WORKING PAPER

10-03

The AGIR project: Ageing, Health and Retirement in Europe

Bio-demographic aspects of ageing:
Data for Belgium

Federal
Planning Bureau
Economic analyses and forecasts

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July 2003

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Federal Planning Bureau

The Belgian Federal Planning Bureau (FPB) is a public agency under the authority of the Prime Minister and the Minister of Economic Affairs. The FPB has a legal status that gives it an autonomy and intellectual independence within the Belgian federal public sector.

FPB's activities are primarily focused on macroeconomic forecasting, analyzing and assessing policies in economic, social and environmental fields.

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Responsible Editor Henri Bogaert
Legal Depot: D / 2003 / 7433 / 20

The AGIR project – acronym of Ageing, health and retirement in Europe – is a research project financed by the Fifth Research Framework Programme of the European Community for Research, Technological development and Demonstration (RTD) activities, "Quality of Life and Management of Living Resources" programme, key action 6 "The ageing population" (QOL-2001-6.1-3), proposal nr QLRT-2001-0517. It is worked out by eight members of the European network ENEPRI, created in 1999 at the initiative of CEPS, the Center for European Policy Studies in Brussels.

The participation of the Belgian Federal Planning Bureau, consisted essentially in a commented transfer of Belgian data for the first three Work packages of this research project. The most significant results are reflected in two Working Papers:

10-03 The AGIR project: Ageing, Health and Retirement in Europe. Bio-demographic aspects of ageing: Data for Belgium.

11-03 The AGIR project: Ageing, Health and Retirement in Europe. Use of health care and nursing care by the elderly: Data for Belgium.

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List of abbreviations:

AA	Average age of the population
DFLE	Disability Free Life Expectancy
FPB	Federal Planning Bureau
GHQ	General Health Questionnaire
HIS	Health Interview Survey
HLE	Healthy life expectancy
LE	Life Expectancy
LFS	Labour Force Survey
NIS	National Institute for Statistics
MI	Masculinity index
MLD	Modal Life Duration
ODR	Old age dependency ratio
Qx	Probability of death
YDR	Youth dependency ratio

0 Foreword: the AGIR project

A. Overview of the AGIR project

The Belgian Federal Planning Bureau is one of the participating research institutes in the AGIR project (Ageing, Health and Retirement in Europe) co-financed by the European Union within the Fifth Research Framework Programme and carried out in collaboration with seven institutions of the ENEPRI network, to which the FPB is associated. The aim of the AGIR project is to study to what extent the health and the fitness of elderly have improved, how elderly people make use of health care and which effect ageing and the health status of the elderly can have on the decision to retire and on the future evolution of the public health care and pension expenditures.

B. The Fifth Research Framework Programme of the European Community

The Fifth Research Framework Programme, adopted on 22nd December 1998, defined the European Community activities in the field of research, technological development and demonstration for the period 1998-2002. It has been conceived to help solve problems and to respond to major socio-economic challenges facing the European Union.

Asides bursaries and various fellowships for young or experienced researchers or for hosts to sustain the organization of training activities, the Fifth Research Framework Programme developed various Specific Programmes aiming at financing researches lead by at least two legal entities from different EU-countries or associated states, under which the one named the "Quality of Life and Management of Living Resources" programme. This QOL programme is structured around six key actions:

1. Food, nutrition and health;
2. Control of infectious disease;
3. The 'cell' factory;
4. Environment and health;
5. Sustainable agriculture, fisheries and forestry, and integrated development of rural areas including mountain areas;
6. The ageing population and disabilities.

The AGIR project was introduced under the key action 6 "The ageing population" (QOL-2001-6.1-3), proposal nr QLRT-2001-0517.

C. ENEPRI

The European Network of Economic Policy Research Institutes (ENEPRI) was created in 1999 at the initiative of the Centre for European Policy Studies (CEPS) in Brussels, also financed during the first four years by the European Commission under the 5th Research Framework Programme. ENEPRI brings together leading national institutes from a number of EU member states and accession countries.

ENEPRI was initially formed by 8 partner institutes in EU member states and one institute in Poland and has now been expanded to 25 partner institutes, which include members from most of the EU-27 countries. The activities of the Network are coordinated and managed by CEPS.

The following institutes are (among others) members of the ENEPRI network:

Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), Paris;
Centre for European Policy Studies (CEPS), Brussels;
Netherlands Bureau for Economic Policy Analysis (CPB), The Hague;
Deutsches Institut für Wirtschaftsforschung (DIW), Berlin;
Research Institute of the Finnish Economy (ETLA), Helsinki;
Fundacion de Estudios de Economia Aplicada (FEDEA), Madrid;
Belgian Federal Planning Bureau (FPB), Brussels;
Instituto di Studi e Analisi Economica (ISAE), Rome;
National Institute for Economic and Social Research (NIESR), London;
Niezalezny Osrodek Bana Economicznych (NOBE), Lodz, Poland.

The network aims to foster the international diffusion of existing research, to help to co-ordinate research plans, to conduct joint research and to increase public awareness of the European dimension of national economic policy issues.

The activities of ENEPRI include the organization of workshops and conferences, the publication of working papers and policy papers and the development of common research projects.

Currently ENEPRI members are conducting a major study on the health and demographic trends in the EU and its implications for health care, retirement and public finances: AGIR - Ageing, health and retirement in Europe. A joint project focusing on the analysis of demographic uncertainties and the sustainability of the social welfare systems, DEMWEL, started in January 2003. A Research Training Network on Health, Ageing and Retirement, called REVISER, started hiring trainees from spring 2003.

D. AGIR

The aim of the AGIR project is to study to what extent the fitness and health of the elderly have improved, and to use this information to estimate the future demand for health care by the elderly. The program will try to predict whether the trend in early retirement will continue along with the improvement of the fitness of the elderly. Ultimately, scenarios will be produced for the development of health and pension expenditure. Several options for social and budgetary policy will be analysed.

The first phase of the project consists of three work packages (WP) and concentrates on data gathering. Each WP is organized by a different member state institution and studies a different topic.

WP1 Bio-demographic aspects of ageing (FEDEA - Spain)

WP1 studies the bio-demographic aspects of population ageing. The aim is to get a better understanding of the nature of ageing. Not only is it important to analyse how fast a population gets older, it is also important to see what effect age has on the population's health and fitness, especially of the elderly. This WP concentrates on the health status of different age cohorts, by confronting purely demographic data with data on the health of the population and indicators concerning the quality of life. By doing so, one should get a better view on the past development, the current state and the potential future development of the health of the elderly.

WP2 Use of health care and nursing care by the elderly (DIW - Germany)

WP2 studies the use of health and nursing care by the elderly, by making a distinction between care in institutions and informal care. This distinction is necessary because there are indications that the demand of institutional care is increasing not only due to ageing, but also due to changes in family structure and labour market participation, especially of women.

WP3 Determinants of retirement (ETLA - Finland)

WP3 studies the determinants of retirement, going beyond the analysis of the well-known financial incentives. Its aim is to broaden the scope of these earlier studies by bringing in information on individuals' valuation of leisure and domestic work. A great deal of this information is gathered through national time use surveys. ETLA expects to find evidence to support the claim that, apart from the financial incentives and health status, the value of leisure time has important influence on the early retirement decisions.

The second phase of the project consists of another three work packages, which use the data gathered in phase one as input.

WP4 Alternative scenarios for health, life expectancy and social expenditure

Organized jointly by CPB (The Netherlands) and DIW (Germany), this WP aims at estimating the consequences of population ageing and the link between age and health on expenditure for health care and pensions.

WP5 Implications for social and financial policy (NIESR - UK)

The participating institutes in this WP will assess the implications of population ageing for public policy, notably with respect to the scope for influencing the development of social and budgetary policy.

WP6 Synthesis, final conference, publication and dissemination (CEPS)

The aim of this WP is to prepare a synthesis of findings of the preceding phases and to summarize the results. This WP will also be devoted to an assessment of the implications for the European Union's policies and actions with respect to ageing.

The FPB participated in the WPs of the first phase.

I Introduction

First work package of AGIR on bio-demographic effects of ageing

This Working Paper reflects the contribution of the FPB to the first work package of the AGIR project, organized by the Spanish FEDEA. It thoroughly studies the bio-demographic aspects of population ageing. The aim is to get a better understanding of the nature of ageing. Not only is it important to analyse how fast a population gets older, it is also important to see what effect age has on the population's health and fitness, especially of the elderly.

This work package concentrates on the health status of different age cohorts, by confronting purely demographic data with data on the health of the population and indicators concerning the quality of life. By doing so, one should get a better view on the past development, the current state and the potential future development of the health of the elderly.

The output of this work package will be used in further work packages in the second phase of the program, in which scenarios will be produced and consequences for demand for health care and pension decisions will be studied.

II Results of data gathering process

The evolution of the population

The data gathered for this working package can be divided into different sections. First section covers data on population and population growth. It studies some measures that describe specific characteristics of the population, such as the average age of the population and the structure of the population by age and gender. Population ageing is then approached by calculating the senility index, the youth- and elderly dependency ratios, as well as the intensity of ageing.

Its causes: changes in fertility and mortality

The second section covers fertility in Belgium. It analyses the evolution of the number of births since 1950 as well as the evolution of the crude birth rate since the beginning of last century. A look at total fertility rates completes the analysis.

Thirdly mortality data are studied. Different methodologies are discussed that can be used to report on the number of deaths and mortality data for Belgium. These include the numbers of deaths by age and gender and infant death.

In the fourth section probabilities of death and survival curves are analysed, both which are the outcome of the construction of mortality tables. The methodology of these mortality tables is explained in detail in appendix.

Its consequences for longevity and life courses

The section on longevity, the time span between birth and death, shows the evolution in life expectancies at different ages, modal and median life duration as well as record age.

Life courses show how people organize this time span between birth and death and how this organization has changed over time. Major events recorded are: age at completion of school, age at first job, age at household formation, age at first child, retirement age and age at first widowhood. These are all events that are very likely to take place at some point during the lifetime of any individual. It is interesting to detect shifts in these life decisions.

And finally… the link between age and health status

Finally, a light is shed on morbidity of the population. Some indicators give a good idea of the health status of the population, by means of the perceived health and disability. Disability is approached through data on blindness, deafness, mental health and handicaps in mobility due to physical constraints.

Data on subjective health and disability allowed to calculate the healthy life expectancy and the disability free life expectancy. These indicate the number of years one can expect to live in good health or without disability. The study also tries to evaluate whether there has been compression or expansion in morbidity, or, in other words, whether people live longer in better or in worse health.

Data were gathered from FPB Population Data and Population Projections, publications of the National Institute of Statistics (NIS), the Ministry of Social Affairs and Public Health, the Institute for Social Security and the Health Interview Surveys carried out in 1997 and 2001 by the Scientific Institute for Public Health. The source of the data is mentioned each time.

A. Population

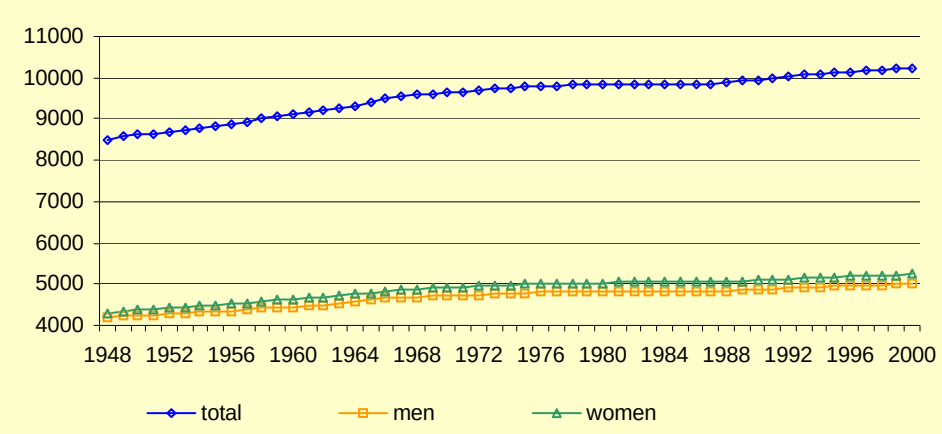
1. Total population

Population data exist from 1948 to 2000 for each single year, by age and gender on January 1st. The data were recorded by the FPB, based on data provided by the N.I.S. Corrections were then made for inter-census mis-estimations. The last age includes people aged 99 and older.

Population increased from 8.5 million in 1948 to 10.2 million in 2000

Figure 1 shows the evolution of the population of Belgium, total and by gender, from 1948 to 2000. Detailed tables with population by gender and by age groups can be found in appendix.

FIGURE 1 - Belgian population (January 1st), total and by gender, in thousands, 1948-2000



Source: NIS, FPB.

In 1948, Belgium counted approximately 8.5 million inhabitants, of which 4.2 million men and 4.3 million women. This number has increased over the years and has reached about 10.2 million inhabitants in the year 2000, of which 5 million men and 5.2 million women. The male and female populations have developed in a similar way, there being slightly more women than men.

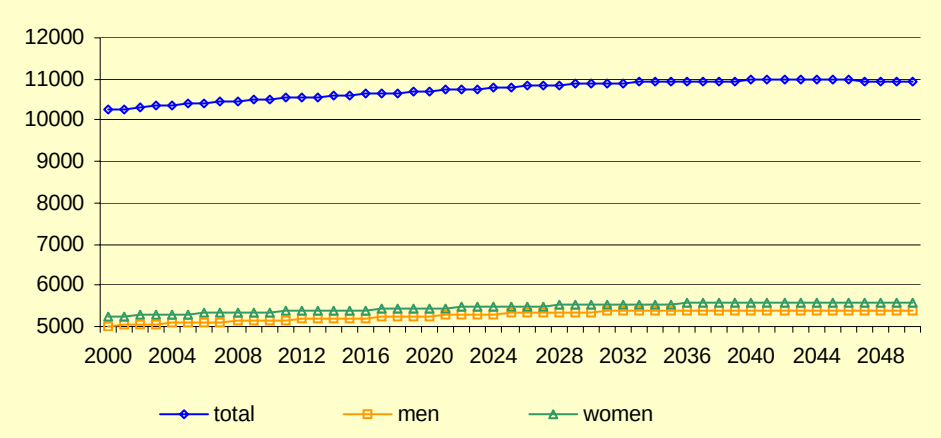
Population projections up to 2050

Together with the NIS and with the collaboration of qualified scientists in the field, the FPB has made population projections up to 2050 (NIS-FPB, 2001). These rely on the following assumptions regarding fertility, mortality and migration. Fertility, measured by the average number of children per woman, is expected to increase from 1.6 in 2000 to 1.73 in 2050. Life expectancy is assumed to increase over the years, though to a lesser extent than in the past decade. In 2050, men will expect

to live 83.90 years, compared to 75.06 years in 2000. Women will expect to live 88.87 years, compared to 81.53 years in 2000. Migration is assumed to remain fairly constant over the period 2000-2050 (the migration balance being 18,400 in 2000 and 17,300 in 2050).

Figure 2 shows the projected evolution of the population, total and by gender, from 2000 to 2050, based on the assumptions mentioned above. Data can be found in appendix.

FIGURE 2 - Belgian population (January 1st), total and by gender, in thousands, 2000-2050



Source: NIS – FPB Population Projections (2001).

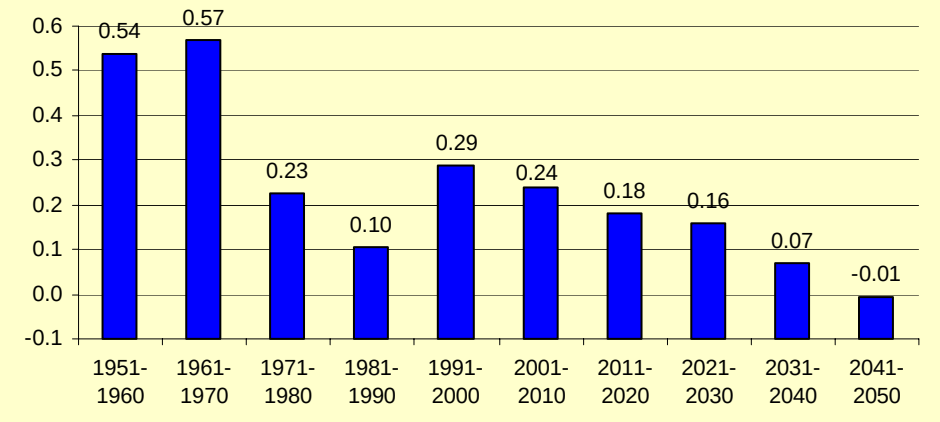
These projections expect the population to increase slightly between now and the year 2050. By 2050, Belgium will count approximately 10.9 million inhabitants, of which 5.4 million men and 5.5 million women. The biggest increase will take place the first 30 years. Between 2030 and 2050, the total amount of the population is expected to remain more or less stable.

2. Population growth

Highest population growth rates in the fifties, sixties and seventies

The population has increased from 8,512,195 in 1948 to 10,239,085 in 2000 and is expected to increase further to 10,930,102 by 2050. The decennial population growth rates give some more information. These are shown in figure 3 (average rates in 10 year periods).

FIGURE 3 - Average population growth by ten years, 1951-2050



Source: NIS, FPB, , FPB calculations.

Until the seventies, the growth rates (around 0.5-0.6) were higher than after that period. Especially during the eighties, the growth rate was rather low: 0.1 on average. At the end of the eighties, the growth rate picked up a little to 0.3, but never reached the rate of the period 1951-1970 and should not do so in the frame of the held forecasts hypotheses, leading to a stabilization in the total size of the population. This confirms the image shown by the projections: the number of inhabitants will not significantly increase by the year 2050. Based on projections, population growth should be 0.2 between 2000 and 2025 and 0.05 between 2026 and 2050. Between 2041 and 2050, population growth is even expected to be negative.

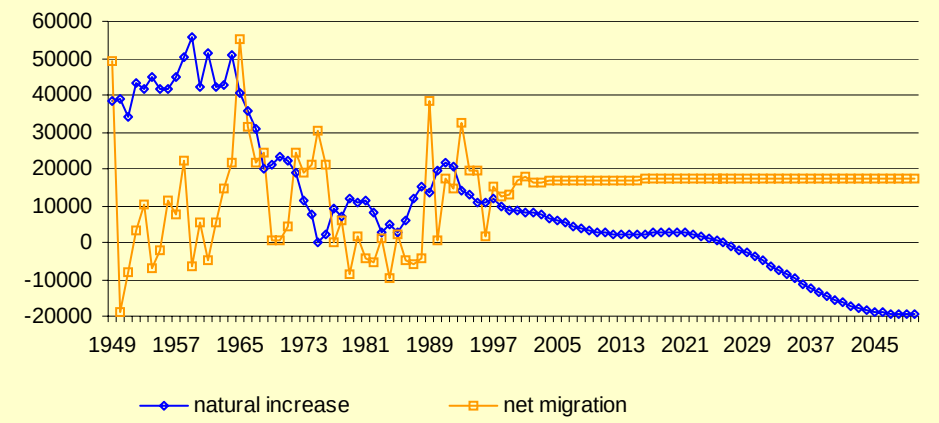
Three determinants for population growth

Population growth is the result of several factors: the number of births, the number of deaths and the net migration (the difference between the number of immigrants and emigrants). The difference between the number of births and the number of deaths gives the *natural increase* of the population. The increase in the population that cannot be explained by the natural increase is *net migration*. A positive net migration means more people immigrated than emigrated.

Figure 4 shows the natural increase and net migration from 1948 until 2050[1].

