

## Main Features of Epidemiological Development in Hungary after the Second World War\*

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There have been three periods of epidemiological development in Hungary since the end of the Second World War: the hopeful beginnings between 1948 and 1966, the chronic, qualified epidemiological crisis from 1967 to 1993, and the period of renewal since 1994. In the first period, life expectancy increased by 8.5 years, in the second period it became 0.8 years shorter, but for the male population, 2.7 years shorter. In the last thirteen years, life expectancy has lengthened by 4.1 years. In six decades, the age and the cause structure of mortality have changed substantially. In 1947, 48 percent of total deaths were among the over-sixties; in 2006 this figure was 78 percent. In the same period, the proportion of deaths from infectious diseases went down from 11.8 to 0.6 percent; from cardiovascular diseases, up from 22.9 to 50.6 percent; and from cancers, up from 9.5 to 24.6 percent. The secular trend of mortality – general, age-specific and cause-specific – to a large extent was badly influenced by the two fundamental changes in socioeconomic and political structure experienced by the country in a historically short period. The improvement since the transition will only be sustainable if today's large geographical differences in mortality – the result of the social, rather than the physical environment – are reduced.

#### KEYWORDS:

Differential mortality.  
Epidemiology.

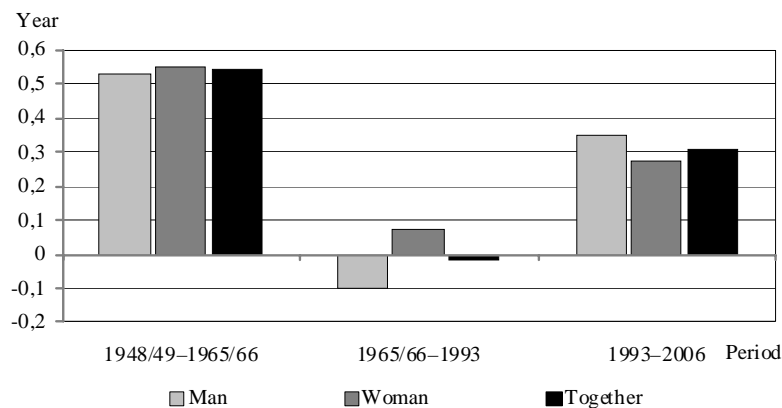
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Epidemiological conditions (morbidity, mortality and life expectancy) changed more in the decades following the Second World War than in the centuries that preceded it, a statement which is as true for Hungary as for the world as a whole. What makes Hungary different, however, is that the continuity of epidemiological development was broken by a violent transformation of society. From the mid-1960s onwards, the satellite countries east of the Elbe fell behind the Western European countries in terms of mortality and life expectancy. In Hungary, a *chronic, qualified epidemiological crisis* set in and was deepened by the shockwaves of the political transition in the early 1990s. Life expectancies were worse in 1993 than in 1966. The turning point came in 1994, and in the following thirteen years life expectancy at birth lengthened by 4.1 years as Hungary started to catch up with the countries forming the core of the European Union.<sup>1</sup> It will take another ten-fifteen years to reach the life expectancy prevalent at present in the EU.

Epidemiological development in the six decades following the war may be divided into three periods: the hopeful start between 1948 and 1966, the chronic, qualified epidemiological crisis between 1967 and 1993, and the period of renewal starting in 1994. Figure 1 shows the annual average change in life expectancies for men, women and the total population in the three post-war periods of epidemiological development. The divergent patterns of life expectancy in each period show up markedly.

Figure 1. Annual average change in life expectancy at birth in the three periods of post-Second World War epidemiological development



<sup>1</sup> Countries which were EU members before May 2004, namely Austria, Belgium, Denmark, Finland, France, Greece, the Netherlands, Ireland, Luxembourg, the United Kingdom, Germany, Italy, Portugal, Spain, Sweden.

## 1. The hopeful beginnings: 1948–1966

The population of the country – in mortality terms – had recovered from the destruction of war by 1947. After the extremely high number and rate of deaths in 1944 and 1945, fewer people died in 1947 than in 1943. In fact, 1947 was the first year in the seventy-year history of registration of deaths in which the death rate fell below 13 per thousand. Life expectancy in 1948/49 approached 61 years, 4.4 years higher than in 1941.

The healthy trend continued up to the mid-1960s: mortality greatly improved, as expressed in both the number and the rate of deaths. In the decade up to 1944, an average of a hundred and thirty thousand people died each year representing a crude mortality rate of 14.1 per thousand, compared with annual averages of a hundred and five thousand or 10.8 per thousand between 1947 and 1966. Proof of the consistency of the secular trend is that the death rate of 12.9 per thousand at the start of the two-decade period fell to 10.0 by 1966. Progress was greatest in infant mortality: there were twenty thousand infant deaths in 1947, 106.6 per thousand live births, a rate which went down to 38.4 in 1966. Life expectancy also improved: the generation born in 1948/49 had a life expectancy of 60.9 years, a figure which rose to 69.6 by 1965/66. A striking feature of life expectancy improvement was its almost exclusive confinement to infancy and young adulthood; another was the almost equal improvement for men and women. *Nota bene*: a key development for later epidemiological development was that male life expectancy peaked at 67.3 years in 1965/66, an almost unbroken upward trend of seven decades.

