THESES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PhD)

ESTABLISHMENT, OPERATION AND EVALUATION OF THE NATIONAL MORBIDITY REGISTRATION SYSTEM IN HUNGARY

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DEBRECEN, 2005

1. INTRODUCTION

1.1. Health status of the Hungarian population

Since 1981 the population of Hungary is decreasing: the number of deaths exceeded the number of live births up to the millennium. The decrease of the number as well as the rate of live births undoubtedly plays a significant role in the natural decrease of the Hungarian population, but at the level of the crude death rate observed in 1960-1964 natural decrease had not been observed until the mid 1990s or would have became marginally apparent only in the second half of the 90s.

Remarkable increase of premature mortality among men in Hungary started at the middle of the 1970s, reaching its peak in 1993 (830/100 000 population). Abreast the average premature mortality of the European Union constantly decreased resulting that the gap between Hungarian males' mortality and the EU average further increased. The increase of the Hungarian population' mortality was on a bigger scale in comparison to the mortality experience of the population of Central and Eastern Europe (CEE) placing Hungary into an unfavourable position even among these countries. After the peak of premature mortality among men in 1993, mortality shifted into a decreasing trend but its degree did not exceed that of the EU average. The much favourable premature mortality of women, in comparison to men, fall significantly behind both the EU and Central and Eastern European averages.

In a thorough analysis of premature mortality by age pointed out that mortality of the age group 1-24 years is only marginally worse than that of the EU average and substantially better than the CEE average, whereas the mortality trend of the population of 25-64 years of age – in that mainly the age groups 35-44 and 45-54 years – is responsible for the unfavourable trend of premature mortality in Hungary.

Looking at the relative risk of premature death (using the EU average as baseline) by causes, mortality of circulatory system disorders, neoplasms and digestive tract disorders significantly increased since 1980 among both genders. The situation is especially warning in case of digestive tract disorders' mortality (relative risk of premature death was six times higher among men and four times among women in 2000) and even more in the mortality of chronic liver disease and cirrhosis.

Behind the unfavourable mortality figures of the Hungarian population in international comparison there are significant regional differences of premature mortality in both sexes. Within Hungary both total mortality and the major cause specific mortality figures indicate

that the most affected populations are in counties in the North-Hungarian, South- and North Great Plain regions (mostly Szabolcs-Szatmár-Bereg, Borsod-Abaúj-Zemplén, Bács-Kiskun).

However, mortality is an incomplete assessment of population health. Death is only the final stage in an often lengthy period of ill-health. Valid data on morbidity have many uses. They can inform the process of determining priorities, developing health policy, and evaluating effectiveness.

1.2. Methods used for morbidity monitoring

Basically there are four methods available for morbidity monitoring:

1. hospital based morbidity monitoring systems (routine statistics, registries),
2. health interview and health examination surveys,
3. notification of infectious diseases,
4. morbidity data collected in primary care.

There are examples for all four methods in Hungary, but the utilization of data from different sources has to be judged in view of the advantages and disadvantages of these methods.

1.2.1. Hospital based morbidity monitoring systems

Although hospital based databases are important parts of the health information system their use as part of needs assessment process is questionable. One of the major biases of hospital morbidity statistics is that they tend to reflect the utilisation of hospital services rather than the objective needs. Furthermore morbidity data based on hospital discharge rates are affected by errors originating from differences in clinical and coding practices, documentation of records, and clinical diagnosis.

There are three typical examples of morbidity monitoring systems based on hospital care in Hungary: 1. The Centre for Healthcare Information; 2. National Cancer Registry; 3. National Registry of Congenital Anomalies.

Numerous literatures are available about the low validity and accuracy of coding of hospital statistics. Therefore hospital based morbidity statistics are not recommended to use for the measurement of health related needs in the population.

1.2.2. Health surveys

Health surveys permits to collect information on health problems of great public health importance and its determinants on a population of interest. Health surveys targets not only those who seek medical care because of complaints but the general population. From the

formation of health promotion strategies point of view only those health surveys are at particular importance which provides information about the relationship between health status and health determinants and socio-economical factors.

Several health surveys had been carried out in the past two decades to describe the health status of the Hungarian population. Among these regarding both methodology and usability of collected data the National Health Interview Survey carried out in 2000 and 2003 can be considered as the most modern component of the national health monitoring system.

