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Cardiovascular Disease in Central and East Europe

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ABSTRACT

Cardiovascular disease (CVD) contributes greatly to inequalities in health in Europe. The CVD death rate in Ukraine (the highest) is seven fold higher than in France (the lowest). There is also a striking difference in CVD mortality between European Union (EU) members before the enlargement in 2004 and Central and East European (CEE) countries that joined the EU in 2004 and non-EU countries. The difference in CVD mortality between West and East Europe grew during the 1970s and 1980s when rates declined in the West and either remained the same or rose in the CEE countries. Political reforms at the beginning of the 1990s, which were followed by great socio-economic changes coincided with further diversification in CVD mortality in CEE countries. Diverse trends in CVD mortality were followed by larger gaps in life expectancy between West and East Europe and within the CEE.

Rapid development of high technology treatment procedures, which followed the economic recovery of the CEE countries, would have only limited influence on the overall control of CVD. Exposure to classic risk factors might largely explain the longitudinal trend in falling CVD mortality in some countries, but it is unlikely that it could explain rapid changes in the others. Still, large potential to control the disease lies in developing effective preventive policies with targets to lower exposure to the classic CVD risk factors. The recent history of CVD in CEE countries makes the "alcohol hypothesis" less convincing as an explanation for CVD mortality trends and differences between East and West Europe. The hypothesis that dynamic changes in CVD mortality in CEE countries are triggered and explained largely by psychosocial factors is attractive. However, if confirmed, transforming such knowledge into a practical health policy would be a great challenge.

Key words: CVD mortality, Central and East Europe, risk factors, alcohol consumption, economic psychosocial risk factors, medical treatment

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INTRODUCTION

In developed countries, diseases of the heart and circulatory system (cardiovascular disease or CVD) are the main cause of deaths, an important cause of disability and a source of large economic and social cost to the society. In the European Union (15 countries before 2004), Coronary Heart Disease (CHD) and brain stroke were the most frequent forms of CVD (about 37% and 25%, respectively). In the Central and East European (CEE) countries, CHD and stroke were responsible for 49 percent and 32 percent of all CVD deaths, respectively.[1] These differences suggest that CHD and stroke contribute largely to the East-West difference in CVD mortality and life expectancy gap. The knowledge of the nature of the disease, its prevention and treatment increased largely in recent decades but regional inequality due to CVD still remains one of the most important public health problems in Europe and worldwide.

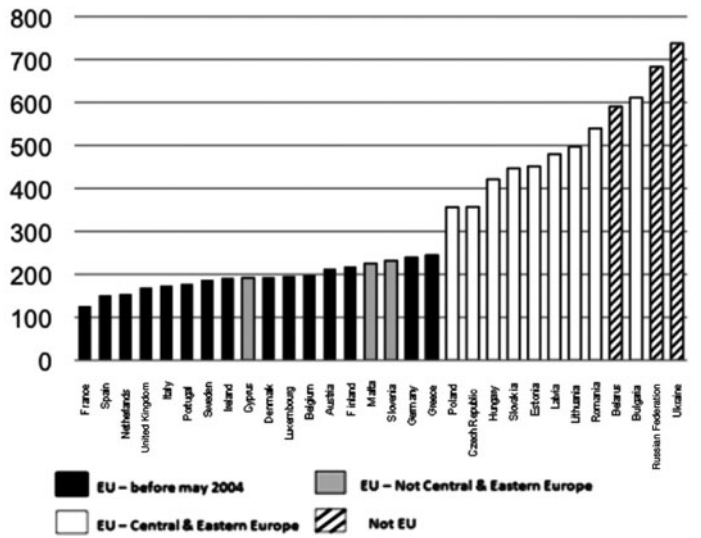

Fig. 1. Age-standardized CVD death rates (per 100.000) in European Union (27 countries) and three Eastern European not EU countries (last available year).

Source: WHO Europe, European HFA Database, December 2011.[3]

In the period from the 1980s through the1990s, Europe experienced a large political transformation that ended with enlargement of the European Union (EU) from 15 to 27 countries. The area of the EU changed from 3,19 to 4,23 million square kilometres and the population increased from 376 to 495 million citizens.[2] These changes were mainly the effect of the inclusion of CEE countries, for which the period just before and after inclusion was a time of large political, economic and social revolutionary changes. At the time of accession to the EU the populations of CEE countries were characterized by worse health indicators than those of Western Europe, with a large life expectancy gap between the West and East of the continent. This paper will focus on the differences in CVD mortality trends between CEE countries and debate possible explanations.

