

Wassenaarseweg 56  
2333 AL Leiden  
P.O. Box 124  
2300 AC Leiden  
The Netherlands

Fax +31 71 17 63 82  
Phone +31 71 18 18 18

TNO-report

AN INTERNATIONAL COMPARISON OF HEALTH  
EXPECTANCIES

TNO-PG 94.046

July 1994

All rights reserved.  
No part of this publication may be  
reproduced and/or published by print,  
photoprint, microfilm or any other means  
without the previous written consent of  
TNO.

In case this report was drafted on  
instructions, the rights and obligations of  
contracting parties are subject to either the  
'Standard Conditions for Research  
Instructions given to TNO', or the relevant  
agreement concluded between the  
contracting parties.

Submitting the report for inspection to  
parties who have a direct interest is  
permitted.

© TNO

H.C. Boshuizen  
H.P.A. van de Water

Netherlands organization for  
applied scientific research

TNO Health Research aims at improving the prevention and  
treatment of human diseases and disorders by making  
fundamental and problem-oriented, medical-biological,  
psycho-social and epidemiological knowledge applicable to  
public health and health care.



The Standard Conditions for Research Instructions  
given to TNO, as filed at the Registry of the District Court  
and the Chamber of Commerce in The Hague  
shall apply to all instructions given to TNO.

CIP-GEGEVENS KONINKLIJKE BIBLIOTHEEK, DEN HAAG

Boshuizen, H.C.

An international comparison of health expectancies / H.C.  
Boshuizen, H.P.A. van de Water. - Leiden : TNO Preventie  
en Gezondheid. - Tab.  
TNO-PG 94.046. - Met lit. opg.  
ISBN 90-6743-329-2  
Trefw.: levensverwachting / gezondheidszorg.

Deze uitgave is te bestellen door het overmaken van f 34,65 (incl. BTW) op postbankrekeningnr.  
99.889 ten name van het NIPG-TNO te Leiden onder vermelding van bestelnummer 94.046.

CONTENTS	page
SAMENVATTING	i
1. INTRODUCTION	1
2. THE INVENTORY: MATERIAL AND METHODS	2
2.1 Studies included in the inventory	2
2.2 Collection of information	4
3. THE INVENTORY: AN OVERVIEW OF THE INFORMATION COLLECTED	6
3.1 Aspect of (ill)health used	6
3.2 Data sources	8
3.3 Calculation methods	10
3.4 Years of calculation	12
3.5 Other remarks	12
4. COMPARISON OF HEALTH EXPECTANCIES	13
4.1 Functional limitation-free life expectancy	13
4.2 Activity restriction-free life expectancy	15
4.3 General handicap-free life expectancy	21
4.4 Occupational handicap-free life expectancy	25
4.5 Life expectancy free in good perceived health	25
5. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS	29
5.1 The inventory	29
5.2 Interpretation of differences in health expectancies	30
5.3 Calculation comparable health expectancies	32
5.4 Conclusions and implications for policy	33
5.5 Recommendations	35

	page
5.5.1      Recommendations to investigators in the field of health expectancy	35
5.5.2      Recommendations for the Netherlands	36
 REFERENCES	 37
 APPENDICES	 39

## SAMENVATTING

Gezonde levensverwachting (GLV) is een relatief nieuwe indicator voor de Volksgezondheid waarin gegevens over sterfte worden gecombineerd met gegevens over de gezondheid van de bevolking. De GLV wordt meestal berekend met de zgn. Sullivan methode. De met deze methode berekende GLV voor een bepaald jaar geeft weer, hoeveel levensjaren iemand gemiddeld zou doorbrengen in goede gezondheid, wanneer de toestand van de volksgezondheid (sterftecijfers en prevalentie van gezondheid) gedurende een heel leven hetzelfde zouden zijn als in dat jaar. Ook in ons land is deze berekeningsmethode toegepast. De resultaten geven onder andere inzicht in de trend over de laatste jaren, verschillen tussen geslachten en tussen sociaal-economische klassen. Voor het beleid is het nuttig om te weten waar Nederland wat betreft gezonde levensverwachting 'staat' ten opzichte van andere landen. Wanneer de GLV in een ander land duidelijk hoger is, valt er immers mogelijk iets te leren van het gezondheidsbeleid dat in dat land wordt gevoerd. De GLV is tot nu toe in verschillende landen steeds anders berekend. Daarom is in 1992 door het ministerie van Welzijn, Volksgezondheid en Cultuur een opdracht verstrekt voor een project "Internationale vergelijking van gezonde levensverwachting", waarin de volgende activiteiten moesten worden uitgevoerd:

- Het leveren van een overzicht van de manier waarop de GLV in verschillende landen wordt berekend.
- Het interpreteren van de verschillen tussen de voor Nederland en andere landen berekende GLVs.
- Het berekenen van enkele meer vergelijkbare GLVs voor Nederland en een of meer andere landen.

Het project was beperkt tot

- GLVs berekend voor de OESO-landen
- GLV die betrekking hebben op een heel land (dus niet op een enkele regio binnen een land)
- GLVs berekend met de Sullivan methode.

### Overzicht van de berekeningswijzen in andere landen

Dit overzicht is te vinden in bijlage A van het rapport, waar voor iedere gezonde levensverwachting onder meer is aangegeven uit welke gegevens deze is berekend. Een gezonde levensverwachting blijkt te zijn berekend voor 17 van de 24 OESO-landen. Geen GLVs zijn berekend voor Griekenland, Ierland, IJsland, Luxemburg, Oostenrijk, Portugal en Turkije. Voor de 17

overige landen is wel een GLV berekend, zij het dat deze niet in alle gevallen voldoet aan de criteria voor opname in het overzicht.

Uit het overzicht blijkt, dat datgene wat onder de noemer "gezonde levensverwachting" wordt gepresenteerd, in feite heel heterogeen is. Het grootste verschil zit in de aspecten van gezondheid die in de berekening worden betrokken. Binnen de groep van internationale onderzoekers die zich onder de naam "REVES" (Reseau Espérance de Vie en Santé) met deze indicator bezig houden, is dit al eerder onderkend. Daar is voorgesteld om verschillende soorten levensverwachting te onderscheiden, gebruikmakend van het conceptuele schema dat ten grondslag ligt aan de ICIDH-classificatie voor gevolgen van ziekten. Deze classificatie, de International Classification of Impairments, Disabilities and Handicaps, is gebaseerd op een model waarin ziekten kunnen leiden tot stoornissen (Impairments), die kunnen leiden tot beperkingen (Disabilities) die weer aanleiding kunnen zijn voor een Handicap. Op grond van deze systematiek wordt binnen REVES voorgesteld te spreken van "levensverwachting zonder stoornissen", "levensverwachting zonder beperkingen" en "levensverwachting zonder handicaps", waarbij de "levensverwachting zonder beperkingen" verder wordt onderverdeeld in de "levensverwachting zonder functionele beperkingen" en de "levensverwachting zonder beperkingen in activiteiten". Functionele beperkingen zijn hierbij beperkingen van een bepaalde functie, bijv kunnen bukken of kunnen lopen. Bij beperkingen in activiteiten moet gedacht worden aan complexere handelingen, bijvoorbeeld eten koken of zich zelf aankleden. Een vijfde type levensverwachting is de "levensverwachting in goede ervaren gezondheid", die niet is gebaseerd op gegevens over gevolgen van ziekten, maar op gegevens over de eigen beoordeling van personen van hun gezondheid. De twee typen GLVs die tot nu toe voor Nederland meestal worden berekend, zijn in dit rapport ingedeeld in de groepen "levensverwachting zonder activiteiten beperkingen" en een "levensverwachting in goede ervaren gezondheid".

Alle in het overzicht opgenomen gezonde levensverwachtingensresultaten zijn volgens dit schema ingedeeld (tabel i).

Tabel i. Typen GLVs die in de verschillende landen berekend zijn

type GLV	landen
zonder stoornissen	
zonder beperkingen	
zonder functionele beperkingen	AUSTRALIE, NEDERLAND, SPANJE, VERENIGD KONINKRIJK
zonder beperkingen in activiteiten	CANADA, DENEMARKEN, NEDERLAND, ZWITSERLAND, VERENIGDE STATEN
zonder handicaps	AUSTRALIE, CANADA, DENEMARKEN, DUITSLAND, FINLAND, FRANKRIJK, NOORWEGEN, VERENIGD KONINKRIJK, VERENIGDE STATEN, ZWEDEN
In goede ervaren gezondheid	DENEMARKEN, DUITSLAND, ITALIE, NEDERLAND

Het blijkt dat internationaal vooral vaak de "levensverwachting zonder handicaps" (in 10 landen) is berekend. Daarnaast presenteren 5 landen de "levensverwachting zonder activiteiten beperkingen" en 4 landen de "levensverwachting in goede ervaren gezondheid" en de "levensverwachting zonder functionele beperkingen". De "levensverwachting zonder stoornissen" is op nationaal niveau nog voor geen van de OESO landen uitgerekend. Tot slot zijn er nog een viertal GLVs gepubliceerd die niet in één van deze groepen te passen zijn.

In tabel i zijn de GLVs gegroepeerd op grond van het aspect van gezondheid waarmee zij berekend zijn. Dat betekent echter niet dat dit aspect van gezondheid binnen de groep ook telkens op dezelfde manier geoperationaliseerd is. Daarnaast zijn er ook enkele verschillen in berekeningswijze geconstateerd, wat eveneens de vergelijkbaarheid van uitkomsten kan beïnvloeden.

*Conclusie:* Op grond van het gebruikte aspect van gezondheid kunnen we een vijftal typen GLVs onderscheiden, die internationaal niet allemaal even vaak worden berekend. Verschillen in de operationalisatie van het betreffende aspect van gezondheid kunnen echter ook binnen één type het vergelijken van GLVs bemoeilijken.

### Het berekenen van nieuwe, meer vergelijkbare gezonde levensverwachtingen

Een voorwaarde voor vergelijkbare GLVs is dat deze, uitgaande van eenzelfde aspect van gezondheid, gebaseerd zijn op gezondheidsenquêtes die qua opzet en gebruikte meetinstrumenten overeenkomen. Bestaande inventarisaties van vragen in gezondheidsenquêtes laten zien dat die vergelijkbaarheid op dit moment ver te zoeken is. Zelfs de enkelvoudige vraag over ervaren gezondheid wordt in Nederland anders gesteld dan in andere landen. Dit betreft met name de twee laatste antwoordcategorieën ("soms goed en soms slecht" en "slecht") die afwijken van het in andere landen gebruikelijke (en ook internationaal aanbevolen) "slecht" en "zeer slecht". Het berekenen van echt vergelijkbare GLVs is daarom momenteel niet mogelijk. In een aantal gevallen konden echter wel gezonde levensverwachtingen worden berekend die meer vergelijkbaar waren dan degene die al waren berekend. Deze worden besproken in de volgende paragraaf.

*Conclusie:* De internationale vergelijkbaarheid van meetinstrumenten die worden gebruikt in gezondheidsenquêtes is momenteel gering.

### Verschillen tussen Nederland en andere landen

In dit onderdeel van het project is telkens binnen de 5 onderscheiden hoofdgroepen gekeken of een verschil tussen een GLV voor Nederland en voor een ander land, verklaard kon worden uit de gebruikte operationalisaties.

Hierbij zijn waar mogelijk nieuwe GLVs berekend voor Nederland die beter vergelijkbaar zijn met de GLVs die internationaal al zijn berekend.

De verschillen tussen Nederland en andere landen blijken inderdaad in veel gevallen te verklaren door de gebruikte operationalisaties. Tabel ii geeft de GLVs uit het rapport die nog het meest vergelijkbaar zijn. Het betreft hier soms de GLV bij de geboorte en soms de GLV op 16 jarige leeftijd (omdat sommige gegevens alleen bekend zijn voor personen van 16 jaar en ouder). Dit is aangegeven in de kolom leeftijd.

Tabel II. Levensverwachting (LV), Gezonde levensverwachting (GLV) en het Gezond Leven percentage (GLP) bij de geboorte of op 16 jarige leeftijd (aangegeven in de tweede kolom) in Nederland vergeleken met enkele andere landen

OP LEEFTIJD		mannen			vrouwen		
		LV	GLV	GLP	LV	GLV	GLP
<b>LEVENSWACHTING ZONDER BEPERKINGEN (VERKORTE OESO-INDICATOR)</b>							
Denemarken (Rasmussen en Brønnum-Hansen 1990)							
1986-1987	16	56.7	49.8	88%	62.4	52.0	83%
Nederland (nieuw berekend)							
1984-1985	16	57.9	48.6	84%	64.5	46.5	72%
<b>LEVENSWACHTING ZONDER HANDICAPS</b>							
Verenigd Koninkrijk (Bebbington 1991)							
1988	0	72.4	58.5	81%	78.1	61.2	78%
Nederland (nieuw berekend)							
1991-92	0	74.2	61.4	83%	80.2	63.5	79%
<b>LEVENSWACHTING IN GOEDE ERVAREN GEZONDHEID</b>							
Denemarken (Rasmussen en Brønnum-Hansen 1990) (nieuw berekend)							
1986-1987	16	56.7	44.6	79%	62.4	46.0	74%
Nederland (Boshuizen et al. 1992)							
1986	16	58.1	45.8	79%	64.6	46.4	72%

Bij het interpreteren van deze getallen moet er rekening mee worden gehouden dat deze getallen zijn onderworpen aan toevalsfluctuaties vanwege de beperkte steekproefgrootte van gezondheidsenquêtes. De standaardfout ten gevolge van de steekproefvariatie bedraagt echter nooit meer dan een half jaar.

Uit de tabel blijkt dat de levensverwachting in Nederland hoger is dan in het Verenigd Koninkrijk en Denemarken. Het percentage van de levensverwachting doorgebracht zonder handicaps lijkt niet te verschillen in het Verenigd Koninkrijk en in Nederland. Dat betekent dat het aantal levensjaren dat wordt doorgebracht zonder handicaps in Nederland ook groter is. In Denemarken is het percentage van het leven dat wordt doorgebracht zonder beperkingen voor vrouwen groter dan voor Nederlandse vrouwen. Ook voor het percentage handicaps (niet in de tabel opgenomen) geldt dit. Het percentage van het leven dat wordt doorgebracht in goede ervaren gezondheid verschilt echter niet voor Nederlandse en Deense mannen, terwijl het voor Deense vrouwen slechts weinig hoger is (ook te verklaren door toeval).

**Conclusie:** De meest GLVs zijn moeilijk vergelijkbaar tussen landen. Slechts tussen enkele landen kan een voorzichtige vergelijking worden gemaakt.

Wat telkens op viel bij het vergelijken van Nederland met andere landen, was dat het verschil in ongezonde levensverwachting tussen mannen en vrouwen in Nederland over het algemeen hoger is dan dat in andere landen. Het is moeilijk te zien hoe dit te verklaren valt uit verschillen in operationalisering van het begrip gezondheid.

**Conclusie:** In Nederland lijken vrouwen ten opzichte van mannen een veel groter deel van het leven in ongezondheid door te brengen dan in de meeste andere landen het geval is.

#### Consequenties voor het beleid en aanbevelingen

Kort samengevat blijkt uit dit rapport dat we nog een lange weg te gaan hebben voordat er GLVs kunnen worden berekend die tussen landen onderling vergelijkbaar zijn. Een belangrijke oorzaak is dat de gezondheidsenquêtes, die de gegevens moeten leveren op grond waarvan een GLV berekend wordt, in de diverse landen verschillen qua opzet en gebruikte meetinstrumenten. Een reden waarom een betere harmonisatie van gezondheidsenquêtes niet makkelijk te bereiken is, is dat de noodzakelijke veranderingen in de nationale enquêtes, er toe leiden dat de gegevens op nationaal niveau niet langer in de tijd vergelijkbaar zijn. Hoewel voor dergelijke trendbreuken wel oplossingen zijn te bedenken, kosten deze extra inspanning en middelen. Internationale harmonisatie zal nog veel inspanningen kosten en resultaten zijn pas op de lange termijn te verwachten. Doorgaan met de huidige werkwijze in Nederland is op kortere termijn waarschijnlijk meer rendabel. Daarom wordt aanbevolen wel in internationaal verband mee te werken aan harmonisatie, maar dit binnen Nederland niet als eerste prioriteit te beschouwen. Meewerken aan harmonisatie betekent niet alleen het ontwikkelen van gemeenschappelijk meetinstrumenten, maar ook het daarna implementeren van de vastgestelde instrumenten.

De twee typen GLVs die in Nederland meestal worden gebruikt (de levensverwachting zonder activiteiten beperking, en de levensverwachting in goede ervaren gezondheid) zijn niet de twee typen GLVs die internationaal het meest worden berekend. Gezien de grote diversiteit in internationale berekeningen, is het echter weinig zinvol om in Nederland standaard andere typen GLVs te gaan berekenen.

Het rapport eindigt met aanbevelingen, onderverdeeld in aanbevelingen voor onderzoekers die GLVs berekenen en aanbevelingen gericht op Nederland. Deze laatste aanbevelingen zijn:

- Er is geen goede reden om verandering te brengen in de twee typen GLVs die momenteel standaard in Nederland worden berekend.
- Deelname aan voortgaande internationale inspanningen om te komen tot het harmoniseren van meetinstrumenten voor gezondheidsindicatoren in gezondheidsonquêtes blijft noodzakelijk.
- Overwogen moet worden om de vraag naar ervaren gezondheid in de CBS gezondheids-enquête aan te passen aan de internationale aanbevelingen (maar niet zonder maatregelen die voorzien in 'reparatie' van de trendbreuk die hierdoor ontstaat).
- Onderzoek naar de vraag waarom de respons op de Nederlandse gezondheidsonquête zoveel lager is dan die op vergelijkbare enquêtes in andere landen lijkt nuttig.
- Omdat de gezondheidsverschillen tussen mannen en vrouwen in Nederland internationaal gezien vrij groot zijn, lijkt nader onderzoek naar de oorzaken van deze verschillen zinvol.



## 1. INTRODUCTION

In 1992, the Dutch Ministry of Health commissioned a study of the comparability of health expectancies calculated for different countries. Health expectancy is a health indicator which integrates information on both mortality and morbidity. It indicates the number of years an average person can expect to live in good health should the level of Public Health present in the year for which health expectancy is computed persist during his or her entire lifetime. The concept was first proposed by Sanders (1964), and a first calculation was carried out by Sullivan (1971) for the USA. During the eighties, it became increasingly popular and today health expectancy has been calculated for many countries. In 1985 it was proposed as an optional regional indicator which could be used to monitor progress towards targets for Health for All by the Year 2000 in Europe (WHO 1985). In 1989, an international network on health expectancy, known by its French acronym REVES (Réseau Espérance de Vie en Santé), was established. During the early meetings of this network, it became clear that an overview of the methods by which health expectancy was calculated in different countries did not exist. The first aim of this project therefore is to provide a review of health expectancy calculations. A second aim is to determine how health expectancy in the Netherlands compares to that in other countries.

This project consists of three phases:

1. Make an inventory of the different methods used to calculate health expectancy internationally
2. Comparison of values calculated for other countries with those calculated for the Netherlands.
3. If useful and feasible, calculation of new health expectancies for the Netherlands which are more easily compared with health expectancies calculated for other countries.

The results of this study are reported in this paper. The inventory of the ways in which health expectancies are calculated in different countries is presented in chapters 2 and 3. The inventory itself is given in appendix A. In chapter 4 the results of phases 2 and 3 are reported. The last chapter of this report contains a discussion of the project together with the conclusions and recommendations.

## 2. THE INVENTORY: MATERIAL AND METHODS

In this chapter we will describe the manner in which we prepared the inventory of methods used to calculate health expectancies.

### 2.1 Studies included in the inventory

Since the work on health expectancy to date is rather extensive, this inventory had to be restricted in some ways. These restrictions are:

- Only OECD member states are included. The reason for this is that differences between developed and developing countries are rather large. These differences will be revealed even when the methods used are not entirely comparable, since the error introduced by differences in methods are smaller than the differences already present. On the other hand, differences are expected to be small among developed countries. Therefore considerable caution is needed when interpreting these differences, since they can easily be the result of differences in data collection or calculation methods.
- Only health expectancies on a national level are considered. This means that health expectancies calculated for regions within countries are not included.
- Only health expectancies calculated by means of the so-called "Sullivan method" are included. The "Sullivan method" uses the idea first implemented by Sullivan (1971) to calculate a health expectancy through combining an ordinary life table with prevalence rates for ill health. There are other methods, such as the so-called multistate method, but for these method one needs data from longitudinal studies, which are lacking in many countries. Since the Sullivan method and the multistate method measure something different (Crimmins et al., 1993), it is not useful to compare the results of a multistate approach in one country with those of a Sullivan method in others. The reason for choosing the Sullivan method is that this method has been used in most countries.
- Only studies published before 1994 are included, because the draft version of this inventory had to be finished before the 7th meeting of the International Network on Health Expectancy (REVES) in February 1994. At this meeting the draft inventory was presented and the authors of the papers included were asked to check whether their work was quoted correctly. This means, however, that new calculations presented at this meeting could not be included. In appendix B recent papers that could not be included are listed.

Table 1 gives an overview of the health expectancies calculated for each country and calendar year. It shows both the studies included in the inventory and those excluded because they were not published until 1994. This table also includes two studies which do not meet our inclusion criteria but were the only studies for a country: Japan (based on regional data and on the double decrement method instead of the Sullivan method) and Belgium (based on regional data).

To locate papers describing the calculation of these health expectancies, we used the REVES bibliography series (Romieu, 1992, 1993), supplemented by papers received upon request from researchers within the REVES network.

**Table 1:** Overview of studies by country and calendar year of calculation (based on the mortality data used)

country	<1980	80	81	82	83	84	85	86	87	88	89	90	91	92	93
AUSTRALIA	*									*					o <sup>2)</sup>
BELGIUM		o <sup>1)</sup>					o <sup>1)</sup>				oo <sup>1)</sup>				
CANADA	**								**						
DENMARK			**												
GERMANY (before 1990: West-Germany)				*											
FINLAND									*		o <sup>2)</sup>				
FRANCE			*											o <sup>2</sup>	
ITALY			*												
JAPAN											o <sup>1)</sup>				
THE NETHERLANDS		*	*	**	**	**	**	**	*	*	**	**	**	**	**
NEW ZEALAND			*												
NORWAY	oo <sup>2)</sup>						oo <sup>2)</sup>					*			
SWEDEN	*			*								*			
SWITZERLAND			*									*			
UNITED KINGDOM	**		*					**			*				
USA	**	*						*		*					

\* = included in the inventory

o = not included in the inventory

\*\* or oo: 2 or more health expectancies calculated

1) not included in the inventory because the study did not meet the inclusion criteria; included here because it is the only study in this country

2) not included in the inventory because the study was presented at the 7st REVES meeting, after the inventory was finished

Table 1 shows that health expectancies have been calculated for 17 of the 24 OECD countries; health expectancy has not been calculated for Austria, Greece, Iceland, Ireland, Luxembourg, Portugal and Turkey. In the Netherlands health expectancies have been calculated every year since 1981; this was possible because the Health Interview Survey in the Netherlands is an on-going survey.