1.2.3. *Morbidity monitoring in primary care*

Morbidity data collected in general practices are of great value, as general practitioners are gatekeepers to the rest of the health care system. There are now examples of successful systems based in primary care from many parts of the world.

Essentially, there are two models for collecting morbidity data in primary care. One is based on episodes of care, recording data on all doctor–patient interactions, gathering information on consultation rates and patterns of clinical management; the other focuses on specific disorders, using a limited number of standardized case definitions and attempting to assess the burden of disease attributable to those disorders in the population in question. The first model is exemplified by the English General Practice Research Database Programme, and the use of ICPC codes, while the second one is illustrated by the Morbidity Sentinel Stations Programme that is now operational in several European countries. Both these approaches have shown how primary care records are a potentially rich source of morbidity data.

2. OBJECTIVES

Our objectives were the followings:

1. To implement and evaluate a methodology that would collect valid, complete, continuous, and representative morbidity data (by age, gender and regional distribution) on selected diseases of major public health importance.

2. A subsequent goal was to ensure sustainability of the system and to build sufficient analytic capacity to be able to present the results in an appropriate format to health professionals and key decision-makers.

3. To compare the data originating from our program with morbidity data from other sources in order to judge the disease specific validity and usability of different morbidity data collection methods. The results of such comparative analysis could significantly contribute to the rationalisation of morbidity monitoring and also abolishing parallelism.

4. With the results of the preliminary evaluation of the program we aimed to further extend it ensuring national representativeness.

5. To serve a demonstration project for Hungary and to provide a sound basis for postgraduate public health training and longitudinal research in general practice.

3. DATA AND METHODS

By 1998 the School of Public Health in the University of Debrecen and the National Public Health and Medical Officer Service had established computerized community laboratories in four county public health offices. The four counties (Hajdú-Bihar, Szabolcs-Szatmár-Bereg, Győr-Moson-Sopron, and Zala) were chosen to represent the eastern and western parts of Hungary, reflecting well-recognized differences in measures of health, as well as in other factors such as economic activity. These laboratories formed the foci of the sentinel surveillance system. Staff in the county offices was asked to recruit a sample of general practitioners in their county that was representative both geographically and in terms of settlement size included. Based on the experience and success of the first phase of the program in order to expand the morbidity data collection involving further regions of the country two counties (Komárom-Esztergom és Bács-Kiskun) from the Central Hungarian region and two more from the Southern Transdanubia (Baranya) and Northern Hungarian (Heves) regions joined our program in 2001 and 2004 in turn. The major criteria for being selected were the possession of computer facilities, and commitment to participate in a continuous data collection programme. Each general practice had facilities for computerized data entry. Several issues were considered in designing the system. Recognizing the already high administrative load of general practitioners, the method of data collection should minimize their additional workload once the initial phase of assessing prevalence data was complete. The data should be standardized and the system should be logistically feasible, implying sampling rather than seeking to provide complete population coverage, and with a focus on a discrete list of conditions that were important in public health terms in Hungary. Data collection began in October 1998.

3.1. Study population

The study population includes people who belong to the practices of the participating general practitioners at any time (open cohort). Direct information can be obtained about the morbidity of the selected diseases in the study population, but with the use of appropriate weights based on age, and gender distribution of practices and counties, county specific estimates can be derived as well. The practices have been chosen in a manner that settlements with different size would be represented in every county thus there is the possibility that settlement size could be also considered as a determinant of disease incidence. With certain

restrictions (ignoring differences between counties), indices of the country can also be estimated.

3.2. Data collection and case definition

The programme collects data on the following diseases: hypertension, diabetes mellitus, liver cirrhosis, ischaemic heart disease (except myocardial infarction), acute myocardial infarction, stroke, malignant neoplasm of trachea, bronchi and lung, malignant neoplasm of colon and rectum, malignant neoplasm of breast, malignant neoplasm of cervix and malignant neoplasm of prostate. Standardized diagnostic criteria were developed, based on existing definitions. However, in many cases, especially cancer, diagnosis is likely to be made not in general practice but in hospital or specialist outpatient clinics. In these cases it was not possible to apply the standardized criteria and it was necessary for general practitioners to use the diagnosis provided. On recruitment, participating general practitioners provided data on patients who were known to have any of the relevant conditions as well as the age and gender breakdown of the practice population. Data on the composition of practice populations has been updated each January. Each month, notifications of incident cases of any of the conditions included in the scheme is forwarded to the relevant county offices of the National Public Health and Medical Officer Service, where they are coded, using a taxonomy based on the Tenth Revision of the International Classification of Diseases. Data are then forwarded quarterly to the School of Public Health.

