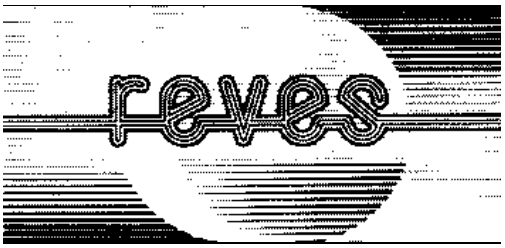

Réseau Espérance de Vie en Santé
Network on Health Expectancy and the Disability Process

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Global Assessment in Positive Health

Contribution of the Network on Health Expectancy and the Disability Process

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GLOBAL ASSESMENT IN POSITIVE HEALTH

Summary

The continuing fall in human mortality has important consequences. Not only is it increasing life expectancy and the proportion of population reaching older ages in many (especially developed) countries, but it is also modifying the average state of health of populations. In particular the growing prevalance of chronic diseases and disabilities - which best reflects this change in the relation between mortality and morbidity - has focussed attention on the increasing tension between the length of life versus the quality of the extra years lived. The question as to whether people survive only to live on in poor health, has fueled a debate that resulted in three theories: an expansion of morbidity hypothesis, a compression of morbidity theory and a dynamic equilibrium concept (more chronic disease but generally milder in character).

As traditional health indicators fell short in adequately covering this new epidemiological transition, a new indicator for population health emerged: health expectancy. This indicator integrates information on mortality and morbidity, especially in terms of the consequences of diseases. For the latter the international network of researchers on health expectancy (REVES) has adopted the WHO International Classification of Impairments, Disabilities and Handicaps (ICIDH) as a framework.

During the last decennium calculations of health expectancies have been carried out in 37 countries. This global report gives an overview of the most important results of these studies. Although international comparison of results is not yet justified due to differences in study design and data collection, this report attempts to make an important step forward into the direction of comparability by the application of a classification system for different types of health expectancies. The main categories in this system are related to the ICD (disease-free life expectancy), the ICIDH (impairment-, disability- and handicap-free life expectancy), perceived health and quality adjustment.

The analysis of all these studies allows important conclusions to be drawn in terms of inequalities between sexes, regions and social status which, given the many studies that confirm these findings, will be valid for the majority of countries. Generally the inequalities found emphasise the differences which already exist in life expectancies. Women have greater life expectancies in good health than men, but the proportion of life that they spend free of disability or handicap is slightly lower; health expectancy in more developed (urban) regions is longer than in less developed (rural) areas; and the poorest and least educated not only experience shorter lives but also a larger proportion of ill health. The available chronological series show some general trends over a 30 year period: in most developed countries, concurrent to the increase in life expectancy, an equivalent increase in life expectancy free of severe disability is found. All severity levels combined, however, disability-free life expectancy seems to be stabilising. Thus contrary to widely held beliefs, on the basis of available evidence and this first analysis, years with severe handicap and/or disability are not increasing. While the results for all severity levels combined seem to favour the expansion of morbidity hypothesis, the evolution of severe disability and handicap appears to follow the equilibrium theory. Level of severity and reversability therefore will be important issues in future health expectancy studies.

The determinants of health are numerous and compared to health care reforms, general improvements in the standard of living of populations (nutrition, education, working conditions, environment) explain perhaps the greatest part of the decrease in mortality and the consequent increase in life expectancy. The continuing fall in mortality has an impact at three levels: (i) it increases the volume of the elderly population; (ii) it further ages the total population; and (iii) it modifies the average state of health. This last point may have serious consequences but life expectancy, a quantitative indicator of years lived, will not reflect this change. The fall in mortality and the consequent lengthening of life in non-healthy states - especially amongst the elderly - increases the prevalence of chronic, non-lethal impairments (sensory impairments, cognitive impairments, osteo-articulatory impairments). It is not clear whether this increase is compensated by a decrease in the incidence of various illnesses and by a general improvement in the level of health of successive cohorts over time. The quantitative information provided by life expectancy therefore needs to be complemented by qualitative information concerning the nature of the years lived; in particular the nature of the years lived at higher ages, but also the nature of the years of life expectancy gained through falls in mortality at all ages in life. Important differences may be expected between developed and developing countries, according to the point they have reached in terms of health transition.

It has been on the basis of these considerations that the concept of health expectancy has been developed and in particular the notion of disability-free life expectancy (or active life expectancy).

PART I: theories, methods and indicators (definitions)

1. The theories of the evolution of health status

The sustained and continuous increase in life expectancy over recent years was totally unexpected. The drop in the mortality of the very old in Western countries, for example, was particularly surprising. The question has been raised as to whether people are now surviving chronic diseases only to live on in poor health. This question has fueled an important debate during the first half of the 1980s about the relationship between the evolution of mortality and the evolution of morbidity, which has gradually centred around three theories [1-2]. A general decline in health would be forecasted by the first [3-4], an improvement in health by the second [5-6], while no change would be expected under the third [7].

1) According to Gruenberg and Kramer, the decline in mortality rates is the result of a decline in the fatality rate of chronic diseases rather than a decline in the incidence of these diseases or a slowing in their rate of progression. The postponement of death will result in a worsening of the severity of chronic diseases [3-4]. This is what Kramer called, in 1980, the '*pandemic of mental disorders, chronic diseases and disabilities*' [4]. In 1991, Olshansky et al have further refined this theory, which they have called an '*expansion of morbidity hypothesis*' [8].

2) The theory of the compression of morbidity was first proposed by Fries in 1980 [5]. This thesis postulates that '*(a) if the morbid period is defined from the onset of chronic infirmity until death, and (b) if the time occurrence of such morbid events can be postponed, and (c) if adult life expectancy is relatively constant, then (d) morbidity will be compressed into a shorter period of time'* [6]. Fries considers that in the United States '*the compression of morbidity is presently occurring, in part, and for some'* [6].

3) Manton (1982) is responsible for the concept of *'dynamic equilibrium'*. According to this concept, the increase in life expectancy is partly explained by a slowing down in the rate of progression of chronic diseases. Thus although the decline in mortality leads to an increase in the prevalence of chronic diseases, these diseases will in general be milder in character [7].

It is important to note that all these theories concerning the present evolution of the health status of populations may be expressed as the relationship between health expectancy and life expectancy. Using disability as an example, the *'pandemic'* theory may be expressed as a decline in the ratio of disability-free life expectancy to life expectancy, '*compression of morbidity'* as an increase in the ratio of disability-free life expectancy to life expectancy. Taking into account levels of severity, the theory of *'dynamic equilibrium'* means a decline in the ratio of total disability-free life expectancy to life expectancy and a levelling off or an increase in the ratio of severe disability-free life expectancy to life expectancy.

There is no reason to think that only one theory is to be verified. On the contrary, changes in disability are as much a part of the health transition as the changes in the levels and the causes of mortality. Such an analysis could bring together the different theories which would correspond to different phases of the health transition. On this point, one can refer to the work by Myers and Lamb, 1993[1].

[1]. Myers GC, Lamb VL. (1993) Theoretical perspectives on healthy life expectancy. In: Robine JM et al. Eds. Calculation of health expectancies, harmonization, concensus achieved an future perspectives. John Libbey.

2. The methods of calculation

The principle of the calculation of health expectancy was postulated as early as 1964 [9] and a first method of calculation was proposed in 1971 by Sullivan [10]. Three different methods of calculation of health expectancies exist: (i) the observed prevalence life table method (Sullivan's method); (ii) the double decrement life table method; (iii) and the multistate life table method.

The main advantage of the *observed prevalence life table method* (Sullivan's method) lies in the separate collection of mortality and disability data and in the ready availability of the data necessary for the calculation. Basic cross-sectional surveys are sufficient to collect the observed prevalence of disability within the population; however the indicator obtained is not really a period indicator**.** The problem with this method lies in approximating the period prevalence by the observed prevalence of disability.

The *double decrement life table method* is based on the observation, during the study period, of the occurence of two events corresponding to two possible outcomes: mortality and disability. The simplified method used by Katz et al. [11] results from using the probabilities of survival without disability directly observed at the end of the study period. This implies that the two outcomes studied are irreversible. The advantage of this method is that it really provides a *period indicator* based on data that are not too difficult to collect. The main drawback lies, as for the method following, in the non-separated collection of the mortality and disability data; the accuracy of the mortality data depending on the size and the representativeness of the study sample.

The *multistate life table method* has been proposed by Rogers et al. [12] in order to take into account *the recovery of lost functions* and return to a state of good health. The advantage of this method - based on transitions between states of health - is that it gives a period indicator that takes into account the *reversibility of disability*. The specific drawback of the multistate life table method arises from the scarceness of adequate data. Data requirements for multistate methods are considerable and there are very few countries where national data are available or likely to be available for some time [13]. Biases are introduced when the gaps between successive waves of longitudinal studies are too long, thus failing to capture a part of the flows between health states during the inter-survey period.

In conclusion, the observed prevalence life table method uses cross-sectional disability and mortality data, whereas the double decrement and multistate life table methods depend upon longitudinal data sets. There are enormous financial and political implications in the choice between two such data collection strategies, with cross-sectional being much more likely to have been conducted in most countries. However, longitudinal data and multistate methods are essential for projecting the health of populations.

Sullivan's method is very simple and has been discussed by many authors [14]. The years lived between the various ages by the population of a life table are qualified on the basis of the institutionalization rate (generally provided by a census) and the prevalence rate of permanent and temporary limitation of activity (from national health or disability surveys). Once the table is modified, the period life expectancy is calculated in the traditional manner, according to various states of functional disability. So, one can obtain a series of health expectancy values including *disability-free life expectancy* and *life expectancy with disability*.

Taking the survivors (b) in a life table (see Table 1), the number of years of life between each age (c) are first calculated. Rates of prevalence of disability (d) are then used to calculate the number of years lived with disability. By substracting these from the number of years lived between each age (c), the number of years lived without disability is obtained (e). The cumulative total of these years (f) is then computed from any given age x (a) and related to the total number of survivors (b) at that age to obtain disability-free life expectancy (g). For example the total number of years without disability from age 65 upwards is thus 1,153,013.2 in Table 1. This total is divided by the number of survivors aged 65 to estimate DFLE at age 65: 1,153,013.2 (f) divided by 89,347 (b), i.e. 12.9 years.

