
Reviews/Analyses

Measurement and utilization of healthy life expectancy: conceptual issues

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The periodic calculation of healthy life expectancies permits the evaluation of the impact of new health policies at a given moment, as well as the assessment of trends under changing health conditions. In spite of their apparent simplicity, the results obtained will have to be interpreted by experts. Useful reference values can be provided by international comparisons. However, several choices remain to be made, such as (i) the types of morbidity and disability data to be associated with mortality data; (ii) the multiple indicators available; (iii) the type of observations to be recorded, i.e., "abilities" or "performances"; (iv) whether or not the recovery of lost functions should be considered; (v) the mode of computation, i.e., life expectancy before the first morbid event or global healthy life expectancy; and (vi) the determination of thresholds based on either relative or absolute criteria.

Determining population health status

Numerous attributes have been attached to the measurement of healthy life expectancy (*1*). But in the absence of a clear distinction between the health status of *individuals* and that of *populations*, two questions arise that are connected and often confused with one another:

- (1) By living to a greater age, are we not individually becoming more and more weak and decrepit?
- (2) As more people survive at every age level, are we not collectively becoming less strong and less effective at each increasing age?

Any calculation of healthy life expectancy must take into account the health status of the population and determine whether this improves over a period of time.

A calculation of cross-sectional healthy life expectancy answers the first question given above

for a fictitious cohort of individuals who would be subject, at all ages, to various health influences during a chosen period (e.g., one year) — influences such as forces that determine mortality, morbidity, disability, and cure or recovery. This calculation cannot measure (1) the health status of the individual because each member of the cohort would have experienced or will experience a different history, or (2) the health status of the population, which during the chosen period would involve multiple cohorts, but it can measure the conditions influencing the population's health during the given period. Repeating the cross-sectional calculation would indicate the changes in healthy life expectancy of that same fictitious cohort when subjected at each age period to specific health conditions over many years in succession. A comparison of the figures obtained for these successive cross-sectional life expectancies provides an answer to the second question.

It is well known that in Western countries the successive cross-sectional life expectancies have increased greatly during the present century. The conclusion from this is that the conditions for a longer life are evolving favourably. But what about the *healthy* life expectancies in the same moment and conditions, if it had been possible to calculate them? Would they also have increased and, if so, at the same rate or more quickly or less quickly than the life expectancies?

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The various cases

As regards each cohort exposed to different successive sets of health conditions, (i) is there an absolute or relative "compression" in the number of years of bad health within the life expectancy (2), or (ii) has more or less of a "balance" been maintained between the numbers of years of good and bad health, or (iii) is there a general "expansion" in the number of years of bad health (3)? Unfortunately certain results show that under successive time periods the disability-free life expectancy will increase less quickly than life expectancy (1). In such cases, which are perhaps the most probable for the immediate future, the improvement in healthy life expectancy would, paradoxically, be accompanied by an increase in the number of years lived in bad health within the total life expectancy.

A favourable evolution in health conditions, as reflected in the healthy life expectancy of a fictitious cohort, does not preclude an increase in the number of years lived in bad health. In other words, in terms of survivors and under successive time periods there could be from one year to the next, for a given age, both more survivors in good health and more survivors in bad health, and the increase in the number of the latter may be such that they represent a greater proportion of the total number of survivors.

Interpretation of the results

Expectation of life and expectation of life in good health at birth. Just as the total increase in the number of survivors reflects a favourable evolution in conditions that defer mortality, an increase in the number of survivors in good health would on the whole show a favourable evolution in health conditions. On the other hand, an increase in the number of survivors in poor health, examined in isolation, would not necessarily provide any information on the unfavourable development of health conditions, for such an increase could be encountered in every case, whether there is "compression", "balance" or "expansion". For similar reasons, the examination in isolation of the proportion of survivors in good or in bad health would not enable us to determine whether there had been a favourable or unfavourable evolution in the prevalent health conditions. Every increase in the number of survivors in bad health must be examined in association with what is happening in regard to the number of survivors in good health, in order to obtain a precise picture of the evolution of the latter.