## 2.2 Collection of information

The primary source of information for the inventory was papers in which calculation of a health expectancy is described. When vital information was lacking in these papers, we wrote to the authors for additional information. Since health expectancy is based on data from national health or disability surveys in many cases, we used several recent inventories of health surveys and measurement instruments for health surveys as general sources of information (Evers, 1990; Kunst, 1993; CDC 1994) as well as more specific information on single health surveys (e.g. NCHS Vital and health statistics series 10).

Using this information we have compiled a fact sheet for each type of health expectancy calculated for each country. Each sheet was given a code, consisting of a three letter country code and a number. In the next chapter we will refer to these codes. The fact sheets contain the following information:

- \* Publication(s) on which the description is based

This section lists the references cited in the reports or papers which present the health expectancies and additional publications on the survey from which data were collected. References to general publications on health surveys (as in section 2.1) are not included here.

- \* Aspect of (ill)health used

Here the terms used by the original authors (translated into English) are given. In the next chapter the health expectancy will be grouped according to the aspect of health used; for this classification we will relabel the terms in order to have a consistent terminology, based on the recommendations of the REVES subcommittee on conceptual harmonization.

- \* Details of measurement

Here the way in which the particular aspect of health was measured is described in detail. This consists mainly of the questions taken from health surveys.

- \* Data sources

The sources of data used for calculation. Since almost all studies (except Rogers et al. 1990) used the official life table derived from national vital statistics, we have omitted this data source from the description.

\* Details of the survey(s) used

Information is given on the response rate for the survey, whether the population of institutions was included in the survey and which age groups took part, as well as other details. Most of the data came from general information on health surveys (Evers 1990, Kunst 1993, CDC 1994).

\* Age categories used

Some authors used data sources that enabled them to carry out calculations for narrowly defined age groups; e.g. Mathers (1991) was able to do the calculations for 1-year age groups, applying a different rate of disability for each group. Other authors based their calculations on tabulated data that have been published, sometimes for fairly broad age groups. This can influence the results of the calculations (see appendix C). This heading therefore refers to the age groups within which the morbidity/disability rate was constant for the purpose of calculation.

\* Calendar years of calculation

The years are given to which the data pertain both for the life tables on which the calculations are based and for the morbidity data, since the two may refer to different years.

Often in one paper several types of health expectancy are presented. If together they form a hierarchy (one includes the other by definition), they are presented on one sheet. If they do not, separate sheets were made for each health expectancy. On the other hand, the same health expectancy is sometimes described in several papers. In that case we made only one fact sheet.

### 3. THE INVENTORY: AN OVERVIEW OF THE INFORMATION COLLECTED

The inventory itself consists of a collection of fact sheets, which can be found in appendix A. The fact sheets are presented according to country in alphabetical order, and each health expectancy calculated for a country has been given a code, consisting of a three letter country code and a number.

Each fact sheet contains a fixed number of elements, as described in the previous chapter. In this chapter we will summarize the information presented in the inventory on each element.

#### 3.1 Aspect of (ill)health used

We have followed the recommendation of the REVES subcommittee on conceptual harmonization to classify the different types of health expectancy described in the inventory. This classification is not based on the description given by the authors themselves (and used in the inventory); instead, information on the details of measurement was used to classify the health expectancies ourselves.

The REVES committee on conceptual harmonization recommended that health expectancies (generic term) should be differentiated according to the ICIDH (International Classification of Impairments, Disabilities and Handicaps) into impairment-free, disability-free and handicap-free life expectancy. They also recommended that disability-free life expectancy be differentiated into functional limitation-free and activity restriction-free life expectancy. Functional limitations are the specific reductions in body functions, e.g. seeing, hearing, climbing stairs. Activity restrictions are specific reductions in daily activities, e.g. dressing, bathing, using the phone. Both are described at the level of the person (in contrast to impairments, which are described at the level of an organ or organ system). We have added disease-free life expectancy and life expectancy in good health to this list. The last type of health expectancy is based on measures that try to capture the entire entity 'health', not only the consequences of disease in terms of impairments, disabilities and handicaps. An important subgroup of life expectancy in good health is life expectancy in good perceived health. Robine and Michel proposed the term healthy life expectancy for this group of health expectancies, and van de Water (1992) used the term perceived (good) health expectancy. Since some also use the term healthy life expectancy as a generic term (i.e. as a synonym of health expectancy) we prefer to use a term that is less prone to misunderstanding. Table 2 gives an overview of the health expectancies calculated to date listed according to this terminology. The

codes on the right (e.g. AUS1) are the codes of the fact sheets; the letters of a code reflect the name of the country. One study (New Zealand) was not included because we had insufficient information to be able to decide where to place this study.

**Table 2.** Overview of types of health expectancy (the codes in the right-hand column refer to the code of a fact sheet. The letters of the codes indicate the country in accordance with the codes used by the OECD)

Disease-free	DEN1, USA7
Impairment-free	
Disability-free	
Functional limitation-free	
- derived from a list of impairments	AUS1, NET4/5, SPA1, UK2
Activity restriction-free	
- list of specific activities (e.g. OECD-list)	CAN2/3/4, DEN5, NET1/6, SWI1/2, USA5
- ADL/IADL-list	NET3, USA4
Handicap-free	
- general	CAN1, DEN3/4, FRA1, UK1, USA2/3/6
- several areas (specified)	AUS1
- occupational /major activity	CAN1, DEN6, GER1, FIN1, NOR1, SWE2/3, USA1/2/3/6
- mobility (able to leave home)	FRA1
In good health	
- perceived health	DEN2, GER2, ITA1, NET2/7
- multi-dimensional health index	SWE1

Under the heading of functional limitation-free life expectancy are listed those studies which used disability data from surveys that assessed disabilities due to impairments. Such surveys start by screening the population for impairments, e.g. by means of such questions as: 'do you see well with both eyes?' Those who answer 'no' are asked further questions on the existence and severity of resulting disabilities.

We divided the activity restriction-free life expectancy into health expectancies calculated solely from questions on the ability to perform ADL (basic Activities of Daily Living, such as bathing, dressing, feeding oneself) and/or IADL (Instrumental Activities of Daily living, such as using a phone, preparing a meal, shopping) and those based on a more comprehensive list of activities (including questions on disabilities due to sensory impairments, such as reading and having a conversation, and more general questions on mobility). Actually, the first are pure activity restrictions, while the latter are a combination of functional limitations and activity restrictions, here rather arbitrarily classified under activity restrictions.

restrictions, while the latter are a combination of functional limitations and activity restrictions, here rather arbitrarily classified under activity restrictions.

We distinguished two main groups of handicap-free life expectancies: The first is based on general questions on the presence of activity restrictions (e.g. 'are you limited in the kind or amount of activities you can perform because of your health?'). The second concerns handicaps with respect to occupation; occupation is used here in the broad sense as in the ICIDH: occupation is what someone normally is occupied with (depending on age, gender and culture) and includes, for example, housekeeping or going to school. In addition to these two main groups, in a few countries life expectancy free of handicaps with respect to other roles was also calculated.

Life expectancy in good health refers mainly to studies on self-rated (perceived) health but also includes a study based on a multi-dimensional approach to health, thus combining data on several aspects of health in a health index.

As can be seen in table 2, the variation in the type of health expectancy calculated is wide and no single (sub)type is dominant: occupational handicap-free life expectancy (based on the ability to perform the major activity usual for one's age and sex) is most prevalent: it has been calculated for 7 countries. Four other types of health expectancy have been calculated for 4 or 5 countries:

- based on disability as given by extensive disability surveys that first screen for impairments (n=4)
- based on a (concise) list of activities and functional limitations (such as the disability indicator proposed by the OECD (McWhinnie, 1981)) (n=5)
- based on one or two general questions on whether one is limited in one's activities for health reasons (n=5)
- based on a single question on self-rated (perceived) health (n=4)

In the next chapter we will compare the health expectancies within these 5 groups and will study in more detail the survey questions that underly these health expectancies.

### 3.2 Data sources

Almost all studies are based on data from a health or disability survey (including health supplements or condition of living surveys). Only for Germany (fact sheet GER1) was a health expectancy calculated from data from a registry of disabled persons.

Response rates for surveys were generally above 80%. Only response rates for Switzerland (75%), Norway (75%) and especially the Netherlands (57% to 79%, but usually around 60%) were lower. Populations of institutions usually were not included in general health surveys. Exceptions are Denmark, Italy, Sweden and Germany (GER2). Special disability surveys, however, usually include the institutional population (e.g. Netherlands Survey on Physical Handicaps 1971-72, the OPCS Disability Survey (U.K.), Health and Activity Limitation Survey Canada, National Long-term Care Survey (USA) and the Australian Bureau of Statistics Disability Survey), except for the survey on impairments, disabilities and handicaps in Spain and the 1986-1988 disability supplement to the Netherlands Health Interview Survey.

Studies based on data from surveys which excluded the institutionalized population have to estimate the population in health-related institutions in order to obtain a realistic estimate of health expectancy. Most do so, using either census or registry data. Some, however, calculate health expectancies without using a correction for health related institutionalization. This applies for Spain, Norway, Finland, New Zealand and two studies in the USA (Colvez and Blanchet, 1983; Pope and Tarlov 1991). The authors of the New Zealand study argue that not taking the institutional population into account does not influence the results very much, because they calculated a partial health expectancy for the age group 15-64 years, and the rates of institutionalization are low at these ages. The health expectancies for Finland and Norway were calculated by a Swedish author in order to compare them with the health expectancy calculated for Sweden, while the study in the USA by Colvez and Blanchet (1983) was originally meant to test calculating procedures on US data before analysing Canadian data.

Another study from the USA (Rogers et al. 1990) incorporated data from sample populations which included some institutionalized persons, but was not in itself a representative sample (this study was meant to point out some methodological issues rather than to calculate a health expectancy for its own sake).

In many studies on health expectancy a distinction is made between long-term and short-term disability (or another aspect of health). In such cases, short-term disability is based on the number of bed days or cutdown days (number of days one has had to cut down on one's activities) in a certain time period (2 or 4 weeks). Someone with a long-term disability, however, can have short-term cutdown days or bed days too. Therefore it is important to avoid double counting of individuals with both long-term and short-term disabilities. When data on both long-term and short-term disabilities are collected in the same survey, this can be done by calculating the rate of short-term disability in the survey population free of long-term disability. If this is not possible, for

instance because data on short-term and long-term disabilities come from different surveys, some form of correction must be applied. In some studies, however, this apparently has not been done, e.g. the health expectancies calculated for Spain and that calculated for the USA by Colvez and Blanchet (1983).

Not all surveys include the whole range of ages. Often children (below 15 or 16 years of age) are excluded (New Zealand, all Scandinavian countries, the Canadian Social Survey, Switzerland (below 20 years)), but sometimes also the aged (75 and older, Switzerland) or very aged (85 and older, Sweden) are left out. In such cases usually partial health expectancies, covering only the age ranges included in the surveys, are calculated. Only for Switzerland was health expectancy at birth calculated.

Several other surveys cover the entire range of ages, although some questions have only been answered by specific age groups. This applies for the Dutch Health Survey, which posed the questions on disability only to those 16 years of age and over and questions on ADL only to those over 55 years of age. Likewise in the Canadian Health and Activity Survey, an extensive list of questions on disability was posed only to those 16 years and over, while younger children were asked a few other questions. Therefore health expectancies calculated from the disability prevalence as given by these surveys are based on different questions for children and for adults.

### 3.3 Calculation methods

Health expectancy is calculated by means of the following formula:

$$HE_a = \frac{\sum_{i=a}^{a_{\max}} r_i L_i}{l_a}$$

In this formula  $HE_a$  is health expectancy at age  $a$ ,  $L_i$  is the number of years lived in age interval  $(i, i+x]$  (taken from the ordinary (abridged) life table),  $x$  being the range of the age stratum,  $r_i$  is the prevalence of being healthy (or not disabled, etc.) in this age interval,  $l_a$  is the number of persons of age  $a$  still alive according to the life table, and  $a_{\max}$  is the starting age of the highest age interval in the life table.

At first sight this formula seems to leave little room for variation in calculation methods. We found, however, that there are differences in the way health expectancy is calculated from this formula:

\* age strata of different ranges (variations in x).

At one end of the spectrum, Mathers (1991) calculated health expectancies based on one-year age intervals up to 99 years of age. At the other end, authors have used prevalence rates for morbidity/disability as published by others in rather coarsely stratified age groups. As an example, the original publication of Sullivan (1971) is presumably based on prevalence rates for the age groups 0-4; 5-14; 15-44; 45-64; 65+. The studies referred to all used the official life tables (based on fine age stratification) in combination with morbidity rates which were assumed to be constant within broad age strata. Most studies, however, lie somewhere in between, using 5-year or 10-year intervals and an  $a_{max}$  of 75 or 85 years. A problem encountered in making this inventory was that many authors are not very clear on which age intervals were used for their calculations.

It is shown in appendix C that a coarse stratification, such as that used by Sullivan, can yield health expectancies that differ by more than one year from those calculated on the basis of shorter age intervals. On the other hand, the age intervals generally used in the Netherlands (5-year intervals up to age 84 years and an upper interval of 85+) produce results which only differ by a few hundredths of a year from those obtained with shorter intervals.

\* using 'pre-treated' prevalence rates.

We identified two kinds of 'pre-treatment' in the inventory:

The first was aimed at smoothing away random fluctuations. This was done by Mathers (1991) for Australia. Whether this is necessary is debatable, since for the indicator health expectancy age-specific rates are averaged, which will also remove random fluctuations. Calculations by Mathers (1991), cited in appendix C, show (not surprisingly) that smoothing away random fluctuations does not make a relevant difference.

The second pre-treatment consisted of fitting a curve to coarsely stratified age-specific data in order to estimate prevalence rates for finer age strata. This was done in the Spanish study and the study of Colvez and Blanchet (1983) for the USA. In appendix C we show that this increases the accuracy of health expectancies based on coarsely stratified data, but that it cannot be guaranteed that it eliminates the bias introduced by coarse stratification entirely.

### 3.4 Years of calculation

In table 1 the years of calculation are shown. In this table we indicate the mid-year of the life table on which the health expectancy was based. In most studies this was close to the year in which the data on health status were collected. Only data on institutionalization sometimes pertained to other years when based on census data (which usually are collected only once every 10 years).

In a few cases, as for the Netherlands and Canada, data from the same life table were combined with prevalence rates for morbidity/disability in different years or life tables from different years were combined with the same prevalence rates, in order to compare the effect of changing only one component on the resulting health expectancy.

### 3.5 Other remarks

A general observation is that published papers often do not give very much information on exactly how health expectancies were calculated. Information on the wording of questions was obtained mainly from sources of information other than the papers themselves. This is probably due to the fact that many papers were presented at a conference (usually one of the meetings of REVES); due to the limited time available for a presentation, methodological details are one of the first things to be skipped. The same thing applied for publications in journals which prefer conciseness over accurate, detailed descriptions. Publications that are not hampered by such restrictions (i.e. reports), generally contain all of the necessary information.

One of the recommendations of this study (see chapter 5) therefore is the creation of a list of elements which should be included in every paper on this subject.

#### 4. COMPARISON OF HEALTH EXPECTANCIES

In this chapter we will compare the health expectancies that have been calculated in the studies included in the inventory with those calculated for the Netherlands and interpret the differences.

We will do this separately for the 5 major groups of health expectancies described in chapter 3. To reduce problems of comparability, we will focus on life expectancies free of long-term disability (or handicap) only. Originally we planned to compare life expectancy free of short-term disability separately. However, by definition, short-term disability is only present in years free of long-term disability. Therefore there must be comparability in long-term disability before one can compare short-term disability. Since we did not manage to achieve sufficient comparability in long-term disability, we refrained from comparing short-term disability.

For each group of health expectancies, we will see whether it is possible to calculate a new health expectancy for the Netherlands which would be closer to the health expectancy calculated for another country. If this possibility exists, we will calculate this health expectancy and present the results of these new calculations.

##### 4.1 Functional limitation-free life expectancy

Table 3 gives an overview of all functional limitation-free life expectancies listed in table 2.

All of these health expectancies are based on special disability surveys. These surveys start by screening the population for impairments, e.g. with questions such as: 'do you see well with both eyes?' Those who answer 'no' are asked further questions on the existence and severity of resulting disabilities and handicaps. All of the more recent surveys were based on the ICIDH. Nevertheless, the surveys differ in their choice of how severe disabilities should be to be included and the type of disability included. The Dutch surveys, in particular, are restricted to physical disabilities, while the other surveys aim to include all types of disability.

Table 3: Life expectancy (LE), functional limitation-free life expectancy (FLFLE) and percentage life expectancy spent free of functional limitation (%FLF) at birth in Australia, Spain, the UK and the Netherlands

	men			women		
	LE	FLFLE	%FLF	LE	FLFLE	%FLF
Australia (Mathers 1991)						
1981	71.4	59.2	83%	78.4	65.0	83%
1988	73.1	58.4	80%	79.5	63.4	80%
the Netherlands (van Ginneken 1990)						
1981-1985 *	72.8	61.8	85%	79.5	66.3	83%
1986-1988	73.5	64.1	87%	79.9	65.1	81%
Spain (Gutiérrez Fisac and Regidor Poyatos 1991)						
1986	73.2	61.6	84%	79.6	63.6	80%
United Kingdom (Bebbington, 1991)						
1985	7.0	56.5	84%	74.5	62.7	84%

\* disability data from 1971-72

That Dutch men were found to spend the greatest percentage of life without functional limitations is therefore not surprising. However, this is not true for Dutch women. Table 3 shows that in the Netherlands and Spain, women spend a larger percentage of their lives with functional limitations than men, while this is not the case in Australia and the U.K. In both Spain and the Netherlands, women have more disabilities involving hearing, seeing, and locomotion (with the exception of running). In both countries men have more disabilities involving speech (Gomez Rodrigues 1989, NCBS 1990). In contrast, in Australia men have more disabilities due to loss of hearing or loss of sight (Mathers, 1991). Although the questions used in the surveys can significantly influence the prevalences observed, it is less likely (although still possible) that they have a considerable influence on the direction of differences between the sexes, especially for well-defined disabilities such as seeing and hearing. Therefore these data indicate that real differences in the prevalence of functional limitations, and thus in life expectancy free of these limitations, exist between countries. However, a more thorough analysis of all of the basic material is needed before a sound conclusion can be drawn. At this point we can only state that the data in table 3 suggest that, compared to Australia and the UK, women in the Netherlands seem to suffer a relative disadvantage compared to men. Whether this is because Dutch men have (compared to men in other countries) the advantage or Dutch women the disadvantage cannot be said.

Since all surveys are based on very complex questionnaires, it is not possible to calculate a health expectancy for the Netherlands which is more easily compared with other health expectancies than that already calculated by van Ginneken.

#### **4.2 Activity restriction-free life expectancy**

We divided activity restriction-free life expectancies into those calculated solely from questions on the ability to perform ADL and/or IADL activities and those based on a more comprehensive list of activities (including questions about disabilities due to sensory impairments and more general questions on mobility). We have only presented results for the second group, because the two health expectancies based on (I)ADL-items were calculated for methodological reasons rather than accurate determination of health expectancy for the relevant country. Furthermore we have not included the results of Liu and Manton for the USA, since they used a complex modelling technique (Grade Of Membership-analysis) to construct prevalence rates for 'pure types' of disabled elderly persons. It is difficult to compare their results with those obtained by means of the simple disabled/non-disabled approach used in all other studies. Since some authors present health expectancies at 15 or 16 years of age (because these questions were only posed to subjects older than 15 years), we present health expectancies (when relevant and possible) for these ages too.

Table 4: Life expectancy (LE), activity restriction-free life expectancy (ARFLE) and percentage life expectancy spent free of activity restriction (%ARF) at birth in Canada, Denmark, Switzerland and the Netherlands

	age	men			women		
		LE	ARFLE	%ARF	LE	ARFLE	%ARF
Canada 1 (Wilkins and Adams, 1992)							
1985-87	0	73.0	61.3	84%	79.8	64.9	81%
1985-87	15	59.0	48.0	81%	65.6	51.2	78%
Canada 2 (Lamb, 1990)							
1986	15	58.6	42.4	72%	65.3	37.7	58%
Denmark (Rasmussen and Brønnum-Hansen 1990)							
1986-1987	16	56.7	49.8	88%	62.4	52.0	83%
The Netherlands 1 (Van Ginneken, 1989)							
1981-1985	0	72.8	62.1	85%	79.5	60.9	77%
	15	58.8	49.3	84%	65.3	48.0	74%
(Boshuizen et al. 1992)							
1983	0	72.3	64.2	89%	79.5	64.6	81%
	15	58.9	50.7	86%	65.4	50.4	77%
1984	0	73.0	60.6	83%	79.6	58.8	74%
	15	59.0	47.5	81%	65.4	45.4	69%
1985	0	72.9	62.2	85%	79.6	61.3	77%
	15	58.9	48.8	83%	65.4	47.4	72%
1989	0	73.7	65.4	89%	80.0	64.7	81%
	15	59.5	51.5	87%	65.7	50.6	77%
1990	0	73.9	65.1	88%	80.1	65.1	81%
	15	59.7	51.2	86%	65.8	51.0	78%
Netherlands 2 (this report)							
1984-1985	16	57.9	48.6	84%	64.5	46.5	72%
1991-1992	16	59.1	52.1	88%	64.8	52.7	82%
Switzerland (Bisig, 1994)							
1981-1982 *)	0	72.6	65.9	91%	79.3	69.7	88%
1989 *)	0	74.0	67.1	91%	80.9	72.9	90%

\*) Including short-term disabilities

The health expectancies in table 4 are all based on a form of the OECD indicator for long-term disability. The OECD indicator for long-term disability, a list of 16 questions proposed by the OECD (McWhinnie, 1981), was used in several countries. Unfortunately, all investigators adapted this list of questions to suit their own purposes. In the Netherlands, the original list was cut down

to 11 questions, 10 of which were used to calculate health expectancies. Danish health expectancy is based on 6 items and Swiss on 5 items. In Canada, on the other hand, items were added as well as left out. Table 5 gives the original questions proposed by the OECD (McWhinnie, 1981) and shows which of these questions is incorporated in the health expectancies in table 4. A plus sign in this table means that a question similar to the OECD question is included, but often the exact wording differs. In addition the answer categories were not always the same as those proposed by the OECD (i.e. yes, without difficulty; yes, with minor difficulty; yes, with major difficulty or no, not able to). This applies for Canada, where respondents had to say whether they have difficulty doing something (yes or no); if the answer was yes they were asked in a second question whether they are completely unable to do so.