1. For the years 2000 and 2001, a third factor influenced the population increase. The government decided to do regularizations for illegal immigrants., people already living in Belgium but not included in the official population. This operation had only a significant influence on the years 2000 and 2001, accounting for respectively about 15,000 and 25,000 people.

FIGURE 4 - Natural increase and net migration, 1949-2050



Source: NIS, FPB.

Between 1949 and 2000, the natural increase of the population was positive in all years, which means that the number of births exceeded the number of deaths. This has contributed to population growth, but doesn't account for all of it. The remainder of the population growth can be attributed to net migration. The natural increase of the population is expected to decrease but remain positive until 2025. From then on, the number of births won't be high enough to compensate for the number of deaths and the natural increase will be negative. In a period of 100 years, the natural increase will have dropped from about 50,000 to -20,000.

Positive net migration

In most years between 1949 and 2000, net migration was positive: there were more immigrants than emigrants. This positive migration added itself to the positive natural increase. In some years, e.g. 1949-1950 and 1961, the net migration was negative but did not lead to a decrease in the population given the higher natural increase. The graph reflects the assumption of a stable, positive net migration of around 17,000 people.

3. Structure of population according to gender or age

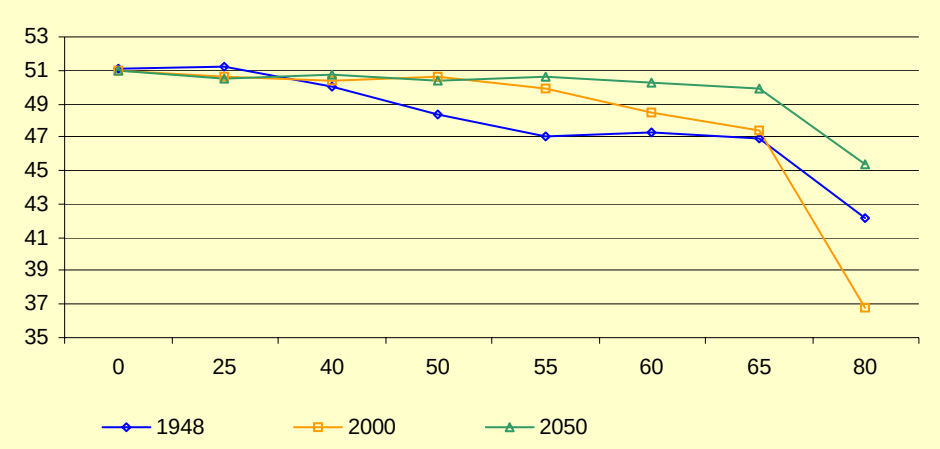
After the analysis of the evolution of the population, its growth rates, as well as the underlying causes for this evolution, this section turns to the structure of the population by gender and by age.

a. Structure of population by gender

Percentage of men in the population drops with age…

The structure of the population by gender is first given by the proportion of men or women in the population. Figure 5 shows the share of men in 1948, 2000 and 2050, for the total population and at several ages. The data can be found in appendix.

FIGURE 5 - Share of men in the population, by age, 1948, 2000 and 2050



Source: NIS, FPB.

About 49.3% of the population in 1948 was male; in 2000 this was 48.9%, in 2050 this is expected to be 49.2%. This proportion is relatively stable across time, and so the total population seems to be divided almost evenly between genders. Yet when looking at different ages, the proportion can vary. The proportion of the population that is male is around 50% in the younger age groups, but drops in the older age groups. Women having higher life expectancies live longer; therefore, the proportion of men in the population drops with age. The drop of the proportion in the older age groups will be smaller in the future though, since the life expectancy of men is expected to catch up a little.

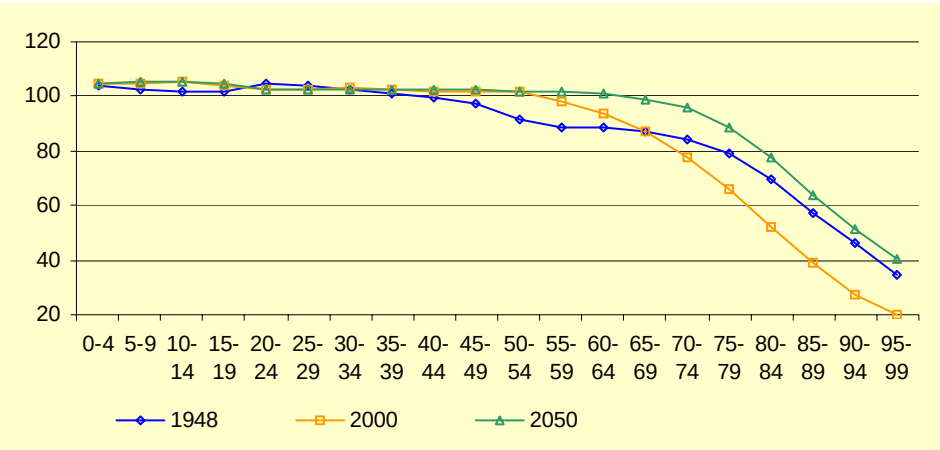
…as well as the masculinity index

Another measure of the gender proportion is the *masculinity index (MI)*, which is the number of men divided by the number of women. An index >100 means that there are more man than women. Inversely, an index <100 means that there are more women than men.

$$\text{masculinity index} = \frac{\text{pop - men}}{\text{pop - women}} \times 100$$

Figure 6 shows the MI by age group for 1948, 2000 and 2050 (based on projections). Detailed data can be found in appendix.

FIGURE 6 - Masculinity index by age group, 1948, 2000 and 2050



Source: NIS, FPB.

Until the age of 45, the MI exceeds 100: there are more men than women. For example, in the youngest age group there are 1.05 men for every woman. After the age of 45-50, the MI drops steadily, and reaches very low values at the highest age group, for example 20 for the age group 95-99 in the year 2000. At this age, there are about 5 women for every man. Even though there are slightly more men than women in the younger age groups, the number of women outweighs the number of men more strongly in the older age groups.

A look at evolution over time does not notify much changes in the younger age groups. Until the age of 44, the MI remains stable around 100. Changes occur in older age groups: the MI dropped between 1948 and 2000. In 1948 the index for 90-95 year old was 46; in 2000 it was 27. This means that the imbalance between men and women increased. But, by 2050 this is expected to rise to 51 for that age group, which is even higher than in 1948; this can be imputed to the forecasts hypotheses.

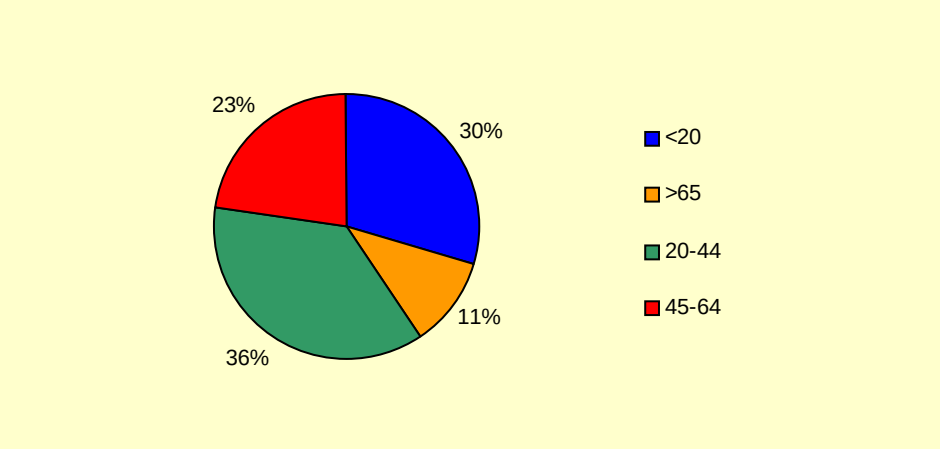
To sum up the structure of the population by gender, until the age of 50 approximately, there are about 50% women and 50% men. In older age groups, the proportion of men in the population and the masculinity index drop, which indicates there are more women than men, due to the higher life expectancy of women.

b. Structure of population by age

Share of oldest age group in population to double by 2050

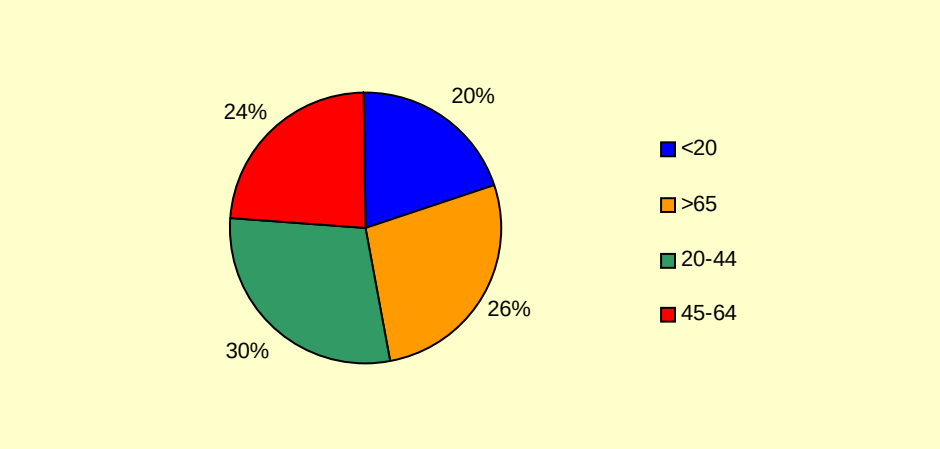
The structure of the population by age is appreciated by dividing the population into four age groups: younger than 20, between 20 and 44, between 45 and 64 and older than 65. The share of each group in the total population has been calculated for the years 1948 and for 2050. The results can be seen in figures 7 and 8.

FIGURE 7 - Population by age group, 1948



Source: NIS, FPB.

FIGURE 8 - Population by age group, 2050



Source: NIS, FPB.

In 1948, 30% of the population was younger than 20, 36% between the age of 20 and 45, 23% between the age of 45 and 65 and 11% was older than 65. In 2000, 25% of the population was younger than 20, 36% between 20 and 45, 22% between 45 and 65 and 17% older than 65. From 1948 to 2000, two age groups have remained fairly stable: the age group between 20 and 44 (36%) and the group between 45 and 64 (22%). The proportion of people younger than 20 has dropped from 30% to 25%, whereas the proportion older than 65 has increased from 11% to 17%.

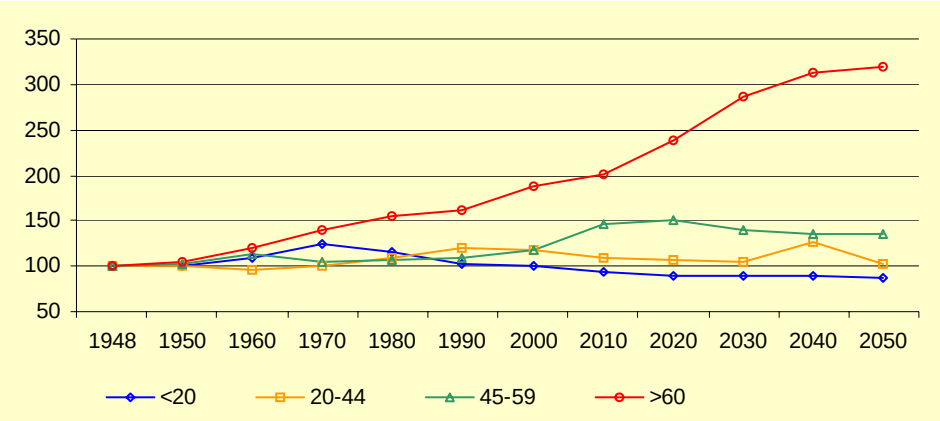
Share of youngest age group to decrease

Based on projections, the share of the youngest age group (<20) is expected to decrease to 20% in 2050. About 29% of the population will be between 20 and 45 years old. This is a decrease compared to 2000 (36%). People aged 45-64 will make up 24% of the population and the oldest age group will make up 26%.

By 2050, half of the population will be older than 45. In 1948 this was only 34%, in 2000 this was 39%.

The two figures above do not show, however, what happened to those shares between 1948 and 2000. Therefore, the relative size of each age group **is given in index,** with 1948 as base year (1948 = 100). The results are shown in figure 9.

FIGURE 9 - Relative size of age groups with 1948 as base year, 1948-2050



Source: NIS, FPB.

The size of the age group of people aged 65 and older compared to 1948 has almost doubled by the year 2000. The age group younger than 20 increased until around 1975 and then decreased to reach about the same number as in 1948. The group between 20-44 first decreased a little in size and then picked up from 1970 to the nineties when incorporating the generations of the post-war baby-boom. The number of people between 45 and 64 inflates for the same reason from the nineties to the year 2015.

The expected relative size of each age group in 2050 compared to 1948 should be:.

- Younger than 20: 87.74
- between 20 and 44: 101.72
- Between 45 and 64: 135.33
- older than 65: 318.29

By 2050 the size of the youngest age group should be appreciably lower compared to 1948, the size of the group between 20 and 44 would be again approximately the same. A true expansion of the size of the older age groups relative to 1948 can be expected. The size of the group of people aged 64 and older in 2050 will be 3 times the size in 1948. This clearly illustrates population ageing.

Change in age structure due to three phenomena…

Three demographic phenomena account for the change in age structure in Belgium's population. Firstly, there has been a decrease in the number of births[1], which means that the base of the age-distribution pyramid is thinning. Secondly, fertility increased sharply after the Second World War. The first cohort of this 'baby boom' will start to retire by the year 2010, and subsequently the pyramid is beginning to fatten at the top. Thirdly, there is the increase in life expectancy[2] both for men and women. These further accentuate the fattening at the top of the age pyramid, and the higher relative size of the older age groups **as has been** shown in figure 9.

All data used in this section can be found in appendix.

4. Average age of the population

The average age (AA) of the population is calculated as the product of each age and the number of people that age, divided by the total population.

$$\text{average age} = \frac{\sum_{i=1}^{111} \text{age}_i \times \text{pop}_i}{\text{total pop}}$$

With: average age = average age of population

age_i = certain age i

pop_i = population of age i

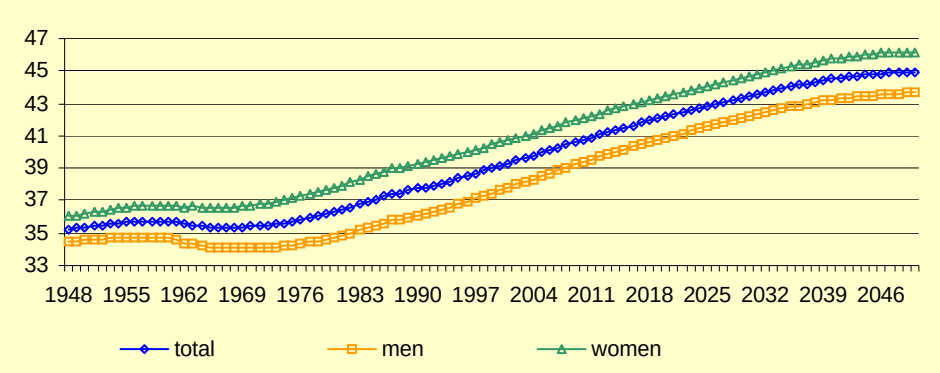
total pop = total population

1. This is analysed in detail in the chapter on fertility.
2. This is analysed in detail in the chapter on longevity.

Increase in average age confirms population ageing

The average age of the population is shown in figure 10.

FIGURE 10 - Average age of the population, total and by gender, 1948-2050



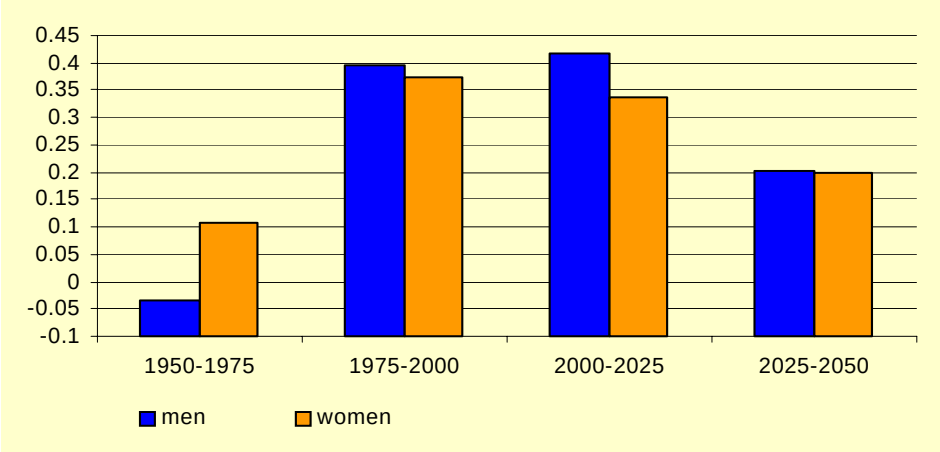
Source: NIS.

The average age has steadily increased from 35.3 in 1948 to 39.15 in 2000. It is expected to increase even further to 44.93 by 2050, based on projections. Similar evolutions can be found for the AA of men (from 34.56 in 1948 to 43.65 in 2050) and women (from 36.17 in 1948 to 46.18 in 2050). The AA of women is higher than that of men since women have a higher life expectancy. The biggest increase took place, and is expected to take place, between 1975 and 2025. After 2025, the average age will still increase but at a lower pace.

Biggest increase in average age between 1975-2000 and 2000-2025

Figure 11 shows the average annual growth rates in 25-year periods of the average age of the population between 1950 and 2050.

FIGURE 11 - Average annual growth rates of average age of population, by gender, 1950-2050



Source: NIS, FPB.

Between 1950 and 1975, the average age of men actually decreased (annual growth rate -0.03), while that of women increased with 0.1% on average annually. Since then, the growth rates have increased significantly. Both for women and for men, the average age grew annually at rates between 0.37 and 0.39 per cent between 1975 and 2000. These growth rates can be expected to remain this high for the 2000-2025 period, and then decrease a little, to 0.2 per cent between 2025-2050.

Except for the 1950-1975 period, the average age of the male population seems to increase at a slightly higher rate than the female population.

5. Ageing of population: senility index, dependency ratio and intensity of ageing

The increase in the average age of the population and the evolution of the population structure by age show that people, on average, become older now than they used to 50 years ago. Combined with the steady fall in the birthrate this leads to a population growing older, or 'ageing'. This population ageing is expected to go on in the future.

Summary statistics on population ageing

The most frequently cited summary statistics regarding these demographic changes are the so-called senility index, dependency ratios and intensity of ageing. These measures give a better idea of the extent to which the population is ageing.

The *senility index* is the proportion of people older than 60 in the population of people younger than 20.

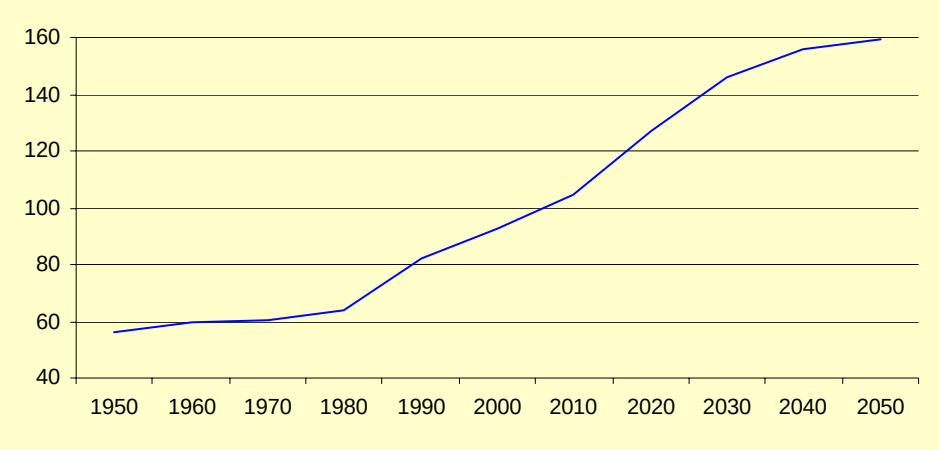
$$\text{senility index} = \frac{\text{pop} \geq 60}{\text{pop} < 20} \times 100$$

This index takes into account the population growing older as well as the drop in fertility. Figure 12 shows the evolution of the senility index from 1950 to 2050.