In the case presented above, in which successive values of disability-free life expectancy increased less quickly than life expectancy, the correct interpretation of the data should mention the following

four points: (i) conditions that defer mortality are evolving favourably, as is shown by the increase in cross-sectional life expectancy; (ii) health conditions (morbidity, disability, etc.) are also evolving favourably, as is likewise shown by the evolution in healthy life expectancy; (iii) however, since healthy life expectancy increases less quickly than life expectancy, the cross-sectional expectancy of life in poor health is increasing to a relatively greater extent; and consequently, (iv) the numbers of persons in bad health among the survivors as a whole are also increasing.

Besides the above analysis of life expectancy at birth and life expectancy of a group initially in good health, in future it will also be necessary to know how to interpret the evolution of life expectancy and healthy life expectancy at any age and particularly at advanced ages.

Expectation of life and expectation of life in good health at 75 years. At advanced ages, 75 years for example, the evolution of healthy life expectancy in the survivors as a whole is clearly the evolution of a weighted mean of two expectancies: the healthy life expectancy of the survivors in good health at 75 years and the healthy life expectancy of the survivors in poor health at 75 years, adjusted for the different weighting of these two groups of survivors to 75 years of age under successive prevailing numbers. Thus, a decrease in successive cross-sectional measures of healthy life expectancy at 75 years of age does not necessarily reflect a deterioration in health conditions. The decrease may be due to an increase in the proportion of survivors in bad health among the total who survive to 75 years. It may conceal both an increase in healthy life expectancy for survivors in good health at 75 years and an increase in the proportion of those survivors in good health at 75 years, in relation to the initial number of people (from birth) in the successive fictitious cohorts. The decrease in healthy life expectancy at an advanced age (in relation to the initial age of the cohort under consideration) may therefore conceal a favourable evolution in health conditions. In this example and under the successive cross-sectional measures, the number of survivors in good health at a given age is higher, and beyond that age these survivors live in good health for a longer period on average.

Until more thorough consideration has been given to ways of interpreting the results at a particular age, it should be noted that the evolution of cross-sectional healthy life expectancy in the survivors as a whole:

- should not be examined in isolation;
- should be examined in association with the

healthy life expectancy of those survivors initially in good health at the age under consideration; and

- should be examined in association with the evolution of the proportion of the survivors in good health at the age under consideration in relation to the initial cohort.

Assessing health conditions during a given period

Calculation of healthy life expectancy would make it possible to assess the health conditions encountered by the population at a given time, in order to find out whether those conditions improve over time and to determine the consequences of an improvement or differential deterioration in the different mortality and morbidity conditions.

Theoretically, the aim is to assess the health status of the population and to find out whether it is improving over time. In practice, the calculation of healthy life expectancy would make it possible to assess the influence of health conditions encountered by that population at a given period and the evolution of those conditions over time. Since it is often more valuable to assess the health conditions encountered by a population at a given time than to determine its "health status", this difference does not matter much.

At first glance the health status of a population seems an attractive concept, but it is a very ambiguous one. Modern definitions of health are very dynamic. Health, for example, can be considered as the "capacity to fall ill and get well", or the capacity to adapt, etc.^a Increasingly these definitions are based on movement (the occurrence of a particular event, entering upon or coming out of a particular state) and less and less on the presence or absence of a particular sign. Thus, in the long run it may be considered that people in good health are all those whose "status", improves (or is maintained) during a period whatever their initial "status", while people in bad health are all those whose "status" deteriorates in any way, whatever the initial "status" (bearing in mind all the usual reservations on normal evolution in relation to age).

A population is fixed in a given space-time situation and is composed of individuals or cohorts of individuals. The modern concepts of health are therefore difficult to tie in with the classical notion of population. The "health status" of a population during a given period is liable to be quickly reduced

to the presence within it of "stocks" (e.g., of dependents, insane person, etc.). These stocks of a given period have very little to do with population health today. They result from a past history which differs greatly from one country to another, or even from one region to another, and which for certain cohorts has already lasted almost a hundred years whereas for others it has barely begun. Assessment of these stocks is not without interest in itself, for they provide information on the "health needs" of the population, which is not our concern here.