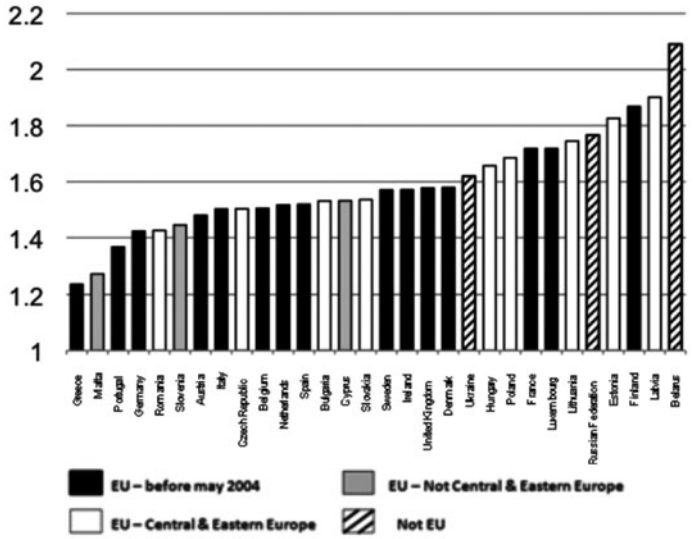

Fig. 2. Men to women ratio of CVD death rates (per 100.000) in European Union (27 countries) and three Eastern European not EU countries (last available year).

Source: WHO Europe, European HFA Database, December 2011.[3]

Despite the increasing knowledge of the determinants of CVD, it is the major contributor to inequalities in health in Europe. Age standardized CVD mortality rates for 30 European countries are presented in Figure1 (latest available data).[3] The CVD mortality rate in Ukraine (the highest) is sevenfold higher than in France (the lowest). There is also a striking difference in CVD mortality between the old EU15 countries (members before the enlargement in 2004), with the countries that joined the EU in

2004 and non-EU countries. In Figure 2, the ratio of CVD death rate in men to CVD death rate in women is presented by country. CVD mortality in men is higher than in women in all European countries and in general CEE countries have high men to women ratios. However, between country differences in the gender mortality gap do not give a satisfactory explanation of the East-West CVD mortality gap. For example, Romania, with one of the highest CVD death rates, has one of the lowest men to women ratios. Also Ukraine, with the highest CVD death rate, has the men to women ratio closest to the mean. In contrast, Finland—an EU15 member, in which the CVD death rate is much lower than in CEE countries, the men to women ratio remains one of the highest.

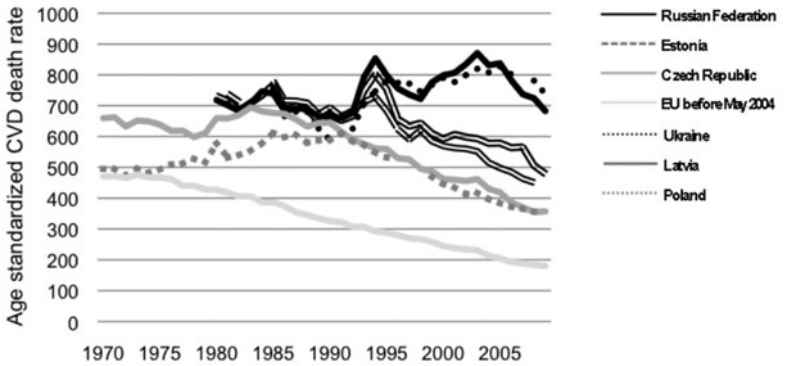

Fig. 3. Age-standardized CVD death rates (per 100.000) in six Central and Eastern European Countries and European Union (15 countries before May 2004).

Source: WHO Europe, European HFA Database, December 2011.[3]

Similar to West Europe, in CEE countries between-sex differences in CVD mortality were not combined with the differences in secular changes in the death rates, and trends in CVD mortality and in life expectancy were similar in men and in women. In Figure 3, trends in age standardized CVD death rates for the total population of six CEE countries are compared with the trends in the EU15 countries. In the early 1970s, differences in CVD mortality between West and East Europe were much smaller. Soon after CVD mortality started to decline in the West and the falling trend continues until today, meanwhile unchanged or rising rates were observed in the CEE countries. In the early 1990s, CVD mortality trends reversed in some East European countries (i.e., Poland, Hungary and Czech Republic), but an unprecedented, steep increase was observed in the others, mainly former Soviet Union countries. These increases halted after three years and CVD

mortality also began to decline in the former Soviet Union countries. After 1998, CVD mortality started to increase again in some former Soviet Union countries (e.g., Russia and Ukraine) and continued to decrease in others (e.g., Baltic countries). In both Russia and Ukraine, the trends reversed in 2004 and continue to fall until the present (Figure 3). Changes in CVD mortality were followed by growing life expectancy gaps between EU and non-EU countries, between EU-CEE countries and other western EU countries, and between former Soviet Union Baltic countries that now belong to the EU and other EU-CEE countries (Figure 4). Understanding determinants of these trends in CVD and explaining the differences in CVD mortality would contribute largely to CVD prevention strategies and health policy in Europe.