Most of the reduction in mortality and the increase in life expectancy derived from fundamental changes in the effectiveness of health care, although living conditions, mainly better nutrition, no doubt also played a part. In the first two decades after the war there was a revolutionary improvement in both preventive and therapeutic medicine. Vaccinations and better public health conditions led to the complete eradication of some infectious diseases and the diminution to an insignificant level of the mortality due to others. There were particular successes in diseases affecting infants and children, such as diphtheria and poliomyelitis. Antibiotics caused a rapid decline in mortality from two frequently fatal diseases, pneumonia and tuberculosis. Penicillin also proved an effective treatment for many previously-lethal infectious diseases besides pneumonia. The overall result was a transformation of the mortality structure. In 1947, infectious diseases accounted for a third of all deaths; by 1966, this had fallen to a tenth. The complementary phenomenon in the new structure was the substantial rise in the number of deaths from cardiovascular diseases and cancer. The former increased from 22.9 to 50.5 percent of all deaths, and the latter from 9.5 to 20.1 percent. The proportion of deaths from external causes also increased. In 1966, these three main cause of death groups accounted for 77.6 percent of all deaths.

Hungary's epidemiological history in the first two post-war decades defies the usual interpretations: society went through a series of traumas which seem inconsistent with improving life expectancy. Socioeconomic success is the usual condition for health improvements, while chaotic conditions, social and economic malfunctioning – especially if these persist for a long time – are normally detrimental to health and everything which determines it, with the concomitant implications for life expectancy.

This deviation from the usual causal relationship can only be explained by the special conditions in the country which permitted epidemiological development to withstand and even profit from the violent transformation of society, in this case invasive state interference. Part of the ethos of dictatorial Communist rule was improvement of the health of the people. Where this was feasible by means of central instructions, compulsory interventions and a low level of investment, progressive public health measures could be an integral part of the “constructive function” of dictatorship. This was a feature of the optimistic decades following the takeover of power, when “mobilisation of the people” and acceleration of technical development were resources that could still be tapped. This happened in nearly every Central-Eastern European country which was “building socialism”, also in China and Cuba. Life expectancy at birth increased at an unprecedented rate, especially through the reduction of infant and child mortality. Infant mortality, indeed, was at that time the most sensitive indicator of health conditions.

It should be noted that the extension of employment and social insurance to the whole population meant that every member of society had access to health care – medical treatment, medicines and, those in work to sick pay. These were major and successful advances.

## **2. The chronic qualified epidemiological crisis: 1967–1993**

By the mid-1960s, the epidemiological transformation in Hungary was complete. The country had entered a new epidemiological regime in which three-quarters of deaths occurred over the age of 60, and three-quarters of deaths were the result of cardiovascular disease, cancer and external causes. At the start of this new phase, life expectancy at birth was approximately 70 years.

There seemed good reason at that time to hope that the effect of the country's semi-peripheral position (in terms of socio-economic development) – the lag in epidemiological development – might be eliminated. Hungarians born in these years looked forward to a living only 0.3 years less than Austrians. What happened in the

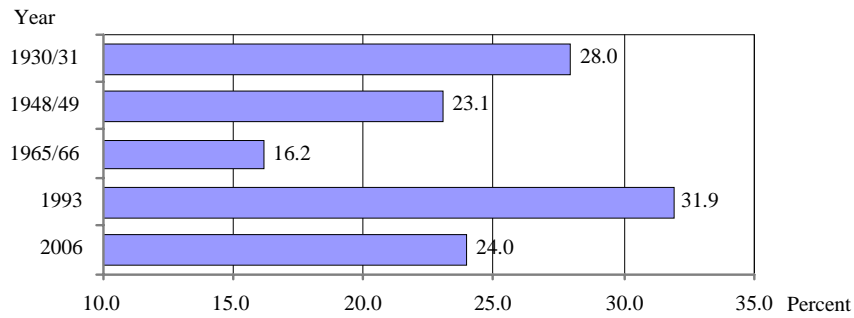
first half of the 1960s was in fact a fortunate conjunction. Life expectancy had been freed from the influence of infectious diseases and was not yet burdened by chronic diseases resulting from wear and tear of the body. To put it more precisely, in terms of worsening life expectancy, the reduction in the former obscured the increase of the latter. When the reserves deriving from reducing infectious disease mortality had run out, life expectancy, especially for men, started to decrease. This first happened in 1967. When the minor decrease in life expectancy heralded the start of the phenomenon, it could still have been put down to random variations in stochastic processes. It gradually became clear, however, that it was a sustained basic trend caused by adverse epidemiological phenomena, mainly, if not exclusively, in the middle-aged male population.

