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Health prospects - trends
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PROJECTIONS OF THE FUTURE HEALTH SITUATION IN EUROPE

Report on a Meeting of a Steering Group on Projections ...

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Meeting of the Steering Group on Projections of the Future Health Situation in Europe -- 17-19 September 1980

PROJECTION OF EUROPEAN HEALTH MANPOWER AND FACILITIES DURING THE TWO COMING DECADES

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SOME BRIEF REFLECTIONS ON PAST TRENDS AND FUTURE RESEARCH

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The present document is aimed at examining in an overview the past trends and future perspectives regarding the projection of health manpower and facilities in industrialized societies. It is hoped that it will pave the way to a large discussion of the matter.

1. - The "requirement-resource" approach of the 1955-1975 period

After recovering from the 2nd World War, the industrialized countries experienced an unprecedented economic growth during more than two decades, from 1950 through 1973, which in turn led to a great deal of achievements in the social field: the ages of compulsory schooling were increased, social security was expanded to cover the people who were not previously protected, the age of retirement was lowered, etc., in many countries. There was a considerable expansion of education, health services, cultural activities, etc., towards the previously under-privileged groups. Moreover, all social groups increased their *per capita* social and economic consumption. Of course, the tempo of growth was not regular and drawbacks were noticeable from time to time in one country or another. But by and large, there was undoubtedly a tremendous increase of wealth in all the industrial world, including the European countries, and the growth in social expenditures seemed everlasting.

All this historic move was creating a growing demand for health services and subsequently for health manpower and facilities. In many countries it was felt that, for the first time, shortage in health manpower could become a reality and that the health facilities available might not be suitable. This was the origin of the "requirement-resource" approach in dealing with management of health facilities and, more specifically, in conducting health manpower studies. The approach consisted of estimating the needed volume of manpower or facilities at a future date and comparing it to the resources available at the same target date. Given the trend in demand for health services, these two sister projections - of requirement and resource - usually showed a gap; in most cases, the requirement exceeded the available resource, and this situation called for decision-making in order to bridge the gap. Consequently, resource in manpower and facilities had to be increased.

As a matter of fact, health manpower and facilities grew everywhere in Europe faster than the population and/or

national wealth during the period 1950-1975. In other words, in each industrialized country, the health manpower/population ratio and the hospital bed/population ratio were drastically increased. Moreover, equipment became more sophisticated, personnel became more carefully trained, and both became more costly.(1)

2. - The turning of the tide: 1975-1978

The crisis of the world economy reached the European national health systems during the years 1975-1978. At this time, in nearly all the developed countries, the implementation of the social security or similar systems put the demand for health services out of reach of the regulating mechanisms of the market: as people do not have to pay or have to pay only a small part of the health services and products they want, the demand for these services and products rises steadily; each national economy has to pay more and more for health. Health is then competing with other national expenditures, such as defence, education, transportation, and other sensitive areas. From another viewpoint, it is thought that in the field of social expenditures, supply is a powerful determinant of demand, e.g. the more nurses available, the higher the demand for nursing services, other things being equal.

Two schools emerged at this turning point. First, many economists thought that at this point in time, the rising health expenditures were not being compensated by a proportionate increase in the level of people's health. In other words, as a system of production and consumption, the health sector was entering the stage of decreasing return. It was then questionable that more and more resources should be devoted to this sector.

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(1) A glance at the various annual issues of the Volume III of the World Health Statistics Annual published by WHO, gives proof of such trends.

The other school was illustrated, *inter alia*, by Illich's book, "Medical Nemesis"[2] which called for an end to the progressive move which had deeply "medicalized" the human society. The reason behind such a desire was not economically-oriented but philosophically-oriented. Nevertheless, both schools were against the growth of the health industry and implicitly rejected the "requirement-resource" approach of the previous period.

3. - The need for a new outlook

The "requirement-resource" approach, as pointed out above, postulates that resource has to follow requirement. Since, in most cases, requirement exceeds current resources, the latter has to be increased. Whatever judgments we may have on the thoughts of the two schools briefly evoked above (see 2), the approach appears unrealistic for the next 10 or 20 years, given the foreseeable economic constraints. A new outlook is therefore needed in the matter.

First, a better knowledge of requirement is needed. Second, projection in health manpower and facilities has to aim primarily at adjusting future available resource to future requirement in the best way. Emphasis is no longer placed on resource growth but on resource distribution and utilization. This does not mean that we exclude increase in manpower and facilities during the next two decades. The basic problem is one of perspective: we no longer look at the growth of resource as the panacea for resolving health problems.[3] Instead, we try to better define requirement and to see how we can make do with available resources to meet the requirement.

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(2) Illich, I. (1975) Medical Nemesis : The Expropriation of Health, London, New York, Calder and Boyars.

(3) Given the upward trend during the previous decades, health resources will increase during the years to come, but probably at a decreasing rate.