Table 1: Disability-free life expectancy by the Sullivan method: France, 1991, female (simplified estimation computed with long term disability only).

Age x	Survivors Sx	Years lived between x and x+a	Prevalence of disability between x and x+a	Years lived without disability between x and x+a	Years lived without disability from x	Long term DFLE from x
(a)	(b)	(c)	(d)	(e)	(f)	(g)
0	100,000	496,176.5	0.0097	491,366.7	7,075,234.3	70,8
5	99,242	496,287.5	0.0242	484,295.5	6,583,867.6	66.3
10	99,158	495,323.9	0.0253	482,791.8	6,099,572.1	61.5
15	99,076	495,697.5	0.0419	474,927.3	5,616,780.3	56.7
20	98,911	493,614.3	0.0358	475,933.2	5,141,853.0	52.0
25	98,685	492,480.1	0.0631	461,390.7	4,665,919.8	47.3
30	98,401	491,880.8	0.0395	472,470.2	4,204,529.1	42.7
35	98,051	488,648.7	0.0548	461,869.0	3,732,058.8	38.1
40	97,583	486,446.6	0.0632	455,709.6	3,270,189.9	33.5
45	96,876	481,630.4	0.0867	439,895.1	2,814,480.3	29.1
50	95,854	476,093.8	0.1068	425,246.1	2,374,585.2	24.8
55	94,400	467,568.3	0.1221	410,472.8	1,949,339.2	20.6
60	92,336	454,383.5	0.1508	385,853.2	1,538,866.4	16.7
65	89,347	436,686.7	0.1885	354,389.6	1,153,013.2	12.9
70	84,952	408,481.5	0.2740	296,546.1	798,623.6	9.4
75	78,000	363,545.5	0.3455	237,955.9	502,077.5	6.4
80	66,522	290,185.4	0.4675	154,519.8	264,121.6	4.0
85	48,434	297,869.1	0.6320	109,601.8	109,601.8	2.3

Source: in annex.

In 1973, it was proposed that a weight be introduced in the calculation in order to obtain a single value (the weighted life expectancy [15] or the value-adjusted life expectancy [16]) which should make it possible to measure the social value of future gains in life expectancy [17].

A first calculation of health expectancy has now been carried out for more than 30 countries [18], principally using Sullivan's method. The limits of this method are increasingly well understood and simulations provide a useful means of assessing its imprecision [19]. Most of the researchers working in this area have regrouped to form an international research network: the Network on Health Expectancy and the Disability Process, known by its French acronym REVES (Réseau Espérance de Vie en Santé) [20]. Calculation methods no longer really present a problem. Obviously it would be preferable if all calculations were made with the multistate method, but this will naturally occur as period data estimates become available. However Sullivan's method provides a useful indicator which can be used, as long as its limitations are understood.

3. The main health expectancy indicators (definition)

The first indicator proposed was disability-free life expectancy [10], followed by active life expectancy [11]. The introduction of concepts from the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) [21] allows one to differentiate among impairment-free, disability-free, and handicap-free life expectancies. Until now, disability-free life expectancy (DFLE) has been the most frequently used expression, often without explicit reference to the WHO-ICIDH concepts and sometimes as the generic term for health expectancies.

Health expectancy is a general term referring to the entire class of indicators expressed in terms of life expectancy in a given state of health (however defined). Health expectancies are hypothetical measures and indicators of current health and mortality conditions. Health expectancies include both "positive" and "negative" health states, which may be defined in terms of impairment, disability, handicap, self-rated health, or other concepts. The sum of health expectancies in a complete set of complementary health states should always equal total life expectancy [22].

In this report, different concepts will be used, principally relating to (a) the ICD framework, (b) the consequences of diseases (ICIDH framework) with subdivisions as proposed by the REVES committee on conceptual harmonization, (c) perceived health and (d) quality-adjustment.

According to the ICD framework:

- *Disease-free life expectancy*, the average number of years an individual is expected to live free of disease if current patterns of mortality and morbidity continue to apply. A well known and

until now only example of a specific disease-free life expectancy is dementia-free life expectancy.

- *Dementia-free life expectancy* is a specific disease-free life expectancy, as dementia is a medical diagnosis. It reflects the average number of years an individual is expected to live without senile dementia if current patterns of mortality and morbidity continue to apply. A calculation using loss of cognitive function would of course result in an impairment-free life expectancy.

According to the ICIDH framework, health expectancies should be differentiated into:

- *Impairment-free life expectancy*, the average number of years an individual is expected to live free of impairment if current patterns of mortality and impairment continue to apply.

- *Disability-free life expectancy*, the average number of years an individual is expected to live free of disability if current patterns of mortality and disability continue to apply.

- *Handicap-free life expectancy*, the average number of years an individual is expected to live free of handicap if current patterns of mortality and handicap continue to apply. The ICIDH distinguishes seven main dimensions of handicap: orientation, physical independence, mobility, occupation, social integration, economic self sufficiency and other handicaps. This report distinguishes independent life expectancy, mobility handicap-free life expectancy and occupational handicap-free life expectancy. When the handicap is assessed in a global manner, the indicator is reported as a general handicap-free life expectancy.

Figure 1: **The different theoretical curves estimated from the WHO model of impairments, disabilities and handicaps superimposed on the observed female survival curve, France 1986-1988 [from work undertaken by Mathers, 1991].**

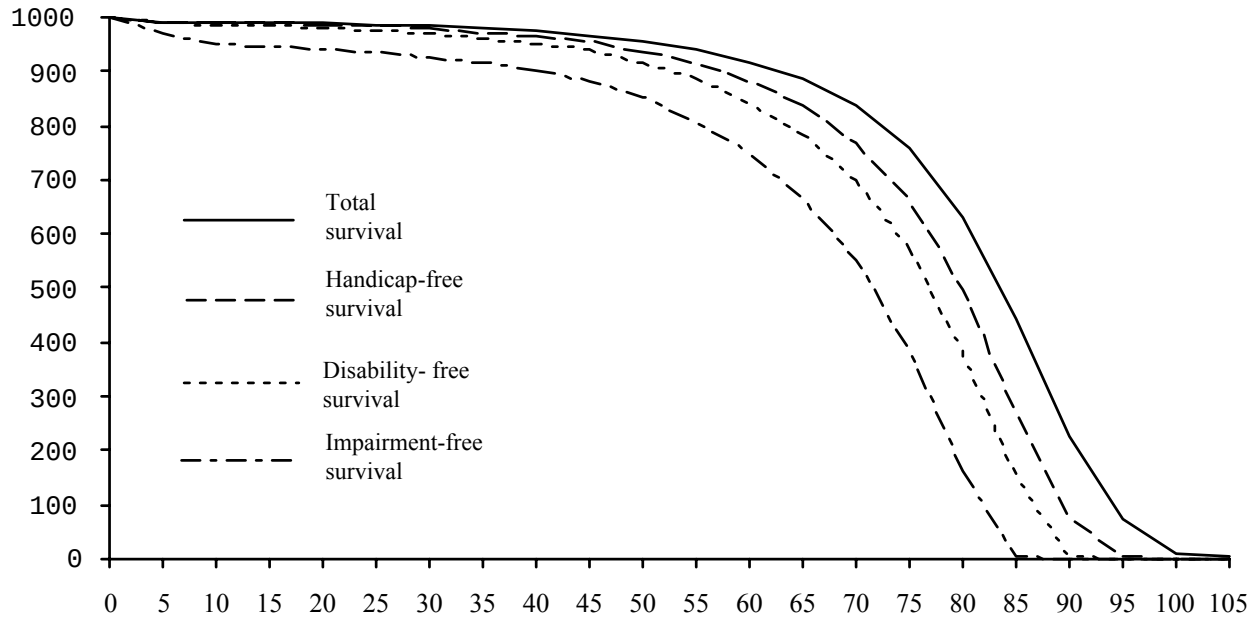


Figure one attempts to visualize these concepts. The areas under the theoretical curves represent the life expectancy and the different health expectancies. Handicap-free life expectancy is closest to the consequences of daily living. Not all impairments lead to disability and not all disabilities lead to handicap.

According to the REVES committee on conceptual harmonization [23], the ICIDH disability-free life expectancy should be differentiated into:

- *Functional limitation-free life expectancy*, the average number of years an individual is expected to live free of functional limitation if current patterns of mortality and disability continue to apply. Functional limitations mean restrictions in abilities, for instance, to bend and pick up something or the ability to walk.

- *Activity restrictriction-free life expectancy*, the average number of years an individual is expected to live free of activity restriction if current patterns of mortality and disability continue to apply. Activity restrictions mean problems in the performance of complex normal human activities like cooking and dressing.

According to Katz et al. [11] and subsequent authors:

- *Active life expectancy* was built to measure independence through the calculation of the average number of years an individual is expected to live without restrictions in a number of activities of daily living (ADL) or instrumental activities of daily living (IADL) if current patterns of mortality and ADL/IADL problems continue to apply. So, given the intention of these authors, active life expectancy is an example of a specific handicap-free life expectancy. Although meant to be an indicator of independent life, the fact that active life expectancy is built with activity restriction data, will always make it difficult to classify. Dependency is not necessarily reflected by the number of inabilities. One could imagine more direct assessments of dependency through one or two general questions leading to other indicators of independent life expectancy. In this work, active life expectancy is classified as an *independent life expectancy.*

Perceived health expectancy is a generic term for health expectancies calculated for health states defined using population data on perceived health status [22]. So:

- *healthy life expectancy*, or life expectancy in good health, is the average number of years an individual is expected to live in a health state defined as the "favorable part" part of the distribution of perceived health status (usually self-rated on a scale of the form *excellent/good/fair/poor*, or alternatively, *very good/good/fair/bad/very bad*).

Health-adjusted life expectancy is a generic term for a weighted expectation of life summed over a complete set of health states. Weights for health states typically range from zero (dead) to unity (optimal health). Health-adjusted life expectancy is a statistical abstraction based on health expectancies in a number of discrete health states and explicit weights for each of those health states. The weights may be empirically derived, based on expert opinion, or arbitrarily chosen [22].

Despite increasing efforts to develop methods at an international level and to standardize health surveys, direct geographic comparisons are impossible since wide differences in disability measures in health surveys still persist. This is illustrated by the most recent estimates of disability-free life expectancies for Western countries produced according to Sullivan's method (see Table 2). Differences in study protocols and definitions of disability will be responsible for at least an important part of the differences in these estimates [23-26]. The same is true for estimates that have been made for developing countries [27, 28].