The health conditions encountered by a population during a given period (forces of mortality, morbidity, disability, cure and recovery, etc.) are much more closely connected with population health today, even though they will never be completely independent of history. Thus, the effectiveness of the various present health programmes must be assessed through their effects on the conditions occurring during the period (flows, probabilities of entering or leaving a particular state) and not on stocks. It would be both erroneous and unjust to try to assess the effectiveness of a policy of maintenance at home on the basis of the prevailing number of individuals in institutions (the stock), for even if it is very effective (i.e., if the probabilities of entering an institution have been greatly reduced), such a policy cannot for a long time have anything more than a marginal effect on the stock. On the other hand, a cross-sectional calculation of non-institutionalized life expectancy over the successive periods would clearly measure the reduction in the probabilities of institutionalization.

Knowing what to measure

Healthy life expectancy is theoretically a tool for checking "what is occurring" or "what is being done" at present, because it makes possible a detailed evaluation of present conditions, i.e., it characterizes a precise period (a year, for example). This tool should make it possible to compare the health conditions in different countries during the same period or to follow the evolution of health conditions in a single country in different periods. Calculation of healthy life expectancy does not provide information on the "needs of the population", which are more in the nature of consequences, including the consequences of past conditions. It is not therefore a tool for social and health planning or programming. On the other hand, health objectives can be fixed in terms of healthy life expectancies.

Measuring incidences

To be able to compare healthy life expectancies between neighbouring countries, the most accurate esti-

^a According to the Constitution of the World Health Organization, "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

mates possible must be available. This entails rejection of the cross-sectional method of Sullivan (4), which provides a gross estimate of the value sought with an unknown degree of precision. This method, which is simple to use, has provided us with the first estimates of the duration of healthy life expectancy in western countries (5). The experimental work illustrates the very limits of non-standardized calculations: none of the values found are strictly comparable. Taken together, they give an indication (a range with upper and lower limits) of the duration of healthy life expectancy in the developed countries (6).

By combining prevalences of disability with a cross-sectional life-table, Sullivan mixes flows and present mortality conditions with the present stock of the disabled; which in itself is largely inherited from past disease conditions, i.e., every country's own particular history. It is impossible to use such a statistical construction for geographical comparisons except, for example, if we wish to make a crude comparison between a few developed countries and a few developing countries. At the outset, a method should be selected that makes healthy life expectancy truly a period indicator and only combines period probabilities, probabilities of death, and probabilities of health. It is therefore necessary to measure the incidence.

Longitudinal surveys and the observation or simulation of incidences have reversed many opinions derived from cross-sectional studies on the health status of elderly populations whether in regard to:

- (i) excess incident disability in old women (7, 8);
- (ii) the prevalence of years of disability in years lived in excess by women (9); and
- (iii) the irreversibility of acquired disability (8, 10, 11, 13).

Checking the quality of the years gained at advanced ages

Let us now consider the first question which was posed at the beginning of this article. By living to a greater age are we not becoming more and more weak? In other words, we are first of all worried by the consequences of the decrease in mortality at advanced ages and we should like to estimate the quality of the years gained at very advanced ages. It is therefore necessary, first and foremost, to evaluate the health conditions encountered by old people, and to do that it is essential to measure the *incidence* of morbid events that indicate or reflect a decrease in the quality of life of the old. Incidentally, it can be observed that the quality of years added before

death, or more generally the quality of total years of life, is an issue that can be raised at any age.^b

Just as the calculation of life expectancy takes into account the decrease in mortality at all ages in life and summarizes the totality of present mortality conditions, calculations of healthy life expectancies would summarize the totality of health conditions. It is therefore necessary also to evaluate the health conditions encountered by the population at all ages—in infancy, during adolescence, etc. In developing countries, it is probable that a combination of mortality and disability data would be of particular relevance for the adult population.

Replying to questions concerning the population as a whole

It is important to examine the questions for the population as a whole and not only those formulated by a particular group of individuals, such as the managers of the health system. Cross-sectional life expectancy is really a checking instrument because the data used in the calculation are clearly defined and known to all. To be able to check on present health conditions, healthy life expectancy must reflect clearly defined and precisely formulated data.

For that reason it is essential to begin drawing up a list of the questions that are asked and to reflect on the source of the questions. Are adults, old people and gerontologists asking the same questions about the quality of the years lived at advanced ages? Is the way of replying to these questions the same? There is no *prima facie* reason: (i) for eliminating a particular question; (ii) for paying more attention to a particular answer; or (iii) for deciding theoretically what should be measured—complaints, disorders, symptoms, diseases, impairments, disabilities, abilities, performances, etc. (12), particularly since in the first instances it will not be possible to reply in terms of healthy life expectancies to many of the questions posed. It is essential, therefore, to consider the questions and to determine above all which of them can be answered. We believe that it is reasonable to collect incidences of clearly defined events which, once aggregated with mortality probabilities, would provide unambiguous answers to the questions.