The increase in mortality was primarily related to *unhealthy lifestyle*. Deteriorating mortality mainly affected people with low levels of education – unskilled and semi-skilled workers and agricultural labourers. A strange paradox emerged. Despite the war, reconstruction, artificially forced industrialisation and the related high rate of migration among unskilled workers, the violent change of ownership in agriculture, the expropriation of private property, the systematic dismantling of the structure of society and the Stalinist terror in political affairs, with all the attendant fear, the two decades between 1947 and 1966 turned out to be one of the most successful periods of 20<sup>th</sup> century epidemiological development, while during the years of consolidation, despite the improvement of living standards and even quality of life, a chronic qualified epidemiological crisis took hold. Just as Hungary had “got out of the storm”, the steadily rising mortality of apparently “new” diseases led to a death rate among men in the middle of their lives which evoked the economic crisis of 1929–32.

Between 1966 and 1993, men’s life expectancy at birth decreased by 2.7 years, and women’s increased by 1.8 years. The improvement among women was not enough to balance out the deterioration among men, and the life expectancy of the population as a whole decreased by 0.8 years. This was an unusual development in peacetime in a civilised European country with a developed health culture. The crisis was qualified, however. The deterioration in life expectancy did not affect the population under 30 or over 75; it had much more severe effects among the male than the female population; and mortality rose only in four of the eight most prevalent main death groups: cancer, cardiovascular diseases, diseases of the digestive system and external causes.

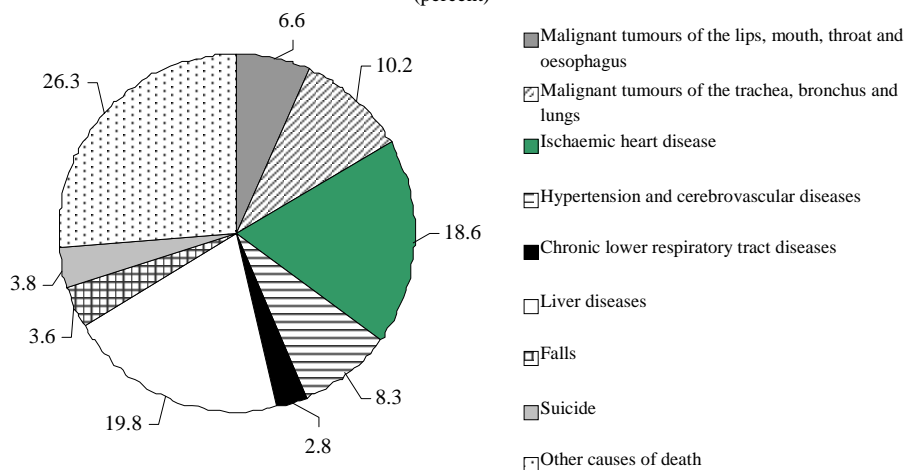
Figure 2 shows the essence of the chronic, qualified epidemiological crisis as regards the men aged between 30 and 60 years. They were the group most severely affected by the crisis. The probability of a thirty-year man not reaching his sixtieth birthday went up from 16.2 percent in 1965/66 to 31.9 percent in 1993, 3.9 percent higher than the 1930/1931 figure.

Figure 2. Male probability of dying between exact ages of 30 and 60 years (percent)



An examination of the structure of cause of death shows which diseases and external fatal incidents grew in frequency to cause the increase in the probability of dying among men between the ages of 30 and 60. The following pie chart (see Figure 3) shows the percents with which increasing frequencies of death of the male population from certain causes contributed to the deterioration of cause-specific mortality between 1966 and 1993. Liver diseases caused nearly a fifth of the increase in probability of dying, coronary heart diseases almost the same, lung cancer about ten percent, hypertension and cerebrovascular diseases together about eight percent, and malignant tumours of the lips, mouth, throat and oesophagus between six and seven percent. These figures are for the segment of the population most affected by the epidemiological crisis.

Figure 3. Contribution of the main increasing cause specific probabilities of dying to the rise of probability of dying for male population between exact ages of 30 and 60 years, 1966–1993 (percent)



Nearly two thirds of the deterioration in mortality, therefore, derived from the increased frequency of death from cancer, cardiovascular diseases and diseases of the digestive system. The mortality in these three main causes of death groups was also largely responsible for the worsening mortality among the population as a whole.