From a concrete point of view, three fields, among others, can be singled-out and explored by prospective studies. They are enumerated here below.

a) A better determination of future requirement of health manpower and facilities by a disintegrated approach

During the previous decades, requirement was in most cases calculated globally, on the basis of econometric models or aggregated indexes such as the bed/population ratio, the personnel/population ratio, etc. Needless to say, these global methods were not able to point out sectoral problems. Moreover, requirement was often overestimated for many sectors by these methods. It now seems of interest to break down the calculations in order to adjust them to each specific health sector. Sectorization of the health system may be operated on the basis of morbidity types (acute illness, chronic disease, mental disorder, etc.) or places of delivery of services (private practice, health center, general hospital, specialized hospital, etc.) or categories of manpower and/or facilities (various health professions, different kinds of facilities, etc.). Such a disintegrated approach has been performed in the past but was not successful because of the lack of two elements: (i) it was done only for some sectors instead of being systematically carried out for all segments of the health system; (ii) it was not summed up in a synthesis which could provide a global view covering the requirement in all the health system. If these two elements are now brought in, it can be hoped that better results can be harvested.

b) A better determination of future requirement of health manpower and facilities by taking into account probable changes in the health system

During the last decades, some changes in the health system of the industrial countries have drastically transformed the requirement pattern for manpower and facilities. Two examples can be singled-out. The first one was related to change in

tuberculosis treatment, which reduced considerably the need for manpower and hospital beds in this sector. The change was not foreseen, and when it became obvious, its implementation was delayed in many countries. There was, therefore, a continuous building-up of sanatoria and a wide-spread training of sanatoria's personnel, both constituted an important wastage. The second example was related to mental health prevention and treatment, change of which led to a progressive reduction of the requirement for beds in psychiatric hospitals. The change was perceived too late, and decision-makers could not stop in time the building of big mental hospitals, which appeared useless after their completion. Such wastages, which could be easily absorbed during the period of rapid economic growth, might become too heavy a burden in the future.

c) Better distribution and utilization of available resources will be the best way to meet future requirement

This idea is self-evident. The problem is that, so far, we are badly lacking in experience in the matter. Sectoral action does not seem very fruitful. What is needed now is a global view of the field which would allow the implementation of selective action in the sensitive segments of the health system. Such a global view cannot be obtained without systematic studies.

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Introduction

The Meeting was opened by Dr A. Weber, Director of Health Information, WHO Regional Office for Europe, on behalf of the Director of the WHO European Region, Dr Leo A. Kaprio. Dr Bui Dang Ha Doan was elected Chairman and Professor M.K. Hakama Rapporteur. The participants are listed in Annex II.

The purpose of the Meeting was: (a) to identify elements which should be included in the projections; (b) to review the methodology of forecasting; (c) to determine priorities in developing projections with regard to disease categories and to elements in the forecasting; and (d) to consider a plan of action for further development of the project, the intention of the Regional Office being to produce periodic publications, if possible every four years, summarizing and updating the forecast.

It was agreed that the purpose of a projection was the most important factor affecting the choice of methodology. Both the available data and the choice of methodology should be considered when making projections for the purposes of management and planning.

For the purposes of the Meeting, it was considered necessary to adopt a limited definition of health, namely "the absence of well-defined diseases or impairments". Socioeconomic factors, such as lifestyle and behaviour, and environmental factors should be considered as variables to be taken into account in projections of health status. In this connexion, it was recognized that one of the main challenges of the regional strategy for attaining health for all by the year 2000 (see document EUR/RC30/8) lies in preventive activities in sectors other than health. Therefore, risk factors and the possible influence on these of preventive activities in other sectors should also become a very important area for forecasting studies.

The methodological aspects of predicting risk factors, morbidity and mortality, the utilization of health services, and health resources were discussed. Four background papers were presented, dealing with the prediction of cancer incidence, projections on the utilization of health services, and manpower projection (two papers). These are listed in Annex I. A limited number of copies (in English) are available upon request from the Regional Office.

Population projection

Any realistic health projection must be based primarily on the expected size and structure of the population. In this respect the age and sex structure is of basic importance, owing to the large differences in age-specific and sex-specific morbidity and mortality. As most European countries take age and sex structure into account when preparing population projections, reliable and detailed information is available. This is especially true for those age groups that are not affected by uncertainties concerning fertility assumptions.

Projections of mortality, morbidity and disability

Attention should be paid to the development of adequate statistical information systems. Actual applications of projections of ill health seem rare. It was considered useful to classify the methods used for health projections into three types: (1) direct extrapolation of past trends according to age, sex, etc.; (2) by the use of data on risk factors; and (3) evaluation of the effects of intervention. The method chosen would depend on its purpose, on the indicator used, and on the disease or other condition causing ill health.

An understanding of the natural history of the disease may prevent gross errors in predictions resulting from the use of Method 1. For several chronic diseases there may be a long latent period between exposure to a causal agent and diagnosis of the disease. If the exposure is highly related to subsequent development of the disease, accurate long-term predictions (Method 2) can be made. Both preventive and therapeutic interventions affect the prognosis. The effects of these interventions on the population level can be predicted and combined in different projections, corresponding to alternative public health actions (Method 3).

Projections of utilization of health services

This was discussed on the basis of the background paper prepared by Dr K. Miltenyi. Utilization of health services is determined mainly by demographic and morbidity factors, while access to health services is determined mainly by the socioeconomic and medical-institutional background. Social insurance has had an important role in the general use of medical health care, providing services free of charge in many cases. The proportion of the population covered by social insurance has increased in recent decades in the European Region.

Although legally and theoretically there are no obstacles preventing people from using health services, there are still significant variations in use, resulting from the type of morbidity or disease, the distance from and access to health institutions, the anticipated time of waiting for services, and personal factors. In rural areas, the distance from the general practitioner may be relevant too, especially for older persons. It was assumed that socioeconomic level, school attendance, etc., also have a bearing on personal attitudes to the use of health services.

Theoretically, all anticipated or planned changes in these factors have to be considered when formulating assumptions about future trends in the utilization of health services. However, statistical data for analysing the relative influence of these factors are rather fragmentary, being derived mainly from small and nonrepresentative surveys.

In addition to self-care, which should receive special attention, three basic groups of health service used by the population may be distinguished: the primary care services, including the services of the general practitioner; outpatient services; and hospital and other inpatient services. Health decision makers determine priorities in the allocation of available funds on the basis of expected changes in the need for these services.