The data supplied to the community laboratory includes the diagnosis (coded according to the International Classification of Diseases) and where and how the diagnosis was made (general practitioner, outpatient clinic, hospital, or autopsy). In addition, transfers in and out (whether on death or otherwise) of the practice are recorded. General practitioners are identified by a code used by the National Public Health and Medical Officer Service. Patients have a unique registration number given by the general practitioner at registration and that can only be decoded by the general practitioner, so preserving anonymity; on the other hand, data on multiple episodes can be linked.

3.3. Statistical analysis

3.3.1. Prevalence data

Baseline age-sex specific prevalence by county was estimated after the initial round of data collection. Using the method of indirect standardisation, age/sex standardised prevalence ratios were calculated for the selected diseases by means of the county average weighted by

the given county's age distribution. These standardised prevalence ratios were used for targeted quality assurance checks.

3.3.2. Incidence data

Incidence data are analysed on yearly basis. Age-sex specific incidence by county is estimated at the end of each year. For smoothing unstable incidence figures originating from scarce data in some monitored diseases age-sex specific yearly incidence estimates are based on data collected through 1999-2003. Using the method of indirect standardisation, age/sex standardised incidence ratios are calculated for the selected diseases by means of the county average weighted by the given county's age distribution.

We have been investigating the trend of incidence of monitored diseases by means of calculating moving averages, of which – initially only in the counties that first been enrolled – we combine data of adjacent years into equal time periods in that way in each step the new time sequence starts with a subsequent year of the original sequence.

3.3.3. Comparison of morbidity data originated from the General Practitoners' Morbidity Sentinel Stations Programme and the Centre for Healthcare Information (GYÓGYINFOK)

We estimated the prevalence of hypertension, diabetes mellitus, chronic liver disease and cirrhosis and first-episode of stroke at 31st December 2001. having the database of the Centre for Healthcare Information (GYÓGYINFOK) containing data since 1996. In the analysis we compared the county-specific prevalence estimates based on GYÓGYINFOK with that of the General Practitoners' Morbidity Sentinel Stations Programme.

3.4. Quality assurance

This system depends on quality assurance at all levels. General practitioners undergo an initial one-day training course and receive regular feedback on both their data quality and the emerging results. They are also invited to six-monthly workshops with participating staff from the county office. Issues arising from these workshops are addressed in information letters sent to all participating general practitioners. Staff from the county office also visit each practice at least once a year to check systems of data collection. This involves a formal validity check in which data on 10 patients are checked. Five patients are chosen randomly from the county database (those patients who had been reported within the programme as having any of the selected diseases) and the other five selected by chance from the general practitioner's computer database, which includes information about all inhabitants registered

at that time. For a given practice the proportion of files checked depends upon the actual number of inhabitants registered in that practice. Data entry also involves several automated checks, identifying values outside acceptable ranges and flagging duplicate entries (diagnoses can only be recorded once for each individual except in the case of stroke or myocardial infarction), although these also elicit queries to confirm reoccurrence. Finally, checks are triggered during analysis when practices are found to have reported standardized rates outside the range of +/- 50% of the expected value and/or the difference between expected and observed cases is ≥ 5 and/or the value for the standardized prevalence ratio is missing, or where an unexpected number of diagnoses originating from a particular setting emerges. For most of the diseases in our study the diagnosis was made by specialists in outpatient clinics and hospitals, therefore we had to rely on the diagnostic algorithms applied in standard medical practice. At this stage of the programme the participating practitioners do not assess the validity of the diagnoses made by specialists.