For infectious diseases, it is easy to describe the cause of death and the mechanism of the processes leading to death: death is *monocausal* when a single agent – for example mycobacterium tuberculosis or TBC – causes the death of a person. However, most of the pathogens responsible for the above diseases or characterised as risk factors are probably of *multicausal* origin. Behind the six diseases or groups of diseases involved here are primarily not inherited factors, but unhealthy lifestyle and the social environment which largely defines it. Most liver diseases are due to the result of heavy alcohol consumption and 85–90 percent of lung cancer to cigarette smoking, while coronary heart disease is frequently related to smoking, unhealthy nutrition, obesity, lack of exercise and sustained or recurrent stress, and often involves hypertension and diabetes. Cerebrovascular disease is strongly related to high-salt and high-fat diet, and often involves hypertension and atherosclerosis. Cancers of the upper third of the digestive system, particularly of the mouth, are predominantly due to the synergistic effects of smoking and alcoholism. Personality changes caused by alcohol addiction involve neglect of health, in this case failure to care for the mouth, which is also a causal factor.

The effects of smoking and heavy drinking on the number of deaths have been effectively quantified in the hierarchy of risk factors. In Hungary, a conservative estimate puts the average annual number of deaths from smoking at 25–28 000, from alcoholism at 15–17 000, corresponding to approximately 19–21 and 11–13 percent of total mortality. At the beginning of the 20<sup>th</sup> century 36–41 thousand deaths may be attributed to the two addictions, this means 27–30 percent of all deaths. This proportion is substantially higher among middle-aged men. In the 35–64 year male age group, approximately 35 percent of deaths at the turn of the millennium and in the first years of the 21<sup>st</sup> century were the consequence of smoking, about 27 percent could be attributed to alcoholism, and about one percent was due to the combined effects of the two addictions. This means that some 63 percent of deaths among middle aged men was caused by these two addictions, or at least were substantially influenced by them. Experts agree that in industrial and postindustrial countries *smoking is the number one risk factor*. The epidemiological significance of alcohol abuse and intoxication, however, depends on drinking culture. In this respect the developed countries fall into different groups. Hungary is grouped together with the Scandinavian, and even more closely with the Slavic countries, where heavy drinking is a serious social problem, and substantially affects mortality rates, especially among men.

Alcoholism has always been a problem in Hungary, but a particular kind of drunkenness, which over several decades gave rise to one of the country's most se-

vere health and social problems, became widespread in the 1950s and 1960s in circumstances deriving partly from Soviet Russian “imports”, partly from socialist industrialisation and partly from Hungary’s version of Soviet-type socialist society. One aspect of this was internal migration; in the big construction projects of the 1950s, everyday heavy drinking was established as a social norm among semi-skilled and unskilled workers who, having largely been recruited from agricultural areas, moved far from their families. For these people, the primary relaxation in after-work free time was drinking in the local bar. When they travelled home every two weeks on the notorious “black trains”<sup>2</sup> running between the heavy-industrial construction projects and the railway stations serving remote, backward rural areas, it was again only bad-quality alcohol which was available to them in large quantities. Drunkenness did not endanger their jobs; in an aggressively downwardly-levelling society, where achievement was not highly valued, there was a generally permissive attitude to alcohol abuse. Thus it was that the first-generation Hungarian “labouring class” went from the new, socialist towns of Leninváros (Lenincity) and Sztálinváros (Stalincity) directly to an “alcoholic paradise”. The legacy of the special kind of drunkenness pervading the lower reaches of society still presents a severe burden to the country as a whole. For those at the top of the social pile, the availability of publicly-funded alcohol as part of official entertainment made drinking during working hours socially acceptable. This was the “apricot-*pálinka* hazard” faced by leaders, the “cadre alcoholism”. In the achievement-oriented society which took shape following the social and political transition, there are some signs, including a levelling off of alcohol consumption for many years that drunkenness is not on the increase<sup>3</sup>. But actually combating this widespread disease among free-market conditions is a problem which Hungarian society has yet to solve.

The question remains as to why the epidemiological crisis was predominantly a phenomenon of the adult population, featuring a high death rate among 40–59 year old men, and did not affect, for example, vulnerable infants or elderly people of declining strength. The explanation lies in the chronic nature of non-infectious diseases and the major risk factors behind them. Two simplified examples will serve as illustrations: if somebody develops an addiction to tobacco or alcohol during their teens or twenties, it usually takes another two-three decades for the first symptoms of lung cancer or liver cirrhosis to appear. Death occurs a few years after the disease manifests itself, very frequently in the fifth or sixth decade, sometimes later. For the large numbers of people who became addicts to one or other, or perhaps both, in the 1950s or 1960s, deaths from lung cancer and liver cirrhosis were very common in the

<sup>2</sup> This has been the nickname of run-down trains directly connecting fortnightly the workplace and junction of local homeward trains.

<sup>3</sup> It is difficult to estimate the per capita alcohol consumption, because a fairly large amount of alcoholic beverages is in the black market.



1970s, 1980s and later. The medical history of cardiovascular diseases is more complicated, but leads to the same outcome.