The distribution of work between primary and specialized institutions, as well as between outpatient and inpatient services, is a crucial part of health planning and projections. Innovations in medicine and pharmacology can result in a shortening of hospital treatment or its replacement by outpatient treatment. However, the opposite may also be true: the application of sophisticated techniques in diagnostic or therapeutic procedures may necessitate inpatient treatment.

Predictions of the use of health services could be outlined on the basis of the three types of model described above. Method 1 models use trends in the utilization of health services, possibly broken down by sex, age, and social and educational levels. Method 2 models would take into account the probable changes in the factors affecting the utilization, while Method 3 models would involve the expected effects of intervention. Predictions of utilization stemming from health needs, as measured by indices of ill health, were also considered. Both approaches were deemed necessary.

Projection of health resources

The Group examined the state of the art regarding projection of health resources, on the basis of two papers submitted by Dr Bui Dang Ha Doan. With regard to projections of health facilities, the single methodology used so far is that of economics; the projection is aimed at determining the money spent on facilities without expressing directly the physical quantities (number of beds, quantity of radiological equipment, etc.). Various methods are available for projecting health manpower resources and requirements. Regarding the projection of health manpower resources, it was agreed that research into alternative resource allocations was necessary, not simply with respect to task delegation but also concerning resources in manpower and equipment. Emphasis was placed on prospective studies of manpower tasks rather than on a simple count of numbers. Concerning the projection of health manpower requirements, three new approaches were singled out: (a) a disintegrated process, taking into account separately the various sectors of the health system, followed by a synthesis giving a global view of future requirements; (b) a better determination of future requirements by making some allowance for unpredicted events when developing projection models; and (c) closer linkage of resource and requirement projections, since better distribution and utilization of future available resources will be the best way to meet future requirements. These three approaches are not mutually exclusive.

Requirements for data on which projections are based

Any projection of resources should preferably be based on projected needs and tasks to be performed; however, procedures using trends in resource allocation and utilization are useful and need further research. Availability and needs for statistical data were considered. The following indicators were regarded as essential in predicting the health situation:

Population

Age, sex, urban/rural, socioeconomic, environmental and behavioural.

Ill health

Indicators include mortality, morbidity (incidence and prevalence) and disability. Emphasis should be placed on the following disease categories: cardiovascular diseases, cancer, violent deaths (accidents, suicides), mental diseases, diseases of the musculoskeletal system, and communicable diseases.

Indicators of survival include expectation of life, infant mortality and perinatal mortality. Finally, absence from work should be included as an indicator of ill health.

Utilization

The following indicators should be considered:

- attendance rates, by type of service;
- duration of stay in hospital;
- cost of service;
- percentage of population entering the health system through primary health care services;
- percentage of first contact with specialists arising out of referral from primary health care services;
- proportion of children immunized against specific diseases;
- percentage of contacts in primary health care which do not involve curative services by category, e.g. family planning, surveillance, health education and promotion, etc.;
- consumption of drugs and appliances; and
- self-care.

Resources

- classic resource-to-population ratios;
- average daily time of availability of primary health care services;
- number of persons working in primary care;
- number of persons working in hospitals and in the community, by category;
- percentage of primary care teams with an established mechanism for community participation;
- percentage of cost of health services devoted to primary care;
- health expenditure as a proportion of the gross national product;
- percentage of health expenditure financed by government (central and local), social security (compulsory insurance), private insurance, private direct payment, etc.

Cross-classification should be considered for those types of elements for which it is relevant.

Recommendations and plan of action

1. This report should be widely disseminated.

2. An inventory should be made of existing methodologies and applications in the health field on the basis of contacts established through dissemination of this report.

3. New methodologies should be developed where necessary.

4. Pilot studies should be undertaken by collaborators in the following three areas: projections of ill health; utilization of health services; health resources.

5. Data required for projections should be reviewed and collected.

6. Technical meetings should be organized on the three areas referred to in point 4.

7. A meeting should follow, to which governments of Member States would be invited to send representatives, in order to decide how the results obtained would be used.

8. The WHO Regional Office for Europe should devote sufficient resources in terms of both funds and staff to meet the requirements of this plan of action. In particular, it is hoped that the Regional Office will play a coordinating role and provide strong leadership in the implementation of this project.

9. Recommended time schedule for the above activities:

Year	Points
1981	1, 2, 3, 5
1982	3, 4, 6, 7

Annex I

LIST OF WORKING PAPERS

1. Projection of European health manpower and facilities during the two coming decades: some brief reflections on past trends and future research - Dr Bui Dang Ha Doan

2. Review of available methodology of projections of future trends in cancer risk - Professor M.K. Hakama

3. Review of available methodology of projection of future trends in the utilization of health services - Dr K. Miltenyi

4. A critical appraisal of the usual methods of health manpower projection - Dr Bui Dang Ha Doan

Annex II

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Neoplasms - 006 ICP/HST 009 ANNEX TO RPT

Rec. 16 Finland

REVIEW OF AVAILABLE METHODOLOGY OF PROJECTIONS OF FUTURE TRENDS IN CANCER RISK

Matti Hakama

Actual applications of projections in cancer epidemiology are relatively rare. In the following different methods used for predicting cancer incidence in Finland are described and some of the purposes of making such predictions are mentioned. This paper is largely based on an article which will be published in the World Health Statistics quarterly in 1980 (1).

The different predictions will be classified into three types: direct extrapolation of past trend (type I), using data on risk factors (type II) and evaluating the effects of intervention (type III).

Type I model: extrapolation of trend

The simplest way of making predictions of cancer incidence or mortality is to assume that the past trend will continue into the future. However, in actual fact past trends indicate little about future risk of disease and therefore it may be advisable to be conservative in the specifications of the model in order to prevent gross differences between predicted and observed values.