The way in which the answers to different questions are combined to calculate health expectancy also differs between countries. In Denmark and the Netherlands, disabled is defined as major difficulty accomplishing one or more items; in Canada and Switzerland a severity score is determined whereby the number of items that cause difficulty also plays a role. The cut-off point between no disability and some disability in Canada is similar to the definition used in Denmark and the Netherlands: having some disability means having difficulty with one or more items. Therefore we have listed those studies using this cut-off point in table 4. In Swiss publications only one cut-off point is considered and it is different from the one used in the Netherlands and Denmark. Therefore some of the persons considered disabled in Switzerland would not be considered disabled according to the Dutch/Danish definition, whereas others would be considered disabled according to the Dutch/Danish but not the Swiss definition.

Table 5 shows that there is some agreement between countries in leaving out the questions on running and chewing. Otherwise, the items included in the health expectancies vary markedly.

Table 5. Long-term disability questions proposed by the OECD and whether these questions are represented in the health expectancies in table 4.

question	Canada		Denmark		Netherlands		Switzerland	
	1	2			1	2		
Is your eyesight good enough to read ordinary newspaper print? (with glasses if usually worn)	+	+	+	+	+	+	+	-
Is your eyesight good enough to see the face of someone at a distance of 4 metres?	+	-	-	+	-	-	-	-
Can you hear what is said in a normal conversation with 3 or 4 persons? (with hearing aid if you usually wear one)	+	-	+	+	+	+	+	-
Can you hear what is said in a normal conversation with one other person? (with hearing aid if you usually wear one)	+	-	-	+	+	-	-	-
Can you speak without difficulty?	+	-	+	-	-	-	-	-
Can you carry an object weighing 5 kilos for 10 metres?	+	+	+	+	+	+	-	-
Could you run 100 metres?	-	-	-	-	-	-	-	-
Can you walk 400 metres without resting?	+	+	+	-	+	-	-	-
Can you walk up and down one flight of stairs without resting?	+	+	+	-	+	-	-	-
Can you move between rooms?	+	-	-	+	-	-	-	-
Can you get in and out bed?	+	-	-	+	-	-	+	-
Can you dress and undress?	+	-	-	+	-	-	+	-
Can you cut your toenails?	+	+	-	-	-	-	-	-
Can you (when standing) bend down and pick up a shoe from the floor?	+	+	-	+	-	-	-	-
Can you cut your own food? (such as meat, fruit, etc.)	+	-	-	-	-	-	-	+
Can you bite and chew hard foods? (for example, a firm apple or celery)	-	-	-	-	-	-	-	-
Other questions	9	3	-	-	-	-	-	-

The shortest health expectancy listed in table 4 is the one for Canada calculated by Lamb. It is hard to explain why this health expectancy is so much shorter than that calculated by Wilkins and Adams for the same country and for the same year, using more questions (but including all those used by Lamb), but from a different survey.

The longest health expectancy was found for Switzerland. This is particularly remarkable because this health expectancy includes short-term disability, which all of the others do not. It is easy to see why this health expectancy is longer than the others: it is based on fewer questions (and thus a respondent has less chance of being counted as disabled) and it does not include the question on carrying an object weighing 5 kilos for 10 metres, which is responsible for a large percentage of disability in the Dutch survey: of the 10 items used in the Netherlands this item contributed the largest number of disabled persons.

Comparison of Canada 1 with the Netherlands revealed that both life expectancy and health expectancy around 1985 were, despite the differences in the questions used, rather similar for men. For women life expectancy was also almost the same. Health expectancy however was shorter for Dutch women, despite the fact that it is based on fewer items. The difference in questions asked makes it difficult to draw a conclusion on the absolute difference in health expectancy between the Netherlands and Canada. The difference in health expectancy between women and men, however, seems to be larger in the Netherlands than in Canada.

To compare Denmark and the Netherlands, we calculated a new health expectancy for the Netherlands (Netherlands 2), using the 6 questions that are the closest to those used in Denmark. The Danish survey contains an item on the ability to speak that is not present in the Dutch Health Interview Survey. We replaced this item with the question: 'Can you carry on a conversation with one other person? (with hearing aid if necessary)'. This question inquires about an activity that requires both speaking and hearing ability. A hearing disability severe enough to interfere with a conversation with one person will surely also interfere with a conversation with 3 or more persons. Therefore such a hearing disability contributes to the Danish rate of disability too, because it will be picked up by that question. We calculated this new health expectancy for both 1984-1985 and 1991-1992. The most important difference between these periods is that in 1989 the question on walking 400 metres without resting was changed: in 1989 the phrase '(with cane if necessary)' was added to this question, which decreased the prevalence of this disability by almost 50%. In the Danish survey the respondents are instructed at the beginning of the series that the questions concern their ability to cope with such aids as eyeglasses, cane, etc. The question itself, however, contains no such phrase, which means that the 1984/1985 data probably are the closest to the Danish data. Comparison of the 1984-85 Dutch health expectancy with Danish health expectancy table 4 shows that despite the longer life expectancy in the Netherlands, healthy life expectancy seems to be longer in Denmark, especially for women. One difference between Danish and Dutch health expectancies is that in the Netherlands the entire institutionalized population was counted as not healthy, while in Denmark only those in institutions who had major difficulty in accomplishing one of the 6 items (hearing, seeing, speaking, walking 400 metres, climbing stairs and carrying 5 kilos) were counted as not healthy. This, however, cannot explain the entire difference observed between Denmark and the Netherlands.

Another factor that we have to consider is that these figures are subject to some variation due to sampling error. We estimate the standard error for Denmark to be 0.5 years at most; for the Netherlands it will be slightly lower. Together with the difference in approach to the institutional

population, this could explain the difference between men, but not that between women. Therefore Dutch women seem to suffer a disadvantage compared to Danish women.

**Table 6.** Life expectancy with disability (DLE) and percentage life expectancy spent with a disability (%D) at 16 years of age for specific disabilities in Denmark and the Netherlands.

Institutional population:	men				women			
	DLE		%D		DLE		%D	
	incl	excl	incl	excl	incl	excl	incl	excl
<b>Follow a conversation with 3 or more persons</b>								
Denmark, 1986		2.3		4%		1.4		2%
The Netherlands 1991/92	3.0	2.0	5%	3%	4.8	2.1	7%	3%
<b>Read the small print of a newspaper</b>								
Denmark, 1986		1.8		3%		2.0		3%
The Netherlands, 1991/92	3.8	2.7	6%	5%	6.4	3.7	10%	6%
<b>Carry 5 kilos 10 metres</b>								
Denmark, 1986		2.0		4%		6.2		10%
The Netherlands, 1991/92	3.2	2.2	6%	4%	10.7	8.0	17%	12%
<b>Walk 400 metres without resting</b>								
Denmark, 1986		3.3		6%		5.7		9%
The Netherlands, 1984/85 *)	5.7	4.7	10%	8%	11.9	8.8	18%	14%
The Netherlands, 1991/92	3.3	2.3	6%	4%	7.4	4.7	11%	7%
<b>Walk up and down stairs **)</b>								
Denmark, 1986		2.9		5%		4.8		8%
The Netherlands, 1991/92	2.5	1.5	4%	3%	5.7	3.0	9%	5%

\*) life table / institutionalization data for 1991/1992, survey data from 1984/1985

\*\*) for both countries, prevalence rates are assumed to be 0 below age 55, because for the Netherlands only data for persons over 55 are available

To investigate this difference further, we calculated health expectancies for Denmark and the Netherlands separately for each of the 5 items seeing, hearing, carrying, walking 400 metres and climbing stairs (table 6). The fact that the institutional population in the Netherlands can only be included in its entirety complicates this comparison. Our solution to this problem was to present health expectancy for a specific disability in the Netherlands with and without the institutional population. The value for the Netherlands without the institutional population will be too low, while that with this population will be too high. If the Danish (ill)health expectancy lies between these two values, health expectancies cannot be said to differ between the two countries. If it does

not, the health expectancies probably differ. For the ability to walk 400 metres we have listed Dutch health expectancies based on data for 1984-85 (no mention of a cane) and for 1991-92.

Table 6 shows that in the Netherlands one generally can expect to spend a larger part of life with a reading disability, and Dutch women can expect more years with hearing and carrying disabilities. The differences in wording of these questions, however, might explain some of the differences. For instance, in the Dutch version, the question on reading refers to "small print" in a newspaper, while the Danish version refers to "ordinary print". The ability to carry 5 kilos in the Netherlands refers to "10 metres", the example being "a full shopping bag"; in Denmark no distance is specified and the example is "a shopping bag". Dutch men and women experience more difficulty walking 400 metres when the 1984/1985 wording is assumed to be closest to the Danish question. At first sight it then seems strange that Dutch men and women do not have more difficulty walking up and down stairs. However, this can be explained by the wording of these questions, since respondents in Denmark are asked whether they are able to walk up and down a flight of stairs without resting, while in the Netherlands the question is just whether one is able to walk up and down stairs.

In summary, the fraction of life free of disability (measured with an instrument based on the one proposed by the OECD) seems to be shorter in the Netherlands than in Denmark, especially for women. Part of this could be due to differences in the wording of questions and part of it to differences in the way the institutionalized population is included. We feel that it is unlikely, however, that these biases entirely explain the difference observed between Dutch and Danish women.

#### 4.3 General handicap-free life expectancy

Table 7 shows the general handicap-free life expectancies that have been calculated to date, plus a health expectancy that we calculated during this study for the Netherlands to compare with these data. For the USA we used only the study of Crimmins et al. (1989), since the other studies did not include the institutional population. All of these health expectancies are based on one or two simple questions instead of an extensive lists. This makes it possible to present these questions here in a table (table 8).

Before this study no handicap-free life expectancy had been calculated for the Netherlands. The Dutch Health Interview Survey, however, contains two questions that are rather similar to the

questions used in the U.K. These questions can be found in table 8. We used these questions to calculate a general handicap-free life expectancy for the Netherlands. The results of these calculations can be found in table 7.

Table 7 shows that the calculations for Denmark 1 yield the highest percentage of handicap-free life expectancy. Table 8 shows that individuals are only regarded as handicapped in terms of this health expectancy if they have cut down on their ordinary activities during the last 14 days. So it is possible that someone who has a permanent handicap is not included because he or she did not cut down on his or her ordinary activities, which were adapted to whatever he or she was still able to do. Therefore this question is not the most suitable way to measure long-term handicaps. The other question in Denmark does not have this disadvantage, but it also does not count people as handicapped who are only occasionally restricted in their activities. For the Netherlands we could calculate a handicap-free life expectancy which also excluded persons who were only occasionally handicapped. Taking the variation due to random error into account, the fraction of life spent without a permanent handicap in the Netherlands is lower than that in Denmark. Looking at the question, we would have expected a higher percentage in the Netherlands. This expectation was based on feeling rather than on fact, since we do not know of any studies which compare these questions. Nevertheless, we feel that these data indicate that the percentage life spent free of general handicaps is shorter in the Netherlands than in Denmark.

Table 7. Life expectancy (LE), general handicap-free life expectancy (HFLE) and percentage life expectancy spent free of handicaps (%HF) at birth in the UK, Canada, USA, France, the Netherlands and at age 16 for Denmark and the Netherlands

	men			women		
	LE	HFLE	%HF	LE	HFLE	%HF
United Kingdom (Bebbington 1991)						
1976	70.0	58.3	83%	76.1	62.0	79%
1981	71.1	58.7	83%	77.1	60.9	79%
1985	71.9	58.8	82%	77.7	61.9	80%
1988	72.4	58.5	81%	78.1	61.2	78%
Canada (Wilkins and Adams 1983)						
1978	70.8	60.3	85%	78.3	64.6	83%
USA (Crimmins et al. 1989)						
1970	67.0	56.5	84%	74.5	62.7	84%
1980	70.1	57.2	82%	77.5	62.8	81%
France (Robine and Colvez 1986)						
1982	70.8	61.9	87%	78.9	67.1	85%
Denmark 1 (Rasmussen and Brønnum-Hansen 1990)						
1986-87 (at age 16)	56.7	54.3	96%	62.4	59.0	95%
Denmark 2 (Rasmussen and Brønnum-Hansen 1990)						
1986-87 (at age 16)	56.7	52.1	92%	62.4	55.7	89%
The Netherlands 1991/1992 *)						
excluding 'intermittently'						
at birth	74.2	67.0	90%	80.2	70.4	88%
at age 16	59.1	52.1	88%	64.8	55.2	85%
including 'intermittently' (at birth)	74.2	61.4	83%	80.2	63.5	79%

\*) life table for 1991/92; data on institutionalization for 1990 and data on percentage with handicap for 1991/1992

Table 8. Survey questions used to calculate the handicap-free life expectancies from table 7.

Country	Question
U.K.	Do you have any long-standing illness, disability or infirmity? if yes: Does this illness or disability limit your activities in any way? y/n
Canada	Is -- limited in any way because of his (her) health? (asked after a question inquiring about limitations in major activity) y/n
USA	In terms of health, are you now able to (perform major activity*) at all? y/n Are you limited in the kind of (major activity*) you can do because of your health? y/n Are you limited in the kind or amount of other activities because of your health? y/n
France	'Are you handicapped or do you simply have difficulties or are impeded in your daily life? y/n
Denmark 1	Over the <u>past 2 weeks</u> has illness, injury, or a complaint made it difficult or impossible for you to carry out your ordinary daily activities (e.g. domestic work or work outside the home, spare time activities, etc.)? yes, number of days/no If yes: Have these difficulties/limitations been of a more constant nature? By constant is meant that the difficulties/limitations are expected to last 6 months or more? yes/no
Denmark 2	Do you feel well enough to do what you want to do? yes, most of the time/yes, now and then/ no (hardly ever)/don't know Handicap is defined as those answering no.
The Netherlands	Are you troubled by any long-standing illness, disorder or handicap? if yes: Are you limited in your daily activities due to this/these illness(es), disorder(s) or handicap(s)? always/intermittently/rarely or never

\* question states the appropriate major activity for the subject, e.g., work, keep house, go to school

When looking at the other handicap-free life expectancies, all of which can be assumed to include individuals with permanent handicaps and with handicaps fluctuating in time, France yields the highest percentage life spent without handicaps. In the question used in France the word "handicapped" is mentioned first and therefore receives more emphasis than in the questions used in other countries. This might lead to some underreporting by those with only small limitations of daily activities.

Of all the questions in table 8, those used in Canada and the USA are the closest, although not identical. For women the percentage life spent free of handicaps in the two countries is similar. On the other hand, Canadian men seem to spend a slightly longer part of their lives without handicaps, although the difference is small; therefore, we cannot exclude the possibility that this is due to the slight differences in the wording of the questions. Since total life expectancy in Canada for both sexes is longer than in the USA, handicap-free life expectancy is also longer in Canada for both sexes. Since the difference in life expectancy is real and a roughly equal prevalence of handicaps is credible, we think this difference in the absolute number of years of handicap-free life expectancy represents a real difference between Canada and the USA, and not one due to differences in methods.

The two questions used in the U.K. are roughly similar to those used in the Netherlands. There are some differences, however: due to differences in language (Dutch does not have two separate

words for "disability" and "handicap") the wording is slightly different. Secondly, the Dutch question refers to limitations of daily activities only, while the English question asks about limitations of activities without further specification. Lastly, there is a difference in answers between the two countries. Despite this, the resulting percentage life spent without a handicap in the two countries is rather similar. Since life expectancy in the Netherlands is longer (more than can be explained by the more recent calendar year), this again means that probably the absolute number of years spent without a handicap is greater in the Netherlands than in the U.K., although we cannot rule out a possible bias due to differences in the wording of the questions.

In summary, we feel that these calculations show that handicap-free life expectancy in Canada is longer than in the USA, and longer in the Netherlands than in the U.K. We are more or less confident about this conclusion, however, mainly because these differences reflect differences in total life expectancy. The data indicate that the percentage life spent with a handicap is higher in the Netherlands than in Denmark. Other differences in handicap-free life expectancy, however, are probably due to differences in the data used for calculation.

#### **4.4 Occupational handicap-free life expectancy**

No occupational handicap-free life expectancy has been calculated for the Netherlands. The Dutch Health Interview Survey does not contain questions suitable for calculation of a health expectancy that can be regarded as such. Therefore comparisons were not possible.

#### **4.5 Life expectancy in good perceived health**

Table 9 shows life expectancy in good perceived health for those countries for which it was calculated. Since these health expectancies are based on a single question, we again present the wording of these questions in a table (table 10). It shows that the questions posed in Germany and Italy are rather different from those used in Denmark and the Netherlands. In the surveys in Germany and Italy the question was whether the subject had been in good health for the last 2 or 4 weeks, while in Denmark and the Netherlands the respondent was asked to rate his or her global health state. Although such an answer might be influenced by a recently experienced illness, the respondent is perfectly able to answer that he or she is generally in very good health even when

just recovering from the flu. On the other hand, the subject might rate his or her health as bad without having been ill recently, as required by the German question.

The Italian and German results are very similar, despite the differences in wording between the questions. Probably, "being in good health" on a specific day is seen as equivalent to "not being ill" on that day.

**Table 9:** Life expectancy (LE), life expectancy in good perceived health (PHE) and percentage life expectancy spent in good perceived health (%PH)

	men			women		
	LE	PHE	%PH	LE	PHE	%PH
<b>Italy (Egidi 1988)</b>						
1982 (at birth)	71.6	64.3	90%	78.2	68.3	87%
<b>Germany (Egidi 1990)</b>						
1986 (at birth)	71.8	63.4	88%	78.4	68.4	87%
<b>Denmark (Rasmussen and Brønnum-Hansen 1990)</b>						
1986-87 (at age 16)	56.7	53.0	93%	62.4	57.1	92%
<b>The Netherlands (Van Ginneken et al. 1989)</b>						
1981-85 (at birth)	72.8	58.9	81%	79.5	60.7	76%
(Boshuizen et al. 1992)						
1981 (at birth) *)	72.7	56.9	78%	79.3	58.0	73%
1983 (at birth)	72.9	58.6	80%	79.5	60.9	77%
1990 (at birth)	73.9	60.0	81%	80.1	60.2	75%

\*) Different answering categories ("very good" is absent)

The results for the Netherlands and Denmark, however, are very different, despite the fact that the questions asked did not differ very much. This, presumably, is due to the choice of a different cut-off point. Life expectancy in good perceived health in Denmark includes those who say their health is "fair", while in the Netherlands this category is not included. To improve the comparability, we recalculated the Danish results applying the cut-off point used in the Netherlands and calculated Dutch health expectancies at age 16 for both cut-off points. In table 11 the results of these calculations are presented.

Table 10 Survey questions used to calculate the life expectancies in good perceived health in table 9.

Country	Question
Italy	Were you always in good health in the past 2 week ? no, number of days / yes
Germany	In the last 4 weeks (including today) have you been ill (including chronic illness) or were you injured in an accident? yes, ill / yes, injured / no
Denmark	How would you judge your present state of health in general? Very good/good/fair/poor/very poor
The Netherlands	What in general is your state of health: very good / good / fair / sometimes good and sometimes bad / bad. In 1981 and 1982 the answer "very good" was absent.

Table 11: Life expectancy in good perceived health (PHE) at age 16, as calculated for the Netherlands (Boschuijzen et al. 1992) and Denmark (based on Rasmussen and Brønnum-Hansen 1990) using the same cut-off points and ages.

		men			women		
		LE	PHE	%PH	LE	PHE	%PH
At age 16							
<b>Good health = only "(very) good"</b>							
Denmark							
1986-87		56.7	44.6	79%	62.4	46.0	74%
The Netherlands							
1981 *)		57.8	43.1	75%	64.2	43.7	68%
1983		57.9	44.9	78%	64.4	46.8	73%
1986		58.1	45.8	79%	64.6	46.4	72%
1990		58.7	45.7	78%	64.9	45.9	71%
<b>Good health includes "fair"</b>							
Denmark							
1986-1987		56.7	53.0	93%	62.4	57.1	92%
The Netherlands							
1981 *)		57.9	51.0	88%	64.2	55.2	86%
1983		57.9	51.9	90%	64.4	56.0	87%
1986		58.1	52.6	90%	64.6	55.3	86%
1990		58.7	53.1	90%	64.9	56.2	87%

\*) Different answering categories ("very good" is absent)

To keep this table short, we did not include all of the years for which Dutch data are available. We included 1986 for comparison with the Danish data and the earliest and latest years in which the same categories were used to answer this question. We also included a year, 1981, in which the categories of answers were different, in order to see what the possible effect of a difference in categories of answers between Denmark and the Netherlands could be. A comparison of 1981 with the other years showed, as expected, that the effect of changing the cut-off point was more pronounced when the cut-off point was close to the categories which differed. This means that in

the case of comparing Denmark and the Netherlands, the cut-off point including only "(very) good" will yield more comparable results.

When comparing the health expectancies in table 11, we have to remember that these values are subject to some variation due to sampling error. For health expectancies based on (very) good health, we estimated the standard error for Denmark to be approximately 0.5 years, while it is slightly lower for the Netherlands. For the other cut-off points standard errors are slightly lower (less than 0.4 years for Denmark).

Table 11 shows that total life expectancy is substantially shorter in Denmark than in the Netherlands. This is not the case for the years spent in "(very) good" health. In view of the standard errors, the health expectancies for women do not differ, while the advantage for men is of borderline significance. The percentage life expectancy spent in good health does not differ between Dutch and Danish men but seems to be higher for Danish women (again of borderline statistical significance).