The primacy of chronic, non-infectious diseases became a major challenge for the societies of capitalist countries several decades before the same occurred in Soviet-type socialist countries. This led to the stagnation or slowing improvement of life expectancy for a while, but did not lead to an epidemiological crisis, and from the mid-1960s life expectancy resumed its upward curve. Indeed, for the first time in the several-thousand year history of epidemiology, the improvement showed up in every age group. It was the inability of the socialist countries to meet the challenge that was really behind the emergence of the chronic epidemiological crisis in Hungary.

The issues of morbidity and mortality rates, the health of the population and life expectancies go beyond mere epidemiology and public health. They form a border area par excellence, and their investigation calls on the disciplines of demography, sociology and, just as importantly, historiography.

Life expectancy has some correspondences, indeed interactions, with economic, social, political and cultural conditions, but these are indirect and complex. It is true that there is a strong correlation between per capita GDP and life expectancy at birth, but the former is not the sole determinant of the latter. Nevertheless, its semi-peripheral socio-economic situation always placed the country at the back of the pack as regards life expectancies, but this is not an argument which addresses the finding that the gap steadily widened for nearly three decades. It is also true that the collapsing communist regime was unviable, but that fact alone is not enough to explain Hungary's chronic epidemiological crisis, because there was no such crisis in other satellite communist countries before the transition.<sup>4</sup> There, the troubles were of smaller magnitude, or to put it another way, had not reached the crisis threshold. But the roots of the troubles were identical.

In the periodization of epidemiological regimes, the second era is that of endemic infectious diseases, and the third and fourth are those of the primacy of non-infectious diseases. The crucial difference between the last two is that in the third, preventing diseases and halting or slowing their progression is possible only to a very modest extent, whereas in the fourth a substantial fraction of degenerative diseases can be prevented and others, largely those related to ageing, may be postponed or their progression slowed. The eras are separated not by a sharp boundary, but by a transition, an evolutionary change. The epidemiological crisis was visited on Hungarian society in the third era. The unviability of the collapsing social-economic-political system was more than the chronic shortage of goods, the "inability of the oppressors to govern in the old way"<sup>5</sup>, it was also proof that the system could not re-

<sup>4</sup> The epidemiological history of the newly independent states of the former Soviet Union is different.

<sup>5</sup> Paraphrasing *V. I. Lenin*.

spond to the challenges of the third epidemiological era. For a long time there was no assessment of the situation and no policy was drawn up. Medical capabilities were also lacking. The ethos of a low-efficiency, negligent regime was unsuitable for implementing a strategy based on *responsibility of the individual, namely health awareness*. And it was health awareness that was lacking more than anything else. There were other deficiencies, but this was probably the punctum saliens.

### **3. A new era in epidemiological development: mortality and life expectancies from 1994**

The epidemiological crisis, as has already been mentioned, was aggravated by the shockwaves of the political and social transition. It reached its nadir in 1993, when 150 000 people died, the death rate was 14.5 per thousand and the life expectancy at birth only 69.1 years. People had not died in such numbers or at such a rate since the end of the Second World War. What is most telling, however, is that life expectancy at birth declined to the level of three decades earlier. It was at this nadir that a new era in epidemiological development started, characterised by the decrease in number and rate of deaths and the substantial, long-lasting and sustainable improvement of life expectancy. From 150 000 in 1993, the number of deaths decreased to between 132 000 and 136 000 from 2000 onwards, and the death rate decreased from 14.5 per thousand to between 13.0 and 13.5 per thousand. In the meantime, the population aged considerably.

Life expectancy of men increased from 64.5 years in 1993 to 69.0 years in 2006, and that of women from 73.8 to 77.4 years, an improvement in the population as a whole of 4.1 years, so that in 2006 the population of Hungary faced a life expectancy of 73.2 years. This is the highest figure in the hundred-year series of life expectancies, although still considerably lower than the European Union average. For the first time in the history of modern epidemiological development, life expectancy increased less for women than men. The principal factor in this outcome is that more and more women smoke, while the number of smokers among men is no longer increasing, in fact some data suggest that fewer men smoke now than one or two decades ago.

Death rates decreased considerably in every age group: from 12.5 to 5.7 per thousand among infants, and by 50 percent in the 35–39 year age-group. In general, the improvement in age-specific mortality was very high up to the ages of 50–55 and more modest among older people. The changes varied between 10 and 70 percent.