Taking into account the recovery of lost functions

In the first two experimental calculations of healthy life expectancies carried out solely with present

^b The Associations of parents of children suffering from neuromuscular diseases, for instance, are more and more interested in the concept of healthy life expectancy.

probabilities, i.e., active life expectancy at 65 years in Massachusetts (USA) (13) and life expectancy without confinement to the home at 65 years in Upper Normandy (France)^c, acquired disabilities were considered to be definitive, without any possible recovery of lost functions (7). This approach was adopted not because it is easier to calculate healthy life expectancies with two rather than three series of probabilities, or more convenient to combine mortality probabilities and probabilities of becoming disabled, while neglecting the probabilities of recovering from the disability, but because in the absence of sufficient data on the incidence of recoveries, it seemed the most reasonable. In both these studies, the absence of usable data on the recovery of lost functions (by sex and age) was linked to the size of the cohorts of the old people followed up and, in particular, the small number of subjects who were initially dependent (in the case of Massachusetts) or initially confined to their homes (in the case of Upper Normandy). More recently, several surveys of specific populations have emphasized that the proportion of disabled persons who regain lost functions is much larger than was generally believed (8–11).

Thus, the image of an inexorable decline of health and functional capacities with age is false and out of date (10), and the idea of an irreversible development of chronic disabling diseases in old people must be revised,^d since otherwise these conventional views can only serve as an excuse for discriminatory practices against old people or those with disabilities. Beyond experimental calculations, it would not be realistic to propose a model that neglected these recoveries, particularly as the improvement in health conditions, which is assessed with the help of prevalent healthy life expectancies, depends as much on therapeutic actions that increase the probabilities of recovery as on preventive actions that diminish the probabilities of becoming disabled. It is essential therefore to measure not only the incidences of morbid events that indicate or reflect a deterioration in the quality of life of the old, as stated earlier, but also the incidences of events that indicate an improvement in the quality of life.

Attempts to simulate the incidence of confinement to the home on the basis of probabilities of death and probabilities of survival observed in Upper

Normandy suggested that the incidence of confinement to the home is almost comparable in men and women. Calculation and comparison of life expectancy and life expectancy without confinement to the home at 65 years of age indicated that 84% of the years lived by men and only 72% of the years lived by women were free of confinement to the home.^e These results were similar to those obtained in Massachusetts in the active life expectancy study (13). On the basis of these results, derived from a model that neglected the forces of recovery of lost functions, the hypothesis was formulated that the excess disability observed in women could be explained by the difference in survival time once the disability observed had been acquired (7). Analysis of National Long-Term Care Surveys (NLTCs) confirmed that the incidence of becoming disabled is approximately the same in men and women and the same hypothesis was adopted to explain excess disability in women (8). The new calculations of active life expectancy incorporating the probabilities of recovery of lost functions show, on the contrary, that the proportion of the years lived without dependence is no higher in men than in women. This result suggests that the extra years lived by women, under present conditions, show the same qualities of vigour and disability as the years lived by men (9).

The proportion of years lived in good health among the total number of years lived beyond a certain age depend on the three forces—mortality, disability, and recovery. However, whether the hypotheses formulated to explain the difference between the sexes in regard to these forces are jointly compatible with this new “balanced” result needs to be verified.

Assessing the quality of life

Because functional capacities and independence play an important role in the quality of life, it is often considered that a calculation of disability-free life expectancy or active life expectancy would assess this quality correctly. In fact, the matter is much more complicated because the quality of life is more closely connected with autonomy than with independence (14), and there is wide interindividual and intercommunity variability in the concept of “quality of life”.

Independent people are by definition autonomous and active life expectancy implies a duration of life without loss of autonomy, but there is no indication of how the autonomy of old people or dependent disabled people is measured. It would seem

^c Brouard, N. & Robine, J.M. *Modelling the confinement of the elderly to the home*. Paper presented at the Conference on Theoretical and Medical Biology, Angers, 16–18 September 1986.