Could this be due to the difference in the wording of the question, especially the differences in categories of answers? A look at the question reveals that this is not very likely: in both cases, the number of categories below and above the cut-off point is the same, as are the two categories on either side of the cut-off point. The results for men (yielding the same percentage of life with less than good health) support this idea.

When the calculations include the category "fair", the advantage in health expectancy of Danish men and women becomes even more pronounced. There is no doubt that this could be due to the differences in categories of answers.

In table 11 there is a tendency for the differences between men and women to be slightly larger in the Netherlands than in Denmark. This difference is not readily explained by differences in wording between the countries: it can be assumed that the effects of differences in wording are similar for men and women. This trend, however, is not very strong and could also be due to chance.

In summary, from these comparisons we can conclude that although life expectancy in the Netherlands is longer than in Denmark, Dutch women can expect to spend a larger part of their lives in less than good health than Danish women, although the difference is of borderline statistical significance. No such difference was found for men.

## 5. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This report had three aims:

1. To inventory the different ways in which health expectancy has been calculated internationally
2. To compare values calculated in other countries with values calculated for the Netherlands.
3. If useful and feasible, to calculate new health expectancies for the Netherlands which are more easily compared with health expectancies that have been calculated in other countries.

In this chapter we will briefly summarize the results with regard to these three aims and at the same time discuss some aspects which have not been covered yet. In a following section we will describe our conclusions and discuss their possible implications for policy. We will end with some recommendations.

### 5.1 The inventory

A first observation while compiling the inventory was that published papers often do not give information on exactly how health expectancies were calculated. Therefore when only papers and not reports were available, information on the exact wording of the questions regularly had to come from sources of information other than the papers themselves. This makes comparison of results obtained directly from the publications difficult. When we saw the questions on which a health expectancy was based, we sometimes realized that the description in the paper led us to expect something different. An example is the health expectancy for Italy, which is based on "subjective health status". Without knowing the question, it was difficult to see why the health expectancy for Italy was so much longer than that for the Netherlands (table 9). Once the question was known (table 10) this was easily explained.

The inventory soon revealed that the health expectancies that have been calculated to date are all very different. To create some order in the heterogeneous collection of health expectancies, we categorized them into more homogeneous groups, each group sharing the aspect of health on which it is based. These groups were formed on the basis of the recommendations of the REVES network.

This approach worked well in that it led to the creation of groups within which the comparability of health expectancies could sensibly be discussed. However, it did not increase homogeneity of

the results very much. By this we mean that the range of health expectancies within one group often varied as much as within the total group of health expectancies. This should have been expected, because the length of health expectancy does not depend only on the aspect of health chosen, but also on the cut-off points used to define "healthy". To obtain homogeneous results, both of these factors have to be taken into account.

Another observation is that the calculation of some of the health expectancies published was carried out with considerable attention to details, e.g. correction for missing data in surveys, estimation of the institutional population, etc., while other authors use the Sullivan method just to obtain a crude estimate of health expectancy and ignore the fact that the institutional population, for example, is not included in the survey on which they based their calculations. As an example: in the USA the work of Crimmins et al. (1989) can be seen as an exponent of the first approach, while Pope and Tarlow (1991) represent the second approach. This means that the accuracy of the calculated health expectancies varies widely. This is something that has to be taken into account too. A related observation is that in some (especially older) studies erroneous calculations are sometimes made, e.g. correcting estimates of point prevalences for duration of the state of ill health and not correcting for the double counting of short-term and long-term disability. We observed that the type of publication is not an indicator of the quality of the methods used: these errors were also seen in papers published in peer-reviewed journals.

A last observation concerns the response rates reported for the surveys. The response rate for most surveys was fairly high: response rates of over 90% were reported in many cases. The response rates for the Dutch Health Interview Survey (currently below 60%) stands out as exceptionally low and it is hard to see why. Within the Netherlands the value of the results of the Health Interview Survey has been questioned because of the low response rates (Mackenbach, 1993). In view of the much higher response rates achieved in other countries, improving the response rates of the Dutch Health Interview Survey should be possible.

## **5.2 Interpretation of differences in health expectancies**

As discussed in the previous paragraph, the health expectancies that have been calculated to date are rarely comparable. In chapter 4 we tried to interpret the differences between the health expectancies calculated for the Netherlands (including those that have been calculated specifically

for this report) and those calculated in other countries. We started by trying to explain the differences in health expectancy as the result of differences in questions used, the wording of these questions, categories of answers used, etc. As a rule it was possible to ascribe the differences to these factors. Of course this does not mean that there are no differences in health expectancy between the Netherlands and these countries, but it does imply that with the data on hand we are not able to tell whether these differences really exist or not.

There is one case, however, in which we believe it unlikely that differences in the measurement instruments used were able to cause the differences in health expectancies. This concerns the comparison of Denmark and the Netherlands. Since no studies are available in which these measurement instruments are compared, this remains to some extent a matter of opinion. We observed that total life expectancy is considerably longer in the Netherlands. However, the percentage life expectancy spent without disabilities (measured with 6 items from the OECD-indicator for disability) is so much lower for Dutch women that we find it difficult to explain this as a difference in wording of the questions, especially since the difference is much smaller for Dutch men. Also the percentage life expectancy spent in self-rated good health is somewhat lower for Dutch than for Danish women, while no such difference is seen for men; furthermore the percentage life spent free of handicap was higher for both Danish women and men, and in our opinion the wording of the question cannot explain this.

In another case (comparing general handicap-free life expectancy in the United Kingdom and the Netherlands), the percentage life spent in good health was rather similar for both countries, while we had no reason to expect beforehand that the wording of questions used would lead to different prevalences of handicaps. In this case total life expectancy is clearly longer in the Netherlands. Since there is no indication of differences in the percentage life spent with a handicap, this then means that handicap-free life expectancy will also be longer in the Netherlands.

Another finding concerns the difference in the percentage life spent in health between men and women. For all types of health expectancies, the differences between men and women in the Netherlands were among the highest observed internationally. There are three possible explanations for this fact. The first is that Dutch women have a relative disadvantage in health with respect to women in other countries (or Dutch men have a relative advantage). The second explanation is that health surveys in the Netherlands tend to pose questions that elicit an ill-health response more readily from women than from men, while this is less likely or not the case in other countries. A last explanation is that Dutch women and men respond differently to health questions (more than is the case in other countries). We think the first explanation more likely than the last two, but at present we cannot rule out the last two.

### 5.3 Calculation comparable health expectancies

We limited ourselves to the calculation of comparable health expectancies from the Dutch Health Interview Survey of the NCBS. In order to calculate really comparable health expectancies, there must be questions in the Dutch Health Interview Survey that are similar to questions used to calculate health expectancies in other countries. We used the inventories made by Evers (1990) and by Kunst and others (1993) of health status questions in health interview surveys to locate such questions. The harvest was meagre. The only comparable questions were some questions that were part of the OECD indicator of disability. The questions of this indicator, however, were not meant to be used separately and thus no health expectancies have been based on single questions. In order to compare differences on the international level, we calculated some health expectancies from single questions for Denmark and the Netherlands. When doing this, the fact that the Dutch Health Interview Survey does not include the institutional population became a problem, because calculation of a health expectancy requires that one knows whether the institutional population also has this disability. When looking at only one specific disability (e.g. a visual disability), it is no longer possible to assume that everyone in an institution has this disability. So although comparable questions are present, without information on the institutional population, comparisons are still difficult.

Before we started this project, we expected the question on self-rated (perceived) health to be a candidate for the calculation of comparable health expectancies. However, the categories of answers used for this question in the Netherlands were rather unique: in most other countries the lower categories were 'bad' and 'very bad' instead of 'sometimes good, sometimes bad' and 'bad' as in the Dutch Health Interview Survey.

Of course we are not the first to have noticed the many differences between questions asked in health interview surveys and the problems that this creates for international comparison. The WHO regional office for Europe sponsored an effort to develop common instruments for health interview surveys, initiated and organized bij the NCBS. This yielded some recommendations for questions on handicap, disability and self-rated (perceived) health. At the moment, the Dutch Health Interview Survey does not include any of the recommended instruments: of the 10 questions proposed for measurement of disability, only two are included in the questions on ADL for respondents over 55 years; the proposed questions on handicaps are not asked at all; and the question on perceived health does not have the recommended categories 'bad' and 'very bad' as answers.

## 5.4 Conclusions and implications for policy

The main conclusions of this study are:

1. In general differences between the health expectancies calculated for different countries can be explained by differences in the measurement instruments used to collect the basic data. In some cases, however, (e.g. between the Netherlands and Denmark) there appears to be evidence that the differences might be real (i.e. that Danish women spend a larger percentage of their lives in good health than Dutch women). Nevertheless, this is not yet a definite conclusion, since there are still assumptions and conjectures involved.
2. At present the possibilities for calculating comparable health expectancies are small because the questions used to measure health status in Health Interview Surveys differ between countries.
3. The difference between the health expectancy for men and women in the Netherlands is among the highest observed internationally. It is not considered likely that this difference is due to the way in which health expectancy is calculated.

The first two conclusions can be summarized by saying that we have still a long way to go before reliable international comparisons can be made.

A first step towards international comparison is that the measurement instruments for health status used in health surveys must be comparable. This will take a concentrated effort to harmonize the collection of data internationally. But even if the organization of health surveys and the wording of questions were to be the same in all countries, it remains questionable whether true comparability will be achieved: the questions will be in different languages, which means that there could be slight differences in interpretation by respondents. Furthermore, respondents are influenced by cultural factors which also differ between countries.

Another problem encountered in international harmonization of health surveys is the problem of conflicting interests between international agreement and national comparability over time. A change in measurement instruments for health surveys will destroy the continuity of national comparisons over time. This problem is not insurmountable. In principle it is possible to calibrate the new measurement instrument against the old. This requires either a special investigation or a

transition period when both instruments are used simultaneously, which in turn means extra resources; moreover future investigations of time trends will always be complicated.

This raises the question of the importance of international comparisons relative to other research interests. To increase international harmonization of the measurement of health status a substantial effort is needed, while results cannot be expected on a short-term basis. There are many research topics in the field of health expectancy that are applicable within the Netherlands and will yield results that are relevant to policy makers in the short term: comparison of health expectancy between subgroups of the population; which diseases contribute the most to the unhealthy part of life; what is the impact of certain decisions in health care or prevention on health expectancy; what are the trends in time; how to model the development of public health in the future. Nevertheless, we believe that ongoing efforts toward harmonization are important. We recommend that the Netherlands should continue to participate in international efforts toward harmonization but that it should not be a first priority. Participation should not only consist of taking part in the development of common methods but also include their implementation.

A second aspect of comparing health expectancies between countries is that every country should calculate the same type of health expectancy. Currently in the Netherlands two types are commonly calculated: in terms of this report, the first is an activity restriction-free life expectancy (fact sheet NET1 and NET6), the second a life expectancy in good perceived health (NET2 and NET7). Within the Netherlands there is agreement that these two health expectancies are the best to be calculated from the data provided by the Dutch Health Interview Survey. In this report we have shown that internationally handicap-free life expectancy is the type of health expectancy calculated most often. In view of the heterogeneity of these handicap-free health expectancies, we would not really increase international comparability by changing the type of health expectancy calculated in the Netherlands. Moreover the importance of maintaining comparability in time is such that we think that it is important to continue to calculate the two types of health expectancy in use in the Netherlands at this time.

The last conclusion indicates that sex differences in health expectancy might be larger in the Netherlands than in other countries. We think this observation needs further investigation, because understanding the causes of these differences might suggest ways to improve the health of Dutch women.

## 5.5 Recommendations

Finally, on the basis of this study we have formulated a number of recommendations for investigators active in the field of health expectancy in the first place and for those involved in public health research in the Netherlands in the second place.

### 5.5.1 Recommendations to investigators in the field of health expectancy

1. When publishing results of calculation, the methods section should include at least:
  - general information on the survey that yielded the data: sample frame used (especially whether the population in health-related institutions is included), type of survey (postal, personal interview, etc.), response rate, the year of data collection, etc.
  - which life table was used
  - when the institutional population has to be estimated, which data base is used
  - the wording of the questions used to calculate health expectancy (including those for children)
  - did a particular rate apply to the whole sample or only a subgroup (e.g. excluding those with long-term disability)
  - when certain rates were not available, how were they estimated
  - which corrections were applied to the crude data (interpolation, smoothing, etc)
2. If survey data (or certain questions from a survey) are not available for all age groups, the correct methodological approach is to calculate a partial life expectancy. Often, however, full-life health expectancy is wanted. In that case, we recommend that health expectancies be presented not only at birth but also for the age separating estimated from measured data. In that way the reader can differentiate the estimated part of health expectancy from the empirically determined part.
3. Use data from measurement instruments which are internationally standardized whenever possible and continue efforts to standardize the measurement instruments used in national health interview surveys.

### 5.5.2 Recommendations for the Netherlands

1. Continue to calculate the two types of health expectancy in use at the present time.
2. Continue to participate in international efforts to achieve agreement in measurement instruments for health status.
3. The NCBS should decide whether the instrument for measuring self-perceived health recommended by the study group on Common Methods and Instruments for Health Interview Surveys (WHO/CBS 1992) should be used in the Dutch Health Interview Survey. This means replacing the categories "sometimes good, sometimes bad" and "bad" by "bad" and "very bad".  
A drawback of this change is that the time sequence for studies in the Netherlands is disrupted. There are several way to avoid damage:
  - For those over 16, the health interview survey contains a second question on perceived health in which respondents have to rate their (recent) health on a scale from 1 to 10. This question could be used to assess the effect of changing the wording of the other question.
  - For a given period of time, half of the households interviewed could be asked the new question and the other half the old one. These data could be used to correct time series.
4. An investigation of Health Interview Surveys in other countries to determine why response rates are so much higher than for the Dutch Health Interview Survey would be useful, since this could indicate how to improve the response rates.
5. Implementation of the recommended instruments on handicaps and disability is only useful if other countries do so too. At present, these instruments do not seem to be widely used.
6. The difference observed between men and women in the percentage life spent in good health or without disability in the Netherlands is large compared to that seen in other countries. This should be investigated further.

## REFERENCES

- BEBBINGTON AC. Expectation of life without disability measured from the OPCS Disability surveys. Canterbury, University of Kent. Discussion paper 651, PSSRU, August 1989.
- BEBBINGTON AC. The expectation of life without disability in England and Wales: 1976-1988. *Population Trends* 1991;66:26-9.
- BISIG B, GUTZWILLER F. Konzept des Indikators behinderungsfreie Lebenserwartung und Illustration am Beispiel Schweiz. In: Imhof AE, Weinknecht R eds. Erfüllt leben: in Gelassenheit sterben. Beiträge eines Symposiums von 23.-25. November 1993 an der Freien Universität Berlin. Berlin: Duncker & Humblot, 1994.
- BOSHUIZEN HC, PERENBOOM RJM, WATER HPA van de. Trends in Gezonde Levensverwachting in Nederland 1981-1990. Deel I: Resultaten. (Trends in health expectancy in the Netherlands 1981-1990. Part I: Results). (in Dutch). Leiden: Nederlands Instituut voor Praeventieve Gezondheidszorg TNO, 1992. Publ.nr. 92.098.
- BRONNUM-HANSEN H. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolknig. København: Dansk Institut for Klinisk Epidemiologi, 1990.
- CDC. International health Data Reference Guide. Hyattsville (MD): US Department of Health and Human Services, Public Health Service, 1994. DHHS Publication No. (PHS) 94-1007.
- COLVEZ A, BLANCHET M. Potential gains in life expectancy free of disability: a tool for health planning. *Int J Epidemiol* 1983;12(2):224-9.
- CRIMMINS EM, SAITO Y, HAYWARD MD. Sullivan and multistate methods of estimating active life expectancy: two methods, two answers. In: Robine J-M, Mathers CD, Bone MR, Romieu I eds. Calculation of health expectancies: harmonization, consensus achieved and future perspectives. Colloque INSERM 226, John Libbey Eurotext, 1993.155-60.
- CRIMMINS EM, SAITO Y, INGEGRNERI D. Changes in life expectancy and disability-free life expectancy in the United States. *Population and Development Rev* 1989;15(2):235-67.
- EGIDI V. Population ageing and changing lifestyles in Europe. Paper presented at the Seminar on present demographic trends and lifestyles in Europe. Strasbourg, 18-20 september 1990.
- EGIDI V. Stato di salute e morbosità della popolazione. in: The Second report on the Italian demographic situation . Rome: Istituto di Ricerche Sulla Populazione, 1988.115-23.
- EVERS S. Health for all indicators in health interview surveys. WHO/NCBS 1990 (Unformal, unedited publication).
- GINNEKEN JKS van, BANNENBERG AFI, DISSELVELT AG. Gezondheidsverlies ten gevolge van een aantal belangrijke ziektecategorieen in 1981-1985: methodologische aspecten en resultaten (Loss of health due to some important disease categories in 1981-1985: methodological aspects and results). (in Dutch). Leiden: NIPG-TNO, 1989. Publ.nr. 89.064.
- GINNEKEN JKS, WATER HPA van de. A comparison of four methods to determine life expectancy free of disability in the Netherlands. Paper presented at the second workshop on international geographic comparison of health expectancy in Geneva, March 15-16 1990.
- GINNEKEN JKS, WATER HPA van de, SONSBECK JLA van. Gezonde levensverwachting: betekenis en resultaten. In: Gunning-Schepers LJ, Mootz M eds. Gezondheidsmeting. Houten: Bohn Stafleu Van Loghum, 1992.
- GOMEZ RODRIGUES, P. Using the International Classification of Impairments, Disabilities and Handicaps in surveys: the case of Spain. *Wld Hlth Statist Quart* 1989;42:161-6.
- GUTIÉRREZ FISAC JL, REGIDOR POYATOS E. Esperanza de vida libre de incapacidad: un indicador global del estado de salud. *Med Clin (Barc)* 1991;96:453-5.
- KUNST AE, GROENHOF F, MACKENBACH JP, GEURTS JJM. Inventory of data on socio-economic inequalities in self-reported morbidities. Rotterdam/Heerlen: Erasmus University/NCBS, september 1993.
- LAMB VL. Measuring health expectancy in Canada: an empirical assessment using the 1985 Canadian general social survey. Paper presented at the 85-th Annual meeting of the American Sociological Association in Washington D.C. August 1990.
- LIU K, MANTON KG, LIU BM. Morbidity, disability and long-term care of the elderly: implications for insurance financing. *Milbank Q* 1990;68(3):445-92.
- MACKENBACH JP. De CBS-Gezondheidsenquête. *Ned Tijdschr Geneeskd* 1993;137(30):1488-92.
- MATHERS C. Health expectancies in Australia 1981 and 1988. Canberra: Australian Institute of Health AGPS, 1991.

- McWHINNIE JR. Disability assessment in population surveys: results of the O.E.C.D. Common development effort. *Rev Epidém Santé Publ* 29;1981:413-9.
- NCBS/NIMAWO. Physical disability in the population of the Netherlands 1986-1988. The Hague: SDU, 1990. CBS-publication.
- POPE AM, TARLOV AR. Disability in America: towards a national agenda for prevention. Especially Chapter 2: Magnitude and dimensions of disability in the United States. Washington DC: National Academy Press, 1991.41-75.
- RASMUSSEN NK, BRONNUM-HANSEN H. The expectation of life without disability in Denmark. Presentation at the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- ROBINE JM, COLVEZ A. Espérance de vie sans incapacité en France en 1982. *Population* 1986;6:1025-42.
- ROGERS A, ROGERS RG, BELANGER A. Longer life but worse health? Measurement and dynamics. *Gerontologist* 1990;30(5):640-9.
- ROMIEU I, ROBINE J-M. Bibliography series no. 3, Network on health expectancy (REVES). Montpellier: INSERM, februar 1992.
- ROMIEU I, ROBINE J-M. Bibliography series no. 4, Network on health expectancy (REVES). Montpellier: INSERM, December 1993.
- SANDERS BS. Measuring community health levels. *Am J Public Health* 1964;54:1063-70.
- SULLIVAN DF. A single index of mortality and morbidity. *HSMHA Health Reports* 1971;86(4):347-54.
- WATER HPA van de. Policy relevance of the health expectancy indicator: planning the next steps. paper at the fifth meeting of the International Network on health Expectancy 'futere uses of health expectancy indeces. Statistics Canada, Ottawa, 19-20-21 february 1992. (proceedings in press).
- WHO. Targets for health for all: targets in support of the European regional strategy for health for all by the year 2000. Geneva: WHO Regional Office for Europe, 1985. Health Series no 4.
- WHO/NCBS. Third consultation to develop common methods and instruments for Health interview surveys. Report on a WHO meeting, Voorburg, the Netherlands 22-24 September 1992. Voorburg: NCBS, 1993.
- WILKINS R, ADAMS OB. Health expectancy in Canada, late 1970s: demographic, regional, and social dimensions. *Am J Public Health* 1983;73(9):1073-80.
- WILKINS R, ADAMS O. Health Expectancy in Canada, 1986. Presentation at REVES 1. In: Robine J-M, Blanchet M, Dowd JE eds. *Health Expectancy*. First workshop of the International Health Expectancy network (REVES). London: HMNO, 1992.57-60.

## APPENDICES



**APPENDIX A**



**List of OECD countries with fact sheets codes included in this inventory**

Australia	AUS1
Austria	no fact sheet included
Belgium	no fact sheet included*
Canada	CAN1 to CAN4
Denmark	DEN1 to DEN6
Finland	FIN1
France	FRA1
Germany	GER1, GER2
Greece	no fact sheet included
Iceland	no fact sheet included
Ireland	no fact sheet included
Italy	ITA1
Japan	no fact sheet included**
Luxembourg	no fact sheet included
The Netherlands	NET1 to NET7
New Zealand	NZL1
Norway	NOR1
Portugal	no fact sheet included
Spain	SPA1
Sweden	SWE1, SWE2
Switzerland	SWI1, SWI2
Turkey	no fact sheet included
United Kingdom	U.K1, U.K2
USA	USA1 to USA7

---

\* A health expectancy has been calculated but was presented after this inventory was made

\*\* A health expectancy has been calculated but not by means of the Sullivan method



## AUSTRALIA HE-1 (AUS1)

### Source publication(s)

- Mathers C. Health expectancies in Australia 1981 and 1988. Australian Institute of Health: AGPS, Canberra, 1991.