Table 2 Disability-free life expectancy at age 65, in developed countries (studies in chronological order)

	Males			Females		
Years, Countries	LE	DFLE	DFLE/LE (%)	LE	DFLE	DFLE/LE (%)
1985, Japan	15.5	14.1	91.0	18.9	17.1	90.5
1986, Spain	15.0	6.8	45.3	18.4	6.5	35.3
1987, United States	14.8	8.9	60.1	18.7	10.9	58.3
1988-1989, Switzerland	15.4	12.2	79.2	19.6	14.9	76.0
1990, Netherlands	14.4	9.0	62.9	19.0	8.0	42.1
1991, Canada	15.6	8.3	53.2	19.7	9.2	46.7
1991, France	15.7	10.1	64.3	20.1	12.1	60.2
1991, United Kingdom	14.2	7.9	55.6	17.9	9.8	54.7
1992, Australia	15.4	6.4	41.6	19.2	9.0	46.9
1992, Austria	14.9	11.5	77.3	18.3	12.3	67.0

LE: Life Expectancy; DFLE: Disability Free Life Expectancy; Sources: see annex.

The clarification of the concepts and terminology used is very important. It will assist communication within the national and international research community, and enable a better promotion of the concepts to health policy makers and to the general public. For the OECD countries, historic calculations of disability-free life expectancy, calculated without any reference to the WHO - ICIDH conceptual framework, have been classified according to ICIDH concepts by TNO Health Research (the Netherlands) [29]. This first World Health Report, follows this classification as far as possible. When impossible, the term "unclassified disability"-free life expectancy is used for the historic indicators without any explicit reference to the WHO - ICIDH conceptual framework. Thus:

- "*Unclassified disability*"-free life expectancy is the average number of years an individual is expected to live free of "disability" (generic or historic term) if current patterns of mortality and "unclassified disability" continue to apply. This indicator is a combination of mortality and morbidity data without reference to any distinguishable section of the ICIDH.

The WHR95 classification system is summarized in Table 3. It is a provisional system following the TNO classification (1994). Because some conceptual points need more clarification and because the ICIDH is presently being revised, a further evolution of the classification is expected.

Table 3: Provisional classification system of health expectancies according to TNO Health Research 1994 and the World Health Report 1995 (WHR95)

	TNO, 1994	WHR95
Concepts	Health expectancies	Health expectancies
ICD-10		
Disease-free	Disease-free	Disease-free - Dementia-free
ICIDH		
Impairment-free	Impairment-free	Impairment-free
Disability-free	Functional limitation-free - From a list of impairments Activity restriction-free - Specific activities-free - ADL/IADL restriction-free	Functional limitation-free - From a list of impairments Activity restriction-free - Specific activities-free
Handicap-free	General handicap-free Mobility handicap-free Occupational handicap-free Other handicap-free	General handicap-free Independent life - Active life (ADL/IADL) Mobility handicap-free Occupational handicap-free Other handicap-free
Perceived health	In good health Multi-dimensional	In good health
Health-adjusted		Health-adjusted

The only difference between the TNO classification system and the WHR95 classification system concerns the location of the indicator built with the ADL/IADL limitations. As ADL/IADL might indicate the need for adaptation or accommodation rather than dependency on others in daily life, TNO Health Research classified ADL/IADL restrictions as an activity restriction-free life expectancy [29]. In the WHR95 classification system, as previously explained, active life

expectancy (ADL-free) is classified as a handicap-free life expectancy, given the intention of most authors. The fact that this indicator, based on a set of ADL limitations, is meant to describe dependency on others in daily life more than inability or difficulty with the activities has been the main consideration for this decision. So, in ICIDH terminology, the resultant health expectancy is more closely related to handicap than to disability-free life expectancy [22]. However, one should realize that handicap is - next to the presence of disabilities - to a large extent determined by the environment one lives in. Differences in (cultural) environment therefore will always have to be taken into account when making geographical (for instance international) comparisons.

For the harmonization of the health expectancies see:

World Health Organization (1980). *Classification of impairments, disabilities and handicaps*. Geneva, WHO.

Chamie M (1990) *Report of the Sub-committee on Conceptual Harmonization*. REVES paper n°41.

World Health Organization (1992). International statistical classification of diseases and related health problems: tenth revision. Geneva, WHO.

Robine JM, Michel JP (1992). *Towards international harmonization of health expectancy indices*. REVES paper n°86.

Boshuizen HC, van de Water HPA (1994) *An international comparison of health expectancies*. TNO Health Research. TNO-PG 94.046 ISBN 90-6743-329-2.

Mathers C, Robine JM, Wilkins R (1994) *Health expectancy indicators: recommendations for terminology.* In: Mathers CD, McCallum J, Robine JM, (Eds) (1994). *Advances in health expectancies*. Australian Institute of Health and Welfare: AGPS,. Canberra.

PART II: results

1. World calculations

A first calculation of health expectancy has now been carried out for 37 countries principally using the observed prevalence life table method (Sullivan's method). In this second part of the report the terminology used corresponds to the WHR95 classification system and "..." means without reference to ICIDH.

Positive health expectancies are presented in four sets of tables (Tables 5-, 6-, 7-, 8-) according to the WHR95 classification system. In a world report, it is impossible to present all the results available and selections therefore had to be made. The tables presented bring together national values only and the results are restricted to the most recent values of the main 'positive' health expectancies by sex at age 0 and at age 65. Countries appear in a table only if these values are available. Otherwise, if calculations exist at another geographic level or at other ages, the countries

are mentioned in a table foot-note. It is important that results are not only presented at birth but also at higher ages in order to illustrate that, at any age, one can expect to live years in good as well as in bad health, although the balance between the two changes with age. While the presentation of results at birth is evident, the choice of a higher age is arbitrary. The age of 65 may however be considered a reasonable compromise between the situation for developing and developed countries, and given the availability of detailed prevalence data for higher age groups. Only for dementia-free life expectancy may the age of 65 be too young. For all countries involved complementary results for other ages may often to be found in the original sources. Countries are classified according to their level of development (List of the WHO member states): developed market-economy countries (DMEC), developing countries, of which least developed countries (LDC) and other developing countries (ODC), and economies in transition (ET).

The calculations concern 18 out of 25 Developed Market-Economy Countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, and the United States of America; 3 out of 47 Least Developed Countries: Ethiopia, Mali, and Myanmar; 15 out of 97 Other Developing Countries: Bahrain, China, Egypt, Fiji, Indonesia, Jordan, Kuwait, Malaysia, Pakistan, Philippines, Republic of Korea, Sri Lanka, Taïwan, Thailand, and Tunisia; and 1 out of 22 Economies in Transition: Bulgaria (see Table 4).

Table 4: Health expectancy calculations in the world according to level of economic development

Level of development	countries with calculations	
	n	%
DMEC (25)	18	72.0
LDC (47)	3	6.4
ODC (97)	15	15.5
ET (22)	1	4.5

Table 5 assembles the results of calculations according to the International Classification of Diseases. Section 5-1, brings together dementia-free life expectancies.

Table 5: Health expectancies according to the International Classification of Diseases (ICD-10)

5-1 Dementia-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Belgium, 1991 [1]	-	-	-	-	14.0	13.1	18.3	16.1
France, 1988-1990 [2]	-	-	-	-	15.4	14.8	19.7	18.8

Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Australia**, **France** and **United Kingdom.** (See annex).

Table 6 assembles the results of calculations according to the conceptual framework of the International Classification of Impairments, Disabilities, and Handicaps. The WHR95 classification system logically describes the different concepts concerning the consequences of diseases, from the biological point of view (disease) to the social disadvantage point of view (handicaps), through impairments and disabilities. For the presentation of the Tables it seemed more logical to follow an inverse progression, from social disadvantage in daily living to the impairments, thus working back from consequences to underlying mechanisms of the disablement process.

Section 6-1 brings together general handicap-free life expectancies; 6-2, Occupational handicap-free life expectancies; 6-3, Independent life expectancies; 6-4, Mobility handicap-free life expectancies; 6-5, Other handicap-free life expectancies; 6-6, Activity restriction-free life expectancies; 6-7, Functional limitation-free life expectancies; 6-8, Impairment-free life expectancies. Results that could not be classified are presented in section 6-9, as "Unclassified disability"-free life expectancies.

Table 6: Health expectancies according to the framework of the International Classification of Impairments, Disabilities, and Handicaps (ICIDH, WHO 1980)

6-1 General handicap-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Finland, 1986 [1]	-	-	-	-	13.4	4.3	17.4	5.6
France, 1991 [2]	72.9	63.8	81.1	68.5	15.7	10.1	20.1	12.1
Netherlands, 1991-92 [3]	74.2	61.4	80.2	63.5	-	-	-	-
United Kingdom, 1991 [4]	73.2	59.9	78.7	63.0	14.2	7.9	17.9	9.8
Other developing countries								
Indonesia, 1976-1977 [5]	51.8	47.6	54.8	50.7	-	-	-	-

Sources in annex, some values are available at other ages for **Denmark**. (See Annex).

6-2 Independent life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Canada, 1986 [6]	-	-	-	-	14.9	8.1	19.2	9.4
Finland, 1986 [7]	-	-	-	-	13.4	2.5	17.4	2.4
United Kingdom, 1991 [8]*	-	-	-	-	14.3	13.6	18.1	16.9
Least developed countries								
Myanmar, 1989 [9]	-	-	-	-	12.0	11.1	13.5	12.8
Other developing countries								
Bahrain, 1989 [9]	-	-	-	-	12.9	12.3	14.2	13.6
Egypt, 1989 [9]	-	-	-	-	12.1	10.8	13.3	10.1
Fiji, 1984 [9]	-	-	-	-	13.1	10.5	14.6	10.4
Indonesia, 1989 [9]	-	-	-	-	11.5	11.4	12.8	12.4
Jordan, 1989 [9]	-	-	-	-	12.7	11.6	14.1	12.5
Malaysia, 1984 [9]	-	-	-	-	13.4	11.9	15.0	12.7
Philippines, 1984 [9]	-	-	-	-	12.3	11.4	13.8	12.2
Republic of Korea, 1984 [9]	-	-	-	-	12.9	9.0	15.0	9.4
Sri lanka, 1989 [9]	-	-	-	-	13.2	12.3	14.7	13.4
Taïwan, 1991 [10]	-	-	-	-	15.5	11.7	17.5	12.9
Thailand, 1989 [9]	-	-	-	-	12.6	12.4	14.2	13.6
Tunisia, 1989 [9]	-	-	-	-	12.7	11.3	13.8	11.4

* In this table, life expectancy values for the United Kingdom slightly differ from the values in table 6-1. The latter are based on the complete data set of the General Household Survey, while for the calculations of the values in this table - for reason of international comparability - some respondents were excluded.

Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Belgium**, **Japan, United States of America** and **China**. (See annex).

6-3 Mobility handicap-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
France, 1991 [11]	72.9	71.7	81.1	78.8	15.7	14.8	20.1	18.1
Japan, 1985 [12]	74.8	72.6	80.5	77.7	15.5	14.1	18.9	17.1
USA, 1980 [13]	70.1	68.4	77.6	74.6	14.2	13.2	18.4	16.3

Sources in annex.

6-4 Occupational handicap-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Canada, 1978 [14]	70.8	59.2	78.3	62.8	14.4	8.2	18.7	9.9
Germany,* 1983 [15]	70.8	61.5	77.4	69.9	-	-	-	-
U SA, 1987 [16]	71.5	59.9	78.4	64.3	14.8	8.9	18.7	10.9

*For ex Federal Republic of Germany.
Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Denmark, Finland, Norway**, **Sweden** and **New Zealand**. (See annex).

6-5 Other handicap-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Australia, 1992 [17]	74.5	62.1	80.4	66.7	15.4	8.3	19.2	10.2

Sources in annex.

6-6 Activity restriction-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Austria, 1992 [18]	72.9	69.0	79.4	72.4	14.9	11.5	18.3	12.3
Canada, 1991 19]	74.3	60.7	80.7	63.8	15.6	8.3	19.7	9.2
Netherlands, 1990 [20]	73.9	65.1	80.1	65.1	-	-	-	-
Switzerland, 1988-89 [21]	74.0	67.1	80.9	72.9	15.4	12.2	19.6	14.9
USA, 1983 [22]	-	-	-	-	14.4	11.9	18.6	13.6

Sources in annex.

6-7 Functional limitation-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Australia, 1992 [23]	74. 5	58. 2	80. 4	64. 0	15. 4	6. 4	19. 2	9. 0
Netherlands, 1986-88 [24]	73. 5	64. 1	79. 9	65. 1	-	-	-	-
Spain, 1986 [25]	73. 2	61. 6	79. 6	63. 6	15. 0	7. 0	18. 4	6. 9
United Kingdom, 1985 [26]	71. 7	63. 6	77. 5	66. 5	-	-	-	-
Other developing countries								
Indonesia, 1976-1977 [27]	51. 8	47. 8	54. 8	50. 3	-	-	-	-

Sources in annex.

6-8 Impairment-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Other developing countries								
Indonesia, 1976-1977 [27]	51.8	31.2	54.8	32.0	-	-	-	-

Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Ethiopia.** (See annex).

6-9 "Unclassified disability"-free life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Italy, 1980 [28]	70.6	66.8	77.4	72.2	-	-	-	-
Least developed countries								
Mali, 1976 [29]	48.6	45.7	52.2	48.9	-	-	-	-
Other developing countries								
Bahrain, 1981 [29]	64.7	62.9	67.8	66.0	-	-	-	-
China, 1987 [30]	66.6	61.6	69.5	63.7	12.5	8.9	14.6	9.9
Egypt, 1976 [29]	53.1	52.8	55.9	55.8	-	-	-	-
Kuwait, 1980 [29]	69.1	68.2	73.1	72.5	-	-	-	-
Pakistan, 1981 [29]	60.2	59.8	59.9	59.3	-	-	-	-
Thailand, 1981 [29]	64.3	63.5	71.3	70.6	-	-	-	-
Tunisia, 1975 [29]	52.7	51.9	52.5	51.9	-	-	-	-

Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Denmark**, **Bulgaria** and **Spain**. (See annex).

Table 7 assembles the results of calculations according to the concept of perceived health: section 7-1 brings together life expectancies in good perceived health or healthy life expectancies.

Table 7: Health expectancies according to the concept of perceived health

7-1 Life expectancy in good perceived health

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Finland, 1986 [1]	-	-	-	-	13.4	9.6	17.4	11.6
Germany,* 1986 [2]	71.8	63.4	78.4	68.4	-	-	-	-
Italy, 1983 [2]	71.6	64.3	78.2	68.3	-	-	-	-
Netherlands, 1990 [3]	73.8	60.0	80.1	60.2	14.4	9.3	19.0	9.1
Norway, 1985 [4]	72.6	69.0	79.0	74.1	14.3	12.4	18.2	15.2

*For ex Federal Republic of Germany.
Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Denmark** and **Belgium.** (See annex).

Table 8 assembles the results of calculations of health-adjusted life expectancies: section 8-1 brings together disability-adjusted life expectancies.

Table 8: Health-adjusted life expectancies

8-1 Disability-adjusted life expectancy

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Developed market-economy countries								
Canada, 1991 [1]	74.3	69.1	80.7	73.8	15.6	12.6	19.7	15.1

Sources in annex, some values are available at other ages and/or at a smaller geographic level for **Canada**, **Finland**, **Sweden**, **Norway**, **United States of America**, and **China.** (See annex).

The classification of health expectancies according to a conceptual model of the consequences of disease is a first step towards an international harmonization allowing comparisons. However, in order to achieve international comparability, numerous choices still have to be made. For instance, it matters whether one takes into account only long term disability or the most severe disability, or conversely keeps all states, severe or not, long term or not. These choices probably explain a large part of the differences registered in the different sections of Tables 6 and 7.

Several authors combine different conceptual levels in the same indicator. This is for instance the case when the prevalence of negative health is based on occupational handicaps observed for the youngest combined with physical dependence handicaps observed for the oldest, or on activity restrictions reflecting long term disabilities combined with occupational handicaps observed in short term. Thus, an indicator does not always fit completely into one conceptual level, but is classified in the one to which it mainly belongs.

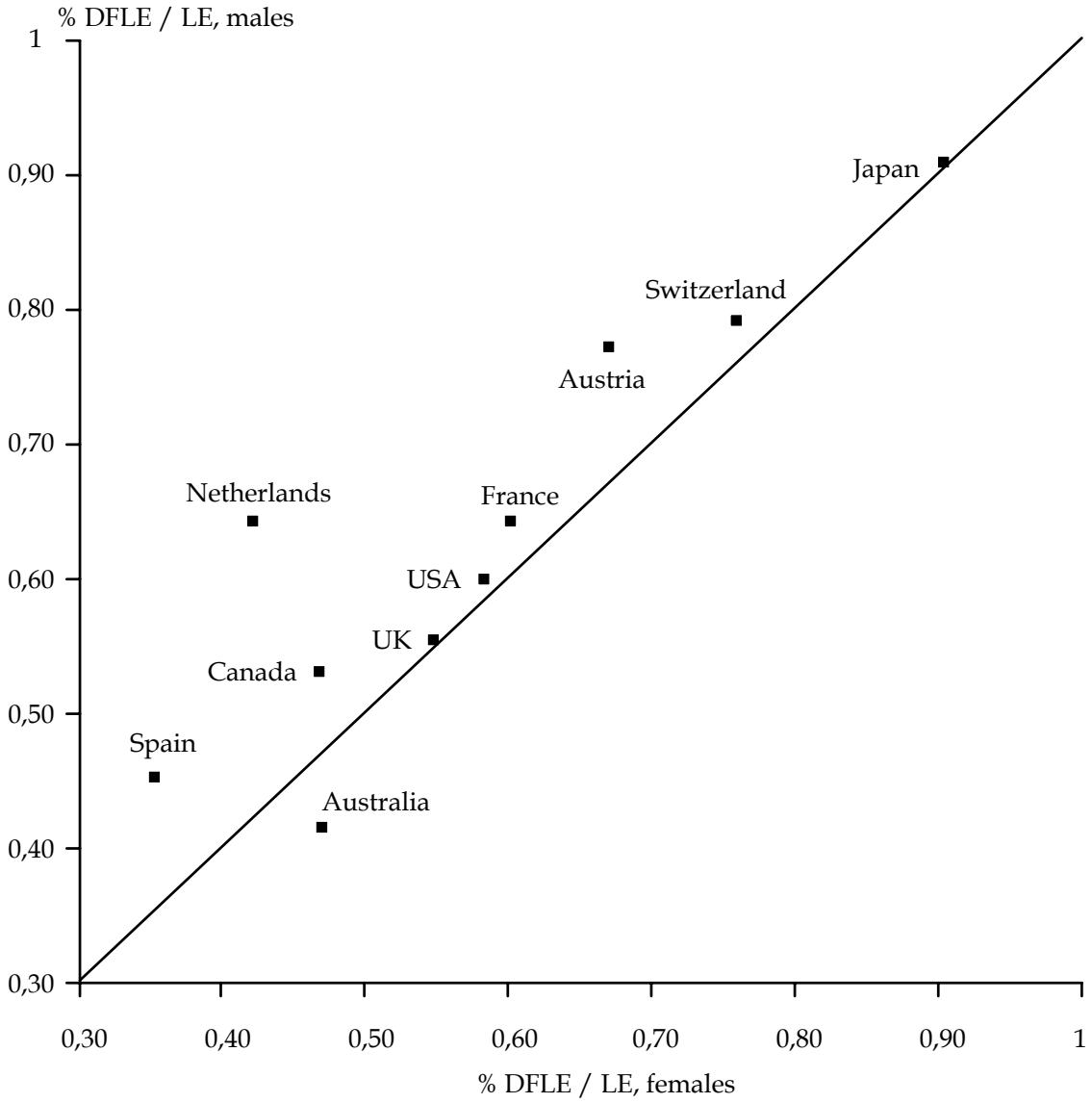
The application of the WHR95 classification system clarifies the heterogeneous aspect of the existing indicators. There is, a priori, no reason to reject the indicators combining different conceptual levels. However, the number of possible combinations is theoretically very large, and at the international level, it will not be possible to keep all of them: choices will have to be made.