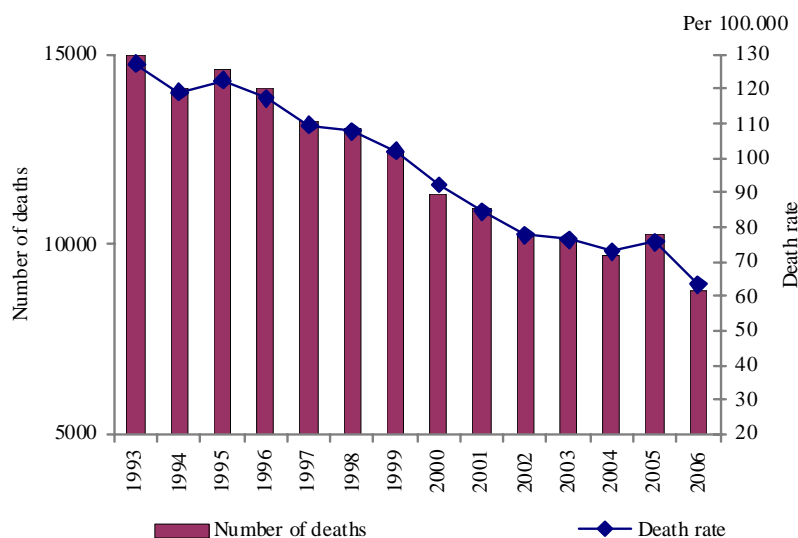
The period of renewal is a slow and gradual transition to the era of delayed progression of disease and postponement of death. It is the result of a complex set of developments dominated by the successes of preventive and curative medicine (primar-

ily in prevention and treatment of cardiovascular diseases) and perceptible changes in lifestyle (particularly nutrition) among the upper and professional upper middle classes. The conditions for these were created by the political and social transition. The capitalism – or more euphemistically market economy – which has taken shape in Hungary over nearly two decades to date, and the accompanying open society are achievement-oriented formations, and demand achievement-oriented behaviour from individuals, in which health-awareness is inherent. The new ethos of society is diffusing from the top downwards; it has still not reached that large set of people who were the losers in the transition.

The relative weight of more effective health care in the decrease of mortality has been quantified. It is measured by the number of deaths avoidable by medical intervention and their frequency. Trivial examples of such mortality are deaths from acute appendicitis and death from high blood pressure, except in old age. Mortality from such causes decreased by nearly 43 percent between 1993 and 2006 and its proportion of total mortality went down from some 22 to 16 percent. Some 40 percent of the improvement in mortality is the result of the decrease of deaths avoidable by medical intervention.

Of the 4.1 year extension of life expectancy at birth, 1.9 years were accounted for by success in treating cardiovascular diseases, primarily acute myocardial infarction, but only 0.4 years by treatment of cancer.

Figure 4. The number of deaths from acute myocardial infarction and the standardised death rate in the period 1993–2006\*



\* The death rate standardised to the WHO "European population" age distribution.

The successes are understandable when the appearance of highly effective medicines, the provision of emergency care throughout almost the entire country and the now-routine nature of surgical interventions in the coronary artery system are taken into account. In the last 7 years, the numbers of various types of the latter have increased by factors of between 4 and 12 depending on type. Acute myocardial infarction is no longer a fatal disease: the number of deaths from this disease decreased from some 15 000 in 1993 to 8 800 in 2006 and the death rate per hundred thousand of population in 2006 was hardly more than a third of the 1993 figure. (See Figure 4.)

In the little more than a decade since the 1994 turning point, the country's lag in epidemiological development originated from its semi-peripheral socio-economic situation and cul-de-sac of modernisation cannot be eliminated but it can be decreased only. Life expectancy in 2006 was still 5.2 years shorter than the average of the expanded EU and about two years shorter than might be expected on the basis of per capital GDP calculated by simple regression analysis. Mortality from cardiovascular diseases is 82 percent higher in Hungary than that of the 25 countries of the EU, and mortality from cancer 31 percent higher; death from external causes is 59 percent more frequent than in the EU.<sup>6</sup> While there has been an epochal improvement in life expectancies, it is clear that Hungary is still at the beginning of a very long journey.

#### **4. Social inequality of life expectancy in the recent period of epidemiological development**

Reducing socially-determined differential mortality will be essential for further improvement of mortality and life expectancy. The first step to do it is to reveal where these differentials can be found. Since geographical mortality differentials in fact manifest socio-economic mortality differentials, much more than environmental ones, this kind of differentials has been studied.

A recently-completed study by the Hungarian Central Statistical Office, taking an ecological approach, analysed life expectancies by human development indicators and determined who were the winners and losers in the decade and a half since the political transition. Life expectancy at birth in the period of 2003–2006 was calculated for the 168 local administrative units-1 (LAUs-1) of Hungary and for the 23 districts of Budapest. The strength of the relationship of life expectancy at birth with per capita gross income (before taxation) and the proportion of people with higher

<sup>6</sup> These figures are standardised, so that the populations are of equal age distribution in the comparison.

education attainment (in the 25 years and older population) was then determined for the universe of local administrative units-1. The correlation coefficient between life expectancy at birth and per capita gross income was 0.68872, and was highly significant:  $p < 0.0001$ . The correlation with the proportion of those with tertiary educational attainment was similarly high, its coefficient being 0.67290,  $p < 0.0001$ .

The 168 LAUs-1 were divided into quintiles. The main findings are:

Average life expectancy in the 168 LAUs-1:

first quintile	73.9
second quintile	72.8
third quintile	72.1
fourth quintile	71.5
fifth quintile	70.6
national average	72.8 years.