3.5.   Investigating Unknown Morbidity

In the survey we investigated the role and magnitude of unknown morbidity in case of hypertension, diabetes mellitus and chronic liver disease among men and women aged 55-64 years who were registered at the general practitioners participating in the General Practitoners' Morbidity Sentinel Stations Programme (GPMSSP) in the counties of Szabolcs-Szatmár-Bereg and Zala in 2001. In the abovementioned diseases the degree of unknown morbidity was estimated by means of physical examinations, blood pressure measurement and laboratory investigations. 36 general practitioners participating in the GPMSSP in the two counties carried out the examinations among inhabitants of both genders (8038 people among them 4550 were in Szabolcs-Szatmár-Bereg and 3488 in Zala) who were registered in the practices at the time of the survey. General practitioners measured blood pressure in every resident by standardised simple mercury sphygmomanometer according to the WHO blood pressure measurement guidelines. A case defined as new/unknown if his/her systolic blood pressure was 140 mmHg or greater and/or diastolic blood pressure was 90 mmHg or greater, had not been reported within the GPMSSP and was not on antihypertensive treatment. At the time of the first visit general practitioners also carried out physical examination for the identification of signs/symptoms of chronic liver disease. In all volunteers – including known diabetic and chronic liver disease cases – fasting blood sample was taken and sent to accredited laboratories. Blood pressure measurement had been carried out first if blood sample taking and blood pressure measurement was done successively. The diagnosis of

diabetes mellitus was done by means of the results of the fasting plasma glucose level according to the following criteria:

suspected case: fasting glucose level: 6.0 – 7.8 mmol/l

definitive case: fasting glucose level > 7.8 mmol/l

A case considered new/unknown if his/her fasting glucose level exceeded 7.8 mmol/l, had not been reported within the GPMSSP and was not on antidiabetic treatment. Suspected cases were transferred for further tests in order to confirm or reject the diagnosis.

The diagnosis of liver cirrhosis is based on a combination of symptoms and positive laboratory findings with at least two of the following symptoms: spider naevus, ascites, palmar and plantar erythema, jaundice, enlarged, firm liver with rounded or nodular edge, and at least one positive laboratory results: increased level of aspartate aminotransferase, alanine aminotransferase, gamma-glutamyl-transpeptidase, alkaline-phosphatase, decreased serum albumin. A case defined as new/unknown if entirely fulfilled the abovementioned criteria and had not been reported within the GPMSSP.

We calculated sex specific prevalence figures adjusted by the newly diagnosed cases in all three diseases in course of descriptive statistical analysis in both counties.

4. RESULTS

Presently 148 GPs – 2.9% of all practices in the country (5125) – collect and provide morbidity data of 2.6% (264,022 people) of the Hungarian population on a monthly basis.

The sex distribution of the monitored population is the following: 47.2% (124,517) men and 52.8% (139,505) woman. The population was representative in terms of age and sex of both the participating counties and the overall Hungarian population.

4.1. Prevalence of cardiovascular diseases, diabetes mellitus and chronic liver disease and cirrhosis

A consistent pattern emerges in which the prevalence of most diseases is highest in the two western counties (Győr-Moson-Sopron and Zala). The disjunction of the prevalence figures can be seen from the age group 55–64 years, which results in the greatest variation in prevalence figures at older ages in both sexes.

The prevalence of hypertension increases steeply with age showing higher prevalence in females from the age 45 years upwards. The prevalence of hypertension was highest in the two western counties (around 50%) among 65–74 year old men, whereas it was less than 40% among a similar aged male population in the two eastern counties. Among women in this age group the prevalence of hypertension exceeded 60% in the two western counties and in one of the eastern counties (Hajdú-Bihar), while in the other eastern county half of the women in this age group suffered from hypertension.

The prevalence of stroke, similarly to hypertension, showed smaller values in Hajdú-Bihar and particularly in Szabolcs-Szatmár–Bereg in the older ages compered to the western counties. This difference is most prominent among people aged 75 years and older, where the prevalence is 2.5 times higher among men living in the western part of the country than that of men living in Szabolcs-Szatmár-Bereg. Among women this difference was even higher (almost 3).