Senility index to more than double by 2050

In 1948, the index was 56.4%: for every person older than 60, there were approximately 2 people younger than 20. By 2000, this figure had risen to 92.6%, or, for every older person, only 1.1 younger people could be found. Based on projections, this index would rise to 159.4%, or, 1.6 older people for every young person in 2050.

FIGURE 12 - Senility index, 1950-2050



Source: NIS, FPB.

Another measure is the *old – age dependency ratio.* This is the number of people older than 60 relative to the number of people between 20 and 59. It tells how many

potentially active people support non-active elderly people, or, gives an indication of the possible dependency burden on workers. Since people have the option to retire at age 60, the potentially active people are considered to be between 20 and 59 years old. A ratio < 100 means that there is more than 1 potentially active person for every older person. A ratio > 100 means there is more than one elderly person for every potentially active person.

$$\text{old age dependency ratio} = \frac{pop \geq 60}{pop20-59} \times 100$$

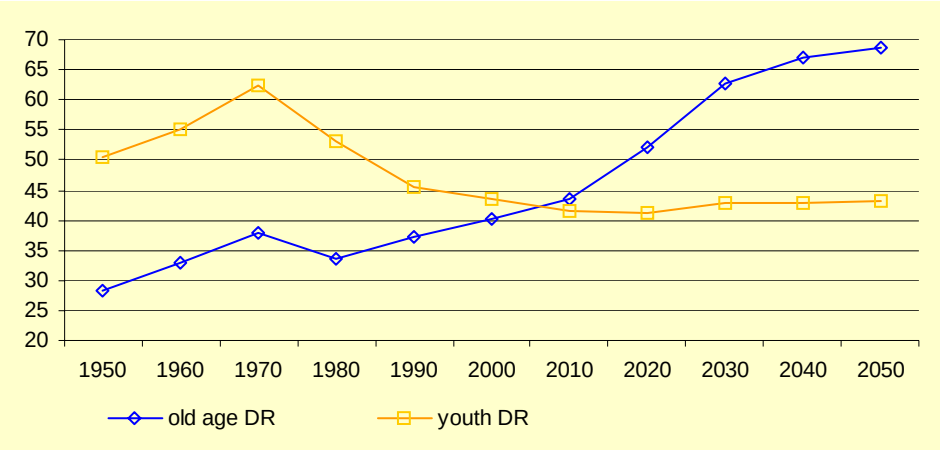
Similarly, the *youth-dependency ratio* is the ratio of the number of people in the population younger than 20 relative to the working age population (19-60). A ratio < 100 means that there is more than 1 potentially active person for every younger, dependent person. A ratio > 100 indicates there is more than one younger, dependent person for every potentially active person.

$$\text{youth dependency ratio} = \frac{pop \leq 19}{pop20-59} \times 100$$

Old-age dependency ratio to increase, youth dependency ratio to decrease

Figure 13 shows the old age and youth dependency ratio of the population from 1950 to 2050.

FIGURE 13 - Old age dependency ratio and youth dependency ratio, 1950-2050



Source: NIS, FPB.

In 1950, the old age dependency ratio (ODR) equalled 28.4. Roughly spoken, this means that for every elderly person in the country, there were 3 potentially active people to support this person. The ODR has known an upward evolution, which stagnated a little during the seventies, even dropped in 1985, but then rose again. In 2000, the ODR was 40.2. For every older person, there were about 2.5 potentially active people in the country. Based on the population projections, the ODR should increase even further in the future. By 2050, it will have reached 68.6, or less than two potentially active people for every older person.

In 1950, the youth dependency ratio (YDR) was 50.4: for every younger person there were approximately 2 potentially active people to support him. The ODR increased until 1970, which is clearly the result of the baby boom of the post-war period. From then on however, the YDR has known a downward evolution, as opposed to the ODR. In 2000, the YDR was 43.4, which means that for every younger

person, there were more potentially active persons to support them than in 1950. The decrease hasn't been that significant as the increase in ODR over the same period. In the future, the YDR should stabilize around 43.

These indicators tell something about how the dependency shifts from children to older persons during demographic transition (Mirkin, Weinberger, p. 41). In 1950, the old age dependency was lower than the youth dependency: in 1950, one potentially active person supported more young people than elderly. The gap between both indicators has narrowed over time. In the future, the ODR is expected to exceed the YDR: workers will now have to support more elderly and fewer youngsters. The ODR is expected to increase; the YDR is expected to remain fairly stable around 43.

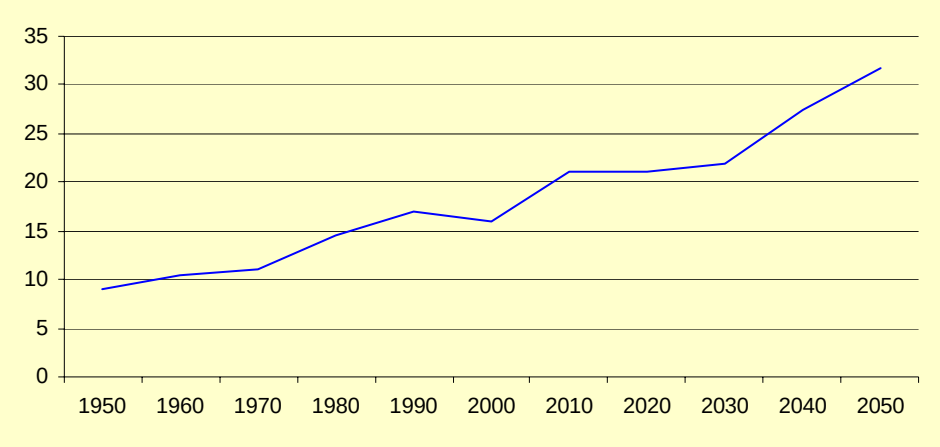
Intensity of ageing increases as well.

Finally, the *intensity of ageing* is the proportion of the population older than 80 of the population older than 60, also called the measure of the "oldest old". This percentage has increased over the years. In 1950, about 9% of the elderly (60+) were older than 80. By 2000, this had risen to 17%. According to projections, this index would rise to reach 31.64% by the year 2050.

$$\text{intensity of ageing} = \frac{\text{pop} \geq 80}{\text{pop} \geq 60} \times 100$$

Figure 14 shows the intensity of ageing from 1950 **up to** 2050.

FIGURE 14 - Intensity of ageing, 1950-2050



Source: NIS, FPB.

All these indicators show that the population is indeed getting older. For every young person, there are more people older than 60 now than there were some 50 years ago, and there are fewer potentially active people supporting non-active people. Also, the proportion of people older than 80 in the population older than 60 has risen, which indicates a higher intensity of ageing.

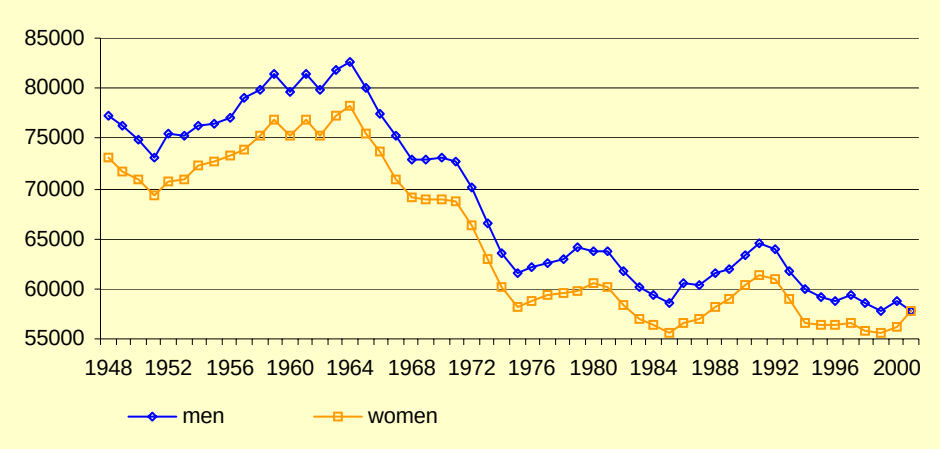
The data used in this paragraph can be found in appendix.

B. Fertility

Baby boom in the fifties, drop number of births since then

In 1950, 74,778 boys were born and 70,894 girls. The evolution of the total number of births from 1948 to 2000 by gender is shown in figure 15. Data can be found in appendix.

FIGURE 15 - Total number of births, by gender, 1948-2000



Source: NIS.

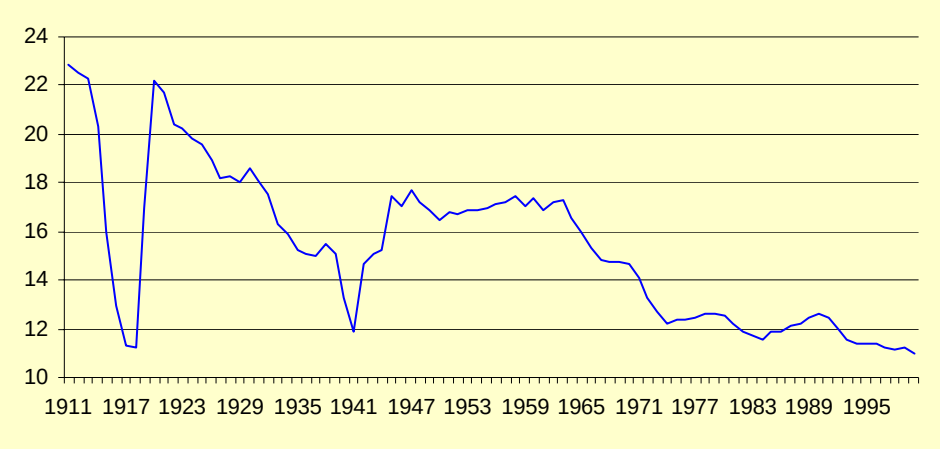
In 1997, 59,277 boys were born and 56,587 girls, so much fewer children are born today then 53 years ago. However, the evolution wasn't constant over the period. The number of births dropped slightly between 1948 and 1951 and then rose until 1964, producing the so-called baby-boom generation following the Second World War. Since 1964, however, the number of births has dropped sharply. Only in 1981-1982 and 1992-93, there was a slight upwards movement.

The difference between gender at birth is fairly constant. On average, more boys are born than girls. In 1950, 1.05 boys were born for each girl. In 1997 this number was 1.04.

Drop in the crude birth rate since the fifties

Of course, the number of births also depends on the size of the population. Therefore, the *crude birth rate (CBR)* is calculated as the number of live births divided by the total population (men and women), expressed as the number of babies born per 1,000 inhabitants. (Lambrecht M., p. 8) The rate is called crude because it doesn't take into consideration the fact that not everyone in the denominator is at risk of giving birth. The CBR is shown in figure 16 from 1911 to 2000.

FIGURE 16 - Crude birth rate, 1911-2000



Source: NIS, FPB.

The crude birth rate has dropped between 1911 and 1996. In 1911, about 18.9 children were born per 1,000 people. By 1996, this was 11.39. The consequences of the two World Wars are clearly visible. During the First World War, from 1914-1918, the CBR collapsed and reached its lowest number in 1918 with about 11 children born per 1,000 inhabitants. After the war, the number of births picked up again. A similar, though less strong situation took place during the Second World War. Between 1939 and 1944 the CBR dropped, and between 1945 and 1950 there's a clear baby boom.

The CBR has limitations. Perhaps the most important one is that it is insensitive to the age structure of the population. Countries with "young" populations will have a higher CBR simply because larger segments of the populations are in the age range when people have children.

Total fertility rate confirms drop in fertility

The *total fertility rate (TFR)* compensates for this **last** limitation. This is the number of children a woman would have if she lived through ages 15-49 of a given year with the specific fertility rates of each of those ages. The difference between the CBR and the TFR is double: in the TFR, only women of 15-49 are considered and it is called the 'total' fertility rate because it takes all these ages into consideration at once, as it is the sum of all age-specific fertility rates (Lambrecht, p. 10, C. Bradford Hale).

The TFR is a period measure, a measure taken at one point in time. But it is used as if it were a cohort measure, a measure that summarizes the experience of a group of people across some part of their lifetime. Thus the TFR for 1995 is the sum of age-specific fertility rates experienced by women during that year, but it is presented as if it captured the childbearing of all women. (C. Bradford Hale)

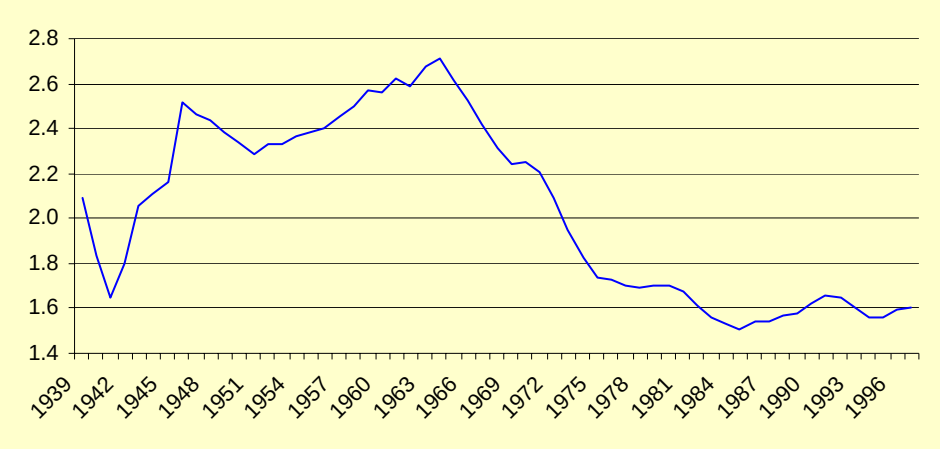
The TFR can help assess the growth potential of societies, taking as a reference the concept of replacement level fertility or the number of children each couple must have if, given the present mortality conditions, both parents are just to replace themselves in the next generation. That number is 2.1 children. (C. Bradford Hale)

T. Eggerickx from the UCL, transmitted data on the TFR from 1846 onwards. In 1846, women had on average 3.81 children. This increased to 4.4 children in 1866, the highest TFR known for Belgium. Then it dropped again, to reach 3.4 children

in 1900, 2.4 children in 1920 and 2.2 children in 1930. Therefore, until 1930, the TFR in Belgium was higher than the replacement level.

Figure 17 shows the total fertility rate between 1939 and 1997.

FIGURE 17 - Total Fertility Rate, 1939-1997



Source: FPB, NIS, UCL (for data prior to 1961).

The TFR was 2.09 in 1939, which means that women had, on average 2.09 children. It dropped during the Second World War. It increased to 2.5 in 1946, then decreased a little to 2.3 in 1951. Then,the effect of the post-war baby boom is again clearly visible: the TFR started to increase in 1952 to reach its peak at 2.7 children per woman in the sixties. The subsequent drop in fertility after the baby boom is also shown. From 1965 on, the TFR has fallen, reaching 2.0 in 1972 and 1.5 in 1985. The TFR has since varied between 1.5 and 1.6. This means that, while in 1939, women had on average 2.09 children; in 1997 this was 1.6, which is well below the replacement level of 2.1 children.

While the TFR is generally accepted as the "best" measure of fertility, it also has limitations. At the extremes of the age range (defined as younger than 20 and older than 40) a large segment of the population may, in fact, not be at risk of childbearing. Age-specific fertility rates for these groups may be overestimated (C. Bradford Hale). Another well known limitation of the TFR is that it doesn't reflect the postponement of births, which in the end can lead the final observed fertility of cohorts of women to be higher than the one expected by the calculation of this transversal measure.

The evolution of the TFR confirms a drop in fertility since the 1960's, already announced by the drop in the number of births as was shown by the CBR.

Reasons for drop in fertility

Several reasons can account for the decrease in fertility the past decennia (Lambrecht M., p. 21; Pinnelli, 2002, p. 4). The most important ones are:

- Fewer people get married nowadays, and when they do, they do so at a later age, so there is less time to have children. Women becoming older, the probability of her conceiving and bringing a pregnancy to term also decreases.
- Infant mortality has dropped[1]. Since the probability to lose a child has fallen, people have fewer incentives to have another baby to 'replace' the lost baby.

- Techniques have come into existence to prevent women from getting pregnant, such as condoms, birth control pill, … or even abortion.

The decreasing fertility could also be due to an increase in the cost of childbearing and -rearing, which causes parents to opt for fewer children. There are several causes for this increase in cost:

- The prohibition for children to work means children do not contribute to household income.
- Education is compulsory until the age of 18, so that children are materially impeded to perform several domestic chores and rely economically on their parents.
- High youth unemployment leads to youngsters being economically dependent longer.
- The child's level of living must be kept in line with the prevailing standards, so that children must be treated at least as well as any other family member, and possibly even better.
- Women are offered new, (relatively) well-paid work opportunities, but they cannot fully exploit them if they have children, because mothers cannot guarantee sufficient flexibility in terms of working hours or spatial mobility. On top of that, well-paid work increases the opportunity cost of staying at home to care for children, making it less interesting to do so.

All these factors might have played a role in the decrease of fertility. (De Santis, 2002, p. 6-7, Pinnelli, 2002, p. 5)

The decrease in fertility has consequences for population dynamics and structure. The base of the age-structured population pyramid will become thinner and the population will be older on average.

C. Mortality

Mortality is the other important natural population determinant. Shifts in death patterns can have serious consequences for the population size and structure. For example, an increase in life expectancy and thus an increase in the age of death, will lead in the beginning, for a given number of births, to an increase in the population (fewer people die) and to an increase in the average age of the population (more older people).

Two approaches to report on mortality

When reporting on mortality, two approaches can be used:

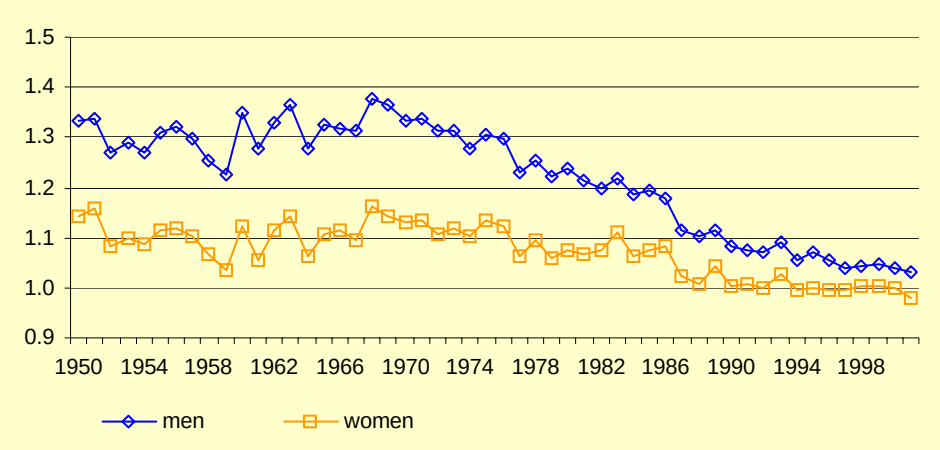
a) Number of deaths by age at death (different years of birth)
b) Number of deaths by year of birth (different age at death).