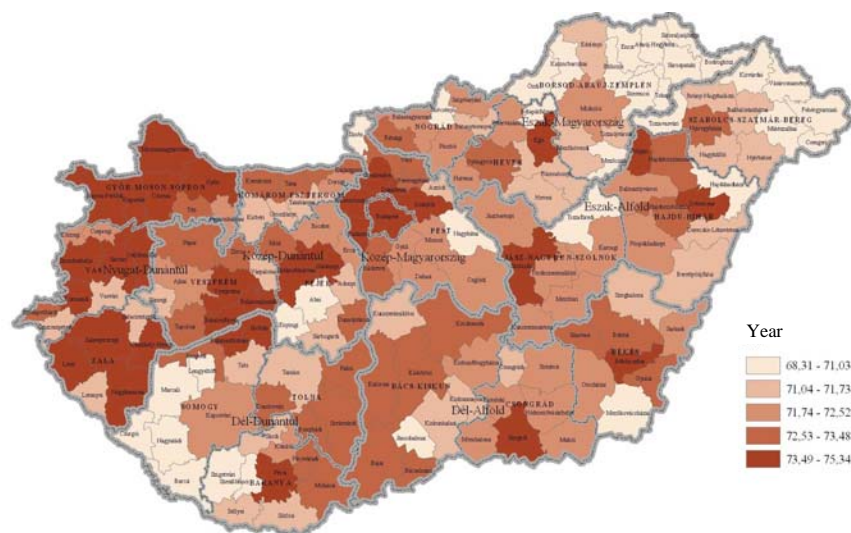
Life expectancy was longest in the Szentendre and Balatonfüred LAUs-1 (75.3 years) and shortest in the Bodrogek LAU-1 (68.3). The difference between the longest and shortest life expectancies was 7.0 years. In the Budapest conurbation and in the resort area of the northern shore of Lake Balaton, per capita gross income was HUF 807 000 and HUF 634 000 respectively in the period of 2003–2006, while in the LAU-1 of Borsod-Abaúj-Zemplén county it was HUF 281 000. The proportion of those with tertiary educational attainment in the 25 years and over population was 20.8 and 13.7 percent respectively in the first two LAUs-1, and 3.4 percent in the third.

Life expectancies were better than the national average in thirty-four LAUs-1 (including Budapest), equal to it in thirty-three, and not as good in a hundred and one. 46.0 percent of the population live in the thirty-four LAUs-1 in which people live longest, and 18.3 percent live in the thirty-three LAUs-1 in the third quintile, where life expectancies are the same as the national average.

The remaining hundred and one LAUs-1 contain 35.8 percent of the Hungarian population. These 3.6 million people live in areas, where the improvement of life expectancies since the transition has not brought them up to the national level. This is especially true in the North Hungary and North Great Plain regions, more precisely in LAUs-1 in the counties of Borsod-Abaúj-Zemplén and Szabolcs-Szatmár-Bereg.

The cartogram of life expectancies at birth in the LAUs-1 (Figure 5) clearly shows that people who live in the LAUs-1 of the Central Hungary, West Transdanubia and Central Transdanubia regions live longer than those in the South Transdanubia, South Great Plain, North Great Plain and North Hungary regions. People living in the LAUs-1 in the Budapest conurbation, large cities and around Lake Balaton have particularly long life expectancy. Life expectancies are generally shorter in LAUs-1 with small populations.

Figure 5. Life expectancy at birth in the LAUs-1, 2003–2006



Although Budapest forms only one of the country's 168 LAUs-1, it has a population of 1.7 million, set against the average LAUs-1 population of 60 000. In the early years of the 21<sup>st</sup> century, people living in Budapest produced 36 percent of the GDP, and per capita GDP was more than twice the national average. These demographic and economic indicators combined to justify analysing Budapest as a separate observational unit and comparing life expectancies in its twenty-three districts.

There are six districts on the right bank of the Danube (Buda), with a total population of 358 000. In the seventeen districts on the left bank (Pest), the total population is 1 344 000. The six Buda districts can be found in the first three quintiles; these are calculated by decreasing life expectancy at birth (see Figure 6). Most of these districts are in green belt areas. The longest life expectancy – 79.4 years – was in the 2<sup>nd</sup> district, where the per capita gross income – HUF 1.4 million – and the proportion of people of 25 and over with tertiary educational attainment – 47.3 percent – were also highest. These figures were by far the best in both Budapest and the country as a whole. Life expectancy was 5.4 years longer than the Budapest average, and 7.2 years longer than those of the 8<sup>th</sup> and 10<sup>th</sup> districts, where life expectancies were worst. It is worth noting that a child born in the 2<sup>nd</sup> district in the first few years of the 21<sup>st</sup> century could look forward to a life eleven years longer than one born in the LAU-1 of Bodrogköz.