2. Analysis of the main results

2-1 Gender differentials

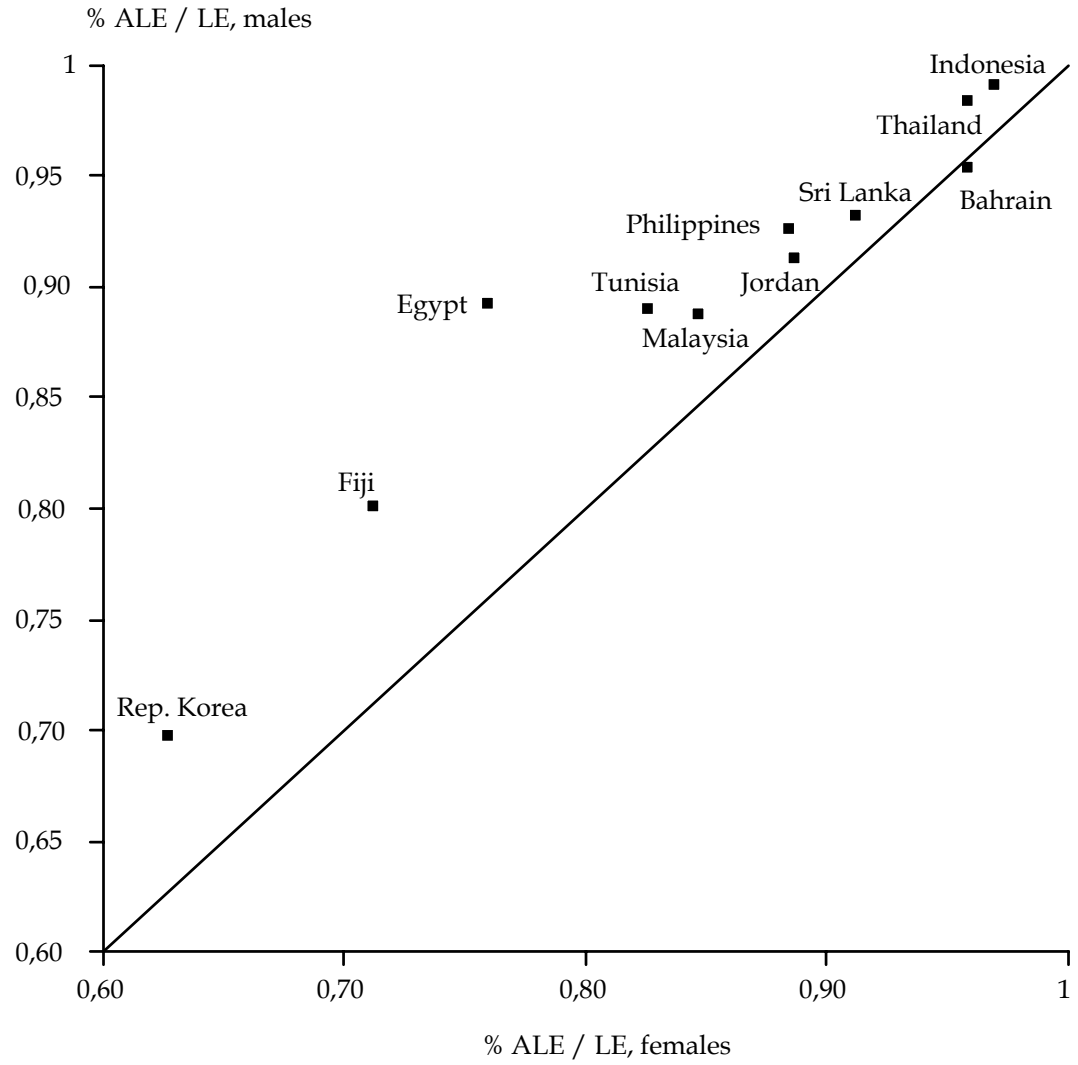
The difference in life expectancy between sexes is somewhat reduced when an estimate of health expectancy is produced. Although most studies indicate that life expectancy and positive health expectancy (handicap-free, disability-free, etc.) is larger for females, they also show that their proportion of morbidity-free years (handicap-free, disability-free, etc.) to total life expectancy is slightly lower than for males in developed countries (see Graph 1) and in developing countries (see Graph 2).

Graph 1: Proportion of "Disability"-free life expectancy (% DFLE) in developed market-economy countries: males versus females at age 65



Without explicit reference to ICIDH.

Graph 2: Proportion of active life expectancy (% ALE) in developing countries - least developed countries excepted - (ODC): males versus females at age 65



Source in annex.

Results from studies using data from repeated wave surveys have suggested that the greater proportion of years lived with disability or handicap by women may be explained by the relatively higher survival of women after the development of these disabilities or handicaps [14, 30, 31].

2-2 National geographic comparisons

Several countries have computed estimates according to geographic criteria in order to make national comparisons: provinces (Canada, [32-34]); states or territories (Australia, [35]); local authority areas (United Kingdom, [36]); community size (Canada, [32-33]); urban / rural (Ethiopia, [37]; China, [38]). As an example, Table 9 brings together functional limitation-free life

expectancies in Australia by sex for the different States and Territories; Table 10 assembles results for China (Sichuan, Xichang) by area of residence: urban or rural.

Table 9: Functional limitation-free life expectancy in Australia, by sex, State and Territory, 1988

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
States and Territories								
New South Wales	72.6	58.2	78.9	63.4	14.5	6.8	18.3	8.6
Victoria	73.6	58.2	79.8	63.0	14.9	6.3	18.9	8.3
Queensland	73.3	58.7	79.8	64.8	15.0	7.0	19.2	9.6
South Australia	73.6	60.1	80.3	64.3	15.0	7.9	19.0	9.0
Western Australia	73.8	57.8	80.1	63.2	15.0	5.8	19.0	8.0
Tasmania	72.5	57.9	78.7	61.3	14.5	6.5	18.4	7.0
Northern Territory	64.8	51.6	71.2	56.5	13.9	-	16.8	-
Australian Capital Territory	74.4	61.6	80.3	62.3	14.8	8.4	18.8	7.0
Differences ACT / NT	9.6	10	9.1	5.8	0.9	-	2.0	-

Source in annex.

Table 9 shows that, as with differences in life expectancy, differences in disability-free life expectancy between States and Territories in Australia are quite large. Table 10 shows that life expectancy and independent life expectancy are lower for rural areas than for urban areas in Xichang prefecture in Sichuan province of China; in addition the proportion of handicap-free years to total life expectancy is lower in rural areas.

Table 10: Independent life expectancy in Xichang (Sichuan, China) by area of residence urban or rural, 1990

	AT AGE 15		AT AGE 65	
	LE	DFLE	LE	DFLE
Area of residence				
Urban	56.3	50.9	12.4	7.1
Rural	53.3	45.4	10.5	4.3
Differences urban / rural	3.0	5.5	1.9	2.8

Source in annex.

2-3 Socio-economic differentials

To date, socio-economic variables have been included in 11 studies from 6 countries: Canada, United States of America, the Netherlands, Finland, Belgium and Sweden. All studies with the exception of one in the United States of America [43] have demonstrated that social inequalities in health are much greater than has been shown by differential mortality: **the poorest, the least educated not only live less long but also suffer a greater part of life with disability or handicap** [11, 32, 33, 39-48].

This was first observed in Canada by Wilkins and Adams [32-33]. These authors have shown that the gap in life expectancy between the richest and poorest sections of the community increases from 6.3 years for overall life expectancy to 14.3 years for occupational handicap-free life expectancy (see Table 11).

Table 11 Occupational handicap-free life expectancy in Canada, by sex, and income level, 1978

	AT BIRTH			
	Male		Female	
	LE	DFLE	LE	DFLE
Income levels				
Lowest	67.1	50.0	76.6	59.9
Second	70.1	57.9	77.6	61.8
Third 70.9	61.1	78.5	64.3	
Fourth	72.0	62.6	79.0	63.5
Highest	73.4	64.3	79.4	67.5
Total 70.8	59.5	78.3	63.6	
Differences highest / lowest	6.3	14.3	2.8	7.6

Source in annex.

Dutch and Finish studies have shown socio-economic inequalities by means of calculations of life expectancies and health expectancies for several educational levels (Tables 12 and Table 13). The conclusions are similar: the higher the educational level, the higher life expectancy and 'positive' health expectancy. Recent studies, based on the indicator of *working life expectancy* lead to supplementary and convergent results concerning the cumulation of inequalities [49].

Table 12: General handicap-free life expectancy at age 25 in Finland by sex, and level of education, 1986

	AT AGE 25			
	Male		Female	
	LE	DFLE	LE	DFLE
Levels of education				
Basic 45.7	26.0	54.0	28.7	
Secondary	48.6	30.3	55.9	32.0
Higher	51.9	39.0	54.6	37.1
All	47.1	28.9	54.6	30.3
Differences higher / basic	6.3	13.0	3.2	8.3

Source in annex.

Table 13: Life expectancy in good health in the Netherlands for male by social class measured by level of education at age 18, 1990

	AT BIRTH		AT AGE 65	
	LE	DFLE	LE	DFLE
Levels of education				
Low	72.2	51.6	13.3	7.2
Middle	74.7	59.0	15.0	8.6
High	76.7	64.2	16.4	10.6
Differences high / low	4.5	12.6	3.1	3.4

Source in annex.

2-4 Causes of handicap, disability and mortality

Theoretically, gains in disability-free or handicap-free life expectancies can be calculated after the elimination of various pathologies, thus allows a ranking of the causes categorised by the effect of their suppression on both mortality and morbidity (disability or handicap). Six studies have been undertaken to date in this area for 5 countries (United States of America, Canada, Australia, Netherlands, and United Kingdom [36]) and these show an important effect from the suppression of locomotion disorders [50, 53], of limb and joint disorders [42], of osteo-articular diseases [51] and of accidents [51-53]. In the most developed countries these causes are either among the first or rank just behind cardio-vascular diseases in importance. This is illustrated by Table 14 for Australia in 1988.