When using these data to construct mortality tables, one has to keep in mind that the choice of approach has implications for the results, such as life expectancy or death probability. The FPB has constructed two data sets, following both approaches. This analysis uses number of deaths by year of birth since this is the methodology used by the National Institute for Statistics for the construction of the mortality tables (see section 4).

1. See the next chapter on mortality.

The total number of deaths has remained fairly constant over time. Between 55,000 and 60,000 men die every year, and between 50,000 and 55,000 women do. The proportion of number of deaths in the total population was, for both genders, about 1.3% in 1950. This percentage has dropped (constant number of deaths and an increasing population) and there seems to be a convergence around 1%. This has remained rather stable since 1985 as can be seen in figure 18.

FIGURE 18 - Number of deaths in proportion of total population, by gender, 1950-2000



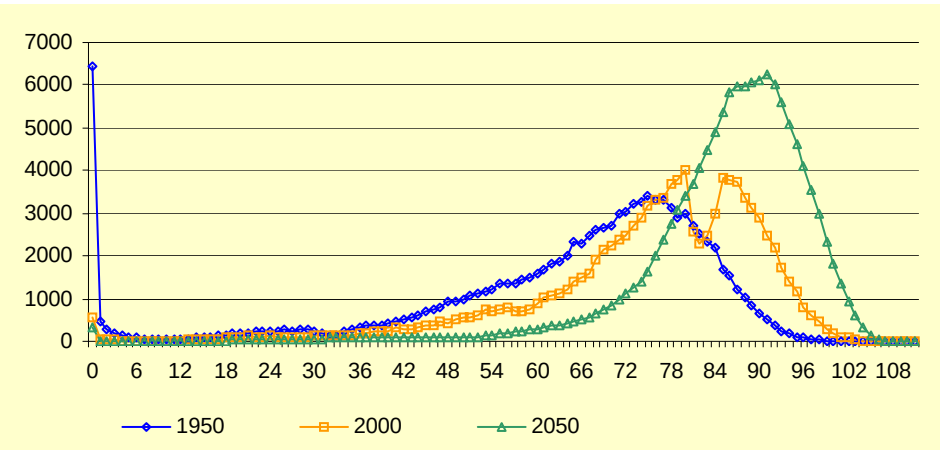
Source: NIS, FPB population data.

To detect at which age most deaths occur, figure 19 shows the number of deaths by age for the total population in 1950, 2000 and 2050[1].

Peak in number of deaths shifts to later ages

In 1950, there were many deaths in the year of birth (infant death). Once the age of 1 was reached, the number of deaths dropped and remained low until the age of 15. Then it gradually increased to reach its peak around the age of 79. In older age groups, the number of deaths dropped again, the remaining population becoming very small.

FIGURE 19 - Number of deaths by age, total population, 1950-2050



Source: NIS, NIS – FPB projections.

1. Based on projections on population and probabilities of death.

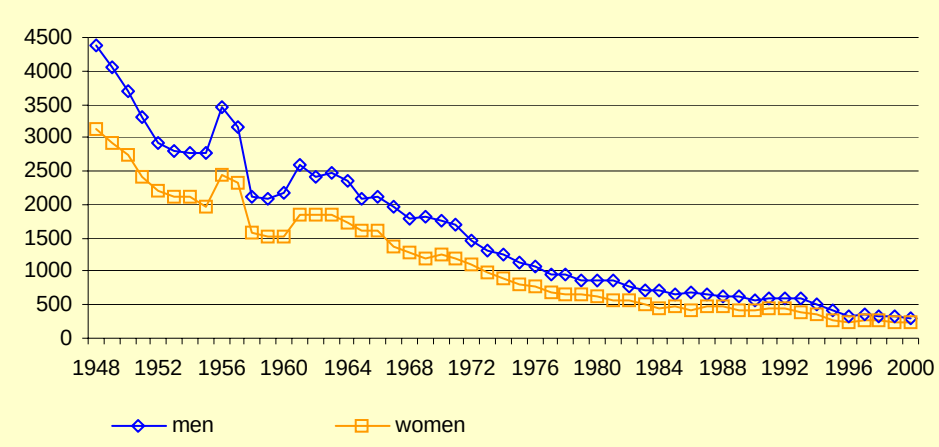
In 2000, the curve has shifted to the right compared to 1950. The number of infant deaths was still high, but much lower than in 1950 (554 as compared to 6,400 in 1950). As in 1950, the number of deaths dropped after the age of 1 until the age of 15, and then gradually rose to reach its peak at age 82-87. This peak is higher than in 1950.

The population projections indicate that the curve will shift even more to the right and the peak will be even higher. Most people will die at the age of 95. Infant death won't decrease much compared to 2000.

Infant death has decreased

There has been a spectacular drop in infant death, as can be seen on figure 20, which gives its evolution between 1948 and 2000.

FIGURE 20 - Number of infant deaths, by gender, 1948-2000



Source: NIS.

The number of children that died before having reached the age of 1 was 10 times less in 2000 than in 1948, also due to the drop in the number of births. This goes for boys and girls. In 1948, 41 out of 1,000 baby boys died; in 2000 this was only 4 out of 1,000. The number of infant death by women dropped from 30 out of 1,000 in 1948 to 3.6 out of thousand in the year 2000. It seems that the decrease in the number of babies born[1] was outnumbered by the decrease in infant death. There is a slight difference between men and women: fewer baby girls die than do baby boys.

What caused mortality to drop?

Several factors can explain this decrease in mortality. The most important ones are:

- sanitary conditions and living conditions have improved significantly in the past decennia;
- nourishment and working conditions are better;
- medical science has improved and better technology exists to prevent and cure diseases;
- life style is more appropriate. Due to rising education, people are more aware of the importance of health.

(Lambrecht M., p. 22; Haffard T., 2002, p. 1)

1. See: crude birth rate and total fertility rate in the fertility paragraph.

The death figures are of course dependent from the evolution of the population itself. To avoid this factor, the next paragraph analyses probabilities of death.

D. Mortality tables, probabilities of death and survivors

1. Methodology mortality tables

Construction of mortality tables….

The methodology used by the NIS and, in the frame of this study by the FPB, to construct mortality tables is explained in detail in appendix, section 7. As mentioned before, when relating to the past they rely on data of death by year of birth. But, for the projection period, the mortality tables rely on data by age at death.

2. Evolution of death probabilities

…and calculation of probabilities of death

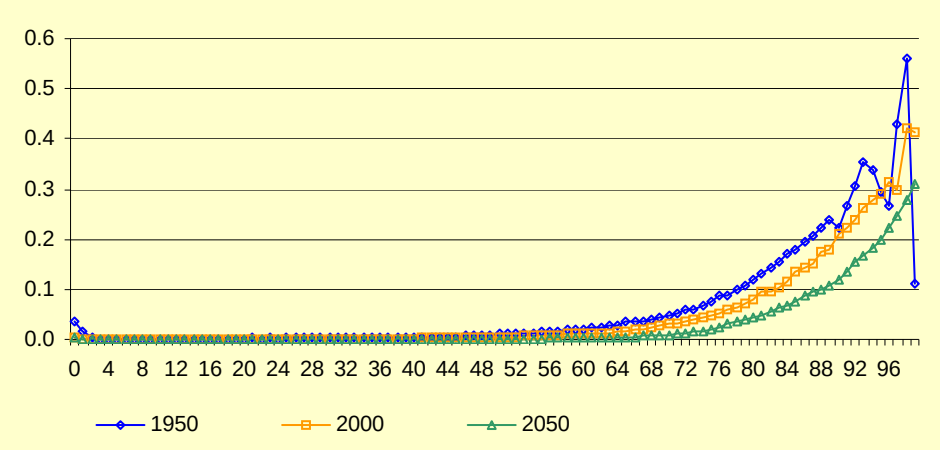
Mortality tables include the probabilities of death as well as the life expectancy at each age. The next chapter will cover life expectancies. This point will concentrate on the analysis of probabilities of death.

The probability of death (qx) gives the probability that a person will pass away in the year before reaching the age x. These qx are calculated by dividing the number of people who died at age (x-1) by the total population aged (x-1). Inversely, the probability to survive at age x can be calculated as (1-qx).

Probability of death increases with age

Figure 21 shows the probabilities of death (qx) for men at all ages in 1950, 2000 (observations) and in 2050 (projections).

FIGURE 21 - Probabilities of death, all ages, men, 1950, 2000 and 2050



Source: NIS, FPB mortality tables.

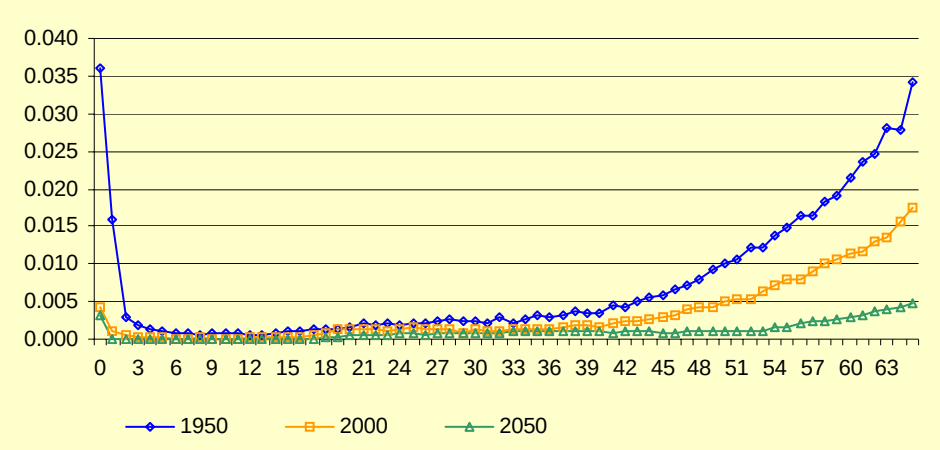
In 2000, probabilities of death dropped at age 1 (newborn babies having a slightly higher chance to die) and remained low (below 0.01) until the age of 60. Then the qx started to rise which age to reach 0.1 around age 80, 0.2 around age 90, 0.3 around age 95 and 0.4 at the age of 100. The qx have dropped slightly between 1950 and 2000, especially in higher age groups, and is expected to decrease even

further in the future; the qx of 2000 lie below those of 1950 and those of 2050 even lower.

qx has decreased since 1950

Figure 22 shows the probabilities of death for men in 1950, 2000 and 2050, only for the ages below 65. These qx weren't shown clearly in the figure above.

FIGURE 22 - Probabilities of death, age 0-65, men, 1950, 2000 and 2050

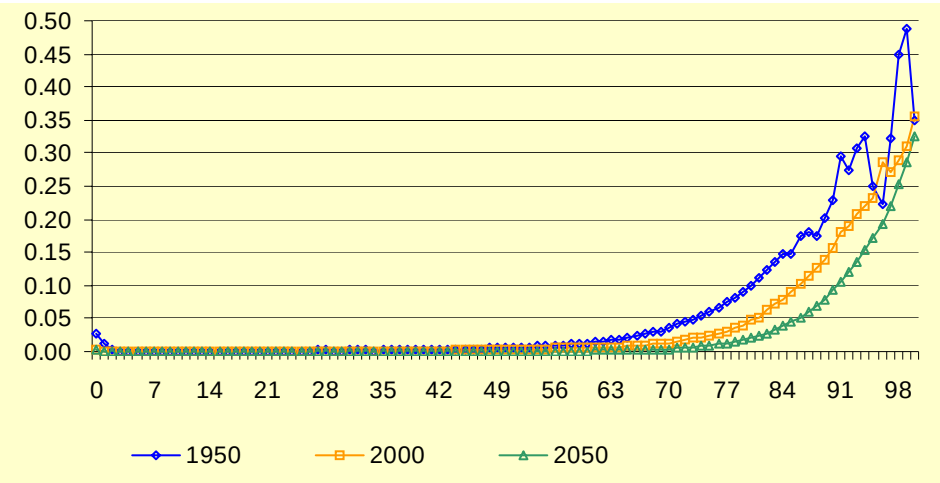


Source: FPB Mortality tables.

This picture analyses in more detail the evolution of qx before the age of 65. For newborns, the probability to die was 0.035 in 1950 and 0.005 in 2000. Once the age of 1 is reached, the qx drops and remains lower than 0.005 until the age of about 45-50. Then it starts to rise with age. Again, the qx is lower in 2000 than in 1950, and is expected to be lower in 2050 than in 2000, especially at older ages.

Figure 23 shows the probabilities of death for women at all ages. This is done for the years 1950 and 2000 based on observations and for 2050 based on projections.

FIGURE 23 - Probabilities of death, all ages, women, 1950, 2000 and 2050



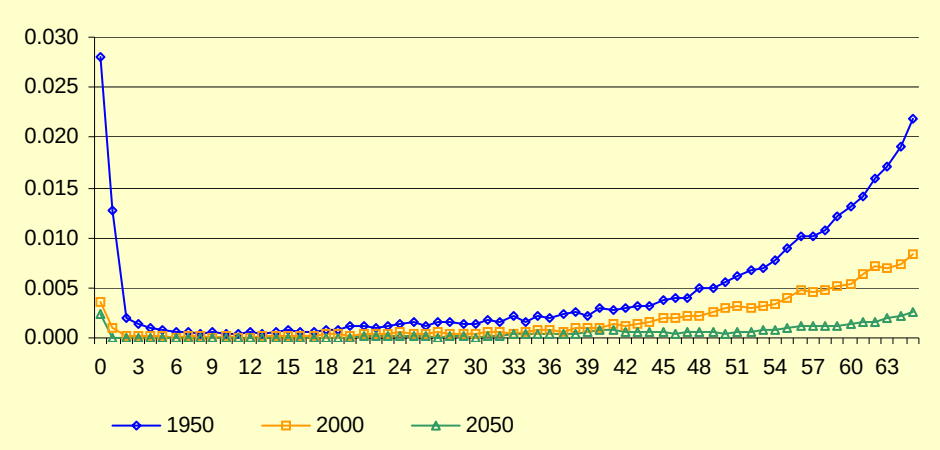
Source: NIS, FPB Mortality tables.

The picture is similar to that for men. In 2000 the qx, being slightly higher for newborn babies, drops after the age of 1, and remains below 0.01 until the age of

65. Then the qx starts to rise, reaching 0.05 at the age of 72 in 1950, at 82 in 2000. qx reaches 0.1 at age 80 in 1950 and age 86 in 2000. In 2050 this is expected to be at age 90. qx keeps rising with age, to reach 0.35 at the age of 100 in 2000. Again, the probability of death in 2000 was lower than in 1950. The qx is expected to decrease even further in the future. At all ages, the curve for 2050 lies below the curve for 2000.

To get a better idea of the evolution of qx for women younger than 65, figure 24 shows these qx in 1950, 2000 and 2050.

FIGURE 24 - Probabilities of death, age 0-65, women, 1950, 2000 and 2050



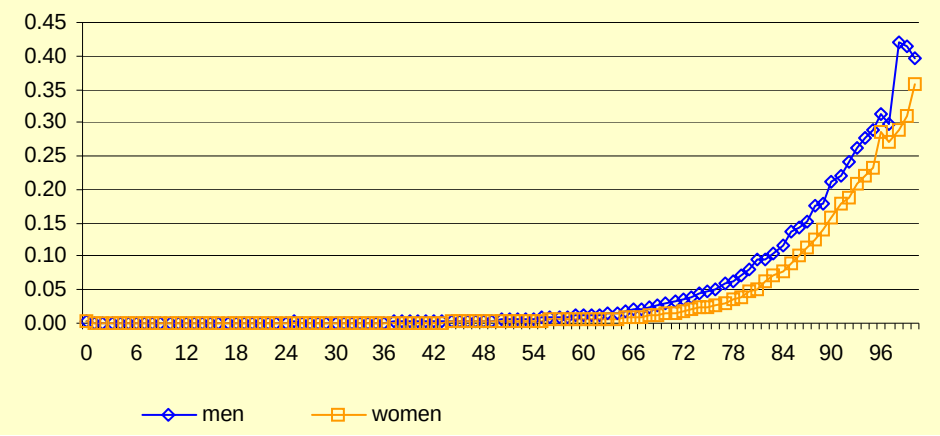
Source: NIS, FPB Mortality tables.

Again, the probability of death drops from 0.03 once the age of one is reached and remains below 0.005 until the age of 50-55. Then it increases with age, to reach 0.02 at age 65 in 1950, and 0.007 at age 65 in 2000. The qx are substantially lower in 2000 than they were in 1950 and are expected to decrease further by 2050, especially after the age of 40.

It is more probable for men to die than for women

In the figures analysed so far, the probabilities of death for women are usually lower than those for men. To check whether there is indeed a difference in death probabilities between genders, figure 25 depicts qx for men and women in 2000 at all ages.

FIGURE 25 - Probabilities of death, all ages, men and women, 2000



Source: FPB Mortality tables.

This picture confirms the expectations: at all ages, the probabilities of death of women are lower than the probabilities of death for men. The qx have a rather similar evolution and seem to increase at the same rate.

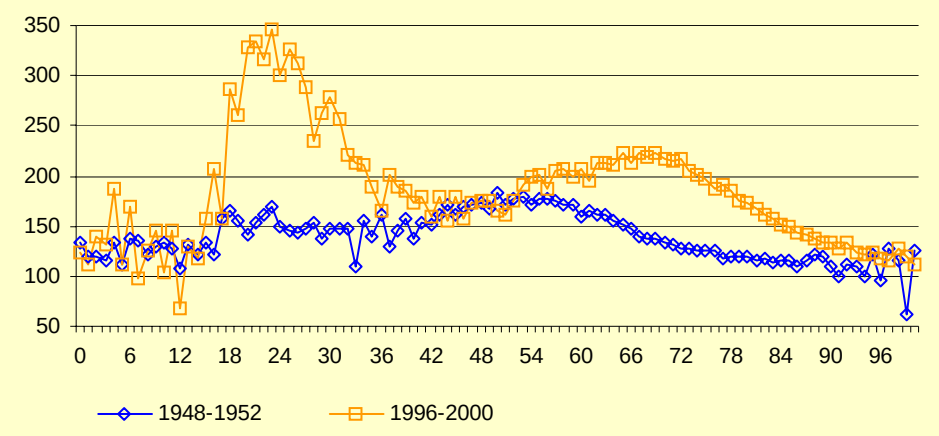
Male overdeath confirms higher qx for men

Another way to check for gender difference in death probabilities, is to calculate the *male overdeath*. This measure is the death probability of men divided by the death probability of women multiplied by hundred.

$$\text{male overdeath} = \frac{Q_x(\text{men})}{Q_x(\text{women})} \times 100$$

If the value exceeds 100, the probability to die is bigger for men than for women. A value lower than 100, means that the probability to die is lower for men than for women. Figure 26 gives the male overdeath by age on average for the period 1948-1952 and 1996-2000.

FIGURE 26 - Male overdeath by age, 1948-1952 and 1996-2000



Source: NIS, FPB Mortality tables and proper calculations.

For the period 1948-1952, the value of the indicator exceeds 100 except at very high ages. This means that, at all ages, the probability to die was bigger for men than for women. For people between 45 and 65, the percentage was even bigger than 150. Only after the age of 90, the measure converges to 100 and even drops below 100 at age 98.

For the period 1996-2000, the values also exceed 100 for most ages, except at the age of 7 and 12. So, again, the probability to die is higher for men than for women, but in fact significantly higher than in the 1948-1952 period, reaching more than 200 or 300%. This holds especially for young men between 18 and 35 and men in the first years of their pension life-time.