Using the 1957-68 data from the Finnish Cancer Registry, projections were made for the incidence of cancer of different anatomical sites for the year 1980 (2, 3, Fig.1). The incidence rates were adjusted for the 1980 sex-specific population forecasts; the linear extrapolation for different cancers with an increasing trend and exponential extrapolation for types of cancers with decreasing trend were assumed. Exponential trend prevented negative values for the predicted incidence, and linear increase in trend usually leads to more conservative estimates than do, for example, higher order polynomials. Fig. 1 shows the total cancer incidence and incidence of various cancers in Finland and predicted incidences for the same for 1980 in terms of a 90 % confidence interval.

Later, the analysis was extended to cover the period 1955-70 and separate predictions were made for each of Finland's 16 central hospital districts (4). In addition to the predicted incidence for 1980 and 1985, the actual number of cancer cases was projected by multiplying population projections (5) by the predicted incidence. This was done at the request of the National Board of Health. The predictions (by central hospital district) were used for planning of oncological facilities and for the allocation of services and resources.

Cancer incidence predictions for the past few years were compared with the recorded incidence rates for the same years. Prediction curves showed a good fit with the observed rates for most cancers of different anatomical sites. However, lung cancer incidence in females and the incidence of melanomas showed

a more rapid increase than was predicted. On the other hand, the incidence of lung and laryngeal cancers in males was less than predicted. The deviations from the predicted incidences were in agreement with changes in etiological exposures (6, 7).

For cancers of several anatomical sites the age/incidence curves are of similar shape for each birth cohort. For the cohorts that will make the most contribution to the incidence in the future, the levels can already be estimated and the trends in incidence rates by age may be used to improve the prediction. This is especially true for cancers where the etiological exposures affect early in life. For example, Haenszel & Correa (8) have postulated that premalignant transformations occur early in life which may lead to stomach cancer at a later age.

The age/incidence curve for epithelial cancers closely follows the Gaussian distribution. Fig. 2 shows selected age-specific incidence rates for stomach cancer among Finnish males for 1962-65 and cohort incidence curves based on extrapolation of the Gaussian distribution (9). It was assumed that the shape of the distribution was the same but the level of the incidence rates changed between different cohorts. In order to show the accuracy of the extrapolation as well, rates for 1953-57 and for 1958-61 are also shown in Fig. 2. The fit was relatively good and the observed rates did not show any systematic deviations from the expected curve.

For the cohort born at the end of the 19th century the risk of stomach cancer was estimated at about 3 in terms of unit risk for the cohort born 20 years later (9). It was possible to verify this prediction by means of observed incidence rates in the 1970s and it was found that the prediction was very accurate for the cohorts born between 1885 and 1920. The age-adjusted cross-sectional rates in Finland were 71 in 1953 and 26 in 1976 per 100 000 person-years.

Type II models: utilization of risk factors in the prediction of cancer risk

If the latent period between first exposure and the diagnosis of cancer is long (for epithelial tumours it is likely to be of the order of 20 years), use of risk factor's trends sometimes make it possible to predict the incidence. The length of the period for which the prediction is made is equal to the length of the latent period. However, for most types of cancer preponderent risk factors have not been established.

Two examples of using data on risk factors in incidence prediction are considered below:

1 prediction of breast cancer incidence on the basis of geographical correlations between different provinces in Finland (10);

2 and prediction of lung cancer incidence for Finnish males based on the prevalence of tobacco smoking (11).

Breast cancer is the leading type of cancer in most western female populations. Risk factors associated with viruses, heredity, standard of living, female hormones, and reproduction have been proposed (12); however, the standard of living and hormonal or reproductive factors seem to be the most important. For example, females with their first pregnancy at the age of less than 30 years have a relative risk equal to the 3 as compared to females with their first pregnancy at less than 20 years of age. A threefold risk of breast cancer is also found between extreme social strata (e.g. women with academic degrees on the one hand and unskilled labourers on the other).

Variables describing fertility and standard of living for the period 1954-58 were correlated with breast cancer incidence during the period 1967-73 for Finland's provinces. A latent period of 15 years was chosen for practical reasons and because different latent periods had only minor effects on the correlation.

The variables "percentage of industrial population", "percentage of urban population" and "taxable income per inhabitant" were selected to describe the standard of living within each province. It was found that taxable income correlated best with the breast cancer incidence.

Fertility rates were available for each of Finland's provinces. Since age at first pregnancy is a strong risk factor it was hypothesized that age-specific fertility rates at 15-19 years or at 20-24 years were the best indicators of breast cancer risk.

However, the general fertility rate proved to have the highest correlation with breast cancer incidence.

When these results were combined and a simple regression model was applied, the following relationship was seen between the risk indicators and the incidence rates:

$$\log(\text{incidence, 1969-73}) = 3.6 - 0.002\ (\text{general fertility, 1954-58}) + 0.00007\ (\text{taxable income, 1954-58}). \quad (1)$$

The above equation had a multiple correlation of 0.90. Using the parameters estimated in this equation and the risk indicators for 1969-73, breast cancer was predicted for the period 1984-88. Fig. 3 shows observed mean annual age-adjusted incidence rates of breast cancer for 1954-58 and 1969-73 and predicted rates for 1984-88 for each of Finland's provinces.

The purpose of the analysis was epidemiological. The significance of the different types of risk factors was analysed from geographical correlations (excess weight and the size of the woman were found to be unimportant). The prediction was only a by-product of the study.