^d Haan, M.N. *Compression of morbidity, the Kaiser Permanente Study of Oldest Old*. Paper presented at REVES, Quebec City, 11–12 September 1989.

^e See footnote c.

necessary, therefore, to be able to measure the incidences of events that indicate a deterioration or an improvement in the autonomy of dependent persons. For example, by providing meals-on-wheels services to an old lady who finds it difficult to go out shopping, we may not only be creating a dependence and encouraging the development of disability, which could have been avoided by therapeutic solutions (14), but we may also be reducing the autonomy of the persons concerned, if by having no more shopping to do she loses the right to choose what she is going to eat (15). Close attention must therefore be paid to choosing what activities we can undertake and determining how appropriate they are by making more frequent checks on the quality of the services provided for dependent old people in regard to their autonomy.

The daily activities of old people who may be having difficulties in carrying them out should be carefully assessed without favouring the creation of too much dependence. While the restoration or maintenance of individual abilities is preferable to the provision of home help (14), there is a price to be paid for independent daily functioning. Older persons with increasing functional limitations over a period of years may take steps to perform satisfactorily their daily activities.^f The value of the activities carried out must be compared with theoretical abilities as well as the quality of life with regard to the suffering of pain, anxiety, fatigue, etc.

Thus, the assessment of the quality of life during a given period requires many more control instruments to compare the real gains and losses. A list of such instruments, without considering their feasibility, would include:

- (i) life expectancy without loss of autonomy;
- (ii) life expectancy without loss of the ability to carry out daily activities (independent life expectancy);
- (iii) life expectancy without loss of abilities;
- (iv) life expectancy without feeling suffering;

These four items correspond to the following basic questions: how long can one expect to live, i.e., to function, without suffering pain, tiredness and anxiety; without loss of abilities; without deterioration in performance and dependence for carrying out basic actions; and without loss of autonomy?

How long can we expect to live in the community?

In practice the questions asked are much less theoretical and much more practical, e.g., how long can

we expect to live without being placed in an institution or long-term hospital establishment?

An assessment of the present conditions for institutionalization, e.g., admission to and discharge from inpatient facilities, when more and more programmes for support in the home are being established, is clearly required. In theory, non-institutional life expectancy is the best measure of the effectiveness of policies designed to enable old people to remain in their own homes. Its repeated calculation should show whether the conditions in favour of institutionalization in the successive periods are diminishing.

When a chronological series of non-institutional life expectancies have been established for several countries, an international comparison could usefully be carried out. This could also explain why two comparable countries with very similar cross-sectional life expectancies should show an important difference in their non-institutional life expectancies. The determination of cross-sectional non-institutional life expectancy would combine the probabilities of death with the present probabilities of admission to and discharge from institutions. For international comparisons one should make sure that the definitions of institutions are compatible between the countries concerned.

But how do we define an institution? Especially now when (i) a variety of home-care services (nursing, physiotherapy, etc.) for maintaining old people in their own homes are being developed, which previously could only be given in institutions; (ii) policies are being defined for making long-stay hospitals and nursing homes more like an ordinary home (for example, do the persons in the establishment have a personal telephone with a direct line or one going through a switchboard); and (iii) old people's homes have been developing therapeutic sections and medical beds and are more and more frequently providing care on the spot.

Where can a line be drawn between ordinary homes, which are becoming more and more treatment-orientated and to which the home-care service often has the keys, and establishments that are increasingly respecting one's privacy so that the inhabitants have their own possessions and their own keys to their rooms? In such situations there can be no identical definitions of "institution" between one country and another. However, if comparisons are to be made of non-institutional life expectancies an agreement must first be reached on a unified definition of "institution". Should it not be based more on excluding the community and geriatric enclaves than on concepts of services?

As in the case of dependent persons it would also be of value to be able to assess the autonomy

^f See footnote d, page 795.

and social isolation of persons placed in institutions in order to determine the quality of their life under the conditions of the given period. It is possible, therefore, from the outset to add two new components of healthy life expectancies to the above-mentioned list:

- non-institutional life expectancy;
- life expectancy without social isolation.

Assessing the maintenance of quality of life in the community. At what price is it possible to maintain a person in his or her home? This brings up a second series of questions on the quality of the life lived in the community. Is confinement to one's home the price to be paid for maintenance there? Is going back to live with their children the price to be paid for maintenance in the community? Two more healthy life expectancies can now be defined specific to each of these:

- life expectancy without confinement to one's home;
- life expectancy under one's own roof.