Why is it more probable for men to die?

Why is the probability of death for men higher? Haffard (2002) mentions several reasons (biological, sociological, environmental as well as economical) in his paper "*La mortalité différentielle des sexes*". The most important ones relate to:

- *Different biological constitution:* due to the composition of chromosomes (XY for men and XX for women), men have less natural resistance against disease than women do, even in the fetal phase, when they aren't even born and before any environmental influences can come into play. (p. 1-2)

It is estimated that these differences account for about 2 years of the difference in life expectancy between men and women. (p. 4)

- *Psychological factors:* men are more negligent about their health than women are (p. 2).
- *Socio-economic factors*: the division of roles by gender protects women from certain diseases and dangerous situations men are often exposed to, for example warfare (p. 2).
- *Behaviour*: men drink more alcohol, smoke more often and work out less. These factors all contribute to higher death probabilities (p. 3).

Herdan (2002, p. 25-43) lists some additional factors that lead to men dying younger:

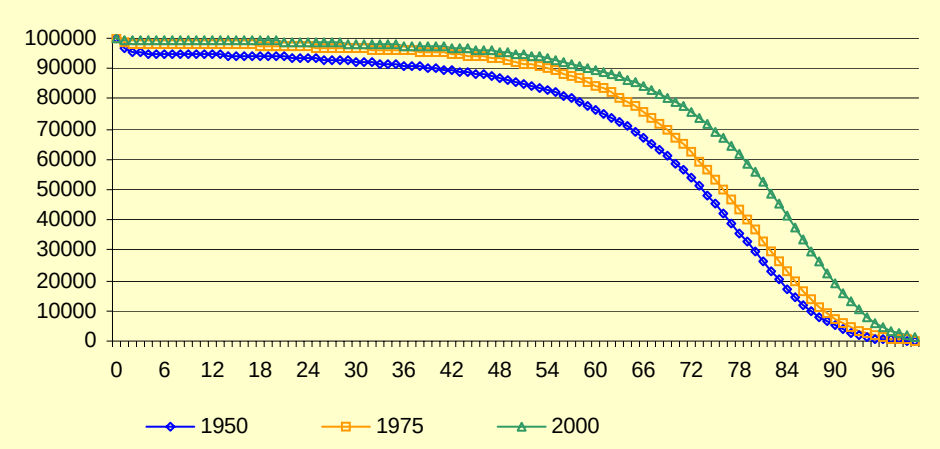
- *Iron overload*: women lose a lot of iron during menstruation. The overload of iron in male bodies causes them to die sooner since iron increases the risk for heart disease.
- *Risk behaviour (*see Haffard): also includes drug use and automobile driving.
- Socio-economic status and labour market participation.
- *Interaction between all these factors:* for example, lung cancer is the result of biological, environmental and behavioural factors.

3. Survival curves

Survival curves show survivors of a fictive cohort

The mortality table made up with the death probabilities and a fictive cohort of 100,000 people also gives the number of survivors by age. The survival curve sums up the numbers of survivors by age of the fictive cohort. The area under the curve is the life expectancy of the individual (Gakidou, Murray, Frenk, p. 4). Figure 27 shows the survival curves in 1950, 1975 and 2000.

FIGURE 27 - Survival curves for 100,000 fictive cohort, 1950-2000



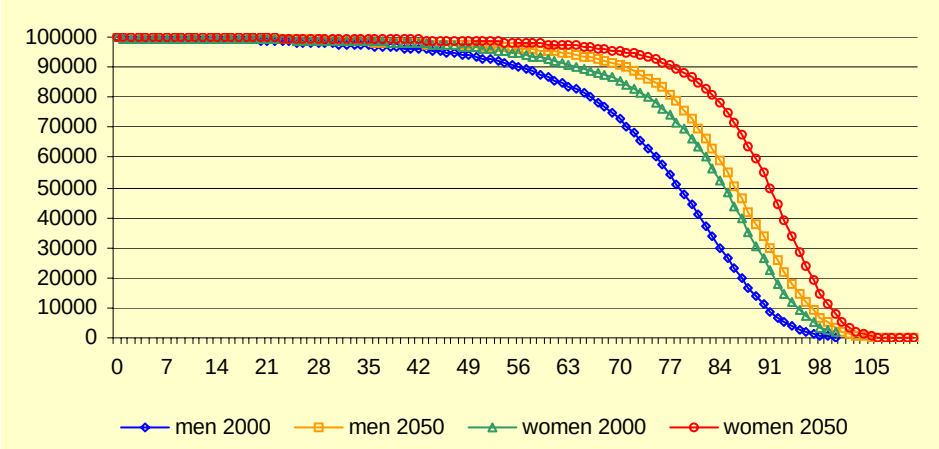
Source: FPB Mortality tables.

Rectangularisation of the curve due to population ageing

The survival curve has shifted upwards and to the right between 1950 and 2000: more people survive at younger ages and die later. In 1950, 20% of the population had died by the age of 56; at that age out of a cohort of 100,000 persons there were 80,000 survivors. In 2000, it wasn't until the age of 73 that this percentage was reached.

Figure 28 shows the survival curves based on the population projections, both for men and women, in 2000 and in 2050.

FIGURE 28 - Survival curves for 100,000 fictive cohort, by gender, 2000 and 2050



Source: FPB Mortality Table projections.

This figure shows a further 'rectangularisation' of the survival curves in the future. For both men and women, the survival curve in 2050 is situated to the right and above the curve in 2000. This means that people live longer and most deaths occur at later ages, the original cohort living almost in its entirety during a still longer period.

E. Longevity

Demographic changes affect longevity

Longevity is the time span that elapses between birth and death and can be measured in several ways. Different indicators exist to analyse longevity. This section studies the evolution of these indicators to detect changes in longevity that might have occurred in the past 50 years or so. The projections also can shed light on what might happen to longevity in the next 50 years.

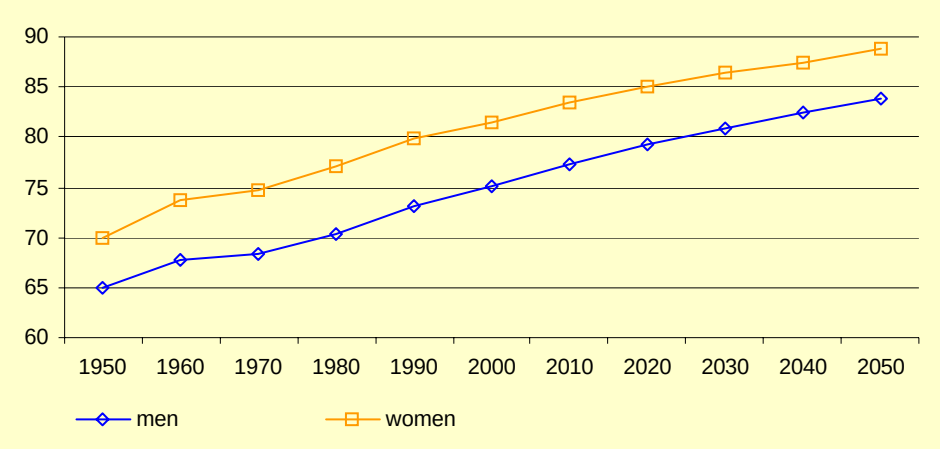
A first set of indicators is the life expectancy (LE) at a certain age. The LE gives the average numbers of years one can expect to live given his or her age following the mortality conditions of the time being. It is based on mortality tables. LE at birth, at the age of 65 and at the age of 80 help appraise the ageing of the population. Tables with detailed data can be found in appendix.

1. Life expectancy at birth

Life expectancy at birth too increases

Life expectancy at birth is the most widely used and most commonly known indicator for longevity. It tells how many years a newborn baby can expect to live following the mortality conditions of the time being. Figure 29 shows the evolution in LE at birth, for both sexes, from 1950 to 2050.

FIGURE 29 - Life expectancy at birth, by gender, 1950-2050



Source: FPB Mortality tables.

In 1950, a boy could expect to live 65 years, a girl 70 years. Since 1950, LE at birth has increased: by 2000, baby boys could expect to live 75 years, or 10 years longer than in 1950. Baby girls born in 2000 had a life expectancy of 81 years, or 11 years longer.

Women have higher life expectancy

Women have a higher life expectancy than men, and this has remained over the years. The difference between genders has even increased a little bit. In 1950, the difference in years between men and women was 4.98; in 2000 the difference was 6.30 years.

However, the hypotheses underlying the population projections imply that the gap between genders should narrow down, though only a little bit.

Several reasons can explain this reversal of the tendency. According to demographers since women have a higher LE, this life expectancy lies closer to the biological limit, and it therefore can't rise that much any more. On top of that, the differences in life style and risk behaviour between men and women have diminished, which causes the LE of men to get closer to that of women. For example, women work full time now, whereas before, they often spent the day at home; they also smoke more and know more stress.

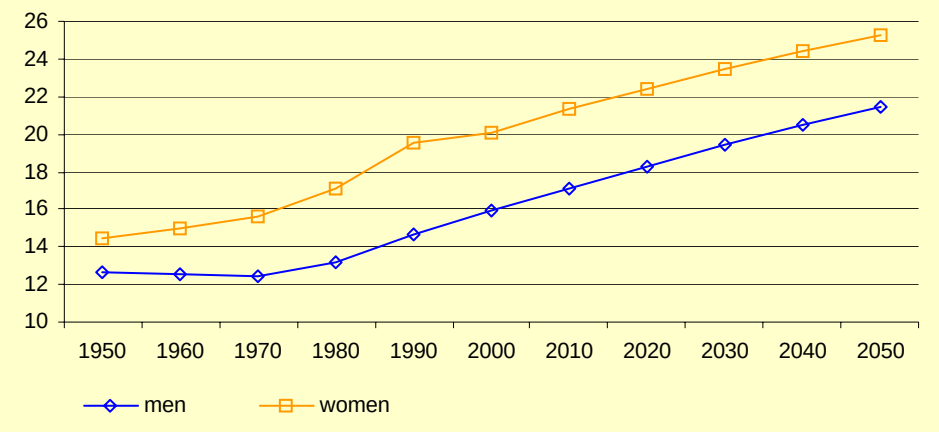
In 2030, men will have a LE at birth of 81 years, women of 86 years. By 2050 this is expected to increase to 84 for men and 89 for women. The gap between the LE of men and women would then be about 5 years, which is indeed less than the 6.3 years observed in 2000.

2. Life expectancy at 65

Life expectancy at age 65 increases

Life expectancy at 65 tells how many years a 65-year old person can expect to live. Figure 30 shows the LE at 65 for both men and women from 1950 to 2050.

FIGURE 30 - Life expectancy at 65 by gender, 1950-2050



Source: FPB Mortality tables.

In 1950, a 65-year old man could expect to live 12.6 more years, a 65-year old woman 14.5 years. This LE remained fairly constant for men until the seventies and then started to rise. By 2000, a 65-year old man could expect to live 15.9 years, or 3.3 years longer than in 1950. By 2000, a 65-year old woman could expect to live 20 years. This is 5.5 years longer than in 1950.

Women have a higher life expectancy at 65 than men

Women have a higher LE at 65 than men, and the difference has increased over the years. In 1948, the difference in LE was only 1.8 years; in 2000 this had risen to 4 years.

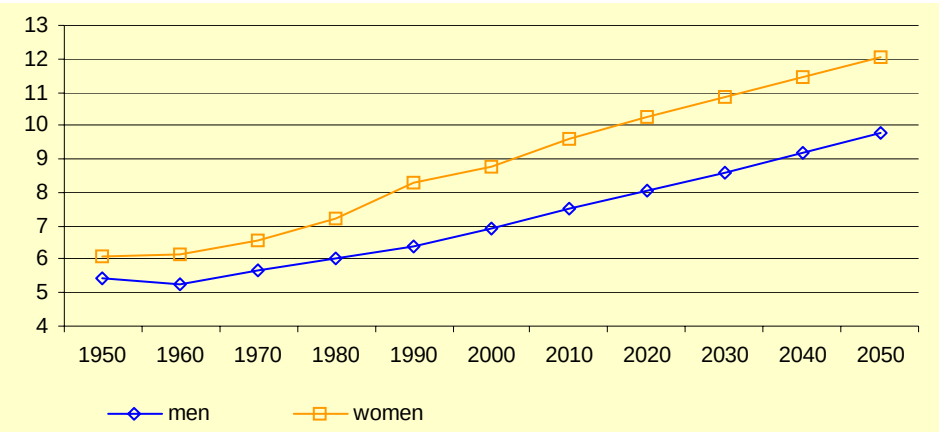
Based on projections, 65-year-old men in 2030 will expect to live 19.5 years; women that age can expect to live 23.5 more years. In 2050, the LE at 65 will have reached 21.5 for men and 25 for women. Between 2000 and 2050, LE at 65 would increase by 6 years for men and 5 years for women. Again, this attests that men seem to catch up a little on women as far as longevity is concerned.

3. Life expectancy at 80

Life expectancy at age 80 increases too

Finally, life expectancy at 80 tells how many more years an 80-year old person can expect to live. Figure 31 shows the life expectancy at 80 by gender from 1950 until 2050.

FIGURE 31 - Life expectancy at 80, by gender, 1950-2050



Source: FPB Mortality tables.

In 1950, a man aged 80 could expect to live 5.4 years. This LE dropped a little, to 5.2 in 1960, but then rose steadily to reach 6.9 in 2000. Thus, an 80-year old man in 2000 could expect to live 1.5 years longer than in 1950. Women aged 80 in 1950 had a LE of 6 years. This LE at age 80 rose over the entire period, first slowly, then faster, and reached 8.8 years in 2000. Between 1950 and 2000 there was an increase of 2.8 years for 80-year old women.

Higher life expectancy at age 80 for women

Life expectancy at age 80 is higher for women than for men. In 1950, the difference between genders was rather small: only 0.6 years. In 2000 however, this was 1.9 years. This is due to the fact that women live longer, and this is best reflected in the life expectancy at higher ages.

Projections show that 80-year-old men will have on average 8.5 more years to live in 2030, women 11 more years. In 2050, men aged 80 can expect to live 9.7 more years and women 12 more years. The gap between genders at age 80 widens and reaches 2.5 years in 2050.

Conclusion: people can expect to live longer at all ages

The main conclusion is that people can expect to live longer, at all ages. This increased life expectancy is related partly to better public and environmental health and to medical care, including advances in the prevention, treatment and management of serious illness (AARP, 2002, p. 34). Other causes for the increase in life expectancy could be a higher awareness of the population of the importance of health and a more suitable life style (more exercise, better eating habits, less smoking and alcohol consumption)…

Question remains whether the LE will continue to increase, or whether a biological limit will be reached at some point in the future.

There are four other indicators worth mentioning when studying the lengthening of life: the modal and median life duration, life endurance and the record age. These have been calculated from 1950 until 2000, total and by gender. The tables can be found in the appendix.

4. Modal life duration

Increase in modal life duration

The modal life duration (MLD) is the age at which most deaths take place (in absolute figures) in a certain year. By convention, infant deaths are not taken into account, since a high incidence of infant death would cause the MLD to be null, and wouldn't tell us anything about population ageing.

The MLD of men and women together has risen from 76 in 1950 to 86 in the year 2000. For men, the MLD rose from 76 in 1950 to 80 in 2000, for women this was from 77 to 86. The MLD of women is higher than for men, most women die later than most men do. This difference becomes greater over time. In 1950, the difference between men and women was only 1 year; in 2000 it was 6 years.

Population projections allow to calculate the MLD until 2050. In 2035, the MLD of men would be 84, of women 89. By 2050, this age would have increased even further to 86 for men and 91 for women.

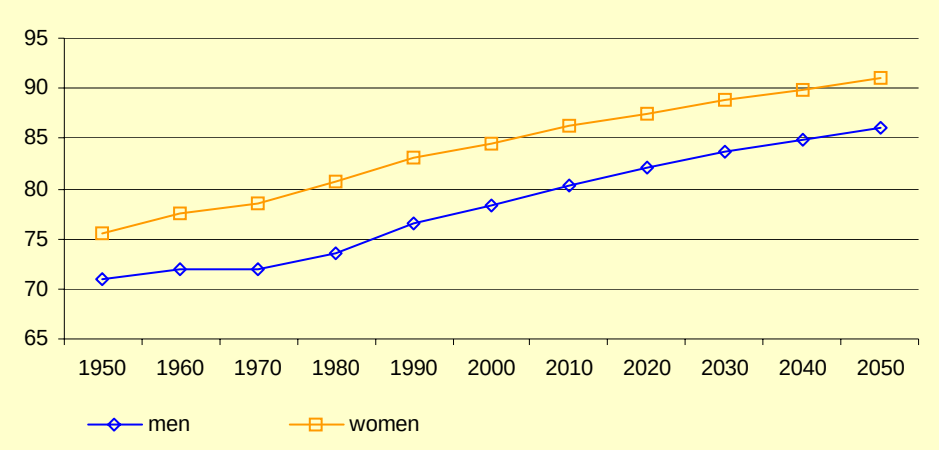
5. Median life duration

The median life duration is the age at which 50% of a certain cohort has deceased. In the absence of longitudinal data, the fictive cohorts of 100,000 of the mortality tables have been used. Interpolation techniques lead to the exact age at which 50,000 people of the cohort has died.

Increase in median life duration

The median life duration of the total population rose from 73.39 in 1950 to 81.66 in 2000. A similar evolution goes for men and women separately. The median life duration of men rose from 70.91 in 1950 to 86.15 in 2050. For women, the rise was from 75.62 in 1950 to 90.93 in 2050. This is shown in figure 32.

FIGURE 32 - Median life duration by gender, 1950-2050



Source: FPB mortality tables, FPB calculations.

Between 1950 and 1970, the median life duration of both sexes was somewhat stable. The rise in the median life duration started in the early seventies and has continued up to now. However, the growth rate seems to be dropping in the recent years.

Median life duration is higher for women

The median life duration for women is higher than that for men. It has also grown faster. The difference between men and women in years was 4.71 in 1950, 6.2 in 2000.

Based on projections, it is expected that the median life duration for men will be 83.6 in 2030 and 88.8 for women. By 2050 this is expected to rise to 86 for men and 90.9 for women. The difference between genders is not expected to disappear in the future.

6. Life endurance

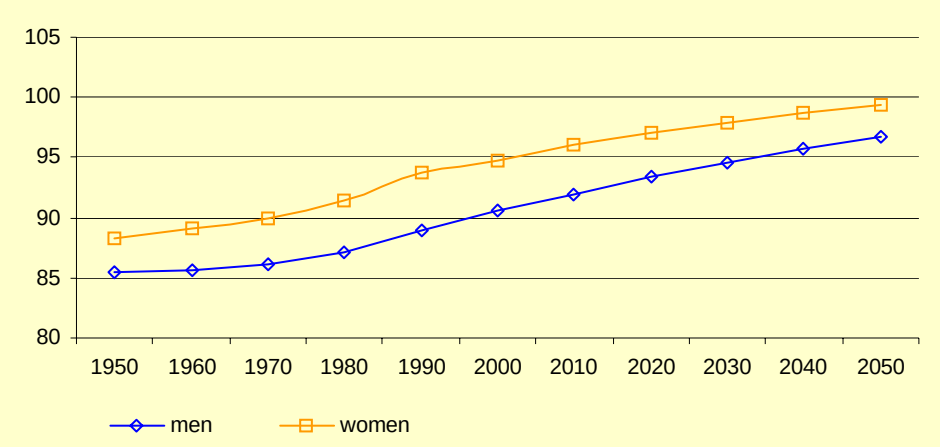
Life endurance is the age at which 90% of a cohort has deceased. Again, this measure is based on mortality tables used as a fictive cohort and with interpolation techniques.

