy lifestyle.[12,43-45] The 2021 Guideline of The European Society of Cardiology includes the most up-to-date protocols with regard to cardiovascular risk assessment which contain details on individual risk reduction strategies and therapeutic targets. The guideline designates the promotion and facilitation of a healthy lifestyle to be followed lifelong as the most important preventive factor. The guideline also emphasizes

antitrombocitne terapije i intervencije specifično prilagođene pojedinim bolestima, a navodi se i pozitivan utjecaj cjeloživotne procjene rizika. Prevencijske smjernice spominju javnozdravstvene mjere, reprezentaciju, primjenu društvenih strategija smanjenja rizika i uvođenje mjera za smanjenje zagađenja zraka kao neke od metoda koje ciljaju na smanjenje rizika na društvenoj razini[44].

Uvođenje regulacija vezanih za niže poreze na zdravu hranu važan je čimbenik u donošenju odluka o zdravstvenim mjerama.

Ovo istraživanje ima neka ograničenja koja su potencijalno utjecala na rezultate, uključujući manjak raspoloživih podataka iz baze podataka SZO-a (nedostatak podataka o smrtnosti od IBS-a koji se može izraziti apsolutnim brojevima, mjestimičan nedostatak standardiziranih podataka o smrtnosti), razlike u statističkom računanju smrtnosti među različitim zemljama, varijacije u obvezama vezanima uz izvješćivanje o smrtnosti i razlike u protokolima za validaciju podatka. Mogućnost usporedbe naših rezultata s rezultatima drugih istraživanja bila je ograničena zbog razlika u zemljopisnoj kategorizaciji zemalja. Zbog znatnog nedostatka raspoloživih podataka nismo bili u mogućnosti produljiti razdoblje istraživanja na kasnije godine.

the assessment of psycho-social stress, the importance of anti-thrombocyte therapy, disease-specific interventions and introduces the benefits of life-long risk assessment. The prevention guideline mentions public health policy, representation, the application of societal risk reduction strategies and the introduction of measures to reduce air-pollution among methods targeting societal risk reduction.[44]

The introduction of regulations regarding the lower taxes on healthy foods has been an important element in health-policy decision making.

Our research has some limitations which may have influenced our findings including lack of available data from the WHO database (lack of mortality data on IHD which could be expressed in absolute numbers, occasional lack of standardised mortality data), differences in mortality statistics used by the different countries, variations in reporting obligations and differences in data validation protocols. The comparison of our results with findings of other research is limited due to differences in geographical categorisation of the countries. Due to considerable lack of available data we could not extend the timeline of our research to include further years.

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