The principle is always the same: to refine the assessment of health conditions in a given period by using more control instruments. In this case, the decrease in the probabilities of having to enter an institution, for example, should not be at the expense of an increase in the probabilities of being confined to the home, and going back to live with one's children is not a substitute for being placed in an institution or vice versa.

However, the difficulties of international comparisons when using such instruments are obvious. There is a climatic dimension to confinement to the home which would interfere, for example, with direct comparisons between France and Canada. There is also a cultural dimension that would bias any comparison with strongly Islamic countries. The cultural dimension is still more obvious in the mode of cohabitation. It is certainly valuable to compare such instruments on an international basis but their use must be limited to very similar countries with closely harmonized data collections.

Measuring and comparing abilities or performances

The only way of removing biases due to climatic, cultural, religious or other factors would be to study abilities or theoretical capacities, rather than everyday performances or capacities used, which are too closely connected with the environment. Answers can be sought therefore to the following questions: (i) For how long is a person capable of getting about outside his or her home? (ii) For how long is a person capable of living alone in an ordinary

dwelling? (iii) For how long is a person able to maintain social activities in the community?

Performances are capacities used in a specific physical and social environment: nobody lives in an institution if there is no institution. A particular environment, climate, pollution, health policy, etc. is precisely what is characteristic of a given period and what defines the health conditions encountered by the population during that period. Abilities, on the other hand, are theoretical capacities that are much more closely connected with the history of the various generations than with the given period.

By calculating cross-sectional values the researcher is largely freed from considering each country's or each generation's own particular history. In using mortality data, the researcher is not interested in those who are already dead but in those who are going to die during the given period (in a given year, for example). When using performance data, such as confinement to the home, the researcher would be interested not in those who are already confined to their homes (prevalence stock), but in those who are going to be so confined or released from such confinement during the given period (incidence flows). When using ability data, such as the ability to leave one's home, the researcher would be interested not in those who have already lost that ability but in those who are going to lose it or recover it during the given period. What difference is there between the two period probabilities: the probability of being confined to one's home and the probability of losing the ability to leave one's home? The question is a complicated one.

In international mortality comparisons, no attempt is made to eliminate the effect of environment on mortality, e.g., by discarding a particular cause of death because it is too closely connected with the environment. Both physical and social environmental conditions influence the mortality encountered by the population. Thus, a comparison of cross-sectional life expectancy between, for example, France and a central African country does not compare the health status of the two populations but the conditions influencing the mortality encountered by these two populations. Therefore one cannot eliminate performances in daily functioning from calculations of cross-sectional healthy life expectancies because they are intimately connected with the environment in any given period. There is also a close relationship between mortality data and performance data in daily functioning, since survival depends on one's performance in a particular environment.

Calculations of healthy life expectancies with data on loss and recovery of abilities could be compared from one country to another. These, however,

would supply another theoretical assessment of the health conditions encountered by a population by combining survival performances in a particular environment with capabilities of functioning. Until conclusions are available from a more thorough study of the advantages and shortcomings of the various types of data that can be aggregated with mortality data, caution must be exercised as to the combinations selected. It is doubtless better to develop a greater number of simple instruments, some of them associating performances in functioning and other associating abilities with mortality, rather than to carry out complex statistical aggregations that are very difficult to grasp.

Assessing more severe conditions

While a general assessment is needed of the duration and quality of life in the community, answers are also needed to more specific questions corresponding to anxieties regarding the deterioration of the aged that are independent of the type of dwelling occupied and the mode of cohabitation. An assessment must be made of the most severe conditions and the probabilities of recovery from them. An initial list of such conditions would comprise mental deterioration, social isolation, loss of independence in carrying out certain private activities of daily living (ADL, such as going to the lavatory, washing, and changing clothes), incontinence, loss of independence for eating, confinement to bed (bedridden), and finally loss of autonomy.

Healthy life expectancies based on data on the loss/recovery of function in regard to these health conditions would supply information on:

- the duration of life without mental deterioration;
- the duration of life without social isolation;
- the duration of life without loss of dignity (loss of independence in carrying out private ADL as mentioned above);
- the duration of life without suffering from incontinence;
- the duration of life without confinement to bed (bedridden); and
- the duration of life without loss of autonomy.