Increase in the life endurance

Following the mortality tables of 1950, 90% of the total population should have died by the age of 86.98. In 2000, this age had risen to 93.14. This is an increase of 6.16 years. Based on projections, the life endurance is expected to be 94.5 in 2030 for men and 97.9 for women. By 2050 the life endurance is expected to increase even further, to eventually reach 96.7 for men and 99,34 for women.

Of a cohort of men in 1950, 90%should have died by the age of 85.52. In 2050 this should be 96.70, which means an increase of 11.18 years. A female cohort in 1950 should have had a life endurance of 88.26, in 2050 this would be 99.34. This is an increase of 11.08 years.

FIGURE 33 - Life endurance, by gender, 1950-2050



Source: FPB mortality tables, FPB calculations.

Women have higher life endurance

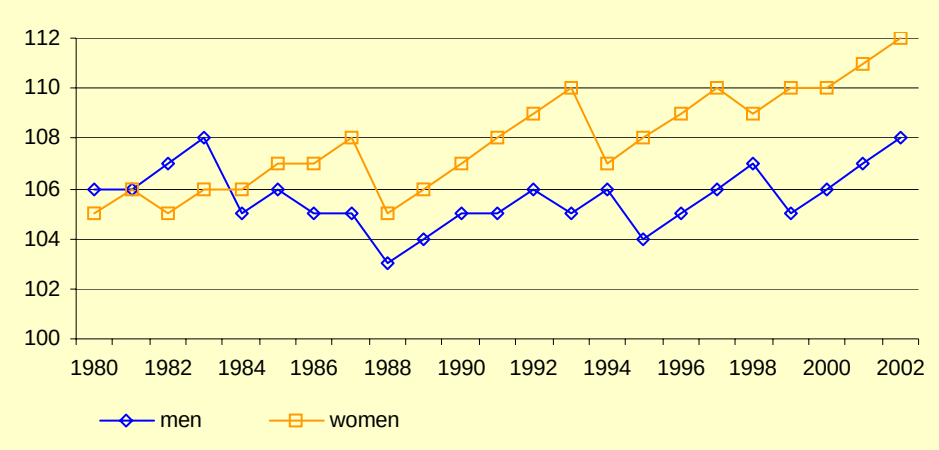
Figure 33 shows the evolution of the life endurance for both sexes from 1950 to 2050. This figure clearly depicts the rise in the life endurance, which underlines the lengthening of life. The life endurance of women is again higher than that of men; this difference which increased in the past should reduce in the coming future.

7. Record age

Record age has risen since 1980

The record age is the age of the oldest person alive[1]. The record age for men and women from 1980 to 2002 is shown in figure 34.

FIGURE 34 - Record age, men and women, 1980-2002



Source: Michel Poulain, UCL.

In 1980, the oldest man alive in Belgium was 106, the oldest woman 105. The record age varied between 1980 and 2002, for men between the ages of 103 and 108, for women between the ages of 105 and 112. Until 1984, the oldest person in the country was a man. Since 1984, the oldest person has always been a woman. In 2002, the oldest man was 108, the oldest women 112. The record age has increased over the years.

F. Life courses

*Demographic changes lead to **modifications** in lifetime decisions, and vice versa*

Besides the consequences of the past baby-boom, population ageing is driven by falling fertility rates and rising longevity; a reflection of the fact that people are having fewer children and are living longer. These demographic parameters are affected by, and in turn affect, the way people behave over their life cycle. Therefore it is important to understand these life-cycle dynamics to study population ageing. (Stephenson, Scobie, 2002, p. 4) This paragraph comments on data which illustrate the evolution of life cycle decisions.

In general, it has been challenging to gather data on life courses. In many cases, the actual age at which a certain event takes place differs from the statutory age of the event. However, only few data on the actual age exist, and it is sometimes doubtful whether the statutory age would be a good indicator for the life courses. Whenever possible, data have been collected that approach the actual age, to get at least an idea of the evolution and changes in life courses.

1. This is not the same as the age of the oldest person to die that year. Record age is the age of the oldest person still alive. The oldest person alive could be 110 years old, for example, while the oldest person who died that year was 'only' 106.

1. Age at which school ends

Statutory learning age set at 18….

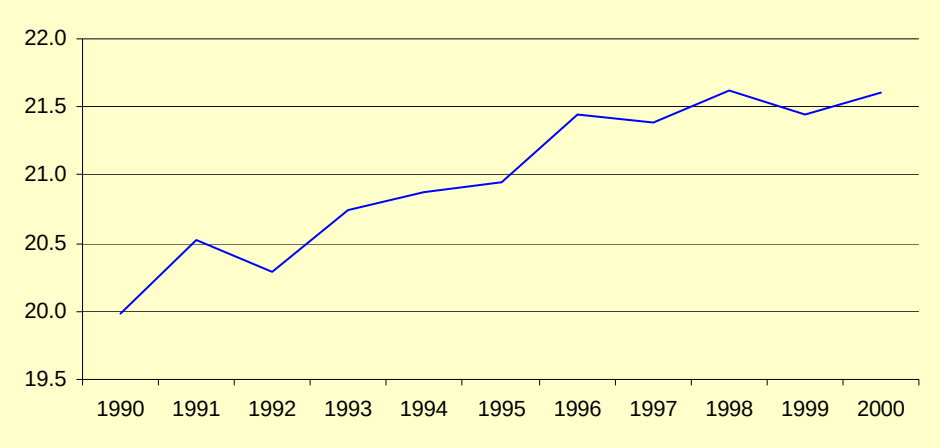
At present, the statutory learning age is 18: students can leave school the day they turn 18. In 1914 the learning age was raised from 6 to 14 years. In 1983, this age was raised to 18 and has remained the same since. It is possible, at the age of 16, to combine school and work, by a division of time between school and apprenticeship until the age of 18.

Such a statutory age, however, isn't a very good indicator for the age at which school ends. Many students go on after completing secondary school and enrol in tertiary education. This is now more the case than 50 years ago. Therefore, it is interesting to see at what age people really end school. The Labour Force Survey (LFS) of 2000 and the Health Interview Survey of 1997 can help in this way.

… but most people continue to study

The LFS included some specific questions concerning the transition from school to labour market. More specifically, respondents were asked in what year they left school for the first time. Based on these data, combined with the respondent's birth year, the average age at which people left school for 1990-2000 has been calculated, without distinction by gender. This is shown in figure 35.

FIGURE 35 - Average age at which people leave school, 1990-2000



Source: NIS, Labour Force Survey, 2000.

The average age of leaving school increased from 19.9 in 1990 to 21.5 in 2000…

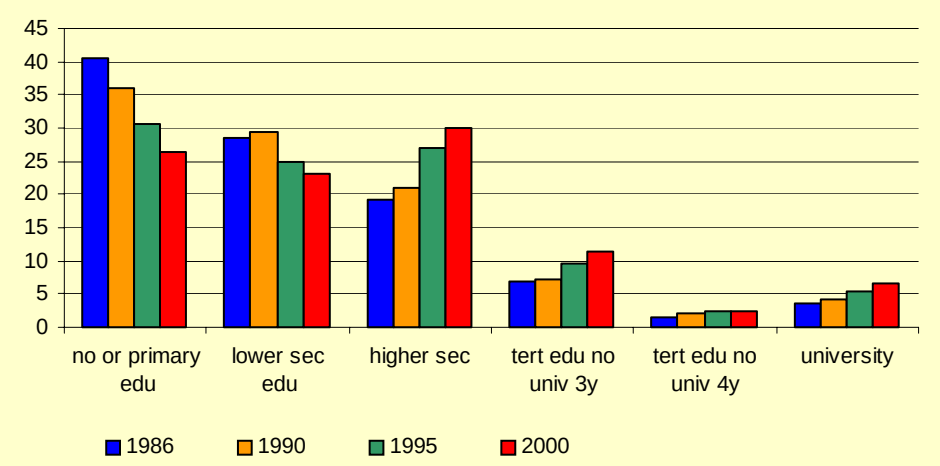
A clear upward trend can be detected in the average age at which people leave school. In 1990, people stopped their school careers at the age of 19.9. By 1995, the average age of all people who left school that year had risen to 20.95. This trend went on until 2000, when people left school, on average, at the age of 21.61. These data show that young people tend to stay in school longer now than they did 10 years ago.

…and attained level of education increased as well

Another way to document on the average age at which school ends, is by looking at the structure of the population by educational level. NIS data allow to calculate the proportion of the total population having had no education or just primary education, lower secondary education, higher secondary education, tertiary education outside university with a distinction between 3 or 4 year course, and finally university level.

These percentages include the entire population, and thus include different generations at the same time. Although no real information about age-specific age at which school ends can be extracted from these data, it is interesting to see that, as time goes by and younger generations join the population, more people attain a higher level of education and the percentage of the population having had no education or just primary education drops. This confirms the fact that younger generations study longer. Figure 36 depicts the structure of the population by educational level for 1986-2000.

FIGURE 36 - Proportion of population older than 15, by educational level, 1986-2000



Source: NIS, Labour force survey.

In 1986, 40.4% of the population had had no education or just primary education. In 2000 this percentage had dropped to 26.3%. On the contrary, the proportion of people having attained a university degree rose from 3.5% in 1986 to 6.7% in 2000. In short, in 2000, more people attained a higher educational level than in 1986. The proportion of higher secondary and tertiary education has increased, while the proportion of people having completed only lower secondary education became smaller.

Due to this evolution of people staying in school longer, entrance into labour market and other lifetime events, such as marriage and children, may be delayed.

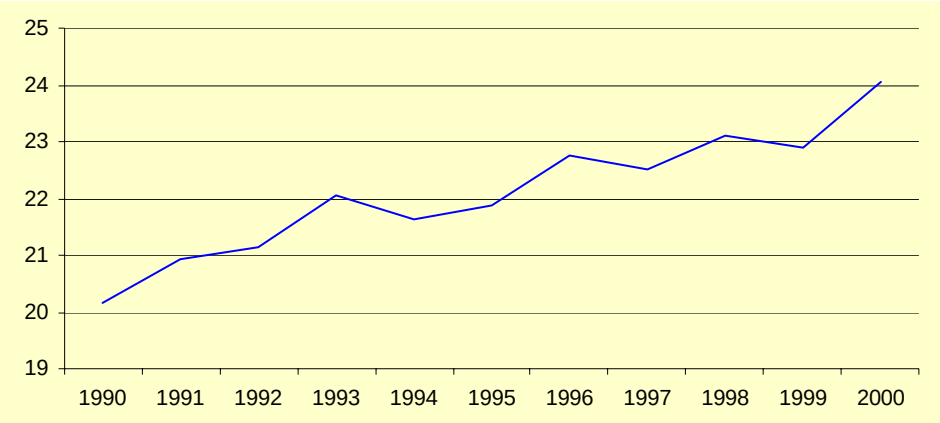
2. Age at first job

People start their first job at later ages

The LFS also questioned respondents about the age at which they first started working on the labour market. These answers combined with the year of birth of the respondent help to calculate the average age at which people started working for the first time for 1990-2000. These data include both the situation in which the first job had been ended in the mean time, as well as the situation in which people were still working in their first job.

Figure 37 shows the average age at which people started their first job for 1990-2000.

FIGURE 37 - Average age at first job, 1990-2000



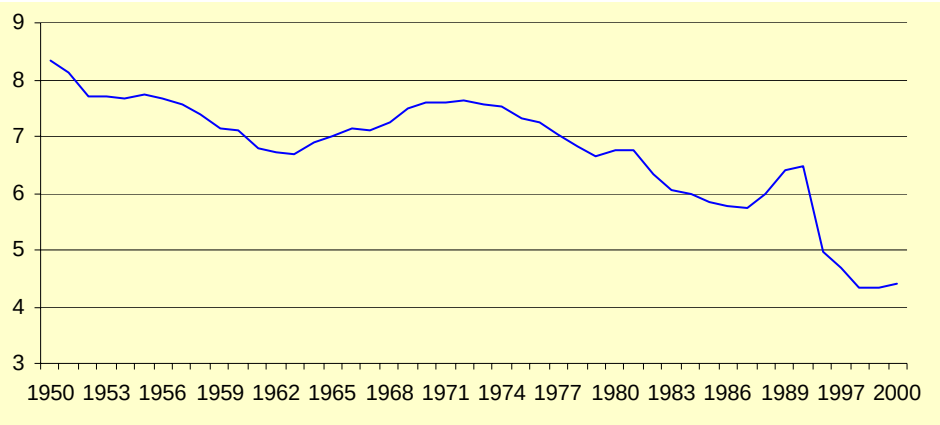
Source: NIS, Labour Force Survey, 2000.

The average age at which people start their first job has increased from 20.1 in 1990, to 22 in 1995 and to 24.0 in 2000. This is not unexpected, given the earlier findings that the average age at which school ends increased as well in the same period (from 19.9 in 1990 to 21.6 in 2000)[1]. Thus, people study longer and enter the labour market at a later age.

3. Age at household formation

The NIS delivers data on the average age of men and women at marriage. It should be kept in mind that these data don't take into account people living together without being married. Recent trends show, however, that fewer people get married and more people cohabitate. This is clearly shown in figure 38, which gives the number of marriages per 1,000 inhabitants between 1950 and 2000.

FIGURE 38 - Number of marriages per 1,000 inhabitants, 1950-2000



Source: NIS.

The number of marriages per 1,000 inhabitants dropped from 8.3 in 1950 to 4.4 in 2000. Therefore, the average age at marriage might not be an exact indicator for the age at household formation.

1. It would be wrong to compare the age at which people leave school and the age at which people start working using these data. The people who left school in 1990 might not necessarily be the ones who started to work the very same year.

People postpone marriage….

Unfortunately, few data on the age at which people decide to cohabitate without being married exist. Based on population censuses in 1981 and 1991, men left their parents' house at the age of 24 in 1981 and at the age of 25 in 1991. For women these ages were 22 and 23 (Bartiaux, 2000, p. 162-163). Since these are the only available data, it has been decided to use the average age at marriage as an indicator for the age at household formation, keeping in mind the limitations of these data. Table 1 gives the average age at marriage from 1950 until 2000.

TABLE 1 - Average age at marriage, by gender, 1950-2000

	1950	1960	1965	1970	1975	1980	1985	1990	1995	2000
Men	25.58	24.75	24.16	23.66	23.50	23.83	24.83	26.41	28.16	29.66
Women	23.33	22.58	21.83	21.50	21.58	21.83	22.83	24.41	26.00	27.25

Source: NIS.

In 1950, the average age at which men got married was 25.58. Women got married at the age of 23.33. Initially, there was a drop in the age at marriage, going from 25.58 in 1950 to 23.50 in 1975 for men, and going from 23.33 in 1950 to 21.50 in 1970 for women. After that, the average age at marriage has risen for both sexes. Women now get married, on average, at the age of 27.25, men at the age of 29.66. This indicates that people now form a household at a higher age than they did half a century ago.

As table 1 indicates, the average age at marriage is higher for men than for women. The difference in age between men and women at marriage is about 2 years and this difference remains fairly constant over time.

Lesthaeghe and Moors (Lesthaeghe, Moors, 2000, p. 154-156; Lesthaeghe, 2000, p. 13-14) mention several determinants of household formation and marriage postponement as observed in industrialized countries:

- *Advanced education*, which has a, first, mechanistic effect in postponing household formation in general, and second, a set of additional effects such as higher female economic autonomy and less reliance on economic support from male partners, a longer search on the marriage market and shifting value preferences in the direction of gender equality and individual freedom.
- *Growing labour market flexibility*, which leads to less secure and less structured career development and hence to the weakening of the economic basis of marriage.
- *Cycles characterized by weakened economic opportunities for new cohorts*, with increased youth unemployment leading to prolonged economic dependence of the parental household.
- *Unfavourable housing conditions*, caused either by a structural shortage or higher rents or purchase prices.
- *Rising consumerism*, leading to higher aspirations with respect to material comfort and to higher minimal material standards for establishing a new household.
- *Greater distrust in the institution of marriage itself* fostered partially by ideational change but also by rising divorce probabilities. There seems to be an *intergenerational transmission of family instability* due to actual experience with problems in the parental households, but also the development of weaker familistic values in general.
- *A more libertarian culture with greater tolerance for alternative life styles*, which has lead to the social diffusion of alternative living arrangements.

All these factors (and many more) have contributed to the shift in age at first marriage.

4. Age of parents at first child

Family expansion is another important moment in the lifetime of an individual. Now that the life span of individuals has increased, it is interesting to see whether this has had an effect of the decisions of parents to have children and when to have them.

…as well as parenthood

Data on the average age of the parents when their children are born are available from 1966 until 2000 for both sexes: for women for the first child and for all children; for men only the average age at birth of all children. These data are given in table 2 below.

TABLE 2 - Average age at birth first/all children, by gender, 1966-2000

	1966	1971	1975	1980	1985	1990	1995	1998	2000
Men, all children	29.00	27.66	27.50	28.66	29.42	30.42	31.42	-	-
Women, all children	27.56	25.33	25.42	26.33	27.08	28.08	28.92	-	-
Women, first child	23.00	23.00	23.42	24.58	25.50	26.42	27.50	27.40	27.5

Source: NIS.

The average age for women at birth of the first child has risen from 23 in 1966 to 27.5 in 2000. The same goes for the average age at all births. After an initial drop between 1966 and 1971, the age of the father rose from 27.66 in 1971 to 31.42 in 1995. For women, the average age at all children rose from 25.33 in 1971 to 28.92 in 1995. Women have children earlier in their life than men do.

This is another indication for the change in life courses of people. Not only do people form a household later, they also postpone parenthood.

5. Retirement age

Statutory retirement age 65 for men and to increase to 65 for women….

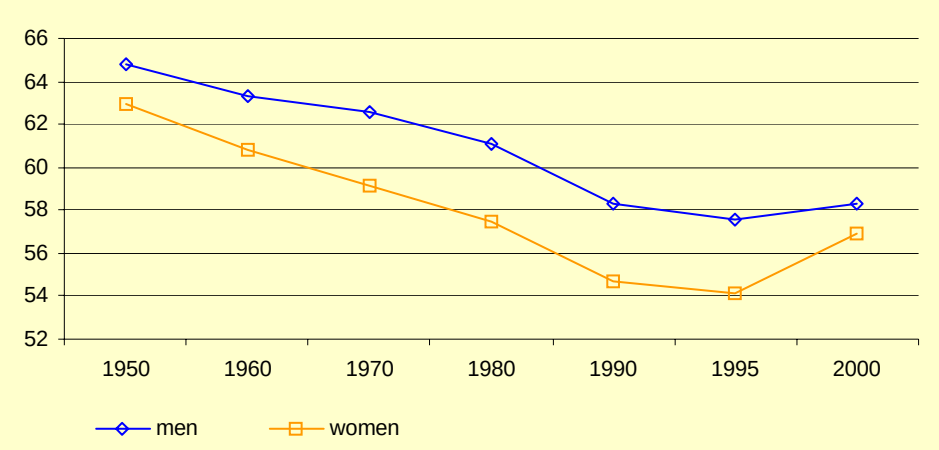
The government has set a statutory retirement age. In the general system for wage earners, the retirement age for men has always been 65. For women, the age was originally set at 65, but was changed in 1953 to 60. It wasn't until recently that the government decided to eliminate the discrimination between genders, in light of the financing of the pensions and the pressure on the government debt, and to observe a EU recommendation. The statutory retirement age of women is to be 65 again by 2009, with a gradual transition (63 in 2003; 64 in 2006). Civil servants and self-employed people can legally retire at the age of 65.