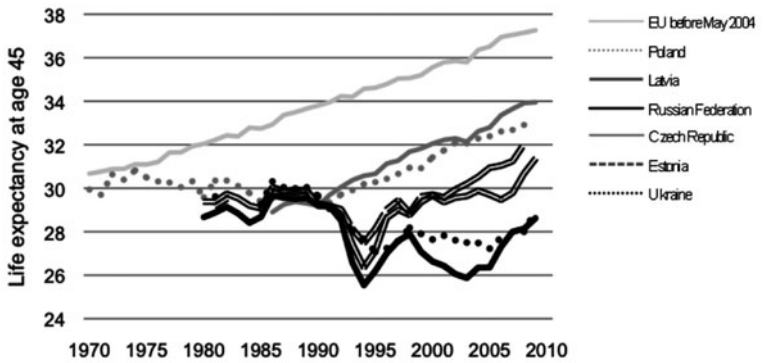

Fig. 4. Life expectancy at age 45 in six Central and Eastern European Countries and European Union (15 countries before May 2004).

Source: WHO Europe, European HFA Database, December 2011.[3]

MEDICAL TREATMENT

The 1982-1994 WHO MONICA (Multinational MONItoring of trends and determinants of CArdiovascular disease) Project collected information on CHD mortality and incidence from within 37 well-defined populations from 21 countries. The findings showed that changes in case fatality rates contributed to 21 percent of the average change in CHD mortality in men and to 35 percent of change in women.[4] Findings of the WHO MONICA Project did not clarify to what extent changes in case fatality could be related to the improvement of treatment and to preventive measures that

affected the natural course of the disease. Nevertheless, introduction of revascularization procedures and the increase in the use of effective cardioprotective drugs is seriously considered as one of the main causes of the decrease in CHD mortality and increase of life expectancy in some medical societies and in the United States is considered as one of the great public health achievements in the 20th century.[5,6]

Around 1995, CEE countries were at the bottom of the scale in the use of coronary angiography. For example, in Poland the number of examinations per one million population was nearly ten times lower than in the top country in Europe (Iceland).[7] In Poland the reaction was fast and impressive. Large investments in the field of invasive cardiology resulted in the opening of over 100 new catheterization laboratories dispersed around the country, which resulted in a steep increase in the number of coronary angiographies and Percuteneous Coronary Interventions (PCIs) performed per year over the next decade. This tremendous effort contributed to improved care in the acute phase of CHD events but could not explain the dynamic decline in CVD mortality as the main decline occurred earlier - between 1991 and 1996. Further, the effectiveness of the treatment in an acute event is dependent upon the time of its application. The earlier it takes place, the better effect can be expected. Some studies from Poland confirmed that frequently treatments are not applied in the recommended time period after the onset of an event and that the main delay is due to the late call for medical service.[8,9]

Recent findings of the project IMPACT Poland confirmed that change in the treatment of acute myocardial infarction could explain only about five percent of the change in CHD mortality.[10] However, similar to the other countries in which the IMPACT project was carried out, changes in all treatments could contribute to a 37 percent change in CHD mortality.[11-15] This could be an effect of the considerable increase in the use of cardioprotective drugs (i.e., aspirin, beta-blockers, ACE-inhibitors, lipid-lowering and anti-diabetic agents) in secondary prevention, which was observed between 1997 and 2006.[12,13] Findings from EUROASPIRE III surveys proved that, with the exception of statins, cardioprotective drugs (especially beta-blockers and ACE-inhibitors) were used more intensively in Poland than in many countries from West Europe. However, the frequency of use of cardioprotective drugs varied in the other CEE countries being generally lower than in West Europe.[14] In conclusion, it is worthwhile to underscore the point that revascularization procedures and cardioprotective treatments remain important tools in the management of CHD, especially in the acute phase and after, but their potentials to control all CVD is limited.