For lung cancer, the most important risk factor is tobacco smoking (13). Cigarette smokers have a lung cancer risk ten times that of non-smokers, and it was estimated that 80 % of all lung cancers among Finnish males were due to cigarette smoking.

In Finland, there is a long tradition of cigarette smoking (14). The first industrial plants manufacturing Russian-type cigarettes

were founded in the 1880s. In the 1920s, the annual consumption was about 1000 cigarettes per adult. In recent years this figure has been about 1800. The time series of the consumption of manufactured cigarettes is available from 1920 and the most recent figure used in the present analysis is for 1978. Lung cancer incidence rates from the Finnish Cancer Registry were available between 1953 and 1975.

Lung cancer incidence for males in Finland was predicted (11) by means of a dynamic linear model (15). The incidence of lung cancer and number of cigarettes smoked per adult were correlated with different time-lags. The correlation was significant for several time-lags of about 10 and 20 years. The following model serves as an example of the results:

$$\underline{y}_t = 24.2 + 17.6\underline{x}_{t-9} + 10.6\underline{x}_{t-10} + 10.3\underline{x}_{t-21} - 14.3\underline{x}_{t-23} \qquad (2)$$

where $\underline{y}_t$ is the lung cancer incidence rate and $\underline{x}_t$ is the consumption of cigarettes in year $\underline{t}$.

This equation allows the prediction to be made of lung cancer incidence for 9 years without any prediction of the cigarette consumption. Fig. 4 shows the predicted incidence rates up to the year 2000 assuming that the consumption of cigarettes will remain in the future at the same level (1800 per adult) as in 1978. The purpose of this analysis was methodological, and the analysis was not carried out in order to devise tools for administrative or scientific purposes.

Type III: Models for predicting the effects of intervention

For purposes of administration and planning it is desirable to have an idea of the effects of intervention of risk factors or related variables on the risk of the disease. This type of prediction assumes knowledge on the natural history of the disease.

The most fruitful theory on carcinogenesis has been the assumption that carcinogenesis is a multistage process. The effect of intervention of risk factors (stopping of smoking, removing of occupational exposure) depends on whether the exposure affects early or late stage carcinogenesis in the multistage process. Cigarette smoking is likely to affect late stages in lung carcinogenesis and stopping of smoking has a relatively immidiate effect on the lung cancer risk. Hence, it is possible to evaluate, say, the results of health education campaigns on the risk of lung cancer in the next few years.

Some of the occupational exposures are likely to affect the early stages of carcinogenesis. As a consequence removing of such an exposure has a limited effect only on the risk of cancer of those workers already exposed.

Mass screenings of cervical cancer are a means of intervention aimed at detecting of preclinical stages of the disease, and the effects on the risk of frankly invasive cervical cancer should be affected relatively rapidly after starting of a screening programme. It was estimated that about 20 % of frankly invasive cases had a preinvasive stage shorter than the time lag between

the repeated screenings within the organized mass screening programme in Finland. This evidence, combined with data on attendance rate, yielded an estimate of a final 60 % reduction in the incidence of frankly invasive cervical cancer (17). It was later possible to verify this prediction by the observed trends in cervical cancer in Finland. The observed incidence rates of invasive cervical cancer have been very similar in 1973, 1974, and 1975 (Fig. 5), indicating that the rates may stabilize close to the value predicted by epidemiological means.

The prediction of the effects of known or postulated intervention is an important administrative (and sometimes scientific) problem, which can be successfully handled by the presently available methodological means. The long-term prediction of cancer risk is a challenging problem without a general solution. Direct extrapolation of past trends of cancer incidence or mortality may lead to grossly erroneous results. The long latent period from the beginning of exposure to the diagnosis of cancer can be utilized in making predictions. The risk factors used as auxiliary variables have two prerequisites: (1) they should be preponderent enough and (2) they should not be subject to unpredictable intervention during the period of prediction.

Some primary sites can be thought to meet these general conditions, but it is unlikely that overall cancer risk or risk of cancer at all specific primary sites could be predicted in this way.

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Fig. 1

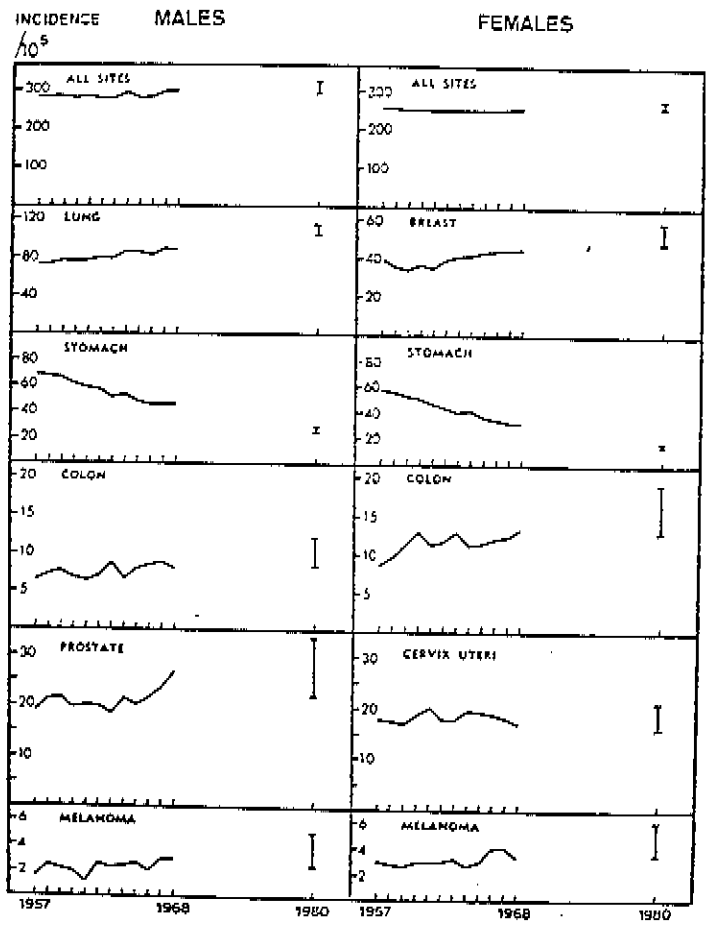
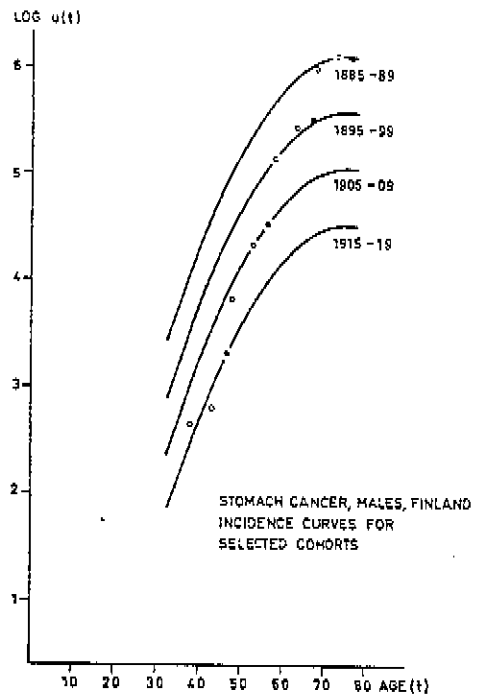