Some of these measurements would clearly correspond to present objectives in public health, such as preventing dependence and keeping old people free for as long as possible to do by themselves all the basic activities of daily living. They would also make it possible to check on the effectiveness of health activities and to quantify the objective, e.g., a 10% reduction over a period of ten years in the proportion of years of dependence among the years lived under the conditions of the given period.

Other measurements would correspond to clearly displayed anxieties, such as fears regarding the increase in the number of persons with mental disorders. To have available at each age (for persons in good mental health and those with mental disorders) figures for life expectancy, with or without mental deterioration, and to compare all the instruments concerned on an international basis, would certainly upset many accepted ideas at a time when we are not even sure that the population of persons with mental disorders has benefited from the general improvement in present mortality conditions as much as the rest of the population.

Other measurements would also help to overcome taboos such as those surrounding problems of urinary incontinence. Whereas the few studies on the subject reveal that the prevalence of incontinence in old women is considerable, nothing has been done for the great majority of those concerned. Through consistent health campaigns in this area, life expectancy with no problem of incontinence could, by summing up the successive cross-sectional conditions in terms of preventing incontinence or doing something about it, become an instrument for checking on the effectiveness of the actions undertaken, even if the campaign had little influence for the time being on the numbers affected (prevalence stock). Finally, other measures would strengthen the great principles such as the right to autonomy which most democratic countries recognize for their citizens including the older ones.

Obtaining the necessary data

Types of cross-sectional calculations

Information solely in one direction (e.g., loss of a function) is sometimes collected on the main cohort without observing, with the same precision, what goes on in the other direction in a specific cohort (e.g., recovery of the lost function). In this case calculations are made of the type, "How long can one expect to live without experiencing a particular event?"—the first event of its type, by definition.

The collection of information for this type of calculation is relatively simple, which is important in the case of a project for standardizing procedures. For international comparisons the protocol should not rule out such calculations, even if a priori it is thought desirable to be able to take into account the recovery of the lost functions. In fact, the protocol should help to better define the two types of possible calculation—with or without recovery of the lost functions—clarifying the specific application of each instrument.

An active life expectancy calculated solely with the probability of becoming ADL-dependent would

provide information on the average length of time during which individuals in a fictitious cohort can expect to live under current conditions without experiencing a first episode of dependence. Such an indicator, which totally neglects the rehabilitation and therapeutic action aspects of current health conditions, is very much directed towards prevention. It would be valuable to carry out at the same time: (i) a calculation for the whole of the population, (ii) a calculation limited to the initially healthy population, and (iii) a calculation limited to the individuals who experience the event under study during the period. This last calculation, carried out regularly, could provide direct information on the possible postponement of the average age of onset of a particular morbid event under the prevailing conditions.

An active life expectancy calculated with the probabilities of becoming ADL-dependent and the probabilities of recovering ADL performances would provide information on the average length of time for which individuals in a fictitious cohort can hope to live under the prevailing conditions without being ADL-dependent. To put it more simply, the arithmetical difference between the two types of active life expectancy would sum up the effectiveness, at a given time, of rehabilitation and therapeutic activities. There again, several calculations can be made—one for the whole population, one limited to the initially healthy population, and a third limited to those individuals who are experiencing the event under study under the prevailing conditions. This last calculation would provide information on the duration of dependence of ADL-dependent persons under prevailing conditions.

Disability thresholds

There are two types of criteria for distinguishing among healthy persons, individuals who acquire a disability and those who recover lost functions:

- absolute criteria of the “threshold” type common to all individuals;
- relative criteria applicable to each individual, taking into account his or her initial state.

For example, with current mobility conditions and with criteria of the threshold type, it would be possible to calculate a life expectancy without confinement to the home, whereas with relative criteria it would be possible to calculate a life expectancy without notable reduction in mobility, whatever the initial level of mobility of each individual may be. The difference between these two types of healthy life expectancy is still more apparent in the example of cognitive capacities. With criteria of the threshold type it would be possible to calculate life expectancy without any sign of mental disorder, and with

relative criteria a life expectancy without a notable reduction in intellectual capacities, whatever the initial level of the capacities of each individual.