### Aspect of (ill)health used

- 1) disabled
- 2) handicapped
- 3) severely handicapped

### Sources of data on rates of (ill)health

ABS surveys of disability and handicap 1981 and 1988.

### Details of survey data used

- 1) disabled:  
one or more of the following disabilities or impairments which had lasted or were likely to last for six month or more:
  - loss of sight (even with glasses or contact lenses)
  - loss of hearing
  - speech difficulties in native language
  - blackouts, fits, or loss of consciousness
  - slowness at learning or understanding
  - incomplete use of arms or fingers
  - incomplete use of feet or legs
  - long term treatment for nerves or an emotional condition
  - restriction in physical activities or in doing physical work
  - disfigurement or deformity
  - need for help or supervision because of a mental disability
  - long-term treatment or medication (but still restricted in some way by the condition being treated)

2) handicapped:

a disabled person aged 5 years or over who was further identified as being limited to some degree in his/her ability to perform certain tasks in relation to one or more of the following five areas:

- self care
- mobility
- verbal communication
- schooling
- employment

Under 5 years of age all disabled children are regarded as being handicapped.

3) Severely handicapped:

handicapped in self care, mobility or verbal communication; and

personal help or supervision required or the person is unable to perform one or more of the following tasks:

- Self care: Showering/bathing, dressing, eating a meal
- Mobility: using public transport, moving around in unfamiliar places, walking 200 metres, walking up and down stairs without a handrail, moving around inside the home/health establishment
- Verbal Communication: Understanding strangers, understanding family/friends/staff; being understood by strangers; being understood by family/friends/staff.

**Details of the survey(s) used**

Response rate: 93%

Institutionalized population included: yes, if in institutions for health care (but not boarding school pupils, inmates of gaols and reformatories)

Age groups included: all

If necessary proxies were used

**Age categories used**

Data and calculations for 1-year age categories.

**Calendar years of calculation**

1981 and 1988 (both for life tables and disability data)

### **Remarks**

- For 1981 the denominators of the survey had to be estimated. For this reason, rates for 95+ were unreliable. Therefore rates for 95+ from 1988 were used. For 85-94 adjusted rates were determined from fitted linear trends according to age over the range 75 - 95+ to minimise sample error.
- Prevalence rates were smoothed.



## CANADA HE-1 (CAN1)

### Source publication(s)

- Wilkins R, Adams OB. Health expectancy in Canada, late 1970s: Demographic, Regional, and Social Dimensions. *Am J Public Health* 1983;73(9):1073-1080
- Wilkins R, Adams OB. Changes in the healthfulness of life of the elderly population: an empirical approach. *Rev Epidém et Santé Publ* 1987;35:225-235.
- Wilkins R, Adams O. Quality-adjusted life expectancy: weighting of expected years in each state of health. In: Robine J-M, Blanchet M, Dowd JE (ed). *Health Expectancy*. First workshop of the International Health Expectancy network (REVES). London: HMNO, 1992. p 71-73
- Wilkins R, Adams O. Healthfulness of life. Institute for Research Policy. Montreal 1983.

NOTE: This fact sheet only gives the details of the calculation of the health expectancy for 1978 as described in these papers.

### Aspect of (ill)health used

institutionalization

long term disability: activity limitation

short-term disability: bed days and cut-down days (restricted activity)

### Sources of data on rates of (ill)health

Institutionalization: Annual returns from hospitals and special care facilities (total volume) and admission/separation data (sex-age distribution).

Long-term disability and short-term disability: Canadian Health Survey 1978-79.

### Details of survey data used

Institutionalization: Staying in long-term care units, long-stay public psychiatric hospitals, long-term special care facilities (excluding residents receiving room and board only). Special care facilities include homes for the aged, mentally retarded, and physically handicapped.

**Activity limitations:****Based on the following questions:**

What was -- doing most of the past 12 months? Depending on the answer to this question, the following questions were asked:

- working --> Is -- limited in the kind or amount of work he (she) can do because of his (her) health?  
(If not) Is -- limited in any way because of his (her) health?
- keeping house --> Is -- limited in the kind or amount of housework he (she) can do because of his (her) health?  
(If not) Is -- limited in any way because of his (her) health?
- school --> Does -- have to go to a certain type of school because of his (her) health?  
(If not) Is -- limited in any way because of his (her) health?
- retired/not working --> Does --'s health now keep him (her) from work, keeping house or going to school?  
(If not) Is -- limited in the kind or amount of activities he (she) can do because of his (her) health?  
(If not) Is -- limited in any way because of his (her) health?
- child 1-6 --> Is -- able to take part at all in ordinary play with other children?  
(If yes) Is -- limited in the kind or amount of play he (she) can participate in because of his (her) health?  
(If not) Is -- limited in any way because of his (her) health?
- Baby --> Is -- limited in any way because of his / her health?

From these questions three levels of disability were defined:

1. Major activity (work, school or housework) impossible
2. Major activity (work, school or housework) restricted
3. Only minor activity restricted

Short-term disability (rates were based on persons who did not report long-term disability):

Questions used were:

The next few questions refer to the past 2 weeks.

What was -- doing most of those 2 weeks? working / housework / school / retired / child 1-6 / baby under 1 / other

During those 2 weeks did you stay in bed at all because of your health? y/n

If yes, how many days did you stay in bed for all or most of the day (including any nights spent as patient in a hospital)?

The next 2 questions were only asked of those answering working / housework / school above:

During those 2 weeks, did -- 's health keep him (her) from { work / housework / school } at all? no / yes

How many days did illness or injury keep -- from { work / housework / school } for all or most of the day?

Were there any other days during those 2 weeks when -- cut down on things he (she) usually does because of his (her) health? (Again, not counting both the days in bed and days lost from { work / housework / school } ) How many days did -- cut down for all or most of the day?

#### **Details of the survey(s) used**

Response rate: over 95%

Institutional population included: no

Age groups included: all

#### **Age categories used**

0-14; 15-24 ; 25-44 ; 45-64; 65+

#### **Calendar years of calculation**

Life table: 1978

Survey data: 1978-79

Institutionalization: 1978

#### **Remarks**

- In these papers health expectancies also are presented according to region, community size and socio-economic class. In this fact sheet details on these aspects are not given.

## CANADA HE-2 (CAN2)

### Source publication(s)

- Wilkins R. Adams O. Health Expectancy in Canada, 1986. Presentation at REVES 1. In: Health Expectancy. In: Robine J-M, Blanchet M. Dowd JE (ed). Health Expectancy. First workshop of the International Health Expectancy network (REVES). London: HMNO, 1992, pp 57-60

### Aspect of (ill)health used

Long-term disability (physical or mental) according to severity

### Sources of data on rates of (ill)health

1986 Health and Activity Limitations Survey 1986-87

### Details of survey data used

The disability questions were (all with two possible answers, yes and no):

1. Do you have any trouble hearing what is said in a normal conversation with one other person?
2. Do you have any trouble hearing what is said in a group conversation with at least three other people?
3. Are you able to hear what is being said over the telephone?
4. Do you have any trouble seeing clearly the print on this page?
5. Do you have any trouble seeing clearly the face of someone from 12 feet / 4 metres (example: across a room), with glasses if normally worn?
6. Have you been diagnosed by an eye specialist as being legally blind?
7. Do you have any trouble speaking and being understood because of a condition or health problem?
8. Do you have any trouble walking 400 yards/400 metres without resting (about a quarter of a mile)?
9. Do you have any trouble walking up and down a flight of stairs, that is about 12 steps?
10. Do you have any trouble carrying an object of 10 pounds for 30 feet/5 kg for 10 metres (example: carrying a 10 pound bag of flour)?
11. Do you have any trouble moving from one room to another or moving about in a room?
12. Do you have any trouble standing for long periods of time, that is, more than 20 minutes?

13. Do you have any trouble bending down and picking up an object from the floor (example: a shoe)?
14. Do you have any trouble dressing and undressing yourself?
15. Do you have any trouble getting in and out of bed?
16. Do you have any trouble cutting your own toenails or tying your own shoelaces?
17. Do you have any trouble using your fingers to grasp or handle, for example using scissors or pliers?
18. Do you have any trouble reaching in any direction (example: above your head)?
19. Do you have any trouble cutting your own food?
20. Because of a long-term physical condition or health problem, that is, one that is expected to last 6 month or more, are you limited in the kind or amount of activity you can do (i) at home? (ii) at school? (iii) or supporting yourself by such activities as fishing, trapping or crafts? (iv) in other activities such as travel, sports, or leisure?
21. Has a school, or a health professional ever told you that you have a learning disability?
22. From time to time, everyone has trouble remembering the name of a familiar person, or learning something new, or they experience moments of confusion. However, do you have any ongoing problems with your ability to remember or learn?
23. Because of a long-term emotional, psychological, nervous, or mental health condition, are you limited in the kind or amount of activity you can do?

For children below 15 years, other questions were used.

Each question was followed by further questions about the severity of the limitation.

A disability score was calculated: for each question 1 point was given in case of partial loss of function, and 2 points in case of severe loss of function. Persons were classified as:

- no disability: score 0
- slight disability: score 1-4
- moderate disability: score 5-10
- severe disability: score 11+

#### **Details of the survey(s) used**

response rate: household component: 93%;

institutions component: 99%

institutional population included: yes

age groups included: all

The HALS was linked to the 1986 census. Census information was used to develop a sample frame for the HALS, in which persons with activity limitations (according to census information) were oversampled. Also a separate sample was taken of those living in institutions. Weighing was applied to obtain rates that are representative for the entire population.

**Age categories used**

0-14, 15-24, 25-34, 35-54, 55-64, 65-74, 75-84, 85+

**Calendar years of calculation**

life table: 1985-87

survey data: 1986

**Remarks**

## CANADA HE-3 (CAN3)

### Source publication(s)

- Wilkins R, Adams O. Health Expectancy trends in Canada, 1951-1986. Presentation at REVES 1. In: Health Expectancy. In: Robine J-M, Blanchet M, Dowd JE (ed). Health Expectancy. First workshop of the International Health Expectancy network (REVES). London: HMNO, 1992, pp 109-112.

NOTE: in this paper trends in rates of activity limitations, institutionalization and mortality are described using multiple data sources. The fact sheet describes the health expectancies calculated in this paper with 1926, 1951 and 1986 life tables, using constant disability rates.

### Aspect of (ill)health used

Long-term disability (physical or mental) according to severity

### Sources of data on rates of (ill)health

1986 Health and Activity Limitations Survey 1986-87

### Details of survey data used

Disability rates from HALS, see CAN2 for details.

### Details of the survey(s) used

response rate: household component: 93%; institution component: 99%

institutional population included: yes

age groups included: all

### Age categories used

0-14, 15-24, 25-34, 35-54, 55-64, 65-74, 75-84, 85+

### Calendar years of calculation

life table: 1926, 1951, 1986

disability rates: 1986

### Remarks

## **CANADA HE-4 (CAN4)**

### **Source publication(s)**

- Lamb VL. Measuring Health expectancy in Canada: An empirical assessment using the 1985 Canadian General Social Survey. Paper presented at the 85th annual meeting of the American Sociological Association in Washington D.C. August 1990.

### **Aspect of (ill)health used**

disability  
being institutionalized.

### **Sources of data on rates of (ill)health**

Source: Canadian General Social Survey 1985

Data on institutionalization: 1981 census data on inmates of hospitals and related institutions

### **Details of survey data used**

Having trouble doing at least one out of nine tasks on an average day. The nine tasks are:  
walking 400 metres

walking up and down stairs

carrying an object weighing 5 kilograms 10 metres

standing for a long period of time (20 minutes or more)

bending down to pick up an object from the floor

cutting one's toenails

using one's fingers to grasp or handle

reaching above one's head

seeing well enough to read the newspaper (includes wearing glasses)

### **Details of the survey(s) used**

response rate: 86.5% for those under 65, and 83.3% for those over 65 years of age

institutional population included: no

age groups included: 15+

This was a national survey, but residents of the Yukon and northwest Territories were excluded.

Elderly were oversampled, but results were weighted to represent the target population

**Age categories used**

15-24 ; 25-34 ; 35-44 ; 45-54 ; 55-64 ; 65-74 ; 75+

**Calendar years of calculation**

Life table: 1986

Survey data: 1986

Institutionalization: 1981

**Remarks**



## DENMARK HE-1 (DEN1)

### Source publication(s)

- N.Kr. Rasmussen - H. Brønnum-Hansen. The expectation of life without disability in Denmark. Presentation to the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- The Danish Institute for Clinical Epidemiology. The Danish Health and Morbidity Survey 1986-1987. Interview schedule. Translation by Hanne Faergeman.
- Henrik Brønnum-Hansen. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolkning. København, Dansk Institut for Klinisk Epidemiologi, 1990.

### Aspect of (ill)health used

longstanding illness

### Sources of data on rates of (ill)health

Danish Health and Morbidity Survey 1986/1987

### Details of survey data used

Questions used:

Do you suffer from any longstanding illness, longstanding sequelae from injury, any handicap or other longstanding complaint? yes/no

### Details of the survey(s) used

response rate: 80%

institutional population included: yes

age groups: 16+

### Age categories used

16-25, 26-35 ; 36-45 ; 46-55 ; 56-65 ; 66-75 ; 76+

### Calendar years of calculation

life table: 1986-1987

survey data: 1986/87

**Remarks**

A second calculation was made, using a correction for duration of illness.

**Other remarks**

## DENMARK HE-2 (DEN2)

### Source publication(s)

- N.Kr. Rasmussen - H. Brønnum-Hansen. The expectation of life without disability in Denmark. Presentation to the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- The Danish Institute for Clinical Epidemiology. The Danish Health and Morbidity Survey 1986-1987. Interview schedule. Translation by Hanne Faergeman.
- Henrik Brønnum-Hansen. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolkning. København, Dansk Institut for Klinisk Epidemiologi, 1990.

### Aspect of (ill)health used

perceived global health

### Sources of data on rates of (ill)health

Danish Health and Morbidity Survey 1986/1987

### Details of survey data used

Questions used:

How would you judge your present state of health in general? Very good/good/fair/poor/very poor  
Those answering Very good, good or fair were defined as having good perceived global health

### Details of the survey(s) used

response rate: 80%

institutional population included: yes

age groups: 16+

### Age categories used

16-25, 26-35 ; 36-45 ; 46-55 ; 56-65 ; 66-75 ; 76+

### Calendar years of calculation

life table: 1986-1987

survey data: 1986/87

### Remarks

## DENMARK HE-3 (DEN3)

### Source publication(s)

- N.Kr. Rasmussen - H. Brønnum-Hansen. The expectation of life without disability in Denmark. Presentation to the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- The Danish Institute for Clinical Epidemiology. The Danish Health and Morbidity Survey 1986-1987. Interview schedule. Translation by Hanne Faergeman.
- Henrik Brønnum-Hansen. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolknig. København, Dansk Institut for Klinisk Epidemiologi, 1990.

### Aspect of (ill)health used

perception of being well enough to do what one wants to do

### Sources of data on rates of (ill)health

Danish Health and Morbidity Survey 1986/1987

### Details of survey data used

Questions used:

Do you feel well enough to do what you want to do?

yes, most of the time/yes, now and then/ no (hardly ever)/don't know

Those answering 'no (hardly ever)' were considered to be in ill health.

### Details of the survey(s) used

response rate: 80%

institutional population included: yes

age groups: 16+

### Age categories used

16-25, 26-35 ; 36-45 ; 46-55 ; 56-65 ; 66-75 ; 76+

**Calendar years of calculation**

life table: 1986-1987

survey data: 1986/87

**Remarks**

## DENMARK HE-4 (DEN4)

### Source publication(s)

- N.Kr. Rasmussen - H. Brønnum-Hansen. The expectation of life without disability in Denmark. Presentation to the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- The Danish Institute for Clinical Epidemiology. The Danish Health and Morbidity Survey 1986-1987. Interview schedule. Translation by Hanne Faergeman.
- Henrik Brønnum-Hansen. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolkning. København, Dansk Institut for Klinisk Epidemiologi, 1990.

### Aspect of (ill)health used

long term disability

### Sources of data on rates of (ill)health

Danish Health and Morbidity Survey 1986/1987

### Details of survey data used

Questions used:

Over the past 2 weeks has illness, injury, or a complaint made it difficult or impossible for you to carry out your ordinary daily activities (e.g. domestic work or work outside the home, spare time activities, etc.)? yes, number of days/no

If yes: Have these difficulties/limitations been of a more constant nature? By constant is meant that the difficulties/limitations are expected to last 6 months or more? yes/no

### Details of the survey(s) used

response rate: 80%

institutional population included: yes

age groups: 16+

### Age categories used

16-25, 26-35 ; 36-45 ; 46-55 ; 56-65 ; 66-75 ; 76+

**Calendar years of calculation**

life table: 1986-1987

survey data: 1986/87

**Remarks**

## DENMARK HE-5 (DEN5)

### Source publication(s)

- N.Kr. Rasmussen - H. Brønnum-Hansen. The expectation of life without disability in Denmark. Presentation to the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- The Danish Institute for Clinical Epidemiology. The Danish Health and Morbidity Survey 1986-1987. Interview schedule. Translation by Hanne Faergeman.
- Henrik Brønnum-Hansen. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolknig. København, Dansk Institut for Klinisk Epidemiologi, 1990.

### Aspect of (ill)health used

restriction of physical functioning

### Sources of data on rates of (ill)health

Danish Health and Morbidity Survey 1986/1987

### Details of survey data used

Questions used:

The next questions concern your ability to cope with everyday activities, e.g. with aids such as eyeglasses, cane, etc. Disregard temporary problems.

Are you able to do the following with no difficulty, with minor difficulty, with major difficulty, or not at all?

- read ordinary newspaper print (with glasses, if normally worn)
- hear what is said in a normal conversation with 3 or more other people (with hearing aid if normally worn)
- (to be answered by interviewer) speaks with no difficulty/speaks with some difficulty/speaks with major difficulty
- walk 400 metres without resting
- walk up and down a flight of stairs without resting
- carry 5 kilos (e.g. a shopping bag)

Those having major difficulty with at least one of these activities are defined as having a restricted physical function.

**Details of the survey(s) used**

response rate: 80%

institutional population included: yes

age groups: 16+

**Age categories used**

16-25, 26-35 ; 36-45 ; 46-55 ; 56-65 ; 66-75 ; 76+

**Calendar years of calculation**

life table: 1986-1987

survey data: 1986/87

**Remarks**

## DENMARK HE-6 (DEN6)

### Source publication(s)

- N.Kr. Rasmussen - H. Brønnum-Hansen. The expectation of life without disability in Denmark. Presentation to the XII. Scientific meeting of the International Epidemiological Association. Los Angeles, California, USA, August 5-9, 1990.
- The Danish Institute for Clinical Epidemiology. The Danish Health and Morbidity Survey 1986-1987. Interview schedule. Translation by Hanne Faergeman.
- Henrik Brønnum-Hansen. Tabte gode leveår. Forventet levetid med sygdom, handicap, dårligt helbred m.m. i den danske voksnebefolkning. København, Dansk Institut for Klinisk Epidemiologi, 1990.

### Aspect of (ill)health used

receiving disability pension

### Sources of data on rates of (ill)health

Danish Health and Morbidity Survey 1986/1987

### Details of survey data used

Questions used:

Do you receive any kind of pension?

if yes: What kind of pension do you receive?

age conditional pension / health conditional early retirement pension / non-health conditional early retirement pension / other

### Details of the survey(s) used

response rate: 80%

institutional population included: yes

age groups: 16+

### Age categories used

16-25, 26-35 ; 36-45 ; 46-55 ; 56-65 ; 66-75 ; 76+

**Calendar years of calculation**

life table: 1986-1987

survey data: 1986/87

**Remarks**



## FINLAND HE-1 (FIN1)

### Source publication(s)

- Pettersson H. Hälsoidex för den svenska befolkningen. Rappot från ett utvecklingsprojekt.  
Statistika centralbyrån, 1992.

### Aspect of (ill)health used

Simple health index, comparable for Sweden, Finland and Norway

### Sources of data on rates of (ill)health

Finland Survey of Living Conditions 1987

### Details of survey data used

Questions used:

Do you suffer from any long-term illness, after-effects of an accident, disability or other ailment (y/n)?

If yes:

Is your working capacity reduced as a consequence of your illness(es)?

To old-age pensioners: Do you find it difficult to carry out any of your normal activities as a consequence of your illness(es)? to a large extent / to some extent / not at all

From these questions 3 categories were formed:

- no long-term illness (full health)
- long-term illness, but working capacity not or only somewhat reduced (slightly unhealthy)
- severely reduced working capacity (severely unhealthy)

### Details of the survey(s) used

response rate: 87%

institutional population included: no

age groups: 16+

### Age categories used

16-24; 25-34; 35-44 ; 45-54; 55-64 ; 65-74 ; 75-84

**Calendar years of calculation**

Life table: 1988

Survey data: 1988

**Remarks**

A health expectancy for Finland was calculated for the purpose of comparison with Sweden.

However, in the Swedish survey the institutional population was included, while this was not the case in the Finnish survey.

Since Swedish data were only available for the ages 16-84, partial health expectancies were calculated.

## FRANCE HE-1 (FRA1)

### Source publication(s)

- Robine JM and Colvez A. Espérance de vie sans incapacité en France en 1982. Population 1986;6:1025-1042.

### Aspect of (ill)health used

- institutionalized or
- disabled; divided into
  - long-term; divided into:
    - \* any long-term disability
    - \* not able to leave the house (with or without help)
  - short-term

### Sources of data on rates of (ill)health

L'enquête sur la santé et les soins médicaux 1980-1981

Institutional population: 1982 census

### Details of survey data used

- Institutionalized: population in:
  - nursing homes (pensionnaires d'un établissement hospitalier)
  - psychiatric hospitals
  - homes for the elderly (hospice ou maison de retraite)
- Long-term disability:

Are you handicapped or do you simply have difficulties or are impeded in your daily life?  
(y/n)

If yes: is the person: not able to get up / able to get up a little / able to leave the home with the help of another person / able to leave the home but needing equipment or a cane / not needing any kind of aid, but some limitations or impediments remain / no problems.

In this study the first two categories and the last 4 were combined.

- Short-term:

Since the last visit of the interviewer (three month ago); Number of days that daily activities (work, study, keeping house etc) have been interrupted due to health problems; Number of days the person had to stay in bed at least half the day due to health problems.