RISK FACTORS

Most of the decline in CVD mortality can be attributed to change in the incidence of the disease. In the WHO MONICA Project, coronary event rate contributed to 79 percent of the average decline in CHD mortality in men and to 65 percent in women.[4] Both incidence and mortality are related to the exposure to modifiable CVD risk factors such as smoking, low physical activity, hypertension, dyslipidemia, unfavourable diet, obesity and diabetes.[15] In the INTERHEART Study, potentially modifiable risk factors accounted for over 90 percent of the risk of an initial acute myocardial infarction.[16] Earlier findings from The WHO MONICA Project confirmed that ten-year trends in CHD were partly explained by changes in classic risk factors.[17] Changes in mortality trends may also be explained by the changes in health-related behaviours such as fruit and vegetable consumption, fat intake or physical activity, which were not subjected to core MONICA observations. Ecological analysis done in Poland in the 1990s suggested that falling CHD mortality coincided with the decreasing consumption of butter and increasing consumption of vegetable oils and "exotic" fruits.[18]

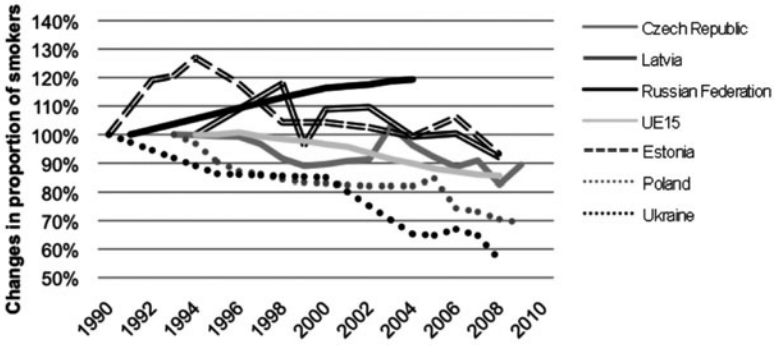

Fig. 5. Changes in smoking in six East and Central European countries and European Union (15 countries before May 2004)

Source: WHO Europe, European HFA Database, December 2011.[3]

Figures 5-7 show percent change in smoking, consumption of fruits and vegetables and changes in proportion of energy from fats in the same CEE countries for which mortality trends were presented earlier in Figure 3. Changes in proportion of smokers, which are reflected by trends in CVD mortality in Poland, Czech Republic and Estonia support the smoking reduction hypothesis. Increase in smoking rates in Estonia occurred at the same time as an increase in CVD mortality in the early 1990s, and a decrease

in smoking rates was followed by the decrease in CVD mortality rates in all three countries. In Poland, since 1990, there was a systematic reduction in the proportion of smokers and despite a small fluctuation in 2005, per cent of smokers in 2009 was about 30 percent lower than in 1993. In the Czech Republic, a steady decline in smoking rates between 1993 and 2002 was observed and then after short increase in 2003, a systematic decrease was observed again. Finally, in 2009 in the Czech Republic the smoking rate was approximately ten percent lower compared to the baseline estimate in 1993. In Russia, there was a fairly stabile increase in smoking rate, which finally resulted in a 20 percent increase in the period from 1991 to 2004. This could contribute to the increase in CVD mortality but did not explain the decrease in the mid-1990s. The relationship between the proportion of smokers and CVD mortality in Latvia was even less clear as fluctuations between 1994 and 2002 were not reflected by changes in CVD mortality, but a later decrease in smoking rate coincided with a fall in the mortality rate. In Ukraine, there has been a fairly stable decline in the proportion of smokers since 1990 with a rising trend in CVD mortality, until 2004, when the trend reversed.

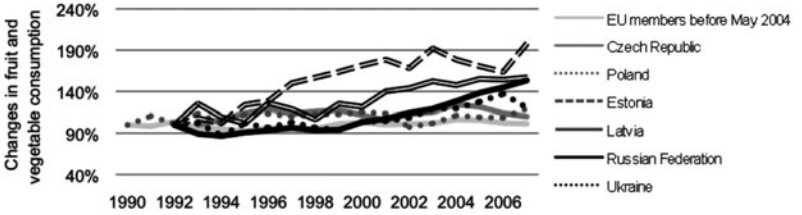

Fig. 6. Changes in fruits and vegetables consumption in six East and Central European countries and European Union (15 countries before May 2004).