Only one of the Pest districts – the small, central 5<sup>th</sup> district – has a place in the first quintile, and two – the 14<sup>th</sup> and 17<sup>th</sup>, consisting largely of detached houses and small blocks of flats – are in the second quintile. Four Pest districts are in the third quintile, five in the fourth, and another five in the fifth. Of those in the fifth quintile, the 8<sup>th</sup> and 9<sup>th</sup> districts are former solid lower-middle-class areas brought into decline

by the turbulent, traumatic history of the city. In the 8<sup>th</sup> district informal segregation has evolved following an influx of Roma people. Many of the people living in the 4<sup>th</sup>, 10<sup>th</sup> and 20<sup>th</sup> districts are industrial workers. Life expectancy is worst in the 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> and 20<sup>th</sup> districts, which form a contiguous island in the south-east of the city, but is about the same in the northern peripheral 4<sup>th</sup> district. Across the city as a whole, life expectancy decreases along a north-west/south-east diagonal axis: as discussed above, it is highest in the 1<sup>st</sup>, 2<sup>nd</sup> and 12<sup>th</sup> districts in Buda and the 5<sup>th</sup> in Pest, and lowest in the 8<sup>th</sup> and 10<sup>th</sup> districts, also in Pest.

The following table gives the breakdown of districts by quintiles, and Figure 6 shows life expectancy at birth.

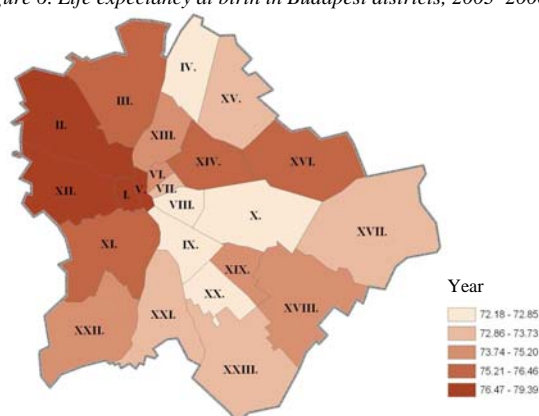
*Life expectancy at birth, per capita gross income and percent of people with tertiary educational attainment in the 25 years and over population in Budapest districts, 2003–2006*

Budapest district quintiles*	Number of inhabitants**	Highest and lowest values of		
		life expectancy at birth (years)	per capita gross income (thousand HUF)	percent of 25 years and over population with tertiary educational attainment
1 <sup>st</sup> quintile: 1 <sup>st</sup> , 2 <sup>nd</sup> , 5 <sup>th</sup> , 12 <sup>th</sup>	197 408	76.7–79.4	1096.2–1398.3	32.1–47.3
2 <sup>nd</sup> quintile: 3 <sup>rd</sup> , 11 <sup>th</sup> , 14 <sup>th</sup> , 16 <sup>th</sup>	449 411	75.4–76.5	895.4–985.5	21.1–33.7
3 <sup>rd</sup> quintile: 6 <sup>th</sup> , 13 <sup>th</sup> , 18 <sup>th</sup> , 19 <sup>th</sup> , 22 <sup>nd</sup>	356 502	74.2–75.2	794.7–926.2	15.0–25.4
4 <sup>th</sup> quintile: 7 <sup>th</sup> , 15 <sup>th</sup> , 17 <sup>th</sup> , 21 <sup>st</sup> , 23 <sup>rd</sup>	318 891	73.3–73.7	671.8–846.4	12.0–20.8
5 <sup>th</sup> quintile: 4 <sup>th</sup> , 8 <sup>th</sup> , 9 <sup>th</sup> , 10 <sup>th</sup> , 20 <sup>th</sup>	379 911	72.2–72.9	615.9–914.8	12.9–21.3
Budapest	1 702 123	74.1	887.4	23.8

\* Classified by decreasing life expectancy at birth.

\*\* Average population in the period of 2003–2006.

*Figure 6. Life expectancy at birth in Budapest districts, 2003–2006*



The correlation coefficient between the gross income per capita and life expectancy at birth is 0.91522, whilst it is 0.86057 between the proportion of people with tertiary educational attainment (in the population 25 years old and older) and life expectancy at birth; both are highly significant:  $p < 0.0001$ .

It may be concluded that among the independent variables the educational attainment is the decisive one, in our case it means the proportion of people with tertiary education in the population 25 years old and older in the observational units. In general, if the educational attainment is a tertiary one then the gross income per capita is high, and conversely with primary educational attainment only the gross income per capita is low. By and large people with low educational attainment: mainly unskilled, semiskilled workers and agricultural labourers are the losers of the socio-economic and political transition. This statement can be proved by simple regression analysis. The correlation coefficient between the proportion of people with tertiary educational attainment and the per capita gross income is 0.79940 in the case of 168 LAUs-1 and 0.90163 in the case of the 23 districts of the capital, both are highly significant:  $p < 0.0001$ .