The prevalence of diabetes also increases with age, although it declines beyond the age group 65–74, presumably reflecting a higher premature mortality among those with diabetics than the general population. The prevalence of diabetes mellitus was found to be significantly higher in the western counties compared to the eastern counties among men aged 45 years or older. The biggest difference was observed in the age group 65–74, where the prevalence of diabetes mellitus was above 10% in the western counties (12.2% and 13.9% respectively) but well below 10% in the eastern counties (7.6% and 6.8% respectively). Among women, as with

the prevalence of hypertension, the same eastern county (Hajdú–Bihar) approximated the western counties, all three having higher than 12% prevalence in the age group 65–74 years.

There was a wide variation in the prevalence of liver cirrhosis between participating counties among both males and females. The prevalence was consistently higher among males in all counties. The prevalence of liver cirrhosis was found to be 1.5–2.5 times higher in Zala county (one of the western counties) compared to the other three counties among middle aged men (35–64 years) and the difference was even higher in the oldest age group (65+ years). The difference in the prevalence of liver cirrhosis among women was greatest in the age group 55–64 years, with the highest result observed in one eastern county (Hajdú-Bihar: 1.5%) and the lowest figure was seen in the other eastern county (Szabolcs-Szatmár–Bereg: 0.5%). The consistent east–west gap observed in the case of hypertension and diabetes mellitus was not seen with liver cirrhosis.

The observed regional pattern in prevalence at the beginning of the programme remained after extension in most monitored diseases; prevalence figures of the population of Bács-Kiskun and Heves counties were similar to the eastern, while prevalence estimated in Baranya and Komárom-Esztergom were like in the counties representing the western part of the country.

4.2. Incidence of cardiovascular diseases, diabetes mellitus and chronic liver disease and cirrhosis

For smoothing unstable incidence figures originating from scarce data in some monitored diseases age-sex specific yearly incidence estimates are based on data collected through 1999-2003. The consistent pattern has been found after prevalence data analysis in which the prevalence of most diseases was highest in the two western counties was not held in incidence results of most diseases.

The incidence of hypertension shows significant difference between the participating counties in both genders, it is greatest in the 55-64 years age group. The highest incidence (45‰/year) is found among people of both sexes aged 55-64 years living in Szabolcs-Szatmár-Bereg county. Furthermore, the risk of hypertension of inhabitants older than 55 years of age living in Szabolcs-Szatmár-Bereg was about 1.5-2 times greater compared to the other three counties' population.

Analysing the regional differences in the incidence of stroke we have found that the relative risk of stroke was 1.5-2 among males aged 55 years or older living in two western counties (Győr-Moson-Sopron and Zala) compared to men of the same age in the other

participating counties. Among women such or even greater difference between east and west was seen only after the age of 65 years.

The incidence of diabetes mellitus is prominently high (23‰/year) among men aged 55-64 years living in Zala county which is twice as high as in men living in the other counties with the exception of Szabolcs-Szamár-Bereg. Among women, this incidence peak affected women living in Szabolcs-Szatmár-Bereg and Győr-Moson-Sopron too.

The incidence of liver cirrhosis was unexpectedly high in the age group of 55-64 years of both sexes in Zala (15‰/year in men and 2.3‰/year in women) and in Szabolcs-Szatmár-Bereg (8.5‰/year in men and 1.9‰/year in women).

The decreasing trend of hypertension incidence among men aged 35-74 years in Győr-Moson-Sopron county since 1999 turned into an unfavourable definitive increase in all ages in 2001/2002. In the other three examined counties (Hajdú-Bihar, Szabolcs-Szatmár-Bereg, and Zala) middle aged men (35-54 years) experienced increasing risk of hypertension since 1999.

Opposing trend has been observed in the trend of stroke incidence between 1999 and 2003 by gender. In all counties in most age groups the risk of stroke has become smaller among men, whereas among women decreasing trend was not observed, moreover incidence of stroke significantly increased in some age groups. This unfavourable pattern was substantially high in the age group 45-54 (risk is more than tripled) and 55-64 years (risk is doubled) in Hajdú-Bihar and 65-74 years (risk is doubled) in Zala counties.

4.3. *Comparison of morbidity data originated from the General Practitoners' Morbidity Sentinel Stations Programme and the Centre for Healthcare Information (GYÓGYINFOK)*

With the exception of the two counties joined the Programme in 2001 (Bács-Kiskun and Komárom-Esztergom) in all participating counties' female population the prevalence of hypertension – in most age groups – based on data collected by general practitioners (GPMSSP) was greater compared to prevalence estimates based on hospital discharge records (GYÓGYINFOK). This difference was particularly high in the older age groups among women. Such difference was not seen among men or occurred on a lower scale.