INCIDENCE
/10^5
MALES
FEMALES
ALL SITES
LUNG
BREAST
STOMACH
COLON
PROSTATE
CERVIX UTERI
MELANOMA
1957
1968
1980

Fig. 2


LOG u(t)
6
5
4
3
2
1
1885 -89
1895 -99
1905 -09
1915 -19
10 20 30 40 50 60 70 80 AGE(t)
STOMACH CANCER, MALES, FINLAND
INCIDENCE CURVES FOR
SELECTED COHORTS

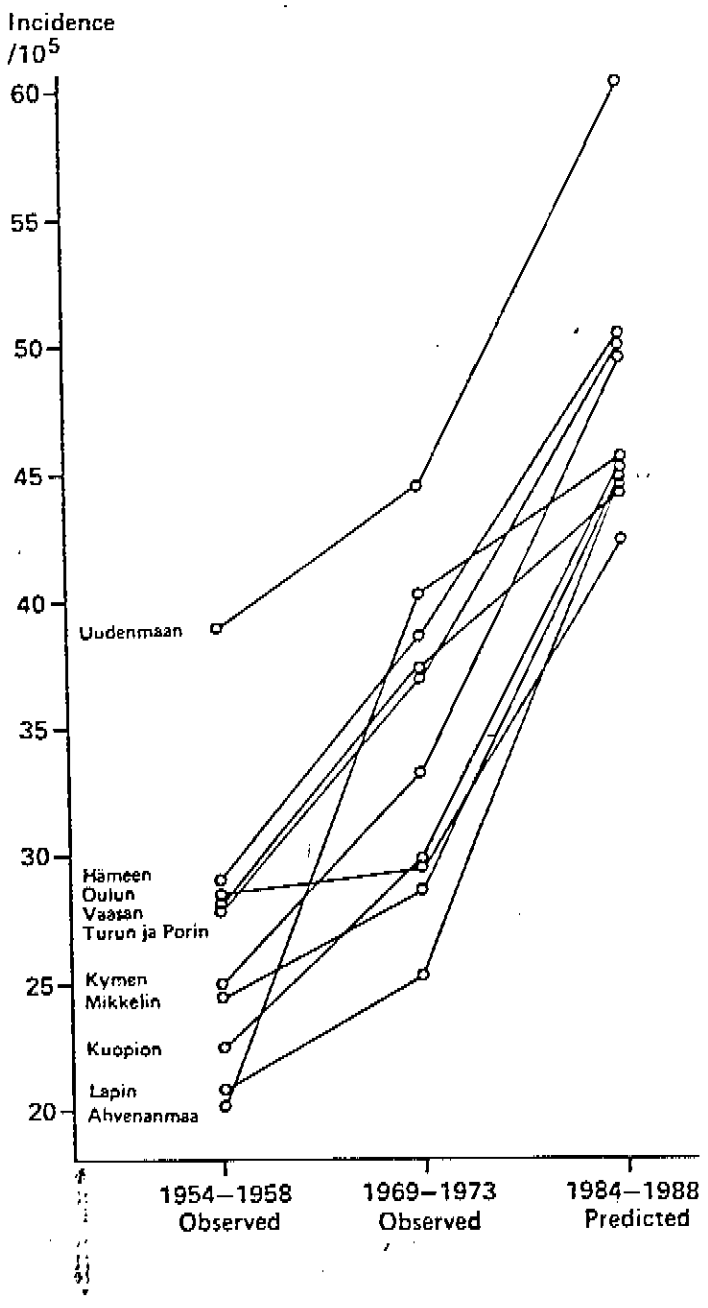
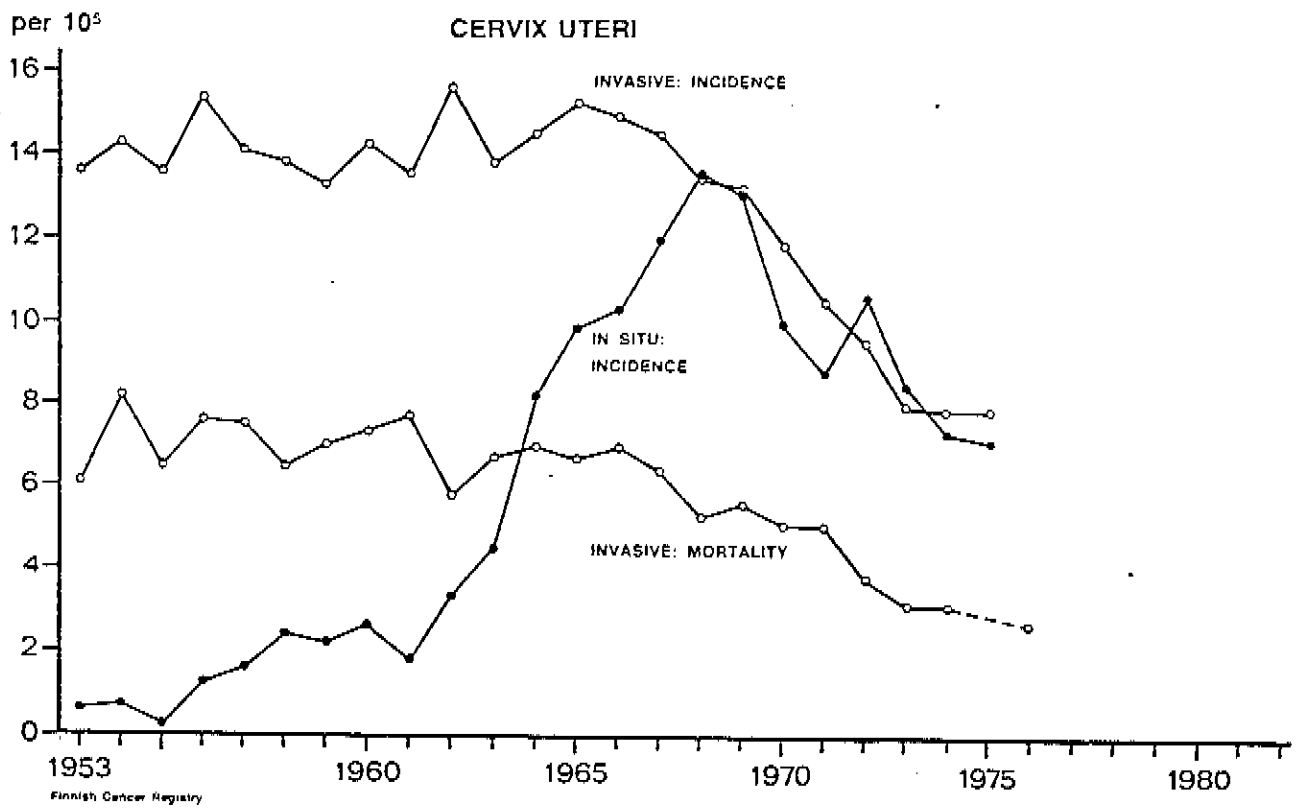