The duration of periods that began before the previous visit of the interviewer or that ended after the current interview was unknown. In the calculations the duration of these periods was assumed to be double the duration of the period of activity restriction/being bedridden observed between the two visits of the interviewer.

The percentage of short-term disability was calculated only for those without permanent disability.

**Details of the survey(s) used**

response rate: This was a 4-wave survey. 6% refused to participate (although the number that did not complete all 4 waves was higher); Percentages were weighted to correct for non-response.

institutional population included: no

age groups included: all

one person answered for all household members

**Age categories used**

65-69 ; 70-74 ; 75-79 ; 80-84 ; 85+

**Calendar years of calculation**

Life table: 1982

Institutional population: 1982

Survey data: 1980-1981

**Remarks**

**(WEST)-GERMANY HE-1 (GER1)****Source publication(s)**

- Brown, C. Aging and disability trends in the third world. Center for assessment and demographic studies. Gallaudet research institute, Washington DC.
- United Nations Statistical Office, Department of International Economic affairs. United Nations Disability Statistics Data Base, Version 1 (c). United Nations Secretariat, New York, 1988.

**Aspect of (ill)health used**

disability

**Sources of data on rates of (ill)health**

Registry of 'Behinderte' 1983, as present in DISTAT

**Details of registry data used**

Person registered as "Behinderte" (limited person) in 1983. The registry of "Behinderte" lists persons with physical, mental and emotional states that limit work participation. To qualify for registration one's ability to work has to be limited by 30% or more. Registration is voluntary, but tax incentives and other incentives are strong and increase with degree of handicap.

**Details of the registry**

Not all handicapped persons are registered. Especially those with minor handicaps, those who became handicapped before 1974 and those already registered in a pension program may not be registered. On the other hand, removal of names from the register is not optimal: those whose handicap has disappeared or who have died may still be listed; those who move to another state within the federal republic may not be removed from the registry in their old state while being entered in the registry of the new state.

**Age categories used**

0,1-4,5-9,10-14,15-19,.....,90+

**Calendar years of calculation**

Mortality data from 1982/1984; morbidity data 1983

**Remarks**

## (WEST)-GERMANY HE-2 (GER2)

### Source publication(s)

- Egidi V. Population ageing and changing lifestyles in Europe. Paper presented on the Seminar on present demographic trends and lifestyles in Europe. Strasbourg, 18-20 september 1990.

### Aspect of (ill)health used

Perceived health

### Sources of data on rates of (ill)health

Federal Republic of Germany Microcensus 1986 (?). Not quite clear from the publication.

### Details of survey data used

In microcensus:

In the last 4 weeks (including today) have you been ill (including chronic illness) or injured by an accident? yes, ill / yes, injured / no

### Details of the survey(s) used

response rate: 88 %

institutional population included: yes

age groups included: all

### Age categories used

As published in the official statistics

### Calendar years of calculation

life table: 1986

survey data: 1986

### Remarks

The questions measure something rather different from self-perceived health as usually measured.

## ITALY HE-1 (ITA1)

### Source publication(s)

- Egidi V. Stato di salute e morbosità della popolazione. in: The Second report on the Italian demographic situation . Rome, Istituto di ricerche sulla popolazione, 1988. pp 115-123.

### Aspect of (ill)health used

- In institutions
- Perceived health (short-term)
- Being bedridden

### Sources of data on rates of (ill)health

Survey on health conditions (Indagine sulle condizioni di salute) ISTAT 1983

### Details of survey data used

- Perceived health:  
Were you always in good health in the past 2 week? yes, number of days / no
- Being bedridden:  
How many days during the past 2 weeks have you had to stay in bed most of the day because of health reasons (excluding days spent in hospital)?

### Details of the survey(s) used

response rate: approx. 94%

institutional population included: yes

age groups included: all

### Age categories used

In the presentation:

0-13 ; 13-29 ; 30-39 ; 40-49 ; 50-59 ; 60-70 ; 71+

It is not clear if these intervals were also used in the calculations

### Calendar years of calculation

Life table: 1982

Survey data: 1983

### Remarks



## THE NETHERLANDS HE-1 (NET1)

### Source publication(s)

- Ginneken JKS, Dissevelt AG, Water HPA van de, Sonsbeek JLA van. Results of two methods to determine health expectancy in the Netherlands in 1981-1985. *Soc Sci Med* 1991;32(10):1129-1136
- Ginneken JKS van, Bannenberg AFI, Disselveld AG. Gezondheidsverlies ten gevolge van een aantal belangrijke ziektecategorieën in 1981-1985: methodologische aspecten en resultaten (Loss of health due to some important disease categories in 1981-1985: methodological aspects and results). (In Dutch). Leyden: NIPG-TNO, 1989. Publ.nr. 89.064.

The results are also given in the following publications:

- Ginneken JKS, Water HPA van de. A comparison of four methods to determine life expectancy free of disability in the Netherlands. Paper presented at the second workshop on international geographic comparison of health expectancy in Geneva, March 15-16 1990.
- Ginneken JKS, Water HPA van de, Sonsbeek JLA van. Gezonde levensverwachting: betekenis en resultaten. In: Gunning-Schepers LJ, Mootz M (ed). *Gezondheidsmeting*. Houten, Bohn Stafleu Van Loghum, 1992.

### Aspect of (ill)health used

In institutions and long-term and short-term disability

### Sources of data on rates of (ill)health

Household population: NCBS Health Interview survey 1984-1985 (long-term disability) and 1983-1986 (short-term disability);

Institutional population: from several sources, as collected by the NCBS.

### Details of survey data used

Long-term disability:

Measured by means of the OECD indicator, using the following 10 questions:

- Are you able to follow a conversation in a group of 3 or more persons?
- Are you able to have a conversation with one other person?
- Are your eyes good enough to read the small print in a newspaper? (if necessary with glasses)
- Are you able to recognize someone's face at a distance of 4 metres?
- Are you able to carry an object weighing 5 kilos, for instance a full shoppingbag, 10 metres?

- If you are standing, are you able to bend down and pick something up from the floor?
- Are you able to walk 400 metres without resting?
- Are you able to dress and undress yourself?
- Are you able to get in and out of bed yourself?
- Are you able to move between rooms on the same floor?

Answers: yes, with no difficulty / yes, with minor difficulty / yes, with major difficulty / no, I am not able to do this

Cited above are the 1984 questions. Slight differences in wording existed between the years

Those who answered: 'Yes, with major difficulty' or 'no' to at least one question were considered disabled.

#### Short-term disability:

During the last two weeks, did you reduce your activities or refrain from doing things that you usually do because of illness or injury? yes/no; If yes:

How many days of the past 14 days did this last? (including Saturdays and Sundays)

#### Details of the survey(s) used

response rate: approx 63%

institutional population included: no

age categories included: all, except that the questions of the OECD list, were only posed to those over 16

#### Age categories used

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+

#### Calendar years of calculation

life table: 1981-1985

data on institutionalization: 1983-84

health survey data: 1984-1985 (long-term) and 1983-1986 (short-term)

### **Remarks**

Only part of the population of homes for the elderly was considered to be in poor health. The fraction being healthy was estimated from the quality of living survey of 1982.

OECD indicator is available only for those over 16. For those under 16 an estimation was made based on the percentage with a longstanding-limiting illness.

A correction factor was used to adjust for the fact that long-term and short-term disability of the same person is counted twice.

## THE NETHERLANDS HE-2 (NET2)

### Source publication(s)

- Ginneken JKS, Dissevelt AG, Water HPA van de, Sonsbeek JLA van. Results of two methods to determine health expectancy in the Netherlands in 1981-1985. *Soc Sci Med* 1991;32(10):1129-1136
- Ginneken JKS van, Bannenberg AFI, Disselveld AG. Gezondheidsverlies ten gevolge van een aantal belangrijke ziektecategorieën in 1981-1985: methodologische aspecten en resultaten (Loss of health due to some important disease categories in 1981-1985: methodological aspects and results). (In Dutch). Leyden: NIPG-TNO, 1989. Publ.nr. 89.064.

The results are also given in the following publications:

- Ginneken JKS, Water HPA van de. A comparison of four methods to determine life expectancy free of disability in the Netherlands. Paper presented at the second workshop on international geographic comparison of health expectancy in Geneva, March 15-16 1990.
- Ginneken JKS, Water HPA van de, Sonsbeek JLA van. Gezonde levensverwachting: betekenis en resultaten. In: Gunning-Schepers LJ, Mootz M (ed). *Gezondheidsmeting*. Houten, Bohn Stafleu Van Loghum, 1992.

### Aspect of (ill)health used

In institutions or

with poor perceived health

### Sources of data on rates of (ill)health

Household population: NCBS Health Interview survey 1983-1985.

Institutional population: from several sources, as collected by the NCBS.

### Details of survey data used

Question used for perceived health:

What in general is your state of health: very good / good / fair / sometimes good and sometimes bad / bad. Those answering very good or good are considered to be in good health.

The rates were corrected by van Ginneken, because he presumed that some of the respondents were only temporarily in less than good health. This correction decreased the rates by 8% (men) and 6% (women), respectively.

**Details of the survey(s) used**

response rate: approx 63%

institutional population included: no

age categories included: all:

**Age categories used**

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+

**Calendar years of calculation**

life table: 1981-1985

data on institutionalization: 1983-84

health survey data: 1983-1985

**Remarks**

Only part of the population of homes for the elderly was considered to be in poor health; the same correction factor was used as in NED1.

## NETHERLANDS HE-3 (NED3)

### Source publication(s)

- Ginneken JKS, Water HPA van de. A comparison of four methods to determine life expectancy free of disability in the Netherlands. Paper presented at the second workshop on international geographic comparison of health expectancy in geneva. March 15-16 1990.

### Aspect of (ill)health used

Institutionalization and

Quality of Life and

Short-term disability

### Sources of data on rates of (ill)health

Short-term disability: NCBS Health Interview Survey 1983-1986

Quality of life: For those over 55 years of age: Quality of Living Survey of the Dutch population of 55 years and over (1982); for those younger than 55 years of age: NCBS Health Interview Survey 1984-1985.

Institutional population: from several sources (as collected by the NCBS).

### Details of survey data used

Short-term disability: During the last two weeks, did you reduce your activities or refrain from things that you usually do because of illness or injury? yes/no; If yes:

How many days of the past 14 days did this last? (including Saturdays and Sundays)

Quality of life:

For those 55 years and older: Data from a 10-item ADL-scale. This scale was:

I will now cite some activities which some persons sometimes have trouble doing. Please indicate for each whether you are able to do this without trouble, with trouble or only with the help of others?

Eat and drink

sit down in and get up out of a chair

get in and out of bed

dress and put on shoes and undress

move to another room on the same floor

walk up and down stairs  
leave and enter your house  
move around outside the house  
wash face and hands  
wash completely (bath, shower)

Those having difficulty with at least one of these activities are defined as disabled

For those below 55 years of age: Measured with the OECD indicator, using the following 10 questions:

- Are you able to follow a conversation in a group of 3 or more persons?
- Are you able to have a conversation with one other person?
- Are your eyes good enough to read the small print in a newspaper? (if necessary with glasses)
- Are you able to recognize someone's face at a distance of 4 metres?
- Are you able to carry an object weighing 5 kilo, for instance a full shoppingbag, for 10 metres?
- If you are standing, are you able to bend down and pick something off the floor?
- Are you able to walk 400 metres without resting?  
Are you able to dress and undress yourself?
- Are you able to get in and out of bed yourself?
- Are you able to move between rooms on the same floor?

Answers: yes, with no difficulty / yes, with minor difficulty / yes, with major difficulty / no, I am not able to do this. Those answering 'yes, with major difficulty' or 'no, I am not able to do this' are considered disabled.

Cited above are the 1984 questions. Slight differences in wording existed between the years

#### Age categories used

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+

#### Calendar years of calculation

Life table: 1981-1985

Institutional population: 1983-1984

Survey data: 1982 and 1983-86

### **Remarks**

Only part of the population of homes for the elderly was considered to be in poor health; the fraction of inmates in good health was estimated from the 1982 quality of life survey. This factor was identical for NED1 to NED5. A correction factor was applied to correct for the overlap between long- and short-term disability.

The OECD indicator was available only for those over 16. For those under 16 an estimation was made based on the percentage with a longstanding-limiting illness.

This method (and NED4) is regarded by the authors as less suitable than methods 1 and 2. They are presented for the purpose of a methodological discussion.

**NETHERLANDS HE-4 (NED4)****Source publication(s)**

- Ginncken JKS, Water HPA van de. A comparison of four methods to determine life expectancy free of disability in the Netherlands. Paper presented at the second workshop on international geographic comparison of health expectancy in geneva. March 15-16 1990.

**Aspect of (ill)health used**

short-term disability and

long-term physical handicaps and disability

**Sources of data on rates of (ill)health**

NCBS Survey on physical handicaps 1971-1972 (long-term disability)

NCBS Health Interview Survey 1983-1986 (short-term disability)

**Details of survey data used**

Short-term disability:

During the last two weeks, did you reduce your activities or refrain from doing things that you usually do because of illness or injury? yes/no; If yes:

How many days of the past 14 days did this last? (including Saturdays and Sundays)

Long-term disability from a survey on physical handicaps. This was a two-stage survey. Screening questions were:

- Are you able to move and use both feet and legs completely and normally? y/n
2. Do you have back trouble which causes you to have difficulty in walking? y/n
  3. Are you able to move and use both arms and hands completely and normally? y/n
  4. Do you see well with both eyes?
  5. Do you hear well with both ears?
  6. Do you have trouble speaking clearly understandable
  7. Do you tire very quickly or have less endurance, breathing trouble, shortness of breath, moments of laboured breathing, palpitations, pain in the chest, heart or lung trouble?
  8. Do you have severe health problems, a long-term illness, a chronic illness: are you permanently or periodically bedridden?

9. Do you have any other physical abnormality or disorder, present since birth and not yet mentioned?
10. Do you have any other physical abnormality or disorder due to illness or old age?
11. Do you have any other complaints, impairments or lasting effects of a previous accident which have not yet been mentioned?

Those who answered yes to one of these questions were further interviewed, to see whether they fulfilled the criteria of the survey for physical disability. This definition was twofold: either some functional impairment of walking, arm-hand function, seeing, hearing, speaking, endurance, continence (urine/facces), balance or other; or not being able to carry out normal activities or being bedridden (continuously or periodically) for 6 month or longer.

#### **Age categories used**

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+

#### **Calendar years of calculation**

Life tables: 1981-1985

Survey data: for long-term disability 1971-1972, and for short-term disability 1983-86

#### **Remarks**

A correction factor was applied to correct for the overlap between long-term and short-term disability.

This method was regarded by the authors as less suitable than NED1 and NED2. It was presented for the purpose of a methodological discussion.

## NETHERLANDS HE-5 (NED5)

### Source publication(s)

- Ginneken JKS, Water HPA van de, Sonsbeek JLA van. Gezonde levensverwachting: betekenis en resultaten. In: Gunning-Schepers LJ, Mootz M (ed). Gezondheidsmeting. Houten. Bohn Stafleu Van Loghum. 1992.
- NCBS/NIMAWO. Physical disability in the population of the netherlands 1986-1988The Hague. SDU/publishers. 1990. CBS-publication

### Aspect of (ill)health used

short-term disability and

long-term physical handicaps and disability

### Sources of data on rates of (ill)health

Institutional population: from several sources (as collected by the NCBS).

Household population: NCBS Health Interview Survey 1983-1986 (short-term) and 1986-88 (long-term)

### Details of survey data used

Short-term disability:

During the last two weeks, did you have reduce your activities or refrain from doing things that you usually do because of illness or injury? yes/no; If yes:

How many days of the past 14 days did this last? (including Saturdays and Sundays)

Long-term disability from a survey on physical handicaps. This was a two-stage survey. Screening questions were:

Screening questions:

1. Do you have any difficulty in using your feet, legs or hips?
2. Is (part of) one of your legs or feet absent?
3. Do you suffer backaches?
4. Do you have any difficulty in using your arms or hands?
5. Is (part of) one of your arms or (part of) one of your hands absent?
6. Do you suffer from dizzy spells or loss of balance?
7. Do you suffer from fits or convulsions?

8. Do you have difficulty seeing (with spectacles or contact lenses if usually worn)?
9. Do you have a hearing aid?
10. Do you have difficulty hearing?
11. Do you have difficulty speaking?
12. Do you have a heart condition?
13. Do you have any lung or respiratory complaints?
14. Do you have any difficulty controlling your bladder or bowels?

Those who answered yes to one of these questions were further interviewed and asked about the presence and severity of disabilities resulting from those impairments. Questions were asked about disabilities involving walking (after yes to 1-3), sitting down/getting up (yes to 1-3), sitting/standing (yes to 1-3), using arms/hands (yes to 4 or 5), being confined (yes to 6 or 7), seeing (yes to 8), hearing (yes to 9 or 10), speaking (yes to 11), endurance (yes to 12 or 13) and continence (yes to 14). Disabilities were divided into: severe, moderate or minor. For the calculation of health expectancies, the prevalence of at least one severe disability was used. The following list shows the cut-off points that were used for a severe disability. A severe disability included:

- Can only walk (indoor or outdoors) with a walking aid;
- needs help to get into and out of bed or to sit down or get up;
- cannot stand for 10 minutes;
- cannot lift an object with one of his/her hands;
- is sometimes not able to go out alone, play in the street, travel by public transport, ride a bicycle without extra risks;
- cannot recognize faces of people at the other side of a room;
- cannot hear what is said during a conversation with at least four persons, even with hearing aid;
- cannot or only barely speak intelligibly or is difficult to understand for strangers;
- suffers regularly from constriction, short windedness, lack of air, or cardiac complaints when walking for ten minutes without stopping;
- has difficulty controlling bladder or bowels one or several times a week

#### **Age categories used**

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+

**Calendar years of calculation**

Life tables: 1981-1985

Institutional population: 1983-1984

Survey data: for long-term disability 1986-1988, and for short-term disability 1983-86

**Remarks**

A correction factor was applied to correct for the overlap between long-term and short-term disability.

Only part of the population of homes for the elderly was considered to be in poor health; the fraction of inmates in good health was estimated from the 1982 quality of life survey. This factor is identical for NED1 to NED3.

## THE NETHERLANDS HE-6 (NED6)

### Source publication(s)

- Perenboom RJM, Boshuizen HC, Water HPA van de. Trends in health expectancies in the Netherlands, 1981-1990. In: Robine J-M, Mathers CD, Bone MR, Romieu I (ed). Calculation of health expectancies: harmonization, consensus achieved and future perspectives. Colloque INSERM 226. John Libbey Eurotext, 1993.
- Boshuizen HC, Perenboom RJM, Water HPA van de. Trends in Gezonde Levensverwachting in Nederland 1981-1990. Deel I: Resultaten (Trends in health expectancy in the Netherlands 1981-1990. Part I: Results). (In Dutch). NIPG-publicatie nr 92.098. Leyden, Nederlands Instituut voor Praeventieve Gezondheidszorg TNO, 1992.
- Perenboom RJM, Boshuizen HC, Water HPA van de. Trends in Gezonde Levensverwachting in Nederland 1981-1990. Deel II: Methodische Aspecten (Trends in health expectancy in the Netherlands 1981-1990. Part II: Methodological aspects). (In Dutch). NIPG-publicatie nr 92.099. Leyden, Nederlands Instituut voor Praeventieve Gezondheidszorg TNO, 1992.

### Aspect of (ill)health used

In institutions and long-term and short-term disability

### Sources of data on rates of (ill)health

NCBS Health Interview survey 1983, 1984, 1985, 1989, 1990

Institutional data from the administration of the AWBZ (General Law for Special Medical costs, which regulates the financing of long-term institutional care) and the statistics on homes for the elderly.

### Details of survey data used

Long-term:

Measure with the OECD-indicator, using the following 7 (age 16-54) or 10 (age 55+) questions: The next questions concern what you are normally able to do, if necessary with aids, such as glasses or hearing aid, if you usually use one. They do not concern temporary problems (of transient nature).

- Are you able to follow a conversation in a group of 3 or more persons? (if necessary with hearing aid)
- Are you able to have a conversation with one other person? (if necessary with hearing aid)

- Are your eyes good enough to read the small print in a newspaper? (if necessary with glasses or contactlenses)
- Are you able to recognize someone's face at a distance of 4 metres? (if necessary with glasses or contactlenses)
- Are you able to carry an object weighing 5 kilos, for instance a full shoppingbag, for 10 metres?
- If you are standing, are you able to bend down and pick something up off the floor?
- Are you able to walk 400 metres without resting? (If necessary with walkingstick)

Answers: yes, with no difficulty / yes, with minor difficulty / yes, with major difficulty / no, I am not able to do this

Only asked of respondents 55 years and older:

Will you tell me if you without difficulty, with difficulty or only with help of others are able to do the following:

- get in and out of bed
- dress/undress
- move to another room on the same floor

The questions above were asked in 1989 and later; for the questions asked in 1985, see NED1. Those who answered "yes, with major difficulty", or "no" to at least one of these questions were considered disabled.

Short-term disability: During the last two weeks, did you reduce your activities or refrain from doing things that you usually do because of illness or injury? yes/no; If yes:

How many days of the past 14 days did this last? (including Saturdays and Sundays)

#### **Details of the survey(s) used**

response rate: 68-57% (decreasing with time)

institutional population included: no

age categories included: OECD-indicator only included for 16+

#### **Age categories used**

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+

### Calendar years of calculation

1983, 1984, 1985, 1989, 1990

(for each year, life tables, data on institutionalization and survey data for that year were used)

### Remarks

Only part of the population of homes for the elderly is considered to be in poor health; the percentage in good health was estimated, using the same estimate as was used in NED1, but using annual data on the (overall) percentage of persons needing help in homes for the elderly to adjust for changes in time.

OECD indicator is available only for those over 16. For those under 16 an estimation was made based on the percentage with a longstanding-limiting illness.