Table 14: Increase in functional limitation-free life expectancy and in total life expectancy in Australia between age 0, age 65 and age 85, resulting from elimination of major causes of morbidity, by sex, 1988

	Between age 0 and 85						Between age 65 and 85					
	Males			Female			Males			Female		
increase in:	LE	DFLE	Rank	LE	DFLE	Rank	LE	DFLE	Rank	LE	DFLE	Rank
Cause of morbidity suppressed (ICD-9)												
Infective disease (1)	0.08	0.27	11	0.06	0.39	10	0.03	0.07	11	0.03	0.17	11
Neoplasms (2)	3.09	1.64	3	2.83	1.53	5	1.99	0.85	5	1.47	0.62	5
Endocr / metab / nutrit.(3)	0.24	0.50	9	0.23	0.48	9	0.12	0.24	7	0.16	0.27	8
Mental disorders (5)	0.16	0.82	8	0.11	1.24	7	0.06	0.22	8	0.07	0.59	6
Nervous system (6)	0.20	1.54	4	0.19	2.04	4	0.10	1.05	3	0.10	1.35	3
Circulatory system (7)	4.72	4.00	2	3.75	3.18	1	3.77	2.93	1	3.37	2.55	1
Respiratory system (8)	0.77	1.34	6	0.54	1.00	8	0.66	0.73	6	0.36	0.37	7
Digestive system (9)	0.36	0.37	10	0.29	0.37	11	0.19	0.17	9	0.19	0.23	10
Genito-urinary system (10)	0.08	0.09	13	0.13	0.17	13	0.08	0.05	12	0.10	0.10	12
Skin & subcutaneous (12)	0.01	0.05	14	0.01	0.10	14	0.00	0.02	13	0.00	0.05	13
Musculoskeletal (13)	0.03	1.52	5	0.06	2.82	3	0.02	0.93	4	0.04	1.94	2
Congenital conditions (14)	0.23	1.23	7	0.23	1.28	6	0.00	0.10	10	0.00	0.26	9
Perinatal conditions (15)	0.30	0.26	12	0.25	0.23	12	0.00	0.00	14	0.00	0.01	14
Injuries (17)	1.78	6.16	1	0.74	2.90	2	0.15	2.16	2	0.11	0.96	4

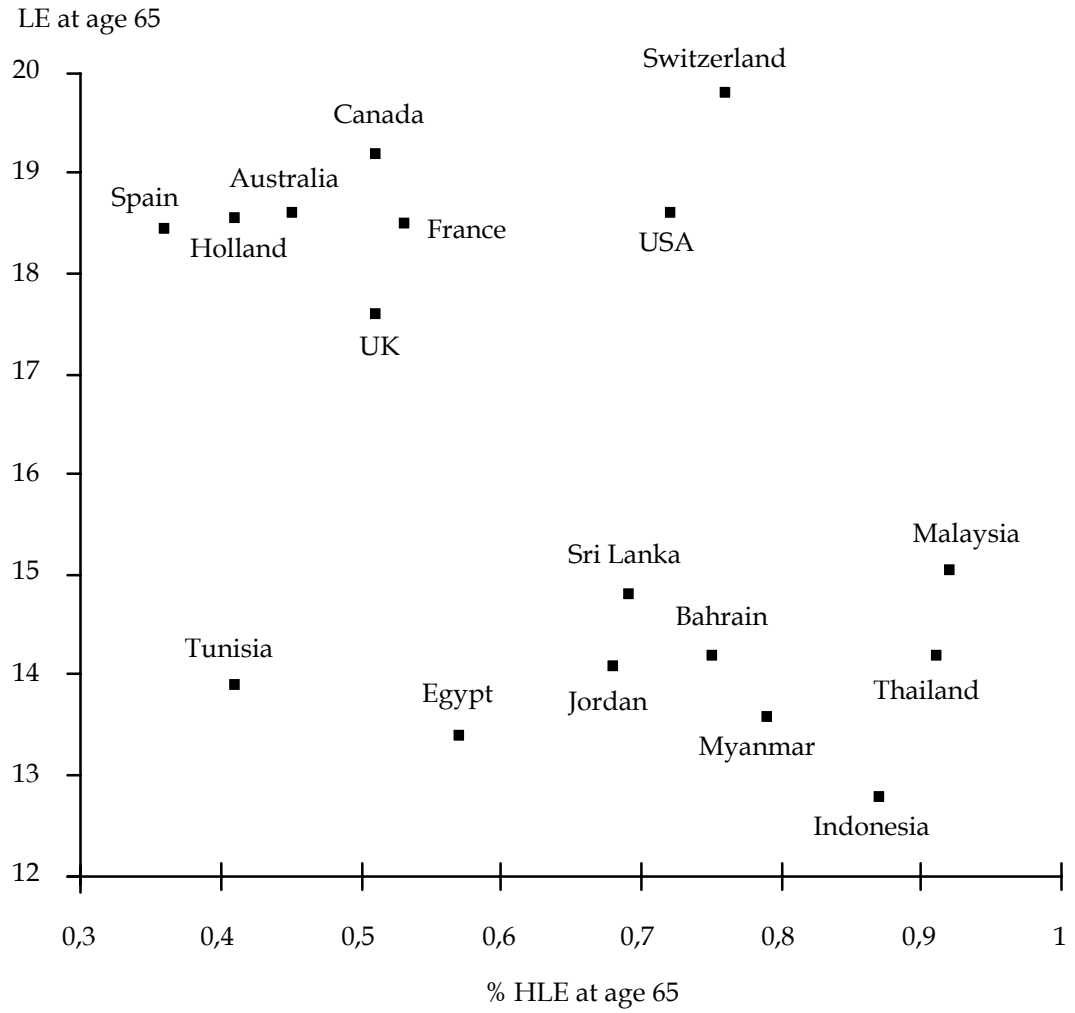
Source in annex.

For developing countries, it would be interesting to compare the effect of suppression of poliomyelitis, dracunculiasis, leprosy, neonatal tetanus, hepatitis B among children, tuberculosis, and malaria on handicap-free or disability-free life expectancy. The allocation of funds by health authorities could then be based on their expected impact on health expectancies.

2-5 Direct international comparisons

As seen in part I, section 3 (Main health expectancy indicators), direct geographic comparisons are still impossible. Disparities between study designs are such that it is impossible, for example, to draw a conclusion with regard to a potential correlation (positive or negative) between life expectancy and the proportion of handicap-free or disability-free years lived. Graph 3, which plots these two values is meant to underline this conclusion. Although countries are gathered around a similar life expectancy (according to the level of development), they diverge when comparing the proportion of life free of handicap or disability within life expectancy. The main reason for this is the great diversity between countries in the way handicap or disability are measured.

Graph 3: Total life expectancy and percentage "healthy life expectancy



Source in annex, estimates not classified according to the WHR95 classification system; without any explicit reference to the ICIDH .

3. Change over time

Several time series of handicap-free or disability-free life expectancy have now been produced (see Table 15). A chronological series consists of at least two cross-sectional health surveys using the same measures and comparable samples. When these series are juxtaposed, they cover a period that extends for some 30 years. The use of comparable samples and repeated use of the same measures of handicap or disability permit comparisons over time for any one study. In 1991, in a first attempt to assess the health status of populations, the American, English and Australian studies were divided into four levels according to severity of handicap or disability: very severe handicap or disability, severe to very severe, moderate to very severe, mild to very severe handicap or disability. This classification permitted a more careful distinction of the trend in handicap or disability according to the degree of severity through the computation of the corresponding indicators [54]. Most authors now distinguish between life expectancy without severe handicap or disability and life expectancy without handicap or disability, all levels combined. The majority of the time a handicap-free or disability-free life expectancy expresses all levels of handicaps or disabilities.

Table 15: Countries for which chronological series are available

Countries	Reference	Available years
United States	U.S. Dep. of HEW, 1969	1958 to 1966
	McKinlay et al, 1989	1964, 1974, 1985
	Colvez and Blanchet, 1983	1962 to 1976
	Crimmins et al, 1989	1970, 1980
	Manton et al, 1994	1982-1984, 1982-1989
New York State	Tu, 1990	1980, 1986
Japan	OECD, 1976	1966 to 1970
	Koizumi, 1985	1965 to 1979
	Nanjo et al, 1987	1975, 1980, 1985
City of Sendai	Tsuji, 1993	1970, 1990
Norway	Grotvedt et al, 1994	1975, 1985
Sweden	Petterson, 1994	1975-80, 1981-85, 1986-90
United Kingdom	Bebbington, 1991	1976, 1981, 1985, 1988, 1991
Finland	Sihvonen, 1994	1978, 1986
France	Robine et al, 1993	1981, 1991
Australia	Mathers, 1994	1981, 1988, 1993
Netherlands	Perenboom et al, 1992	1983 to 1990
Canada	Wilkins et al, 1994	1986, 1991
Taïwan	Tu, 1994	1986, 1991

Sources in annex.

Table 16 assembles all the chronological series of health expectancies available by sex at age 0 and at age 65.

Table 16: Chronological series

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
USA	**Occupational handicap-free life expectancy, 1962-1976**							
1962	66.8	56.8	72.5	60.8	-	-	-	-
1965	66.6	57.0	73.8	63.4	-	-	-	-
1966	66.5	56.6	73.8	63.4	-	-	-	-
1969	66.6	57.0	74.2	63.6	-	-	-	-
1972	67.2	56.8	74.7	63.4	-	-	-	-
1974	67.9	56.5	75.1	62.3	-	-	-	-
1976	68.7	57.1	75.8	62.7	-	-	-	-
USA	**Occupational handicap-free life expectancy, 1970-1980**							
1970	67.0	54.8	74.6	60.4	13.0	6.4	16.8	8.7
1980	70.1	55.5	77.6	60.4	14.2	6.6	18.4	8.9
USA	**Mobility handicap-free life expectancy, 1965-1980**							
1965	66.8	65.2	73.7	71.4	12.9	12.1	16.2	14.9
1970	67.0	65.5	74.6	72.1	13.0	12.1	16.8	15.1
1980	70.1	68.4	77.6	74.6	14.2	13.2	18.4	16.3
USA	**Occupational handicap-free life expectancy, 1964-1985**							
1964	66.8	59.2	73.7	65.5	12.8	6.6	16.2	10.2
1974	68.1	59.2	75.8	65.3	13.4	7.2	17.5	10.7
1985	71.2	51.9	78.2	57.9	14.6	10.5	18.6	13.4
Japan	**Mobility handicap-free life expectancy, 1975-1985**							
1975	71.7	69.3	76.9	74.0	13.7	12.3	16.6	14.7
1980	73.4	70.9	78.8	75.9	14.6	13.2	17.7	15.8
1985	74.8	72.6	80.5	77.7	15.5	14.1	18.9	17.1
Norway	**Independent life expectancy, 1975-1985**							
1975	-	-	-	-	14.0	13.3	17.2	16.1
1985	-	-	-	-	14.4	13.3	18.2	16.9
United Kingdom	**General handicap-free life expectancy, 1976-1991**							
1976	70.0	58.3	76.1	62.0	12.5	7.1	16.6	8.6
1981	71.1	58.7	77.1	61.0	13.1	7.9	17.1	8.5
1985	71.9	58.8	77.7	61.9	13.4	7.8	17.3	9.2
1988	72.4	58.5	78.1	61.2	13.7	7.5	17.6	8.7
1991	73.2	59.9	78.7	63.0	14.2	7.9	17.9	9.8