Incidence
/10^5
60
55
50
45
40
35
30
25
20
Uudenmaan
Hämeen
Oulun
Vaasan
Turun ja Porin
Kymen
Mikkelin
Kuopion
Lapin
Ahvenanmaa
1954–1958
Observed
1969–1973
Observed
1984–1988
Predicted

Fig. 4


New cases/10^5 males
0
10
20
30
40
50
60
70
80
90
1950
1960
1970
1980
1990
2000
2010
Years


per 10^5
CERVIX UTERI
INVASIVE: INCIDENCE
IN SITU:
INCIDENCE
INVASIVE: MORTALITY
16
14
12
10
8
6
4
2
0
1953
1960
1965
1970
1975
1980
Finnish Cancer Registry

Health services - util trends

ANNEX TO RPT

ICP/HST 009

K. Miltényi:

Review of available methodology of projection of future trends in the utilization of health services.

1. In the absence of a generally accepted methodology of projections in this field, I would propose in this paper

/i/ to list some basic factors which can be used as starting points for such exercise;

/ii/ to review the availability of empirical/statistical data;

/iii/ to outline the logic of the methods suggested;

/iv/ to indicate some probable, generally accepted assumptions and their implications.

2. In a simplified model utilization of health services are determined by the following factors

/i/ population; size and structure;

/ii/ morbidity;

/iii/ proportion of morbidity attended by health services.

3. Population projection. It seems evident that any realistic health projection must be based primarily on the expected size and structure of the population. In this respect especially the sex/age structure is of basic importance, considering the strong differences in sex/age specific morbidity. As most European countries do prepare population projection, using generally the component method, reliable, detailed and solid information is avaiable on this topic. This is especially true for the adult and old age groups, which are not affected by the well known uncertainties of the fertility assumptions.

4. Morbidity rates /incidence and prevalence/ by age and sex. Anticipated morbidity rates, of course, have to be based on some empirical, statistical evidence. Statistical data supply in this field seems, however, not adequate. The main sources of data are

/i/ morbidity recorded in retrospective/longitudinal sample population/household surveys;

/ii/ infectious diseases, covered by the compulsory report system;

/iii/ some particular diseases /e.g. cancer/ attended and reported by specialized institutions;

/iv/ hospitalized morbidity, recorded by hospitals;

/v/ incidence and prevalence of economically active persons on sick leave, recorded by the social insurance agency

/vi/ causes of deaths, reported in the vital registration system.

5. Theoretically, data from source 4. /i/ could be considered as most comprehensive and representative. However, in retrospective surveys recall lapse and subjective interpretation of the rather uncertain definition of "illness" may cause serious omissions and bias. In longitudinal surveys the probability of drop out may be correlated with morbidity. The inherent selectivity and/or partiality of data from sources /ii/ - /vi/ are obvious. However one general conclusion is supported by all data i.e. the "U" shaped curve of morbidity by age.