Source: WHO Europe, European HFA Database, December 2011.[3]

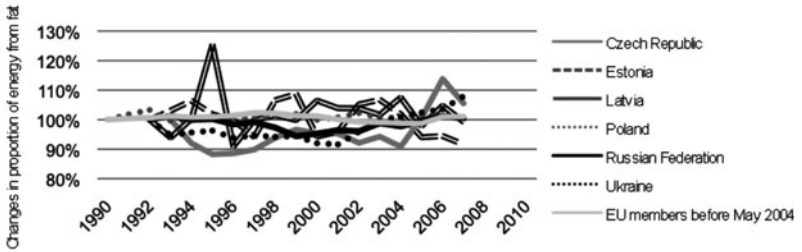

Fig. 7. Changes in proportion of energy from fats in six East and Central European countries and European Union (15 countries before May 2004).

Source: WHO Europe, European HFA Database, December 2011.[3]

In general, in CEE countries consumption of fruits and vegetables increased after 1991. The most pronounced increase was observed in Latvia and Estonia and after 1999 in Russia and Ukraine. However, in the latter countries changes in fruits and vegetables consumption was too limited to explain fluctuations in CVD mortality. In Poland and in the Czech Republic, the increase in fruits and vegetables intake was smaller because the consumption was already higher at baseline. Changes in these countries did not exceed 25 percent (within the same period consumption doubled in Estonia), which could have had less impact on CVD mortality.

Relations between trends of fat intake and CVD mortality are not striking because of strong irregular fluctuations in some countries and stabile consumption in others. For example, in Poland, like in the EU15 countries, consumption of energy from fats remained at the same level since 1990 (there is an evidence mentioned earlier that composition of consumed fats improved[22]). In the Czech Republic there was even a 15 percent increase in consumption of energy from fats at the time when CVD mortality continued to decrease.

According to WHO data from 2002 and projections for 2005 and 2010, exposure to CVD risk factors such as hypertension, elevated cholesterol level or obesity in CEE countries was not higher than in Western Europe.[1] Mean systolic blood pressure in CEE countries was between 124 mmHg and 129 mmHg, mean total cholesterol was between 4.9 mmol/l and 5.5 mmol/l, and mean body mass index between 24.3 kg/m^2 and 26 kg/m^2. All these values were within the range observed in the western EU countries from before the enlargement in 2004 (Figure 8).

After the MONICA study period (1982-1994), evidence from the large population studies based on standardized methods of data collection is scarce. One of the few examples is the national survey carried out in Poland in 2003-2004. This study showed that control of hypertension and dyslipidemias was definitely below expectations, which was mainly due to a combined effect of poor population awareness and poor compliance with medication.[19,20] Further, the effectiveness of national prevention programs introduced later was lower than expected.[21] However, secondary prevention medical care seems to be more effective. In the EUROASPIRE III study, in CEE countries, the proportions of persons who reached the LDL-cholesterol treatment target were slightly lower than in West Europe, which reflected less frequent use of statins. Some other risk factors (e.g., hypertension, overweight, diabetes) were controlled to a similar extent as in the other EU countries or even better. Also, the proportion of patients who attended cardiac rehabilitation program was no worse in the CEE countries. However, lifestyle after an event was generally less favourable. For example, out of six countries with the highest rate of persistent smoking five were from CEE.[18]