In terms of functioning, some individuals are initially very far from the threshold selected, while others are very close to it. On an individual basis the second calculation seems more interesting—how much time can one hope to live without a notable reduction in one’s intellectual capacities?—but this calculation does not apply to any individual in particular, or to any real cohort or population. In both cases there is the question of calculating healthy life expectancy for individuals in a fictitious cohort. It is a matter of two indications on current mental health conditions:

- (i) what proportion of the cohort is crossing the threshold of mental disorder; and
- (ii) what proportion of the cohort is experiencing significant mental deterioration. These two proportions may be very different.

In regard to a common protocol, the use of criteria of the threshold type seems to be simpler at the outset. This option that has been selected for the experimental calculations of cross-sectional healthy life expectancies (9, 11, 13).⁹ It is, of course, not easy to take into account the recovery of lost functions by using relative variations in functioning as the criteria of deterioration in health. Supposing that a method is found of quantifying mobility and that a loss or an improvement of 10% in mobility is considered as significant, an individual who, after having lost 10% of his mobility (recognized deterioration), experiences a slight improvement which is not recognized (<10%), may no longer meet the conditions for significant loss of mobility: he has notably lost part of his mobility, or he has not significantly improved his mobility, or he is no longer in a state of significant loss of mobility compared with his initial situation.

Résumé

Mesure et utilisation de l'espérance de vie en santé: aspects conceptuels

L'article examine toute une série de problèmes conceptuels et théoriques liés au calcul et à l'utilisation des espérances de santé dans les pays développés où l'espérance de vie a fortement augmenté au cours du XX^{ème} siècle. Aurait-on observé la même évolution pour "l'espérance de vie en bonne santé" si on avait été capable de la

⁹ See footnote c on page 795.

mesurer? Des résultats récents semblent indiquer que "l'espérance de vie sans incapacité" augmente moins vite que l'espérance de vie totale. De tels résultats indiqueraient à la fois (i) une amélioration des conditions de mortalité, et (ii) de morbidité de la période, mais aussi (iii) une augmentation relativement plus grande des années vécues en état d'incapacité, et partant (iv) un accroissement de la prévalence de l'incapacité dans la population totale.

Aux âges élevés l'espérance de vie en bonne santé est clairement la moyenne pondérée de deux espérances, celle des sujets en bonne santé et celle des sujets en mauvaise santé. Dans une série de calculs aux âges élevés, une plus grande survie des sujets en mauvaise santé, aux âges plus jeunes, peut en théorie annuler l'effet d'une amélioration des conditions de mortalité et de morbidité de la période, aux âges élevés.

L'état de santé actuel de la population, même s'il n'est pas totalement indépendant de l'histoire, est très lié aux conditions de santé de la période et il est évident que l'efficacité des programmes de santé doit être mesuré à travers leurs effets sur les conditions du moment (probabilités d'entrer ou de quitter un état de santé) et non pas sur le stock des personnes en mauvaise santé. Pour cela les espérances de santé doivent vraiment devenir des indicateurs de la période (i.e. conjoncturels). Cette approche a modifié sensiblement nos connaissances sur la sur-incapacité féminine en termes d'incidence et de prévalence ainsi que sur la réversibilité de l'incapacité. Il est grand temps de reconnaître que l'idée d'un développement irréversible de l'incapacité, au cours du vieillissement, doit être révisée.

On doit multiplier les indicateurs afin de vérifier que ce qui est gagné sur une dimension de la santé n'est pas reperdu sur une autre: par exemple vérifier la qualité des services apportés aux personnes âgées dépendantes en mesurant leur autonomie. On doit aussi distinguer entre les aptitudes théoriques des individus et leurs performances dans la vie quotidienne et mesurer les conditions les plus sévères pour les différentes dimensions de la santé (dépendance pour les actes élémentaires de la vie quotidienne, détérioration mentale, isolement social, perte d'autonomie).

Les calculs opposent les espérances de vie avant la première entrée dans l'état d'incapacité sélectionné (par exemple, l'espérance de vie avant un premier épisode de confinement au domicile) des espérances de vie sans l'état d'incapacité sélectionné (par exemple, l'espérance de vie sans confinement au domicile). Il reste à choisir

le type de seuil, relatif ou absolu, pour définir l'entrée en incapacité et la récupération des fonctions perdues.

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