Flexible retirement systems exist which allow people to retire between the age of 60 and the statutory age, provided that certain career conditions are fulfilled. By 2010, this will only be possible if the person has worked for 35 years. In 2000, the condition was 26 years. (Streel, Weemaes, 2001)

… but for most people the transition into inactivity takes place at younger ages

The OECD has calculated estimates on the average age at which transition into inactivity takes place among older workers. The OECD definition not only includes people retiring, but also pre-pensions and unemployment among older workers. One should keep in mind that only a small part of these people actually receive pension benefits. These average ages are shown in figure 39.

FIGURE 39 - Average age of transition into inactivity (OECD definition), by gender, 1950-2000



Source: Blöndal & Scarpetta, 1996.

Figure 39 shows, for men as well as women, a clear downward trend of the age at which people become inactive on the labour market until 1995. Then there was a slight recovery, due to government incentives for people to work longer.

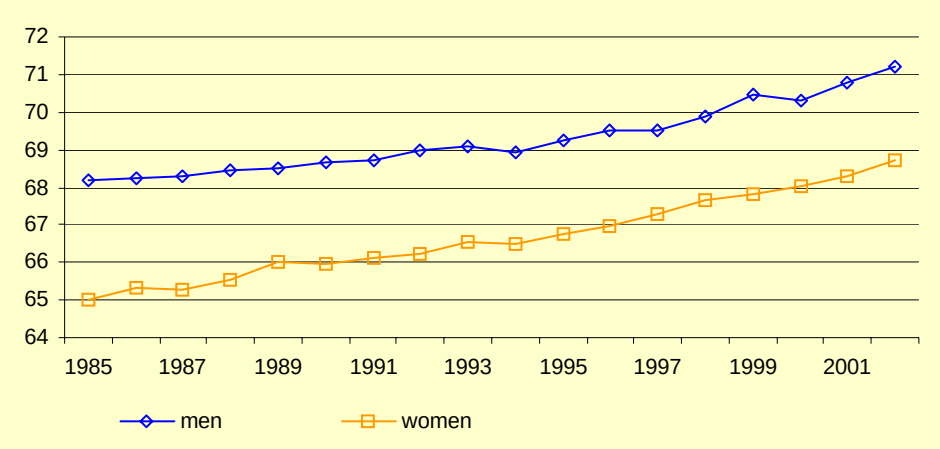
In 1950, men 'retired' on average at the age of 64.8, women at the age of 62.9. By 1970, this had dropped to 62.6 for men and 59.1 for women, to finally reach the lowest observed age in 1995: 57.6 for men and 54.1 for women. This shows that people, even though they can expect to live longer, prefer to leave the labour market earlier in life. Only recently this trend was reversed in a compulsory way.

6. Age at first widowhood

People become widowed later in life

The NIS has provided data on the average age of first widowhood, by gender, from 1985 until 2002. These data are based on population data in the National Registry and are calculated by detecting people who have become widowed during the year and calculating their average age. Only married people are taken into account. People living together who lose a partner are not in these figures. The result is shown in figure 40.

FIGURE 40 - Average age at first widowhood, by gender, 1985-2002



Source: NIS.

In 1985, the average age at first widowhood for men was 68, for women 65. This age gradually increased over time, to reach 69 for men and 67 for women in 1995 and finally 71 for men and 69 for women in 2002. People become widowed later in life. This is logical, considering the increase in life expectancy.

The age at widowhood is lower for women than for men. They are generally younger than their husbands and this difference is reinforced by the fact that men have a lower life-expectancy.

7. Conclusions

Clear shifts in patterns of life courses

The previous paragraphs have shed light on the evolution of life courses. For the past 50 years, data show that people now study longer, start working later, wait longer to form a household and postpone parenthood. Even though people can expect to live longer, they opt to leave the labour market earlier. But this evolution might be countered in the near future by steps taken by the government to keep people on the labour market after the age of 60. People also become widowed later in life, and can thus expect to live together with their partner for a longer time.

In his work on life courses and becoming an adult in Europe, Billari (2002, p. 7-8) mentions several sources, *other than demographic*, which have contributed to this shift in life-time decisions:

- *Institutional factors* or the welfare regime
- *Specific policies*: economic and social policies significantly shape the transition into adulthood, for example, housing subsidies, education policy, labour market policy,…
- *Cultural factors:* for example gender roles, marriage patterns, coresidence of kin.

G. Morbidity

When reporting on morbidity, one has to be aware that definitions can be stretched and can differ between institutions and countries. Following paragraphs will try to present measures that describe the health status of the population in the most appropriate and comprehensive way.

The Health Interview Survey and its (dis)advantages

The data in this section are based on the Health Interview Surveys (HIS) carried out by the Scientific Institute for Public Health in 1997 and 2001. These surveys are important for several reasons. They shed light on the health situation of the population, as seen by the population itself and even include people who rarely make use of health care and are usually left out of statistics. Since the surveys also question other factors, such as education or income, they allow to look at relationships between those factors and the health status of the population.

Nevertheless, one should keep in mind that these are surveys and carry two main drawbacks. First of all, the results are subjective, since the respondents themselves answered the questions about their health, not a doctor. Secondly, even though effort was put into creating a representative test group, extrapolating the results to the entire population might give different results than if one would have interviewed every single member of the population.

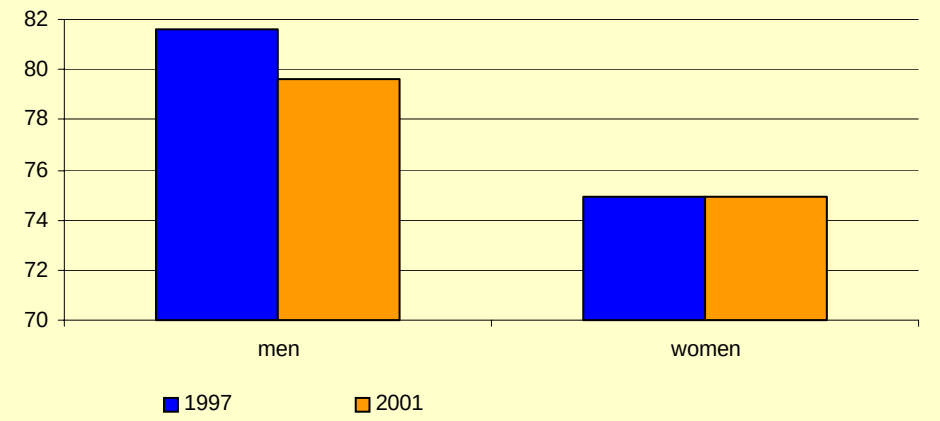
1. Perceived Health

Respondents of the HIS were asked to describe their own health as either "very good", "good", "reasonable", "bad" or "very bad". This is thus a subjective measure, since the respondent judged his own health. The answer might have been influenced by temporary disease, for example, a cold on the day of the interview, which caused the respondent to give a less positive answer than he or she would have given if he or she hadn't had that cold.

Majority of people in good health….

The answers were regrouped into two categories. "Good health" includes the answers 'good' or 'very good'; "bad health" includes the answers 'reasonable, bad or very bad'. Figure 41 shows for each health **status** the proportion of the population that finds his or her health to be *good*, by gender in 1997 and 2001.

FIGURE 41 - Perceived health, % of population in good health, by gender, 1997 and 2001



Source: Health Interview Survey, 1997 and 2001.

….and men more so than women

In 1997, 81.6% of all men considered themselves to be in good health and 74.9% of all women. In 2001, 79.6% of all men interviewed answered to be in good or very good health and 74.9% of all women. Two things draw the attention:

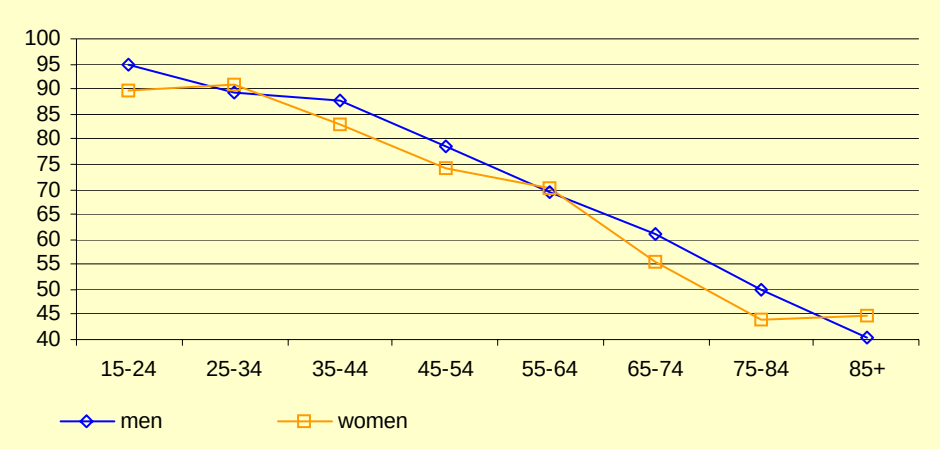
- Men, on average, judge themselves to be in better health than women do.
- The proportion of men in good health decreased a little between 1997 and 2001, while the proportion of women in good health remained the same. The decrease in the percentage for men may be due to a variation of the men's age-structure.

What follows focuses on the most recent data, namely data from 2001. Only when significant differences exist between 1997 and 2001, these will be mentioned. To measure the incidence of ageing and the health of the elderly, perceived health is presented according to age. Do older people consider themselves to be in better or in worse health than younger people do?

Subjective health decreases with age

As defined earlier, what follows distinguish two categories[1] of perceived health. Figure 42 shows the proportion of men and women who say they are in *good health by age group.*

FIGURE 42 - Proportion of population in good health, by age group and gender, 2001



Source: Health Interview Survey, 2001.

As expected, *there is a negative relation between age and subjective good health.* In the youngest age group, 95% of men and 89% of women responded to be in good health. The percentage then drops with age. Of all men aged 45-54, 79% said to be in good health and 74% of all women that age. In the oldest age group, 40% of men and 44% of women are in good health.

At most ages, a *bigger proportion of men* consider themselves to be in good health than women. Only at ages 25-34 and in the oldest age group is the percentage of women higher. At age 55-64, the percentage is almost the same.

One should keep in mind that these are subjective data and that not only health may change with age, but also expectations about health. As people age, "health" begins to encompass a complex set of considerations, including risk of disease and disability as well as threats to quality of life and independence. (AARP, 2002,

1. Figures by five health categories can be found in the tables in the appendix.

p. 36) So perhaps it is not surprising that people in older age groups report lower levels of self-assessed health.

2. Disability

Disability is an important factor that comes to play in people's lives. When suffering from mental or physical disabilities, a person's independence is threatened and the person experiences difficulties in carrying out basic activities of daily life. This reduces the quality of life (WHO, 2001, p. 10). This section studies the state of disability of the population and the relationship with age.

Four aspects of disability

Four variables of the Health Interview Surveys carried out in 1997 and 2001 have been analysed to describe the state of disability of the population: blindness, deafness, mental health problems and mobility handicaps.

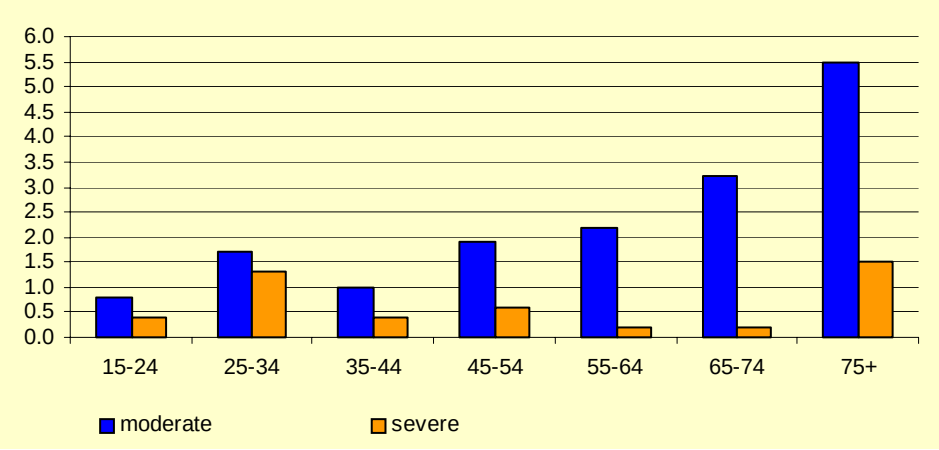
a. Vision impairment

The HIS asked respondents to what extent they experience eyesight problems. Three categories of vision impairment were established: no limitations, moderate and severe impairments. Since the results of 1997 and 2001 are similar, the most recent year only is reported. Data for both years can be found in appendix.

Vision problems increase with age

Figure 43 shows the proportion of the population experiencing moderate or severe vision impairment, by age group, for men in 2001.

FIGURE 43 - Vision impairment by age group, men, 2001



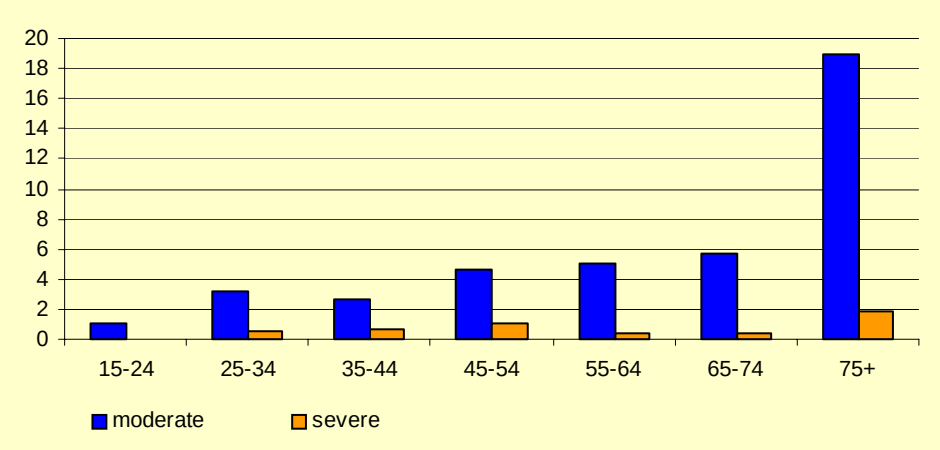
Source: Health Interview Survey, 2001.

In 2001, less than 1% of all 15-24-year-old men suffered moderate or severe vision impairment. The proportion of men suffering moderate impairment increased with age, reaching for example 2% for men aged 55-64, 3% for men between 65 and 74 and 5.5% in the oldest age group. The proportion of the population suffering severe impairment seems to be smaller and even decreases with age until the age of 74. Only in the oldest age group 1.5% of the population suffers from severe impairment.

The majority of men don't experience any problems with eyesight at all. There is a clear relationship between 'no limitations' and age: in the youngest age group, 99% of men don't have any limitations, this percentage drops to 97.5% for 35-44 years olds and 96% for 65-74-year olds. In the oldest age group the percentage is still 93%.

Figure 44 shows the result of the same analysis for women.

FIGURE 44 - Vision impairment by age group, women, 2001



Source: Health Interview Survey, 2001.

The situation for women is similar. The proportion of women suffering moderate vision impairment increases with age. Between 15-24, about 1% of all women has moderate problems, by the age of 45-54 this is 5%, and in the oldest age group 19%. The same goes for severe problems. Less than 1% of women suffer severe problems until the age of 74, in the oldest age group about 2% of women. Again, the majority of women don't experience any problems at all, this proportion being 99% at younger ages, 94% between ages 45-64, and 79% in the oldest age group.

Women suffer more from blindness

Comparing the two figures analysed above, one conclusion is left to be drawn. Vision impairment seems to affect women more than men. For example, in the oldest age group, 5.5% of men suffer moderate impairment, compared to 19% of women. And in the same age group 1.5% of men have severe eyesight problems, compared to 2% of women.

The conclusions can be:

- As expected, there is a *clear relationship between age and eyesight problems.* As people get older, a smaller proportion doesn't have any limitations at all. The proportion of people experiencing moderate impairment

increases with age. Only the relationship between age and severe impairment isn't straightforward for men.
- Little seems to have changed between 1997 and 2001; the percentages are similar.
- Women suffer more from vision impairment than men do.

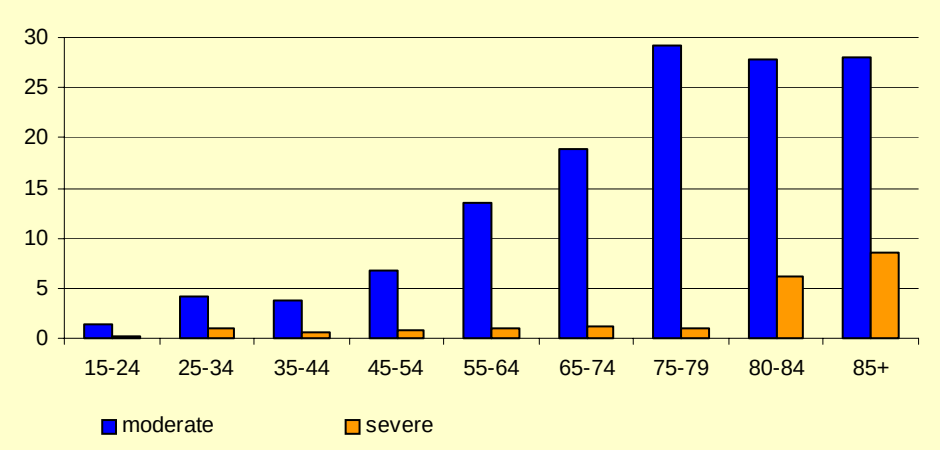
b. Hearing impairment

The HIS also asked respondents to what extent they encounter hearing difficulties: no problems at all, moderate or severe problems. Again, since the results for 1997 and 2001 are similar, only data for 2001 are given here. All data can be found in tables in appendix.

Elderly people have more hearing problems….

Figure 45 shows the percentage of men perceiving moderate or severe hearing problems, by age group in 2001.

FIGURE 45 - Percentage of population hearing problems, by age group and degree, men, 2001



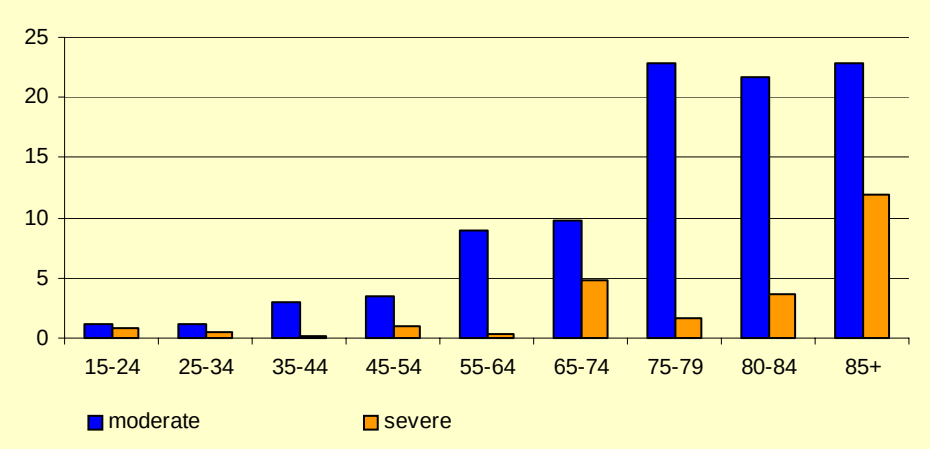
Source: Health Interview Survey, 2001.