Table 16: Chronological series (Continued)

	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
United Kingdom	**Independent life expectancy, 1976-1991**							
1976	-	-	-	-	12.5	11.0	16.5	13.0
1980	-	-	-	-	12.9	11.8	16.9	15.0
1985	-	-	-	-	13.4	12.3	17.4	15.5
1991	-	-	-	-	14.3	13.6	18.1	16.9
Finland	**General handicap-free life expectancy, 1978-1986**							
1978					12.4	4.4	16.2	5.1
1986					13.4	4.3	17.4	5.6
Finland	**Healthy-life expectancy, 1978-1986**							
1978					12.4	8.2	16.2	9.7
1986					13.4	9.6	17.4	11.6
Australia	**Functional limitation-free life expectancy, 1988-1992**							
1981	71.4	59.2	78.4	65.0	13.9	7.9	18.1	10.1
1988	73.1	58.4	79.5	63.4	14.8	6.7	18.7	8.6
1992	74.5	58.2	80.4	64.0	15.4	6.4	19.2	9.0
Australia	**Other handicap-free life expectancy, 1988-1992**							
1981	71.4	63.6	78.4	68.6	13.9	9.6	18.1	11.4
1988	73.1	61.0	79.5	65.5	14.8	8.0	18.7	9.6
1992	74.5	62.1	80.4	66.7	15.4	8.3	19.2	10.2
France	**General handicap-free life expectancy, 1981-1991**							
1981	70.4	60.8	78.6	65.9	14.1	8.8	18.3	9.8
1991	72.9	63.8	81.1	68.5	15.7	10.1	20.1	12.1
France	**Mobility handicap-free life expectancy, 1981-1991**							
1981	70.4	68.9	78.6	76.3	14.1	13.1	18.3	16.5
1991	72.9	71.7	81.1	78.8	15.7	14.8	20.1	18.1
Netherlands	**Healthy life expectancy, 1981-1990**							
1981	72.7	56.9	79.3	58.0	14.0	8.1	18.5	7.8
1982	72.8	56.0	79.4	58.9	14.0	7.1	18.5	8.6
1983	72.9	58.6	79.5	60.9	14.0	8.4	18.6	9.5
1984	73.0	58.3	79.6	59.8	14.0	7.9	18.7	8.6
1985	72.9	59.0	79.6	60.9	14.0	8.4	18.6	10.0
1986	73.2	59.8	79.7	60.7	14.1	8.4	18.8	9.4
1987	73.5	59.8	80.0	61.5	14.3	8.5	19.0	10.0
1988	73.6	60.3	80.2	61.8	14.4	8.6	19.0	9.3
1989	73.7	59.5	80.0	60.8	14.4	8.3	18.9	8.9
1990	73.9	60.0	80.1	60.2	14.4	9.3	19.0	9.1

Table 16: Chronological series (Continued)

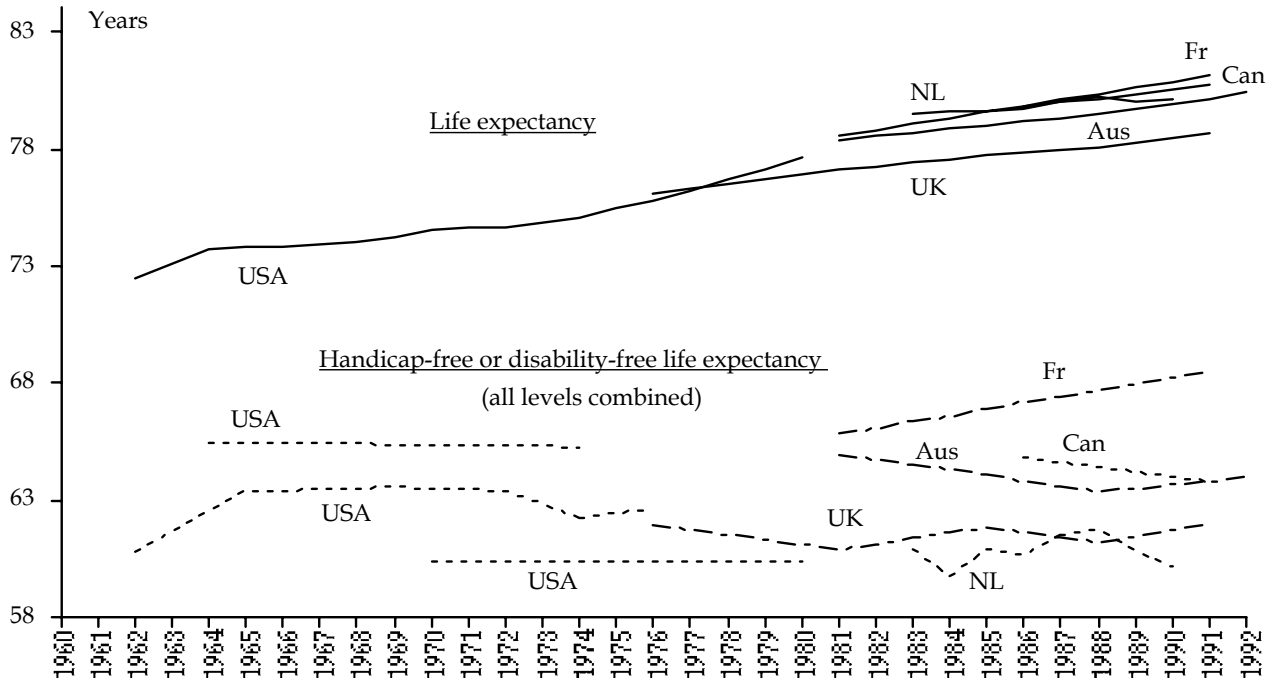
	AT BIRTH				AT AGE 65			
	Male		Female		Male		Female	
	LE	DFLE	LE	DFLE	LE	DFLE	LE	DFLE
Netherlands	**Activity restriction-free life expectancy, 1983-1990**							
1983	72.9	60.1	79.5	60.8	14.0	8.0	18.6	7.4
1984	73.0	56.9	79.6	54.6	14.0	7.7	18.7	5.7
1985	72.9	58.4	79.6	56.8	14.0	7.6	18.6	6.8
1989	73.7	61.1	80.0	60.3	14.3	9.1	18.9	7.5
1990	73.9	60.4	80.1	59.9	14.4	9.0	19.0	8.0
Canada	**Activity restriction-free life expectancy, 1986-1991**							
1986	73.0	61.3	79.8	64.9	14.9	8.1	19.2	9.4
1991	74.3	60.7	80.7	63.8	15.6	8.3	19.7	9.2
Canada	**Health-adjusted life expectancy, 1986-1991**							
1986	73.0	68.5	79.8	73.6	14.9	12.1	19.2	14.8
1991	74.3	69.1	80.7	73.8	15.6	12.6	19.7	15.1
Taiwan	**Occupational handicap-free and independent life expectancy, 1986-1991**							
1986	-	-	-	-	12.9	7.6	14.5	9.1
1991	-	-	-	-	15.5	11.7	17.5	12.9

For complete references, see 'sources table 15' in annex, some values are available for other ages or at a smaller geographic level for **United States**, **Japan** and **Sweden** (see annex Table 16).

3-1 Analysis of changes over time

It is possible to describe and compare overall trends of handicap-free or disability-free life expectancy at birth in the United States [39, 50, 51, 55], England [36, 56], Australia [35, 57], the Netherlands [58], Japan [59], Canada [60] and France [61-62]. Over a period of 30 years, there has been a large increase in life expectancy at birth among males and females from the developed market-economy countries. By contrast, there has been a stagnation in handicap-free or disability-free life expectancy, all levels combined: thus the years of life expectancy gained seems to be almost equivalent to extra years of handicap or disability (see Graph 4).

Graph 4: Handicap-free life expectancy or disability-free life expectancy, all levels combined, for females at birth, International comparison from 1962 to 1991



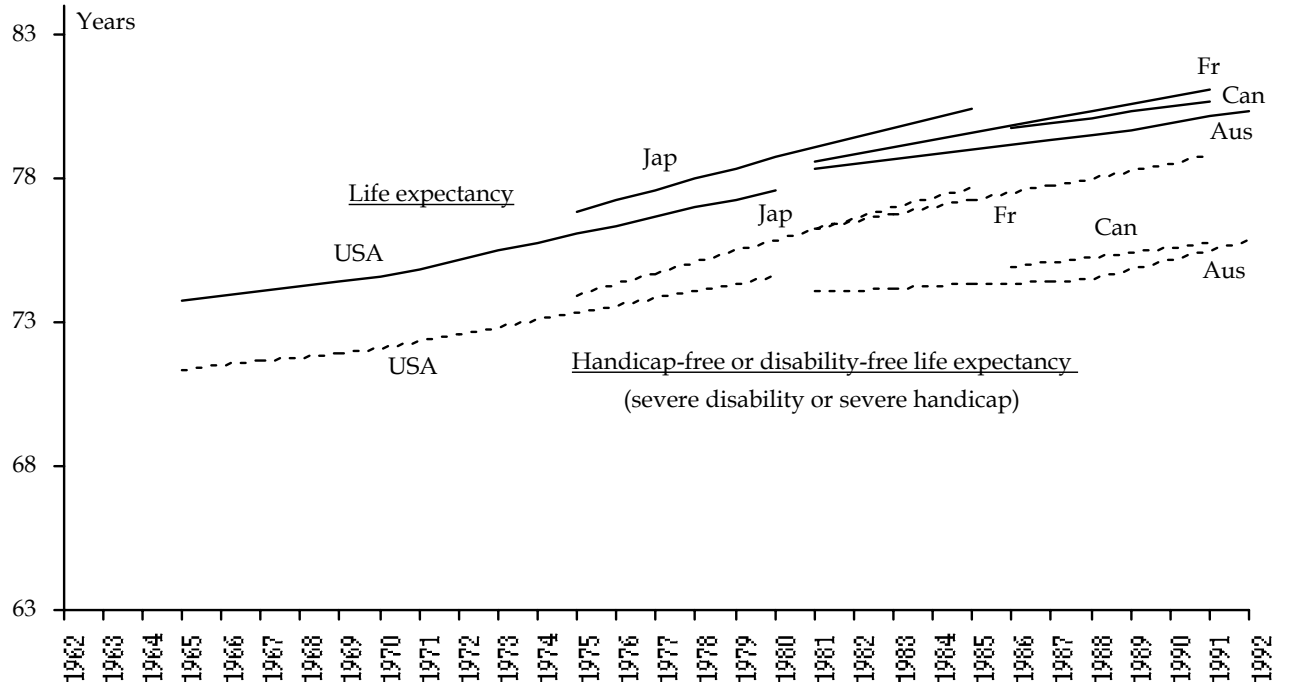
Source in annex.