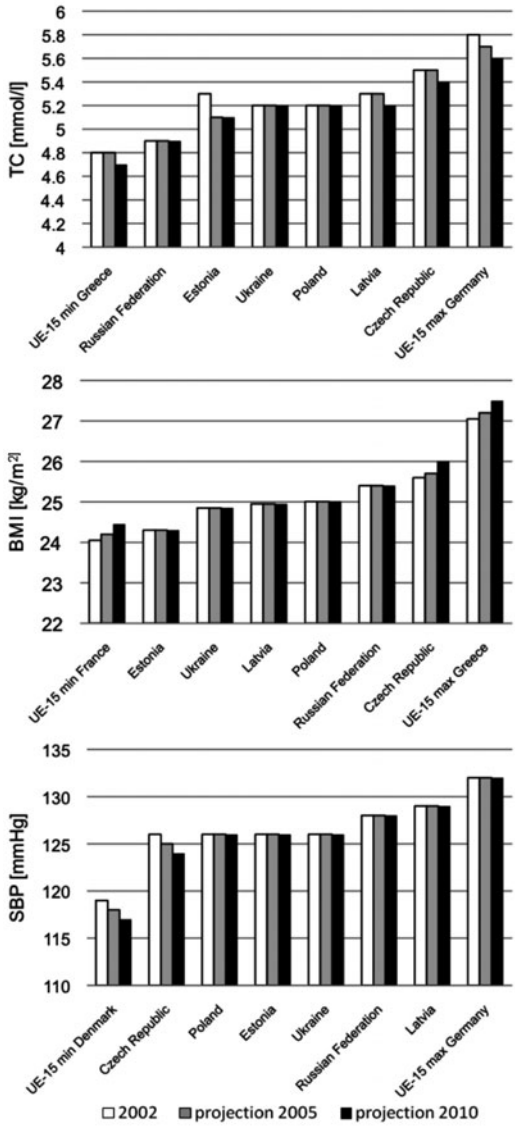

Fig. 8. Exposure to CVD risk factors in six Central and Eastern Europe countries compared to the highest and the lowest values in EU (15 countries before May 2004).

Source: Allender S, Scarborough P, Peto V, Rayner M. European CVD statistics 2008 edition, British Heart Foundation, 2008.[1]

Results from the project IMPACT, which aimed to explain determinants of the decline in CHD mortality in Poland between 1991 and 2005, suggested that 52 percent of the decrease in men and 60 percent in women could be explained by favourable changes in the exposure to risk factors - mainly to hypercholesterolemia and low physical activity in both sexes, smoking in men and hypertension in women.[7] However, earlier study done in Poland did not confirm that change in risk factors was a triggering factor for the dynamic reversal of the trend in 1991. At that time, changes in risk factors in Poland were small and diverse and little explained changes in CHD mortality.[22] Changes in major risk factors that occurred in CEE countries must have had an important impact on CVD mortality, but available data from routine statistics do not confirm that they were the predominant determinants of the trends and especially that changes in risk factors were the main triggering factor for the decline in CVD mortality in all CEE countries.

ALCOHOL HYPOTHESIS

High consumption of alcohol is related to cardiovascular risk independent of classic CVD risk factors and, in addition to the volume consumed, it has been suggested that the pattern of drinking is also important.[19,23,24] There is evidence that episodic consumption of high amounts of alcohol (binge drinking) is associated with high risk of coronary heart disease,[25] stroke[26] and metabolic syndrome.[27] The effect of alcohol consumption on cardiovascular risk is strengthened by the increase of blood pressure in drinkers.[28]

Alcohol consumption was considered to be one of the main factors responsible for striking fluctuations in CVD mortality in the 1980s and mid-1990s in Russia. After the decrease in alcohol consumption, which was the result of Gorbachev's anti-alcohol campaign, a sharp increase in life expectancy in Russia was observed. The decrease in CVD mortality observed at that time was assumed to reflect an effect of reduced alcohol consumption. Such a change could not be explained by other known determinants of health.[29] Also, stabile mortality from neoplasms, in contrast to CVD deaths and deaths from external causes at that time, confirmed that changes in mortality were not an artefact and could be alcohol related.[30] It was suggested that the decrease and later increase in CVD mortality were related to the introduction of the anti-alcohol campaign in June 1985 and its later collapse. In 1992, mortality increased largely when hyperinflation began and alcohol prices were growing much slower than salaries. However, later findings from Russia and observations from other CEE countries do not confirm the alcohol hypothesis. Recent data showed that, when the

CVD mortality had started to decrease in 2004, alcohol consumption was still increasing in Russia. In contrast to Russia, in Ukraine and Estonia, a dynamic decrease in alcohol consumption was reported in the early 1990s, which coincided with increasing CVD mortality. In these two countries, the falling trend in CVD mortality was later observed to coincide with increasing alcohol consumption. Increasing alcohol consumption was also observed in the other CEE countries in which a decreasing CVD mortality trend was observed, including Latvia in which changes in alcohol consumption and CVD mortality were similar to Russia at the beginning of 1990s (Figure 9).

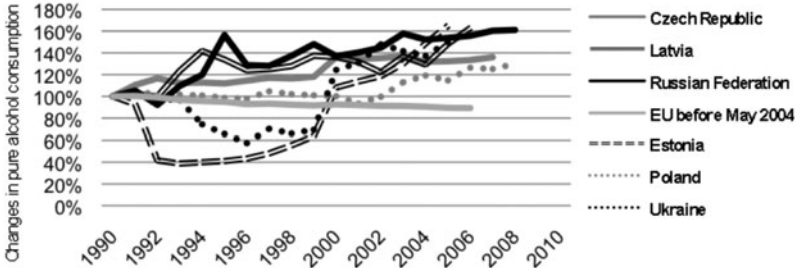

Fig. 9. Pure alcohol consumption in six Central and Eastern European countries and European Union (15 countries before May 2004).