Prevalence of stroke based on hospital discharge data was greater than that of estimates of primary care based data in all six counties in both genders.

Prevalence of diabetes mellitus among both males and females aged 65 years and older was higher according to the data reported by GYÓGYINFOK than that of GPMSSP. The only

exception is Zala county, where among inhabitants of both sexes aged 55 years and older the prevalence of diabetes was significantly higher in view of the results of GPMSSP.

The chronic liver disease and cirrhosis prevalence estimates based on the GYÓGYINFOK database is only slightly less than the estimates of the GPMSSP. The two counties joined the Programme in 2001 (Bács-Kiskun and Komárom-Esztergom) showed similar prevalence figures considering both data sources. Those counties that have been participating in the Programme since the beginning but was not involved in the Unknown Morbidity Survey (Győr-Moson-Sopron and Hajdú-Bihar) exhibited by far greater prevalence if it was calculated according to the GPMSSP than that of the GYÓGYINFOK. Even greater difference was seen in those counties (Szabolcs-Szatmár-Bereg and Zala) that participated in our survey which measured the extent of hidden morbidity in case of chronic liver disease in the age group 55-64 years (Unknown Morbidity Survey).

4.4.   Unknown Morbidity Survey

The participation rate was high in both counties [Zala 79% (2758 people), Szabolcs-Szatmár-Bereg 76% (3476 people)] and there was no major difference between them. The role of unknown morbidity was more prominent in the eastern county exceeding 10% (15% in men and 11% in women) in both sexes. It should be stressed that in the targeted age group (55-64 years) 27% of men and 17% of women in the eastern and 16% of men and 10% of women in the western counties who suffered in high blood pressure had been identified within this survey. The greater value of unknown morbidity resulted in a higher prevalence of hypertension in the eastern county in both sexes after adjustment by the unknown cases.

In case of diabetes mellitus the magnitude of unknown morbidity is extremely high (almost half of the known cases) among 55-64 years old men living in the western county resulting in a very high updated diabetes prevalence (almost 18%). The updated diabetes prevalence figures exceeded 14% in this age group in both counties for both sexes. In both counties the proportion of newly diagnosed diabetes mellitus cases was extremely high: 29% of men and 18 % of women in Zala as well as 24% of men and 26% of women in Szabolcs-Szatmár-Bereg who suffered in the disease was not known by their general practitioners.

The prevalence of chronic liver disease – either known or unknown – in the targeted age group in both counties among both sexes was considerably greater if it was calculated based on diagnoses made by GPs than if only those cases were taken into account that fully met the diagnostic criteria of the disease. A striking example of this phenomenon is the great deviation of the results with respect to the different ways of diagnosis establishment that can

be seen among men in Szabolcs-Szatmár-Bereg: the proportion of known and newly diagnosed men as having chronic liver disease based on the WHO diagnostic criteria did not reach the prevalence that had already been reported by the general practitioners before. In both counties and in both sexes the estimated prevalence of newly diagnosed chronic liver disease was higher than that of yet reported prevalence.

5. DISCUSSION

Despite the successful international examples of primary care based morbidity monitoring systems till the end of 1998 there was no program program operated in Hungary engaged with non-communicable diseases morbidity data collection, except some hospital-based registries, which failed to produce reliable information. Statistical data collected and provided by general practitioners to the National Public Health and Medical Officer Service, because of the lack of established quality control, do not support epidemiological analyses.

The General Practitoners' Morbidity Sentinel Stations Programme, which first was launched involving general practitioners from four counties representing two distinct regions of Hungary, since its start has been extended in two stages – to ensure the representation of the central, northern and southern regions of the country – and proved to be capable of collecting large volumes of morbidity data from representative population samples in different geographical regions in Hungary.

In our morbidity programme, participating general practitioners produce a sample that is representative of the age and sex distribution of the participating counties, therefore the representativeness of prevalence and incidence figures are ensured.

In our programme conditions are coded, using a taxonomy based on the Tenth Revision of the International Classification of Diseases. For most of the diseases in our study GPs report diagnoses were made by specialists in outpatient clinics and hospitals.