6. Apart from the difficulties of the statistical basis, extrapolating present/past morbidity trends implies making both general assumptions for socio-economic development and specific assumptions for the anticipated progress in medicine and pharmacology. The latter, of course, have to be elaborated for individual diseases, or groups of diseases, homogeonous in some respect.

7. A general and basic factor influencing future morbidity, especially as defined by the prevalence, is the aging of the population. The increased life expectancy, together with decreased fertility, will continue the aging process, experienced in the recent decades. This is irrespective of the fact, whether further increase in the life expectancy can be

still anticipated or not. Older age structure - other things being equal - will increase general morbidity.

8. Improvment in infant and child care has increased the survival ratio of handicapped children, development in medicine and surgery the survival of injured, disabled adults. This will have two probable consequences

/i/ the proportion of handicapped/disabled children/adults requiring special educational/social/medical care may increase, emphasising the need for better, more efficient rehabilitation;

/ii/ the number of old age persons requiring - in the absence of younger family members or relatives - either allocations in institutions /hospitals or special homes/pensions/ or some other forms of social care /e.g. visiting nurse, social worker/ will also increase.

Statistics on these phenomena are usually avaiable and adequate to make assumptions for future trends.

9. Access to and utilization of health services are determined mainly by the socio-economic and medical-institutional background. Social insurance has had an important role in the general use of medical/health care, providing services free of charge. The proportion of the population covered by social insurance has increased in the recent decades in Europe, especially in the socialist and Nordic countries approching 100 %. In Hungary e.g. in the 1950-ies about 50 % of the population was covered, in the early 1970-ies 97-99 %. The 1974 Health Act, declaring the right to free medical/health services by virtue of citizenship has completed this process, abolishing the red taping connected with the certification of social insurance participation, required earlier when utilizing health services.

10. Although legally and theoretically there are not obstacles to prevent somebody from the utilization of health services, there are still significant variations in this respect, influenced by the factors as follows.

/i/ type of morbidity/diseases;

/ii/ distance from and access to health institutions. In rural areas distance from the general/district practitioner may be also relevant, especially for older persons,

/iii/ anticipated time of waiting for the services;

/iv/ personal, subjectiv inclination to be attended by the doctor, nurse, hospital etc. influenced also by age, previous experiences, social and cultural background. Earlier it was generally assumed that socio-economic level, school attendance etc. have positive correlation with the disposition to utilize health services. However, some recent experiences may indicate possible changes in this respect, professionals being less inclined than strata with average educational background. Inclination by age is also more or less "U" shaped, with the exception of the oldest age group where some decrease may appear.

11. Theoretically all anticipated or planned changes in these factors have to be considered to formulate assumptions for future trends in the utilization of health services. However, statistical data for analysing the relative influence of these factors are rather scanty and fragmentary, derived mainly from small and non representative surveys.

12. So far "health services" were considered in general in this paper, withous making distinction by the type of these services. In reality three basic groups of health services, utilized directly by the population, can be distinguished

/i/ the services of the general/district practitioner

/ii/ the services of polyclinics i.e. out-patient services

/iii/ the services of hospitals and other in-patient institutions.

One crucial task of health programmes is to determine priorities in the allocation of the avaiable funds /investments, extension, modernization etc./ on the basis of the expected changes in the utilization of these services.

13. During the last decades - at least in Hungary - a general shift was observed from the general practitioner's services towards those of the specialised out-patient institutions. To some extent the decreasing prestige of the general practitioners has contributed to this process. Increasing specialization and instrumentation in the medicine has decreased the competence of the general practitioners, especially in the urban areas sometimes compelling them to daily routine, administration - and to the dispatch of the patients to the relevant specialized institution. This, however, has the inherent danger of the disintegration and dehumanization of the medical practice. Thus, it can be argued that the continuation on this process should be prevented by appropriate health policy measures e.g. making possible the free choice of doctors for the patient, i.e. revitalizing the role of the traditional "family doctor". Policy decisions on such matters may strongly influence future trends, thus they must be incorporated in the projection methodology.

14. The distribution of work between out-patient and in-patient services is a crucial part in health planning/projection. Changes in both direction can be anticipated. Innovations in the medicine and pharmacology can replace treatment - or at least shorten it - previously restricted to hospitals, by methods which can be applied to out-patients. However, the opposite may be also true; the application of sophisticated technics in diagnostic or therapic procedures may necessitate in-patient treatment.

15. It may be perhaps assumed that the general tendency will be towards out-patient services, as it happened e.g. with the TBC, and as it started, at least in some developed countries in the psychiatry. Decreased fertility will reduce the required capacity of obstrectics and gynaecology departments, especially if it is achieved by contraception, replacing the practice of the induced abortions.

16. Thus, it may be assumed that further extension of proper hospital bed capacity, labelled sometimes "active beds", will not be necessary. However, for the reasons mentioned in points 7-8, the increasing demand for "passive" hospital beds can be safely anticipated.

17. Pharmaceutical services have been growing in all European countries for the last two decades. There is no reason to assume the discontinuation of this process.

18. This paper deliberately omitted those public health aspects which are not utilized directly by individuals/households.

19. I am aware that this sketchy paper is full of uncertainties and gaps. This must be partly due to my limited knowledge in this field. However, to some extent it may be the reflection of the current practice in the health planning and projection which seems to lag behind, compared to other fields, i.e. economy or demography. In order to develop an integrated system of economic and social planning the relative backwardness of health planning should be corrected.