Source: WHO Europe, European HFA Database, December 2011.[3]

Routine statistics indicate that, with the exception of Czech Republic, alcohol consumption is lower in CEE than in other EU countries.[3] The type of consumption could however contribute to more harmful health effects of alcohol consumption in CEE countries, which are known to practice binge drinking. According to the results of the prospective study of the Russian population of Novosibirsk, increased risk of cardiovascular death was found only in frequent heavy drinkers (RR=2.05; 95%CI=1.09-3.86),[31] so the risk of CVD death would be higher only in people drinking more than 120g of pure alcohol per occasion and more often than three times a week. Such drinking patterns were found only in five percent of the study group. It is unlikely that the size of that group increased sufficiently to cause a large change in the whole country mortality figures. In another Russian study by Deev et al., no differences in CVD mortality were found between drinkers and non-drinkers.[32] Evidence based on the observation of the mortality and alcohol consumption trends in Russia, their plausibility and biological mechanisms are debated still.[33,34] Nevertheless, it is unlikely that alcohol consumption could fully explain CVD mortality trends in CEE countries and the differences in mortality rates between Eastern and Western Europe.

ECONOMIC AND PSYCHOSOCIAL FACTORS

There were two interesting time points in the history of CVD in CEE. The first at the beginning of the 1990s, when CVD mortality started to decrease dynamically in the Czech Republic, Hungary and Poland continuing until the present. At the same time in the other CEE countries, CVD mortality continued to increase and most countries of the former Soviet Union, particularly Russia, experienced an unprecedented increase in CVD mortality in the years 1992-1994. The second interesting time point was in the year 1998, in which the second rise in CVD mortality was observed in Russia and in some other former Soviet Union countries while in Baltic countries CVD mortality continued to decrease as in the Czech Republic, Hungary and Poland.

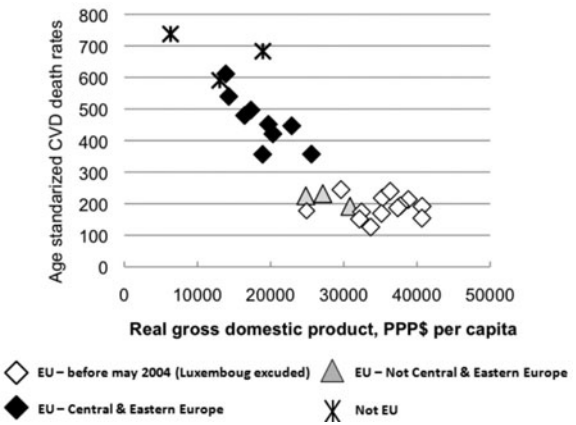

Fig. 10. Relationship between GDP per capita and CVD mortality in European Union and three not EU Eastern European countries (last available year).

Source: WHO Europe, European HFA Database, December 2011.[3]

There is a clear relation between wealth and CVD mortality in Europe. The relation between GDP per capita and CVD mortality is striking (Figure 10). The Russian case supports the hypothesis that rapid increases in mortality seem to coincide with major economic instability. Stuckler et al. pointed out the importance of mass privatization in Russia, which caused unemployment and job instability.[35,36] It is worth however, to add that the effect of privatization was strengthened by the 1992 Rouble crisis, which was followed by the collapse of the pension system and the spread of poverty. Stuckler et al. compared mortality trends between Russia and

Belarus in which transformation to market economy was very limited and privatization of industry was halted quickly. This could not recover the country economy but limited destabilization. Belarus, in which CVD mortality trend was parallel to Russia before 1990, avoided the steep increase in mortality in the next years.[40] However, mass privatization was not only the case in Russia. Rapid, mass privatization also started in Poland in 1990. Unemployment increased from less than one percent in 1990 to 16 percent in 1994.[37] Similar to Russia, privatization was introduced at the same time as a severe financial crisis. In 1990, inflation of Polish Złoty reached nearly 600 percent and it was 70 percent, 43 percent and 35 percent in the next three years respectively.[38] In contrast to Russia, at the time of mass privatization and currency crisis, Poland experienced a dynamic decrease of CVD mortality (Figure 11). The main difference was that in Poland both political transformation and a shift to market economy were welcomed by the public. Also the Czech Republic and Hungary, in which political and economic transformation were accepted by the society, followed the same mortality pattern. In Russia and in the other countries of the former Soviet Union, political reforms and economic transformation were rather shocking for the society. The coincidence of the second rise in CVD mortality with the 1998 Rouble crisis in Russia and some other former Soviet Union countries would confirm the link between economic instability and CVD and it is less surprising that a rise in CVD mortality rates was not observed in former Soviet Union Baltic countries, which at that time introduced economic reforms to allow for their accession to the EU. Comparison of the coincidence of changes in CVD mortality with the economic crises in Poland and in Russia suggest that objective measures of economic instability on the population level are not as important as its perception in the society.