The prevalence of hypertension, stroke, diabetes mellitus and liver cirrhosis is high in all the counties involved. In most cases we have found geographical variations, showing different values in the eastern and western parts of Hungary, with higher values in the western counties. This phenomenon remained in most diseases after the involvement of further counties in 2001 and 2004. The observed differences may be real variation in prevalence as a consequence of variation in incidence, but survival time – as a result of the difference in the efficacy of health care – and proportion of cases identified by the health services may also be important. Finally, the difference in the prevalence figures might be a reflection of the different distribution of unmeasured factors such as social, economical and health behavioural determinants.

A continuous monitoring system such as our programme serves a valuable basis for the exploration of these potential causes. Incidence data just partially explained the different prevalence values between the counties. Furthermore, comparison of the prevalence data with the cause-specific mortality figures of these counties (with the worst results in the eastern counties) clearly suggests a significant role for the unknown morbidity among people living in the eastern part of Hungary.

Results of the Unknown Morbidity Survey carried out in 2001 justified our hypothesis as the role of unknown morbidity in hypertension in both sexes as well as in diabetes mellitus among women was more prominent in the eastern part of the country. The fact that the proportion of undiscovered, therefore not treated, cases of hypertension, diabetes mellitus and chronic liver disease is high in Hungary irrespective of regions draws attention to the importance of screening programmes conducted on a regular basis. The large scale of unknown hypertensive cases and the trend of premature death caused by hypertension and cerebrovascular diseases points out that not only the prevention practices are insufficient but curative and rehabilitation services are operating with severe deficiency in Hungary. Furthermore, the results of the Unknown Morbidity Survey draw attention to the fact that there are no uniform diagnostic criteria in use in primary care in case of chronic liver disease; the overreporting of cases of this disease could partially explain the considerably high premature mortality in comparison to the EU average.

The unfavourable trend in the incidence of most diseases since 1999 indicates the uneffiency of preventive services and the lack of national and regional programmes that aims to improve the health status of the population. Moreover, it suggests the deteriorating trend of health behavioural factors as well as emphasizes the necessity of targeted screening programmes.

The comparison of results of morbidity analysis based on the hospital discharge data collection system (GYÓGYINFOK) and our sentinel station programme unambiguously points out the limitations of a database which was not established for epidemiological data collection with a primary aim to provide information for financial purposes.

The environment and the infrastructure that have been developed as well as data generated in the past several years provide a sound basis for postgraduate public health training and longitudinal research in general practice. There have already been several supplemental study carried out on the basis of the General Practitoners' Morbidity Sentinel Stations Programme.

The international comparison of collected morbidity data in our programme is somewhat difficult because of the lack of available morbidity data in the international literature and the different methodology used for data collection.

The European Commission's recent report on Health Monitoring in Sentinel Practice Networks project reports the prevalence of diabetes mellitus in the year 2000 in six different countries. The only age group of which prevalence date are comparable with our data is 65–74, where the prevalence of diabetes mellitus among men living in the two western counties in

Hungary (Győr-Moson-Sopron county 12.2% and Zala county 13.9%) was higher than the two countries (Belgium 11.2% and Spain (País Vasco) 11%) with the highest period prevalence in this age group. In the two eastern counties participating in the Hungarian General Practitioners' Morbidity Sentinel Stations Programme, in men aged 65–74 years the prevalence of diabetes mellitus did not show major differences from those countries participating in the Sentinel Practice Network. Among females in this age group, the prevalence of diabetes showed substantially higher values in the two western counties (Győr-Moson-Sopron and Zala) and one of the eastern counties (Hajdú-Bihar) in Hungary.

Our experience so far indicates that a sentinel surveillance system based in general practice is feasible in Hungary. Given the lack of familiarity with this concept, regular training, quality control and feedback have been emphasized and have contributed much to the success of the project. We hope that the expansion and development of the sole euroconform morbidity registration program of the country will be continuous in the years to come and will serve an indispensable and valid basis for priority setting and capacity building in the Hungarian health care system. This programme may serve as a demonstration project for Hungary.

6. LIST OF PUBLICATIONS

6.1. *Peer-reviewed articles and book chapters related to the dissertation*

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