Differences with respect to the calculations of van Ginneken (1990, 1991) are:

- Other source of institutional population
- Slightly different estimate of the percentage of healthy persons in homes for the elderly
- Short-term disability rates were used for those without a long-term disability, so counting did not occur and a correction factor was not necessary.
- Slightly different estimates were used for the percentage of long-term disabled among those under 16 years of age

## THE NETHERLANDS HE-7 (NED7)

### Source publication(s)

- Perenboom RJM, Boshuizen HC, Water HPA van de. Trends in health expectancies in the Netherlands. 1981-1990. In: Robine J-M, Mathers CD, Bone MR, Romieu I (ed). Calculation of health expectancies: harmonization, consensus achieved and future perspectives. Colloque INSERM 226. John Libbey Eurotext, 1993.
- Boshuizen HC, Schaapveld K, Water HPA van de, Sonsbeek JLA van. Trends in the Netherlands in the period 1980-1990: some preliminary results. Paper presented to 4th International meeting of the Network on Health Expectancy (REVES), Leyden, 1991.
- Boshuizen HC, Perenboom RJM, Water HPA van de. Trends in Gezonde Levensverwachting in Nederland 1981-1990. Deel I: Resultaten (Trends in health expectancy in the netherlands 1981-1990. Part I: results). (In Dutch). NIPG-publicatie nr 92.098. Leyden, Nederlands Instituut voor Pracventieve Gezondheidszorg TNO, 1992.  
Perenboom RJM, Boshuizen HC, Water HPA van de. Trends in Gezonde Levensverwachting in Nederland 1981-1990. Deel II: Methodische Aspecten (Trends in health expectancy in the netherlands 1981-1990. Part II: Methodological Aspects). (In Dutch). NIPG-publicatie nr 92.099. Leyden, Nederlands Instituut voor Pracventieve Gezondheidszorg TNO, 1992.

### Aspect of (ill)health used

In institutions and with less than good perceived health

### Sources of data on rates of (ill)health

NCBS Health Interview survey 1981-1990;

Institutional data from the administration of the AWBZ (General Law for Special Medical costs, which regulates the financing of long-term institutional care) and the statistics on homes for the elderly.

### Details of survey data used

Question used:

What in general is your state of health:

very good / good / fair / sometimes good and sometimes bad / bad (1983-1990)

good / fair / sometimes good and sometimes bad / bad (1981-1982)

Those with (very) good health were regarded as healthy. Results are also presented using other cut-off points.

#### **Details of the survey(s) used**

response rate: 68-57% (decreasing with time)

institutional population included: no

age categories included: all, but OECD-indicator only included for 16+

#### **Age categories used**

0-4 ; 5-9 ; 10-14 ; 15-19 ; 20-24 ; .... ; 80-84 ; 85+;

For Boshuizen, 1991 (preliminary results) data were used with an upper category of 75+

#### **Calendar years of calculation**

1981-1990

For each year a life table, data on institutionalization and survey data were used for that particular year.

#### **Remarks**

Only part of the population of homes for the elderly is considered to be in poor health; the same estimation was used as in NED6.

Differences with respect to the calculations of van Ginneken (NED2) are:

- Other source of institutional population
- Slightly different estimation of the percentage healthy persons in homes for the elderly
- Results obtained for various cut-off points are presented
- The prevalence rates were not corrected for persons who were only temporarily in less than good health, because point prevalences do not need such a correction

## NEW ZEALAND HE-1 (NZL1)

### Source publication(s)

- Graham P. Davis P. Life expectancy free of disability: a composite measure of population health status.  
Community Health Studies 1990;XIV(2):138-145

### Aspect of (ill)health used

Disability:

- short-term: activity limitation
- long-term: activity limitation.

### Sources of data on rates of (ill)health

Social Indicators Survey 1980-1981

### Details of survey data used

Short-term: number of day of activity limitation in the two weeks prior to the interview.

No short-term disability was allowed for those with long-term disability.

Long-term: based on task performance.

### Details of the survey(s) used

response rate: ?

institutionalized population included: no

age groups included: 15+; however the number of elderly people in the survey is small:  
therefore only data for age 15-64 could be used.

### Age categories used

15-24 ; 25-34 ; 35-44 ; 45-54 ; 55-64

### Calendar years of calculation

Life table: 1981

Survey data: 1980-1981

### **Remarks**

- Calculations were limited to 15-64 years of age (partial life expectancies).
- Institutional population was not included. However, in this range of ages (15-64) this will not influence the results very much.

## NORWAY HE-1 (NOR1)

### Source publication(s)

- Pettersson H. Hälsoindex för den svenska befolkningen. Rappot från ett utvecklingsprojekt. Statistika centralbyrån, 1992.

### Aspect of (ill)health used

Simple health index, comparable for Sweden, Finland and Norway

### Sources of data on rates of (ill)health

Norway Survey of Living Conditions 1988

### Details of survey data used

Questions used:

Do you suffer from any long-term illness, after effects from an accident, disability or other ailment (y/n)?

If yes:

Is your working capacity reduced as a consequence of your illness(es)?

To old-age pensioners: Do you find it difficult to carry on any of your normal activities as a consequence of your illness(es)? to a large extent / to some extent / not at all

From these questions 3 categories were formed:

- no long-term illness (full health)
- long-term illness, but working capacity not or only slightly reduced (slightly unhealthy)
- severely reduced working capacity (severely unhealthy)

### Details of the survey(s) used

response rate: approx 75%

institutional population included: no

age groups included: 16+

### Age categories used

16-24; 25-34; 35-44 ; 45-54; 55-64 ; 65-74 ; 75-84

**Calendar years of calculation**

1988 (both for life table and survey data)

**Remarks**

A health expectancy for Norway was calculated for the purpose of comparison with Sweden.

Since Swedish data were only available for the ages 16-84, a partial health expectancy was calculated.

Note that the institutional population was not included in either the health survey or the calculation of health expectancy (in the case of Sweden it was included in the survey).

## SPAIN HE-1 (SPA1)

### Source publication(s)

- JL Gutiérrez Fisac and E Regidor Poyatos. Esperanza de vida libre de incapacidad: un indicador global del estado de salud. Med Clin (Barc) 1991;96:453-455
- Gomez Rodriguez, P. Using the International Classification of Impairments, Disabilities and Handicaps in surveys: the case of Spain. Wld Hlth Statist Quart 1989;42:161-166
- Teijeiro Alfonsin E, Garcia Ferruelo M. Survey of impairments, disabilities and handicaps in Spain. Int J Rehab Research 1989;12(2):194-198.

### Aspect of (ill)health used

Long-term and short term disability

### Sources of data on rates of (ill)health

Short-term disability: National Health Survey 1987 (Encuesta nacional de Salud).

Long-term disability: Survey on Impairments, Disabilities and Handicaps 1986.

### Details of survey data used

Long-term disability: permanent severe limitation, originating from an impairment or from aging, of the ability to perform a fundamental activity (according to the ICIDH-definition), which is expected to last one year or longer

Included were disabilities of seeing, hearing, speaking, other communication, personal care, walking, climbing stairs, running, going out of the house, activities of daily living, dependence and resistance; environmental disabilities, behavioural disabilities in relation to oneself and in relation to others. Also disabilities that could be corrected with some external device, mechanism or prothesis, or with the help of other persons were included; for a seeing disability only those disabilities that persist despite glasses or contact lenses were included.

### Short-term disability:

Number of bed days in the last 2 weeks

**Details of the survey(s) used**

National Health Survey

response rate: 100%

institutional population included: no

age groups included: 16+

Survey on Impairments, Disabilities and Handicaps

response rate: 99%

institutional population included: no

age groups included: all

**Age categories used**

<1 ; 1-4 ; 5-9; 10-14 ; and so forth

Data on disability were available in 10-year age groups until 65+. These were changed to fit the intervals above by applying polynomial curve fitting.

**Calendar years of calculation**

1986 (mortality and long-term disability) / 1987 (short-term disability)

**Remarks**

- Disability data were interpolated and extrapolated by polynomial regression
- Institutional population was not included.
- The overlap between short-term and long-term disability was not taken into account

**SWEDEN HE-1 (SWE1)****Source publication(s)**

- Pettersson H. Hälsoindex för den svenska befolkningen. Rappot från ett utvecklingsprojekt. Statistika centralbyrån, 1992.
- Pettersson H. A Swedish population health index. Paper presented at the fourth meeting of the International Network on Health Expectancy (REVES), Leyden, 1991.

**Aspect of (ill)health used**

Multi-dimensional health index, covering:

- a. perceived health
- b. presence of long-term illness or disability,
- c. impaired motory function

**Sources of data on rates of (ill)health**

Swedish Health Interview survey (part of the Survey of Living Conditions (SLC)).

**Details of survey data used**

Questions used for construction of the health index:

- a. In your opinion, what is your state of health? Is it: good / bad / in-between?
- b. Do you suffer from any long-term illness, after-effects of an accident, disability or other ailment (y/n)?

If yes:

Is your working capacity reduced as a consequence of your illness(es)?

To old-age pensioners: Do you find it difficult to carry on any of your normal activities as a consequence of your illness(es)? to a large extent / to some extent / not at all

- c. based on the following 4 questions:
  - Can you run a short distance, say 100 metres, if you are in a hurry? y/n [RUN]
  - Can you effortlessly get onto a bus? y/n [GET ON BUS]
  - Can you take a short walk, say 5 minutes, at a fairly quick pace? y/n [WALK]
  - Do you use any aid, e.g. a cane, walker or wheel chair, or do you have to rely on another person when you move? y/n [NEED HELP]

Using these four questions a score for impaired mobility was assigned as follows:

strongly impaired mobility [SEVERE]: needing help (and not able to walk and/or to get on a bus)

slight impaired mobility [SLIGHT]: not needing help, but not able to walk and/or not able to get on a bus

no impaired mobility [NO]: not needing help and able to walk and get on a bus

#### Construction of the health index:

perceived health	impaired mobility	long-term illness			
		long-term illness present		no long-term illn- ess present	
		high extent of disability	some ex- tent of disability	no disability	
good	severe	1	2	2	2
	slight	1	2	2	2
	no	1	2	2	2
in bet- ween	severe	1	2	2	3
	slight	1	2	3	3
	no	2	2	3	3
bad	severe	2	2	3	3
	slight	2	3	3	4
	no	3	3	3	4

#### Details of the survey(s) used

response rate: approx 78%

institutional population included: yes

age groups included: 16-84

**Age categories used**

16-24; 25-34; 35-44 ; 45-54; 55-64 ; 65-74 ; 75-84

**Calendar years of calculation**

75-80 and 81-86 (both life table and survey data)

**Remarks**

Since data were only available for the ages 16-84, mainly partial health expectancies were calculated.

Some calculations of full health expectancies at 16 years of age were made, using simple extrapolations of the prevalences of ill-health in the age groups above 84 years of age.



## **SWEDEN HE-2 (SWE2)**

### **Source publication(s)**

- Pettersson H. Hälsoindex för den svenska befolkningen. Rappot från ett utvecklingsproject. Statistika centralbyrån, 1992.
- Pettersson H. A Swedish population health index. Paper presented at the fourth international workshop on health expectancy (REVES).

### **Aspect of (ill)health used**

Long-term limiting illness, as comparable as possible to the English data

### **Sources of data on rates of (ill)health**

Swedish Survey of Living Conditions 1987

### **Details of survey data used**

Questions used for construction the health index:

Do you suffer from any long-term illness, after-effects of an accident, disability or other ailment (y/n)?

If yes:

Is your working capacity reduced as a consequence of your illness(es)?

To old-age pensioners: Do you find it difficult to carry on any of your normal activities as a consequence of your illness(es)? to a large extent / to some extent / not at all

From these questions 2 categories were formed:

- no long-term illness, or long-term illness, but working capacity not reduced or only slightly reduced
- long-term illness and severely reduced working capacity

### **Details of the survey(s) used**

response rate: approx 78%

institutional population included: yes

age groups included: 16-84

### **Age categories used**

16-44 : 45-64 : 65-74 : 75-84 16-24; 25-34; 35-44 ; 45-54; 55-64 : 65-74 ; 75-84

### Calendar years of calculation

1987 (both life table and survey data)

### Remarks

Data were only available for the ages 16-84, so mainly partial health expectancies were calculated.

### Source publication(s)

- Pettersson H. Hälsoindex för den svenska befolkningen. Rapport från ett utvecklingsprojekt. Statistika centralbyrån. 1992.

### Aspect of (ill)health used

Simple health index, comparable for Sweden, Finland and Norway

### Sources of data on rates of (ill)health

Swedish Survey of Living Conditions 1987

### Details of survey data used

Questions used:

Do you suffer from any long-term illness, after effects of an accident, disability or other ailment (y/n)?

If yes:

Is your working capacity reduced as a consequence of your illness(es)?

To old-age pensioners: Do you find it difficult to carry on any of your normal activities as a consequence of your illness(es)? to a large extent / to some extent / not at all

From these questions 3 categories were formed:

- no long-term illness (full health)
- long-term illness, but working capacity not or only somewhat reduced (slightly unhealthy)
- severely reduced working capacity (severely unhealthy)

### Details of the survey(s) used

response rate approx 78%

institutional population is included

age groups included: 16-84

**Age categories used**

16-24; 25-34; 35-44 ; 45-54; 55-64 ; 65-74 ; 75-84

**Calendar years of calculation**

1987 (both life table and survey data)

**Remarks**

Data were only available for the ages 16-84, so mainly partial health expectancies were calculated.



## SWITZERLAND HE-1 (SWI1)

### Source publication(s)

- Bisig B, Michel JP, Minder ChM et al. Disability-free life expectancy (DFLE): available data in Switzerland. Paper presented at REVES 2. (Bisig B. Espérance de vie sans incapacité. données Suisses. In: Robine J-M et al. (ed) Espérance de santé. Paris, Institut national de la Santé et de l'Institut de Recherche Médical (INSERM):119-133.)
- Bisig B, Gutzwiller F. Konzept des Indikators behinderungsfreie Lebenserwartung und Illustration am Beispiel Schweiz. In: Imhof AE, Weinknecht R (ed). Erfüllt leben - in Gelassenheit sterben. Beiträge eines Symposiums von 23.-25. November 1993 an der Freien Universität Berlin. Berlin, Duncker & Humblot, 1994

### Aspect of (ill)health used

#### Permanent disability

- Living in institutions
- Having severe disabilities, outside institution

#### Temporary disability

### Sources of data on rates of (ill)health

Institutional population: census 1980

SOMIPOPS-survey 1981-1983 (SOMIPOPS= System of Social and Medical Indicators of the Population of Switzerland)

### Details of survey data used

Permanent disability, outside institutions:

For adults:

- Do you see well enough to read a newspaper (with glasses if you wear glasses)?
- Do you hear well enough to follow a normal conversation with at least two others (with hearing-aid if you normally use one)?
- Are you able to get out of bed (without help)?
- Are you able to dress and undress yourself (without help)?
- When eating at a table, are you able to cut meat, fruit, etc. yourself?

Answers: no difficulty / some difficulty / major difficulty / impossible

A severe disability is defined as:

- impossible to do at least one of these, or
- doing 2 or more with major difficulty, or
- doing 1 with major difficulty and at least 2 with some difficulty, or
- doing 4 or more with some difficulty

For children: Does the child have any handicaps ("behinderungen")?

#### Temporary disability:

For children:

Did you, in the last 4 weeks, feel so sick or ill that you had to stay in bed or were not able to go to school or work?

For adults: The number of days you were not able to work or do housekeeping during the last 4 weeks.

#### Details of the survey(s) used

response rate: approx. 75%

institutionalized population included: no

age groups included: all

#### Age categories used

5-year intervals; highest interval 95+.

#### Calendar years of calculation

life table: 1981/2

survey data: 1981-83

institutional population: 1980

#### Remarks

## SWITZERLAND HE-2 (SWI2)

### Source publication(s)

- Bisig B, Michel JP, Minder ChM et al. Disability-free life expectancy (DFLE): available data in Switzerland. Paper presented at REVES 2. (Bisig B, Espérance de vie sans incapacité, données Suisses. In: Robine J-M et al. (ed) Espérance de santé. Paris, Institut national de la Santé et de la Recherche Médical (INSERM):119-133.)
- Bisig B, Gutzwiller F. Konzept des Indikators behinderungsfreie Lebenserwartung und Illustration am Beispiel Schweiz. In: Imhof AE, Weinknecht R (ed). Erfüllt leben - in Gelassenheit sterben. Beiträge eines Symposiums von 23.-25. November 1993 an der Freien Universität Berlin. Berlin, Duncker & Humblot, 1994
- Spuhler Th, Bisig B. Disability-free life expectancy in Switzerland. Abstract REVES 4, Leyden, 1991

### Aspect of (ill)health used

#### Permanent disability:

- Living in institutions
- Having severe disabilities, outside institution

#### Temporary disability

### Sources of data on rates of (ill)health

Institutional population: census 1980

Disability data: IGIP/PROMES 1989

### Details of survey data used

#### Permanent disability, outside institutions:

##### For adults:

- Do you see well enough to read a newspaper (with glasses if you normally wear glasses)?
- Do you hear well enough to follow a conversation with at least two other persons (with a hearing-aid if you normally use one)?
- Are you able to get out of bed without help?
- Are you able to dress and undress yourself without help?
- When eating, are you able to cut meat, fruit, etc. yourself?

Answers: no difficulty / some difficulty / major difficulty / impossible

A severe disability is defined as:

- impossible to do at least one of these, or
- doing 2 or more with major difficulty, or
- doing 1 with major difficulty and at least 2 with some difficulty, or
- doing 4 or more with some difficulty

Temporary disability:

In total, how many days were you not able to go to work or carry out your usual activities (e.g., housekeeping) during the last 4 weeks?

#### **Details of the survey(s) used**

response rate: approx. 70%

institutionalized population included: no

age groups included: 20-74

survey is restricted to a number of regions

#### **Age categories used**

5-year intervals

#### **Calendar years of calculation**

life table: 1989

survey data: 1989

institutional population: 1980

#### **Remarks**

It is not clear where the data on children and older people come from.

## UNITED KINGDOM HE-1 (U.K1)

### Source publication(s)

- Bebbington AC. The expectation of life without disability in England and Wales. *Soc Sci Med* 1988;27(4):321-326
- Bebbington AC. The expectation of life without disability in England and Wales: 1976-1988. *Population Trends* 1991;66:26-29

### Aspect of (ill)health used

limiting longstanding illness

institutionalized

### Sources of data on rates of (ill)health

For limiting longstanding illness: General Household Survey

For institutional population: Data from registers. For 1981 also census data were available for comparison.

### Details of survey data used

Limiting longstanding illness was defined as two times yes to the questions:

"Do you have any long-standing illness, disability or infirmity? (y/n)" and

"Does this illness or disability limit your activities in any way (y/n)?"

As institutional population were included all inmates of the following institutions:

- Local Authority, Voluntary and private homes for the elderly and younger physically handicapped
- Average daily bed use in geriatrics and units for younger disabled in NHS hospitals
- Residents in NHS psychiatric hospitals and in hospitals and units for the mentally handicapped
- Residents in Homes and Hostels for the mentally ill and mentally handicapped

### Details of the survey(s) used

response rate: 81-85%

institutional population included: no

age groups included: 16+

**Age categories used**

0-4 ; 5-14 ; 15-44 ; 45-64 ; 65-74 ; 75+

**Calendar years of calculation**

1976, 1981, 1985, 1988

**Remarks**

In the 1988 paper, the percentage disabled was too high, since the GHS disability rate was also applied to the institutionalized population. In the 1991 article corrected figures are presented. Also the estimates for the total population in 1976 are slightly different.

**Remarks**

Life tables used were not for the United Kingdom as a whole, but only for England and Wales

Counts of institutionalized persons can be compared to census data for 1981.

Using the data from registers underestimates the institutionalized population by 8%.

Petterson (Petterson H. A Swedish population health index. Paper presented at the fourth meeting of the International Network on Health Expectancy (REVES), Leyden, 1991) calculated a partial life expectancy for the ages 16-84 from these data.

**UNITED KINGDOM HE-2 (U.K2)****Source publication(s)**

- Bebbington AC. Expectation of life without disability measured from the OPCS Disability surveys. Discussion paper 651. PSSRU, University of Kent at Canterbury, August 1989.

**Aspect of (ill)health used**

Disability, defined as the ICIDH concept: "Any restriction of ability to perform an activity in the manner or within the range considered normal for a human being".

**Details of survey data used**

The following dimensions of disability were included:

Locomotion, reaching and stretching, dexterity, personal care, continence, seeing, hearing, communication, behaviour, intellectual functioning, consciousness, eating, drinking and digestion, disfigurement.

For each dimension a scale of up to about 15 items was constructed. Scores on these scales were combined into an overall severity score (weighing each dimension in an appropriate manner), ranging from 1 (least severe disability) to 10 (most severe disability). For children under 5 and children aged 5-16 special instruments were developed. See the original paper for details.

**Sources of data on rates of (ill)health**

OPCS Disability survey 1985

**Details of the survey(s) used**

response rates: over 80% in both stages of this multi-stage survey.

institutional population included: yes

age groups included: 16+

**Age categories used**

0-4 ; 5-9 ; 10-15 ; 16-19 ; 20-29 ; 30-39 ; 40-49 ; 50-59 ; 60-69 ; 70-79 ; 80+

**Calendar years of calculation**

1985 (both life table and survey data)

**Remarks**



**UNITED STATES OF AMERICA HE-1 (USA1)****Source publication(s)**

- Sullivan, DF. Disability Components for an Index of Health. A methodological study of an aggregative measure of several forms of disability intended for use as one component of a joint mortality-morbidity index. Rockville Md, national Center for Health Statistics, 1971.
- Sullivan DF. A Single Index of mortality and Morbidity. HSMHA Health Reports 1971;86(4):347-354

**Aspect of (ill)health used**

## 1) Disability

- \* Long-term institutionalization
- \* Long-term disability: Having a chronic condition and usually unable to carry out major activity (work, housework, school)
- \* Short-term disability: activity restriction (cutting down the usual activities because of illness or injury).

## 2) Bed-disability

- \* Long-term institutionalization
- \* Short-term institutionalization
- \* Confinement to bed more than half the daylight hours

**Sources of data on rates of (ill)health**

Institutionalization: Resident Places Survey-1 1963 for persons aged 15 years or over; the 1960 census for those under 15 years of age.

Long-term/short-term institutionalization: National Health Interview Survey 1965-1966

**Details of survey data used**

## 1) Disability

## \* Long-term-institutionalization:

in mental hospitals; geriatric and chronic disease hospitals; nursing and personal care homes (Homes for the aged and the dependent; homes and schools for the physically or mentally handicapped)

\* Long-term disability:

Chronic condition: a condition or impairment that has lasted 3 months or longer, or one which because of its nature can be expected to persist indefinitely.