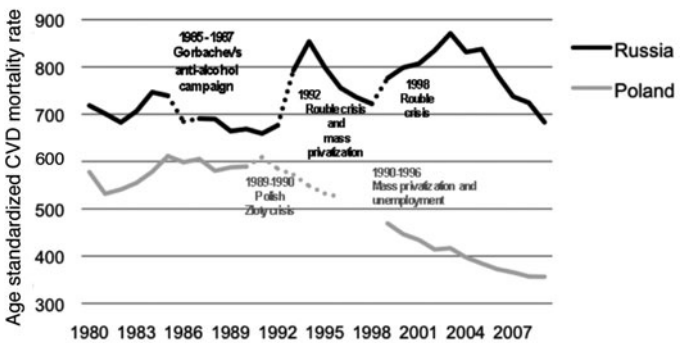

Fig. 11. CVD mortality in Russia and Poland.

Source: WHO Europe, European HFA Database, December 2011.[3]

For individual people, economic instability causes threats that are beyond their control, threats to the social status, respect or acceptance in the group, and to self-worth, which are typical for psychosocial stress. Evidence for the association between chronic psychosocial stress and CVD is accumulating. Such traits as depression, anxiety, low social position, low control over one's own life and health, poor job conditions (effort-reward imbalance, job strain) are recognized as important psychosocial risk factors.[19] The evidence from CEE countries is scarce, but the clear relation between education and CVD mortality, which was confirmed in almost all CEE countries[39-45] seems to support that CVD risk is higher among disadvantaged groups just as it is in Western Europe. There is also confirming evidence that unfavourable working conditions are related to depression and worse health.[40,41]

The hypothesis that dynamic changes in CVD mortality in CEE countries are explained by psychosocial factors is attractive, but there is no firm evidence to confirm it. In the INTERHEART Study adverse psychosocial conditions were associated with an increased risk of myocardial infarction and contributed to 35 percent of the population attributable risk.[42] However, current knowledge does not allow for a quantitative estimate of to what extent differences in the exposure to psychosocial factors explain the variation in CVD mortality between the European countries and the life expectancy gap between East and West Europe.

The relationship between CVD and psychosocial stress was recognized by European scientific societies. However, the present recommendations for clinical practice are limited to the assessment of main psychosocial risk factors followed by intensive intervention on classic risk factors in high risk individuals; no direct intervention to lower exposure to psychosocial stress is postulated.[16] Nevertheless, accumulating knowledge allowed the WHO Commission on Social Determinants of Health to propose three principles of action: 1) improve the condition of daily life, 2) tackle inequitable distribution of power, money and resources, 3) measure and understand the problem and assess the impact of action.[43] It is obvious that the nature of the latter recommendations requires attention from beyond the medical and public health system to - politicians, economists and other structural drivers of daily life. The strategy of intervention seems to be encompassed for the future, but what priority will be assigned to it in CEE in the time of the current economic crisis in the world remains an open question.

CONCLUSIONS

CVD is the most important cause of mortality in CEE countries and contributes largely to the life expectancy gap between East and West Europe. Rapid development of high technology treatment procedures, which followed the economic recovery of the CEE countries would have only limited influence on the overall control of CVD. Exposure to classic risk factors might explain to a large extent the longitudinal trend in falling CVD mortality in some countries but it is unlikely that it could explain rapid changes in the others. Still, large potential to control the disease lies in developing effective preventive policies with targets to lower exposure to the classic CVD risk factors. There is no doubt about the beneficial health effect of controlling alcohol consumption but the recent history of CVD in CEE countries made the "alcohol hypothesis" less convincing as an explanation for CVD mortality trends and differences between East and West Europe. The hypothesis that dynamic changes in CVD mortality in CEE countries are triggered and explained largely by psychosocial factors is attractive. However, if confirmed, transforming such knowledge into a practical health policy would be a great challenge.

Acronyms list:
CEE = Central and East European countries
CHD = Coronary Heart Disease
CVD = Cardiovascular Disease
EU15 = The 15 EU member states prior to 2004
WHO MONICA = Multinational MONItoring of trends and determinants of CArdiovascular disease

Conflicts of Interest: None declared.

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