Among the most recent series, only the Canadian study 1986-1991 seems to indicate a clear decrease in disability-free life expectancy [60] whilst the French study 1981-1991 indicates a marked increase in handicap-free life expectancy [61-62]. In these ten years, general handicap-free life expectancy has increased in France from 3 years for men, reaching 63.8 years, and has increased from 2.6 years for women reaching 68.5 years; meanwhile for both sexes total life expectancy only increases by 2.5 years reaching 72.9 years for males and 81.1 years for females. The increase in handicap-free life expectancy is greater than the increase in life expectancy, illustrating, for this country, the theory of the '*compression of morbidity*'. Gains in general handicap-free life expectancy, in France, are partly due to decreases in mortality and partly to a decrease in handicap at each age.

In fact most of the new series are formed with two points only whereas the shape of the British or Dutch series, already covering several points [36, 56, 58], requires more consideration. The British series is based on 'long-standing illness, disability, or infirmity' [36, 56] and the Dutch series on self-perceived health [58], considered to be a rather robust indicator, since it is a good predictor of mortality. In Australia, the first series 1981-1988 indicated a large decrease in disability-free life expectancy [57] whereas the last estimate indicates a clear increase between 1988 and 1992 [35]. In the same way, the last British estimate for 1991 modifies the previous trend.

A careful examination of the data shows that life expectancies without severe handicap or severe disability are on a parallel course to total life expectancy for developed countries: United States, Japan, Australia, France, and Canada (see Graph 5).

Graph 5: Severe handicap-free or severe disability-free life expectancy, for females at birth, International comparison from 1965 to 1991



Source in annex.

At worst, the results indicate a **pandemic of light** and moderate, **but not of severe** handicaps or severe disabilities. They tend then to confirm the theory of *'dynamic equilibrium'*. According to Manton, the increase in life expectancy is partly explained by a slowing down in the rate of progression of chronic diseases [7]. Thus, although the decline in mortality leads to an increase in the prevalence of handicaps or disabilities, these handicaps or disabilities are less severe. The results discussed here (Graph 4 and 5) are essentially the same for males and females at birth and at age 65.

In summary, in the developed market-economy countries, life expectancies without severe handicap or severe disability are on a parallel course to total life expectancy. For the less severe levels of handicap or disability, the results are not so clear. From all these studies, the minimum that can be concluded is that, whatever the country examined, the increase in life expectancy is not accompanied by an increase in the time spent with severe handicap or severe disability.

Conclusion

The above examples demonstrate the utility of health expectancy indicators for health policy makers: (i) to monitor the inequalities between the sexes, parts of the country (region, area of residence: urban or rural, etc.), or social groups; (ii) to allocate financial resources between programmes (according to the potential gains) and (iii) to evaluate health policies. Disability-free and handicap-free life expectancies at birth are useful in the assessment of health-related quality of life for populations in relation to the length of their life. After age 65, independent or active life expectancy and dementia-free life expectancy are particularly useful in assessing health-related quality of life.

In the last few years, calculations of health expectancy have multiplied. Today, most of the researchers working in this area have regrouped to form an International Network on Health Expectancy and the Disability Process (REVES) [20]. Calculation methods no longer really present a problem. Of course it would be preferable if all calculations were made according to the multistate method, but this will occur naturally as period data estimates become available. Sullivan's method provides a useful indicator which can be used as long as the limitations are understood. The main problems relate principally to the nature of morbidity data and what is measured. To make international comparisons requires a reasonable standardization of study protocols (including surveying institutionalised persons) and questionnaires, in order to obtain better information on performance in daily life and agreement on the tests to be used to measure ability.

The policy relevance of the health expectancy indicator concerns primarily health policy makers at a national level (see above). The collection of internationally comparable data increases the interest of the calculations. How does a given country rank among its neighbours? International comparability would help to allocate international resources directed at improving the health expectancies, an aim which certainly goes beyond survival strategies. However on the basis of available evidence from many countries, and contrary to widely held beliefs, years with severe handicap and/or disability do not appear to be increasing.

The concepts from the International Classification of Impairments, Disabilities, and Handicaps (WHO, ICIDH) provide an initial conceptual framework which facilitates such a standardization. The ICIDH allows differentiation between impairment-free, disability-free and handicap-free life expectancies. Given the importance of level of severity and reversibility of disabilities and handicaps, the assessment of health expectancy would be improved when these two elements are elaborated in the ICIDH revision process. To speed up such a standardization it is hoped that WHO will publish in one of the next World Health Reports a short list of data required to assemble

internationally comparable tables on impairment-free, disability-free and handicap-free life expectancies with a specific study design including survey recommendations and questionnaire wording.

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USA: (a) Life expectancy free of disability (b) Expectation of life without disability (c) Life expectancy free of disability (d) Expectation of life free of bed disability; **Japan**: Life expectancy free of bed disability; **Norway** Able to dress/undress etc...; **United Kingdom**; (a) Health expectancy (b) Life expectancy with the ability to perform ADLs independently; **Finland**: (a) Limiting or extremely limiting long-standing illness, (b) Self rated poor or very poor health; **Australia**: (a) Disability-free life expectancy, (b) Handicap-free life expectancy; **France:** (a) Disability-free life expectancy, (b) Severe disability-free life expectancy; **Netherlands**: (a) Health expectancy (Method 2: poor perceived health free), (b) Health expectancy (Method 1: Disability-free), (c) Activity restriction-free life expectancy; **Canada**: (a) Life expectancy free of disability, (b) Health-adjusted life expectancy; **Taïwan**: Active life expectancy.

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Source: Robine JM. *Tendance de l'espérance de vie sans incapacité en France de 1981 à 1991; comparaisons internationales.* In: Rey JC, Tilquin C. *SYSTED 94 dependency, the challenge for the year 2000*. Swiss Institute for Public Health Press, Geneva 1994:293.

Source Graph 5

Source: Robine JM. *Tendance de l'espérance de vie sans incapacité en France de 1981 à 1991; comparaisons internationales.* In: Rey JC, Tilquin C. *SYSTED 94 dependency, the challenge for the year 2000*. Swiss Institute for Public Health Press, Geneva 1994:293.

REVES, the international Network on Health Expectancy and Disability Process
Réseau Espérance de Vie en santé

Objectives of the network: (1) to consider the necessary conditions for a comparison of several calculations of health expectancy, with a particular view to international geographical comparisons; (2) to reflect on how to interprete chronological series of health expectancy; (3) to examine the possible uses of health expectancy for socio-medical planning and programs; (4) to look at the possibilities of procedural standardization of data collection and health expectancy calculation procedures; (5) to study the disability process.

The network was named REVES (Réseau Espérance de Vie en Santé) in 1989, in Quebec. In 1990, in Geneva, the network considered that the conceptual framework of the International Classification of Impairments, Disabilities and Handicaps proposed by the World Health Organization, was very close to its concerns and after the Durham meeting, it was decided that the study of the disability process would be added to the REVES objectives. In 1991, in Leiden, the network decided to open out widely to developing countries. In 1992, during the 5th meeting in Ottawa, the network started to examine health expectancy losses attributable to various causes and, in Montpellier, the 6th meeting permitted a first overview of the situation relating to standardization of procedures for data collection and health expectancy calculations. Lastly, in 1994, during the Canberra meeting, social inequalities with regard to health expectancy were particularly assessed.

Proceedings: (1) "*Health Expectancy*" (Robine JM, Blanchet M, Dowd JE, Eds, OPCS / HMSO, 1992) / "*Espérance de santé*" (Robine JM, Blanchet M, Dowd JE, Eds, Les Editions INSERM, 1992); (2) "*Calculation of health expectancies*" (Robine JM, Mathers CD, Bone MR, Romieu I, Eds, John Libbey / Les Editions INSERM, 1993); (3) "*Advances in Health expectancies"* (Mathers CD, McCallum J, Robine JM, (Eds), Australian Institute of Health and Welfare: AGPS. 1994).

List of REVES papers: This list accounts for 195 papers handed over to the network.

"Health Expectancy" Bibliography Series: International bibliography journal, bringing together the references of all original documents devoted to health expectancy calculations and their use.

The statitiscal world yearbook: assembles in tabular form, the results of all the calculations on health expectancy worked out worldwide. The second issue was published in 1993. (Editions INSERM. ISBN 2 85598 591 9).

References: (1) Bone MR. International efforts to measure health expectancy. *J of Epidemiol and Community health* 1992;46:555-558.; (2) Adams OB, Wilkins R. Developement of health expectancy indicators. Statistics Canada, *Health reports* 1992 82-003 vol 4 n°1; (3) Mathers CD, Robine JM. *Health expectancy indicators: a review of the work of REVES to date.* In: Robine JM, Mathers CD, Bone MR, Romieu I, Eds. *Calculation of health expectancies; harmonization, consensus achieved and future perspectives* / *Calcul des espérances de vie en santé: harmonisation, acquis et perspectives*. Paris: John Libbey Eurotext, 1993, p. 1-21; (4) Myers G.C. *International research on healthy life expectancy*. In: Feinleib M. Proceedings of the 1991 International Symposium on data on aging. Hyattsville, Maryland: NCHS, 1993. Vital Health Stat 5(7).

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