Questionnaire too complicated for literal citation. In principle: unable to carry on the major activity of their group. The major activity of each group is:

Type of person	limitation
infants (<1 yr)	never severely limited
children 1-5 yrs	unable to or limited in amount or kind of play with other children
School-age children	unable to or limited to certain types of schools or in school attendance
Housewives	unable to or limited in amount or kind of housework
Workers/all other	unable to or limited in amount or kind of work

Example of question: (for workers/ housewives)

In terms of health, are you now able to (work - keep house) at all? (y/n)

Are you limited in the kind of (work - housework) you can do because of your health? (y/n)

Are you limited in the amount of (work - housework) you can do because of your health? (y/n)

\* short-term disabilities:

Were there any days during the past weeks that you cut down on the things you usually do because of illness or injury? Y/N;

if yes: During that period how many days did you cut down for as much as a day?

2) bed-disability:

\* Long-term-institutionalization:

in mental hospitals; geriatric and chronic disease hospitals; nursing and personal care homes (Homes for the aged and the dependent; homes and schools for the physically or mentally handicapped)

\* Short-term institutionalization: hospitals

\* Confinement to bed:

During those 2 weeks, did you stay in bed because of illness or injury? (y/n)

If yes, During that 2-week period, how many days did you stay in bed more than half of the day because of illness or injury? (number of days)

**Details of the survey(s) used**

response rate: approx. 95%

institutionalized population included: no

age groups included: all

**Age categories used**

Morbidity rates are cited for these categories:

0-4 ; 5-14 ; 15-24 ; 25-44 ; 45-64 ; 65 and over in the report in which the rates were estimated

**Calendar years of calculation**

1966 (morbidity) / 1965 (mortality)

**Remarks**

In the rates for institutionalization, those in "nursing and personal care homes" who received neither nursing nor personal care were not counted as "institutionalized".

No double counting of short-term disability and long-term disability occurred.

**UNITED STATES OF AMERICA HE-2 (USA2)****Source publication(s)**

- Colvez A, Blanchet M. Potential gains in life expectancy free of disability: a tool for health planning. *Int J Epidemiol* 1983;12(2):224-229
- Colvez A. Changes in disability-free life expectancy in the USA between 1966 and 1976. In: Robine J-M, Blanchet M, Dowd JE (ed). *Health Expectancy*. First workshop of the International Health Expectancy network (REVES). London: HMNO, 1992, pp 113-115

A preliminary paper of this study (giving slightly different results) is:

- Colvez A. Evolution de l'état de santé au cours de la dernière décennie. Peut-on continuer à parler d'amélioration? Indicateur de santé: document no 5. Québec, 1980.

**Aspect of (ill)health used**

activity restriction, divided into:

long-term:

- main activity impossible
- other limitation

short-term:

- bed-disability
- other short-term disability

**Sources of data on rates of (ill)health**

National Health Interview Survey

**Details of survey data used**

Questionnaire too complicated for literal citation. In principle:

Long-term:

- major activity impossible

This definition depends on usual major activity:

Type of person	limitation
infants (<1 yr)	never limited in major activity
children 1-5 yrs	unable to play with other children
School-age children	unable to go to school
Housewives	unable to keep house
Workers/all other	unable to work

Questions used:

for workers/ housewives:

In terms of health, are you now able to (work - keep house) at all? (y/n)

for school-age children:

In terms of health, would you be able to go to school? Y/N

for children 1-5 years old:

Is .. able to take part at all in ordinary play with other children? Y/N

others over 17:

Does your health keep you from working? Y/N

- other limitations:

Are you limited in any way because of a disability or health? yes/no

short-term disabilities:

- bed-disability

During those 2 weeks, did you stay in bed because of any illness or injury? Y/N;

if yes: During that 2-week period, how many days did you stay in bed all or most of the day?

- other short-term disability

Were there any days during the past weeks that you cut down on the things you usually do because of illness or injury? Y/N;

if yes: During that period how many days did you cut down for as much as a day?

The rate of short-term disability was a measure for the whole population (thus including those with long-term disability)

**Details of the survey(s) used**

response rate: between 95 and 98%

institutionalized population included: no

age groups included: all

**Age categories used**

Morbidity: 0-16 ; 17-44 ; 45-64 ; 65 and over

Life table: 0- ; 1-4; 5-14; 15-24; 25-34; 35-44; 45-54; 55-64; 65-74; 75+

In the calculations, the morbidity rates were interpolated to obtain rates for the life table categories.

**Calendar years of calculation**

1966, 1969, 1972, 1974, 1976

**Remarks**

- Interpolation and extrapolation were used to obtain disability rates for finer age strata.
- Double counts short-term and long term disability
- Institutional population is not included

## UNITED STATES OF AMERICA HE-3 (USA3)

### Source publication(s)

- Crimmins EM, Saito Y, Ingegneri D. Changes in Life Expectancy and Disability-Free Life Expectancy in the United States. *Population and development review* 1989;15(2):235-267
- Crimmins EM, Saito Y, Ingegneri D. Recent values of disability-free life expectancy in the United States. In: Robine J-M, Blanchet M, Dowd JE (ed). *Health Expectancy*. First workshop of the International Health Expectancy network (REVES). London: HMNO, 1992, pp 109-112.

### Aspect of (ill)health used

Institutionalization

Long-term disability

- with some limitation in secondary activity
- with some limitation in major activity
- with inability to perform major activity

Short-term disability

### Sources of data on rates of (ill)health

Institutional population: 1970 and 1980 census

Disability: National Health Interview Survey (NHIS) 1969-1971 and 1979-1981

### Details of survey data used

Institutional population:

mental hospitals, residential treatment centres, tuberculosis hospitals, and homes and schools for the mentally or physically handicapped.

Long-term disability:

Questionnaire too complicated for literal citation. In principle:

- Limitation in secondary activity (Only asked when no limitation of major activity is present):  
Are you limited in the kind or amount of other activities because of your health?  
(other= other than major activity)? yes/no
- Limitation in major activity and

- Unable to perform major activity:  
This depends on usual major activity:

Type of person	limitation
infants (<1 yr)	never severely limited
children 1-5 yrs	unable to or limited in amount or kind of play with other children
School-age children	unable to or limited to certain types of schools or in school attendance
Housewives	
Workers/all other	unable to or limited in amount or kind of housework unable to or limited in amount or kind of work

Example of question: (for workers/ housewives)

In terms of health, are you now able to (work - keep house) at all? (y/n)

Are you limited in the kind of (work - housework) you can do because of your health? (y/n)

Are you limited in the amount of (work - housework) you can do because of your health? (y/n)

#### Short-term disabilities:

Were there any days during the past weeks that you cut down on the things you usually do because of illness or injury? Y/N;

if yes: During that period how many days did you cut down for as much as a day?

#### Details of the survey(s) used

response rate: 95% (1970) and 97% (1980)

institutionalized population included: no

age groups included: all

#### Age categories used

0-4 ; 5-9 ; ..... ; 80-84 ; 85+

**Calendar years of calculation**

Life tables and data on institutionalization: 1970 and 1980

Survey data: 1969-1971 and 1979-1981

**Remarks**

Calculations are described in great detail in the paper

## UNITED STATES OF AMERICA HE-4 (USA4)

### Source publication(s)

- Rogers A, Rogers RG, Blanger A. Longer life but worse health? Measurement and Dynamics. The Gerontologist 1990;30(5):640-649

### Aspect of (ill)health used

Dependency (in ADL)

### Sources of data on rates of (ill)health

2nd wave of the LSOA

### Details of survey data used

Dependence is defined as:

Institutionalised or

Needing assistance with any one of the following tasks:

eating, bathing, dressing, transferring, walking, toileting, getting outside

Questions used:

because of a health or physical problem, do you have any difficulty:

- bathing or showering? y/n
- dressing? y/n
- eating? y/n
- getting in and out of bed or chair? y/n
- walking? y/n
- getting outside? y/n
- using the toilet, including getting to the toilet? y/n

If yes: do you receive help from another person in

( bathing or showering / dressing / eating / getting in and out of bed or chair / walking / getting outside / using the toilet, including getting to the toilet) ? yes/no

### **Details of the survey(s) used**

The LSOA is based on a supplement to the Health Interview Survey (HIS).

Response rate HIS: 96%. Of those, 97% participated in the first wave of the LSOA: 97%. Of those still alive at the time of the second wave, the response rate was 90%. So total (cumulative) response rate was 84%.

Institutionalized population included: not in the first wave; In the second wave only those institutionalized between the first and second wave were included

Age groups included: 70+ in 1984

### **Age categories used**

70-72 ; 72-74 ; .... ; 96+

### **Calendar years of calculation**

morbidity: 1986

mortality: 1984-1986

### **Remarks**

- The purpose of this paper was not to estimate health expectancy accurately, but to illustrate some methodological problems (comparing the Sullivan method to the multistate method).
- This calculation was not based on a life table based on vital statistics, but on the mortality data of the LSOA cohort
- Due to the dataset used, the institutionalized population was underestimated.
- Although the LSOA-cohort was 72+ in 1986, active life expectancy was calculated for age 70; this was most likely done by applying the prevalence rates for 72 years old to the whole category 70-72.

## UNITED STATES OF AMERICA HE-5 (USA5)

### Source publication(s)

- Liu K, Manton KG, Liu BM. Morbidity, disability and long-term care of the elderly: implications for insurance financing. *Milbank Quarterly* 1990;68(3):445-492
- Manton KG. A longitudinal study of functional change and mortality in the United States. *J Gerontol* 1988;43(5):S153-S161.
- Manton KG, Stallard E. Cross-sectional estimates of active life expectancy for the US elderly and oldest-old populations. *J Gerontol* 1991;46:S170-182

### Aspect of (ill)health used

Functional disability: 6 disability-profiles, based on 27 ADL, IADL and functional status items.

### Sources of data on rates of (ill)health

NLTCS 1982 and 1984

### Details of survey data used

#### ADL-items:

needs help with eating  
needs help getting in/out of bed  
needs help getting around inside  
needs help bathing  
needs help using toilet  
bed fast  
no inside activity  
wheelchair fast

#### IADL-items:

needs help with heavy work  
needs help with light work  
needs help with laundry  
needs help with cooking  
needs help with grocery shopping  
needs help getting about outside  
needs help travelling

needs help managing money

needs help taking medicine

needs help making telephone calls

Functional status items:

how much difficulty do you have:

climbing 1 flight of stairs (none/some/very difficult/cannot at all)

bending, e.g., putting on socks (none/some/very difficult/cannot at all)

holding a 10 lb package (none/some/very difficult/cannot at all)

reaching overhead (none/some/very difficult/cannot at all)

combing hair (none/some/very difficult/cannot at all)

washing hair (none/some/very difficult/cannot at all)

grasping an object (none/some/very difficult/cannot at all)

can you see well enough to read a newspaper? y/n

#### Details of the survey(s) used

Response rates:

in 1982: 95% of those disabled (determined in a screening interview); response screening interview: approximately 97%.

in 1984: of those selected for detailed interview (and alive): 95%. No data on response to screening interview are given.

Institutionalized population included: yes, but only interviewed in detail in 1984.

Age groups included: 65+

Only those eligible for Medicare were sampled (95% of all persons over 65).

Only those disabled were interviewed in detail. If a person was interviewed twice (both in 1982 and 1984) the numbers cited in the paper show that only one interview was used in the GOM analysis. This means that those who were disabled at only one of the 2 interview years were over-represented in the sample.

Weighing and other methods were used to adjust for non-response and sampling effects.

#### Age categories used

65-74 ; 75-84 ; 85-94 ; 95+

**Calendar years of calculation**

life table: 1983

morbidity-data: 1982 and 1984

**Remarks**

GOM (Grade of Membership) analysis was used to create the disability-profiles

## UNITED STATES OF AMERICA HE-6 (USA6)

### Source publication(s)

- Pope AM, Tarlov AR. Disability in America. Towards a national agenda for prevention. Washington DC, National academy press, 1991. Especially Chapter 2: Magnitude and dimensions of disability in the United States. pp 41-75.

### Aspect of (ill)health used

activity limitation, divided into: unable to perform major activity; limited in major activity; limited in secondary activities

### Sources of data on rates of (ill)health

National Health Interview survey 1983-85

### Details of survey data used

Mostly identical to the data used by Crimmins et al (1989) for USA3. However, some changes were made after 1982 in the HIS-questionnaire. The most important are:

- the major activity for persons aged 70 and over now is living independently (e.g., the ability to bathe, eat, shop, dress and so forth without the help of another person).
- after 1982 women aged 17-64 who were keeping house were also questioned about their ability to work at a job or business (does not effect data on limitations in major activity but can affect those on secondary activities)

### Details of the survey(s) used

response rate: 95%-98%

institutionalized population included: no

age groups included: all

### Age categories used

Same as those tabulated by LaPlante (not further specified in this publication)

### Calendar years of calculation

Life table: 1987

Morbidity data: 1983-85

**Remarks**

The institutional population was not included in the survey and was also not included in the calculations

## UNITED STATES OF AMERICA HE-7 (USA7)

### Source publication(s)

- Pope AM, Tarlov AR. Disability in America. Towards a national agenda for prevention. Washington DC, National academy press, 1991. Especially Chapter 2: Magnitude and dimensions of disability in the United States. pp 41-75.

### Aspect of (ill)health used

activity limitation, divided into groups according to underlying condition

### Sources of data on rates of (ill)health

National Health Interview survey 1983-85

### Details of survey data used

For the details of measuring activity limitation, see USA6. If someone indicated a limitation, the following questions were asked:

- What condition causes this?
- Besides (condition) is there any other condition that causes this limitation? (reasked if necessary)
- Which of these conditions would you say is the main cause of this limitation?

Main conditions were grouped into: Mobility limitations; intellectual impairments; sensory impairments; chronic diseases; other conditions and impairments.

### Details of the survey(s) used

response rate: 95%-98%

institutionalized population included: no

age groups included: all

### Age categories used

Same as those tabulated by LaPlante (not further specified)

### Calendar years of calculation

Life table: 1987

Morbidity: 1983-85

**Remarks**

The institutional population was not included in the survey and was also not included in the calculations

**APPENDIX B**



**List of papers with new health expectancies that could not be incorporated in the inventory**

Grotvedt L, Viksand G. Life expectancy without disease and disability in Norway. Paper prepared for the 7th meeting of the International network on Health Expectancy (REVES), Canberra 23-25 Februari, 1994.

Mathers C. Health expectancies in Australia 1993. Preliminary results. Paper prepared for the 7th meeting of the International network on Health Expectancy (REVES), Canberra 23-25 Februari, 1994.

Ooyen H van, Roelands M. Estimates of Health Expectancy in Belgium. Paper prepared for the 7th meeting of the International network on Health Expectancy (REVES), Canberra 23-25 February, 1994.

Robine J-M, Mormiche P. L'espérance de vie sans incapacité augmente. INSEE-premiere no. 281, octobre 1993.

Robine J-M. Disability-free life expectancy trends in France: 1981-1991, international comparison. Paper prepared for the 7th meeting of the International network on Health Expectancy (REVES), Canberra 23-25 February, 1994.

Wilkins R, Chen J, Ng E. Changes in health expectancy in Canada from 1986 to 1991. Paper prepared for the 7th meeting of the International network on Health Expectancy (REVES), Canberra 23-25 February, 1994.

Valkonen T, Sihvonen A-P, Lahelma E. Disability-free life expectancy by level of education in Finland. Paper prepared for the 7th meeting of the International network on Health Expectancy (REVES), Canberra 23-25 February, 1994.



**APPENDIX C**



## Effect of calculation methods

Health expectancy is calculated with the following formula:

$$HE_a = \frac{\sum_{i=a}^{a_{\max}} r_i L_i}{l_a}$$

In this formula  $HE_a$  is health expectancy at age  $a$ ,  $L_i$  is the number of years lived in age interval  $(i, i+x]$  (taken from the ordinary (abridged) life table) where  $x$  is the range of the age stratum used,  $r_i$  is the prevalence rate for being healthy (or not disabled, etc) in this age interval,  $l_a$  is the number of persons in the life table still alive at age  $a$ , and  $a_{\max}$  is the starting age of the highest age interval in the life table.

There are some differences in the way health expectancy is calculated from this formula:

- age strata have different ranges (varying  $x$ )
- sometimes the crude age and sex-specific prevalence data from surveys are used, but other authors 'pre-treat' the rates first. Such a pre-treatment is sometimes aimed at smoothing away random fluctuations. In other cases it consists of fitting a curve through coarsely stratified age-specific data in order to estimate prevalence rates for finer age strata.

Table 3. HLE at birth in Australia 1988, calculated with different calculation methods.

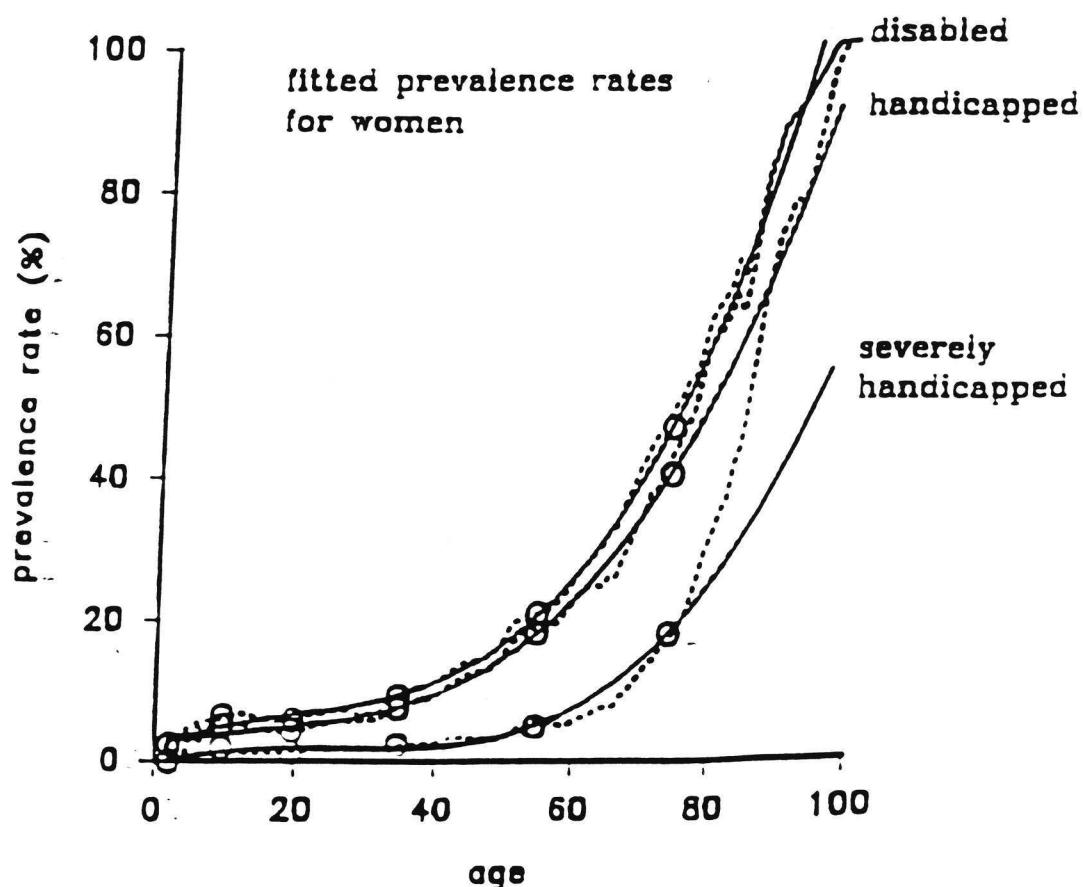
S= life expectancy with severe handicap; H= life expectancy with a handicap; D= life expectancy with a disability.

	men			women		
	S	H	D	S	H	D
standard error *	0.02	0.06	0.07	0.05	0.07	0.08
1-year * (smoothed)	3.20	12.07	14.69	6.01	13.99	16.02
1-year * (crude)	3.17	12.03	14.64	5.97	13.93	15.99
5-years (85+)	3.16	12.05	14.67	5.98	13.98	16.01
Sullivan (0-4, 5-14, 15-44, 45-64, 65+)	2.88	11.58	14.22	4.57	12.50	14.66
Smoothed, from Sullivan-type data	3.15	12.10	14.95	5.15	13.32	15.69

\* source: Mathers 1991

We examined the effect of these variations on the calculated health expectancy. Do they really make a difference which is relevant in practise? To examine this question we took the data presented by Mathers (1991) for Australia in 1988 as an example and calculated these effects for the three different types of health expectancy he presents, namely without disability, without handicap and without a severe handicap. The first row in table 3 shows the health expectancies as calculated by Mathers: they are based on prevalence rates for strata which are only one-year in range; moreover, a smoothing procedure was applied to remove random fluctuations. The second row shows the results of Mathers' calculations when this smoothing procedure was not applied. The differences in the results are of the same magnitude as the statistical variation given by the standard error. So they are not of real importance. We then increased the range of the age strata to see how this would influence the result (rows 3 and 4). Increasing the range of the age strata to 5-year strata with the last stratum including everyone over 85 did not make an important difference. Using a very coarse stratification, however, like the one used in the report of Sullivan (1971), does make an appreciable difference (row 4): about 0.5 years for men and 1.5 years for women. Looking at the calculations more closely, it appears that this bias originated in all age groups except for those under 15.

Figure 1: Fitted prevalence rates for women (solid lines) derived from coarsely stratified rates. The dashed lines are the original prevalence rates.



Lastly, we took the prevalence rates for the coarsest stratification, fitted a polynomial curve through these rates and then used this curve to obtain estimates of prevalence rates for 5-year age groups. Figure 1 illustrates this procedure. The estimated 5-year prevalence rates were used to calculate a new health expectancy (row 5). As can be seen, this gives a result closer to the real value, but not close enough in all cases; there are still differences of 0.7 to 0.9 years. Figure 1 illustrates why: the fitted curve gives reasonable estimates within the age range of the prevalence rates used (the open circles) but can fail outside this range (see the curve for older ages). This cannot be prevented unless the form of the curve is known in advance, which it presently is not.

In Summary, the conclusions from this example are: A coarse stratification can give rather inaccurate estimates; using curve fitting to obtain estimated rates for finer strata improves the estimates, but can still be inaccurate. This is especially the case when the upper age stratum is broad (e.g., 65 and over).

Therefore when calculating health expectancies age strata should be fine. When only data for broad age groups are available, estimating the rates for finer strata by curve fitting helps to improve the estimates but is not as good as using finer strata.



**Reprografie:** TNO-PG  
**Projectnummer:** 5406