In 2001, less than 1% of all 15-24-year-old men suffered moderate or severe hearing problems. The proportion of men suffering moderate problems increases with age, reaching for example 13% for men aged 55-64, 19% for men between 65 and 74 and 28% in the oldest age group. The proportion of the population suffering severe impairment seems to be smaller and even decreases with age until the age of 74. Only in the oldest age groups it goes up to 6 or 8% of men suffering from severe impairment.

The majority of men don't experience any hearing problems at all. There is a clear relationship between 'no limitations' and age: in the youngest age group, 98% of men don't have any limitations, this percentage drops to 85.7% for 55-64 years olds and 80% for 65-74-year olds. In the oldest age group the percentage has dropped to 63%.

Figure 46 shows the same analysis for women in 2001 by age group.

FIGURE 46 - Percentage of population with problems, by age group and degree, women, 2001



Source: Health Interview Survey, 2001.

The situation for women is similar. The proportion of women suffering moderate hearing problems increases with age. Between 15-24, about 1% of all women has moderate problems, by the age of 45-54 this is 3.5%, and in the oldest age group 23%. The same goes for severe problems. Less than 1% of women suffer severe problems until the age of 74, in the oldest age group about 12% of women. The majority of women don't experience any problems at all, this proportion being 98% at younger ages, 95.5% between ages 45-64, and 65% in the oldest age group.

… and men suffer more than women

As opposed to vision impairment, hearing problems seems to affect men more than women. For example, in the oldest age group, 28% of men suffer moderate impairment, compared to 23% of women. And for people aged 80-84, 6% of men have severe hearing problems, compared to 4% of women.

The conclusions can be:

- There seems to be a clear relationship between age and hearing problems. As people get older, a smaller proportion doesn't have any limitations at all. The proportion of people experiencing moderate impairment increases with age. Only the relationship between age and severe impairment isn't straightforward for men.
- Little seems to have changed between 1997 and 2001; the percentages are very similar.
- Men suffer more from hearing impairment than women do.

c. Mental health

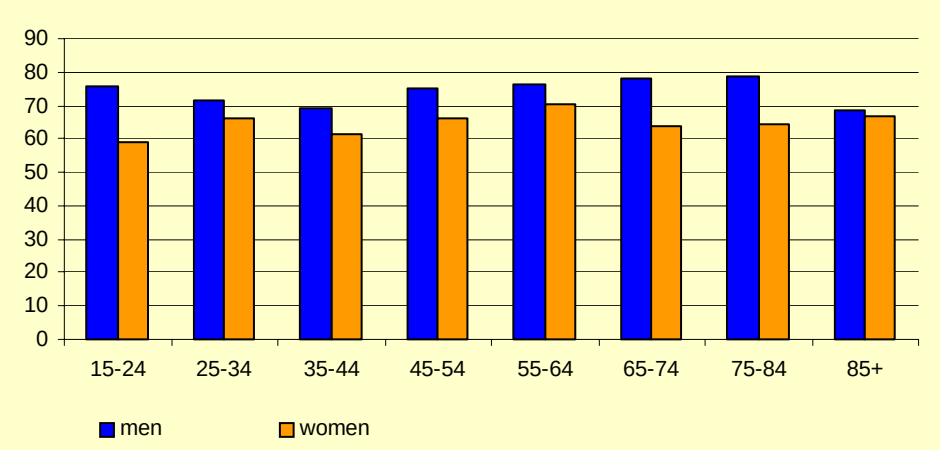
General Health Questionnaire studies mental health

The HIS includes a General Health Questionnaire (GHQ), a screening instrument used to detect psychological and psychiatric conditions. It studies four different 'areas', namely depression, anxiety, hypochondria and visible behaviour that indicates social distortion or inadequate social behaviour. The aim is to differentiate between the healthy people, the moderate and the severe psychiatric patients.

Majority of people mentally healthy, men more than women

Based on this GHQ variable, figure 47 gives the proportion of the population in good and in bad mental health, by age group and gender in 1997. Data can be found in appendix.

FIGURE 47 - Population in good mental health, by age group and gender, 1997



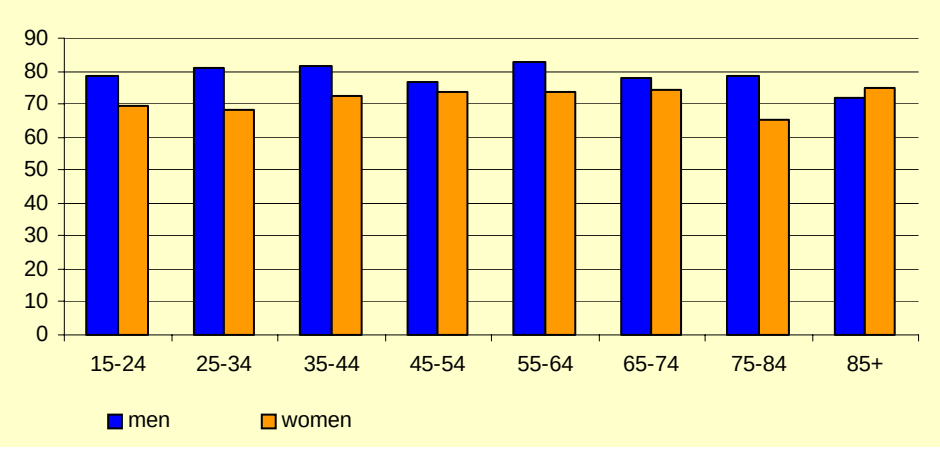
Source: Health Interview Survey, 1997.

Several conclusions can be drawn from this picture:

- In 1997, on average 73% of all men and 64% of all women were in good mental health.
- Men have a better mental health state than women do, at all ages.
- No clear relation between age and mental health can be detected: the percentage of the population in good health varies between 70% and 80% for men and 60% and 70% for women across ages. Only for men it is clear that in the oldest age group (85+), fewer men are in a good mental health state.

A similar figure can be drawn for 2001, shown in figure 48:

FIGURE 48 - Population in good mental health, by age group and gender, 2001



Source: Health Interview Survey, 2001.

In 2001 as in 1997, men seem to be in a better mental health state than women in all age groups, and there seems to be no clear relationship between mental health

state and age. One conclusion that can be drawn from this figure is that a bigger proportion of the population was in good mental health in 2001 than in 1997. In 2001, on average 80% of all men was in good mental health (73% in 1997) and 71% of all women (64% in 1997).

But no clear relation with age

The conclusions can be:
Mental health state has improved a little between 1997 and 2001 and men, in general, have better mental health state than women do. No clear relationship can be found, however, between mental health state and age.

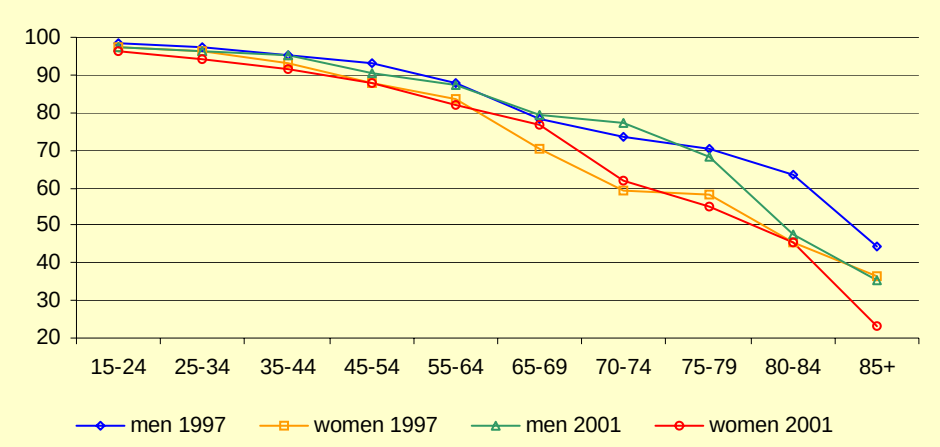
d. Mobility handicap

One of the questions of the HIS **concerns the** mobility handicaps. Recorded is the extent to which people are confined to their house or backyard, their chair or their bed due to physical handicaps, or whether they don't experience any limitations at all.

Elderly people are confronted with more limitations…

This analysis starts by looking at the proportion of people not experiencing any limitations at all. This is shown in figure 49, by gender and age group in 1997 and 2001.

FIGURE 49 - Percentage of population without limitations, by age group and gender, 1997-2001



Source: Health Interview Survey, 1997 and 2001.

… and women more so than men….

The data confirm that there is a clear relationship between age and the extent to which people experience limitations. As people get older, the proportion of the population not suffering any limitations at all drops. In the youngest age groups, about 98% of the population isn't restricted in any way. This percentage stays above 80 until the age of 65 and then drops to reach around 40% for men and 25-35% for women in the oldest age groups. Women find themselves more limited than men, since the percentages are lower.

… and more so in 2001 than in 1997

Both for men and women, the percentages for the younger age groups in 2001 are close to those in 1997, but for older age groups, the percentages are lower. Thus, older people more often find themselves limited in 2001 than in 1997. Keeping in

mind this evolution between 1997 and 2001, 2001 data are now forged ahead. Data for 1997 can be found in appendix.

Most people limited to house or yard, only few to chair or bed

Table 3 shows, both for men and women, the proportion of the population by age group, which finds themselves, due to disability, confined to house or yard, chair or bed.

TABLE 3 - Mobility handicap (% of population) by age group and gender, 2001

	Men			Women		
	House/yard	chair	bed	House/yard	Chair	bed
15-24	0.7	-	0.1	0.1	0.6	0.6
25-34	0.6	-	-	0.4	0.5	0.1
35-44	0.4	0.1	0.1	1.8	0.5	0.3
45-54	1.7	0.4	0.2	1.9	0.5	0.5
55-64	2.5	1.2	0.5	4.9	1.4	0.7
65-74	4.9	2.6	0.1	8.9	3.3	0.8
75-84	6.2	10.6	2.4	20.8	6.3	0.4
85+	12.6	30.1	8.6	25.7	19.7	10.5

Source: Health Interview Survey, 2001.

This table does not include people without limitations.

The conclusions can be:

a) A higher percentage of women experiences restrictions than men, in any age group and for any kind of restriction. Question remains whether these differences are due to gender per se or to gender differences in diseases and conditions causing the mobility handicap.
b) As expected, a clear relationship exists between the proportion of people experiencing restrictions and age. Whether people are confined to their house, their chair or their bed, the proportion of people increases with age.
c) When people do experience restrictions, most of them are confined to their house and backyard. A smaller proportion has to stay in their chair, and an even smaller proportion has to stay in bed. Only in the oldest age groups, more men are confined to their chair than to their house.

Conclusion: clear negative relation with age

Thus, a relationship does exist between age and limitations: as people get older, more people find themselves restricted to their house, chair or bed. This is more the case for women than for men, and the situation had worsened a little between 1997 and 2001.

3. SF36-index of physical functioning

SF36 measures physical functioning

Many definitions and criteria exist to judge someone's health. When surveys are used to interrogate people about their general health status, answers can be very subjective and the results may give a false idea of reality. For this reason, a more objective international measure has been constructed concerning the physical functioning of people.

The SF36 index of physical functioning takes into account the degree in which a person is limited in executing 10 different activities[11]. These activities include walking, bathing, clothing, carrying bags, etc. The score varies from 0 to 100, 100 meaning the person isn't limited at all, 0 meaning that the person has limitations in all activities involved.

Index decreases with age….

Table 4 gives the index by age group and gender in 1997 and 2001. People younger than 15 were excluded from the survey for this question.

TABLE 4 - SF36 score for physical functioning by age group and gender, 1997-2001

	1997		2001	
	Men	Women	Men	Women
15-24	98.2	97.5	97.1	96.4
25-34	97.2	96.1	96.1	94.2
35-44	95.0	93.0	95.4	91.6
45-54	93.0	87.6	90.3	87.6
55-64	87.6	83.6	87.1	81.9
65-69	78.2	70.2	79.6	76.5
70-74	73.5	59.2	77.2	61.8
75-79	70.2	58.1	68.0	55.2
80-84	63.4	45.2	47.3	45.2
85+	44.2	36.5	35.3	23.0
Total	90.3	84.7	89.6	83.1

Source: Health Interview Survey, 1997 and 2001.

… and is lower for women than for men

The conclusions can be:

a) The *clear relationship between age and physical functioning* is confirmed by the data. In both years of survey, the SF36 score is fairly high and exceeds 90 in the youngest age groups, both for men and women. By the time women reach the age of 45 and men the age of 55, the score drops below 90. By the time people have reached the age of 70, the score is around 75 for men and around 60 for women. At age 85 and older, the score drops below 50 and.

1. The 10 activities are: limitations in case of vigorous activities, limitations in case of moderate activities, limitations in case of lifting or carrying groceries, limitations in case of climbing several flights of stairs, limitations in case of climbing one flight of stairs, limitations in case of bending, kneeling or stooping, limitations in case of walking more than one kilometer, limitations in case of walking a few hundred meter, limitations in case of walking one block, limitations in case of bathing or clothing oneself.

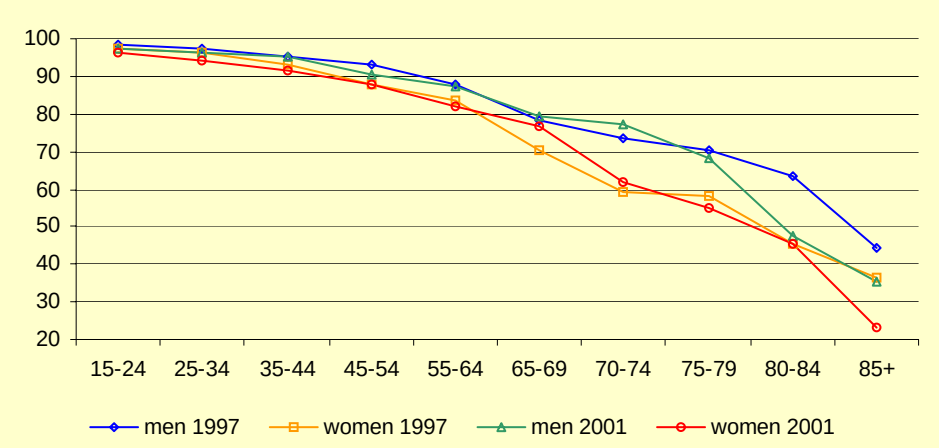
b) *Men have a better score for physical functioning than women*. While in younger age groups, the difference between genders can be ignored, it becomes more important as people get older. The score for women drops faster and is much lower in the oldest age group (e.g. in 2001, 23 for women compared to 35 for men). This makes us believe that as women get older, they encounter more limitations in physical functioning than men do.

c) The score is *lower in 2001 than in 1997*, for both genders all ages.

Decrease in index between 1997 and 2001

Figure 50 shows the SF36-score, by age group and gender in 1997 and 2001.

FIGURE 50 - SF36 score, by age group and gender, 1997-2001



Source: Health Interview Survey, 1997 and 2001.

This SF36-score for physical functioning gives a more objective description of the health status of the population. Together with the data described in former paragraphs, it appears that there is a strong relation between age, on one hand, and health, disability and physical functioning, on the other.

Why is women's health worse than men's?

The last three paragraphs emphasize that women seem to have a worse health than men do, should it be ab**out** subjective health, mental health, mobility handicap or the SF36 score.

One possible explanation for this is that women are more likely than men to experience domestic violence and discrimination in access to education, income, meaningful work or political power. These cumulative disadvantages may mean that women are more likely than men to suffer disabilities and limitations in physical functioning. (WHO, 2001, p. 14)

On top of that, since women live longer, they are more likely to reach the very high ages at which disabilities and multiple health problems are more common. (WHO, 2001, p. 14)

Women's traditional role as family caregivers may also contribute to their increased ill health in older age. Some women are forced to give up paid employment to carry out their care giving responsibilities or never have access to paid employment because they work full time in unpaid care giving roles. Not

only does that leave older women poorer than older men. One must not underestimate the heavy physical burden that sometimes comes along with care giving.

4. Healthy Life Expectancy

Because of the possible bargaining between longer life against quality of life, health expectancy indices, which combine mortality and morbidity into a single composite indicator, provide an attractive tool for monitoring trends in the evolution of population health.

How many years can one expect to live in good health?

Combining the proportion of people who consider themselves to be in bad or in good health with the mortality tables leads to the healthy life expectancy (HLE), which tells the average number of years a person can expect to live in good health given the age he or she has reached at that time.

The HLE is calculated by multiplying the number of years left to live by people with the percentage of people that consider themselves to be in good health. The methodology used is explained in detail in appendix. The HLE will be lower than the life expectancy, since less than 100% of all the people consider themselves to be in good health.

Proportion of healthy remaining life years decreases with age…

Table 5 shows life expectancy (LE), HLE and the difference between the two, which is the number of years one can expect to live in bad health, for men and women, in 2001. It also shows the percentage of years expected to be spent in good health in total LE (= HLE/LE*100), at several ages. Data from 1997 can be found in appendix.

TABLE 5 - LE, HLE, (LE-HLE) and (HLE/LE*100) by age and gender, 2001

	Men				Women			
	LE	HLE	LE-HLE	% HLE	LE	HLE	LE-HLE	% HLE
15	61.1	47.6	13.4	78	67.3	48.8	18.5	73
25	51.5	38.5	13	75	57.5	40.0	17.5	70
35	42.1	30.0	12.1	71	47.7	31.1	16.6	65
45	32.8	21.7	11.1	66	38.2	23.1	15.1	60
55	24.0	14.6	9.4	61	29.0	16.2	12.8	56
60	19.9	11.8	8.1	59	24.6	12.8	11.8	52
65	16.0	8.9	7.1	56	20.3	9.7	10.6	48
70	12.5	6.4	6.1	51	16.2	7.1	9.1	44
75	9.5	4.6	4.9	48	12.4	5.2	7.2	42
80	7.0	2.9	4.1	41	9.0	3.5	5.5	39
85	5.1	1.8	3.3	36	6.4	2.8	3.6	43

Source: FPB mortality tables and Health Interview Survey, 2001.

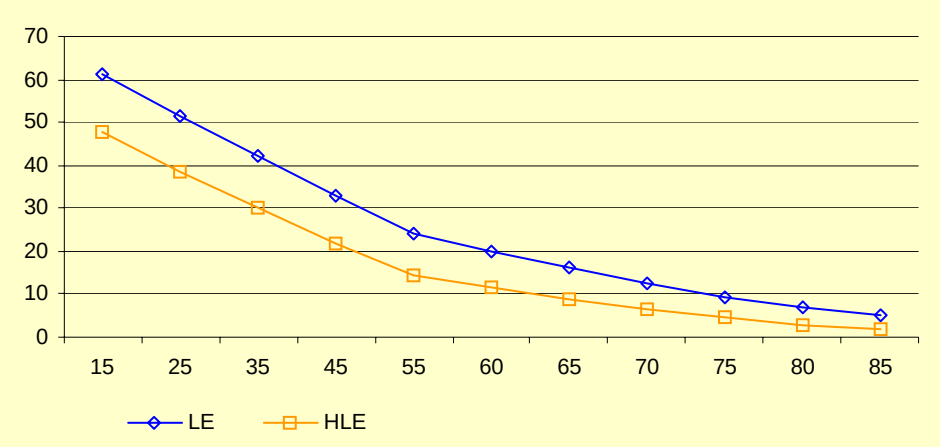
Men aged 15 can expect to live 61.1 years, of which 47.6 in good health and 13.4 in bad health. Men aged 85 have 5.1 more years to live, of which 1.8 in good health and 3.3 in bad health. Women aged 15 can expect to live 67.3 more years, of which

48.8 in good health and 18.5 in bad health. At age 85, 2.8 years of the remaining 6.4 years are to be spent in good health, 3.6 years in bad health.

… and is higher for men than for women

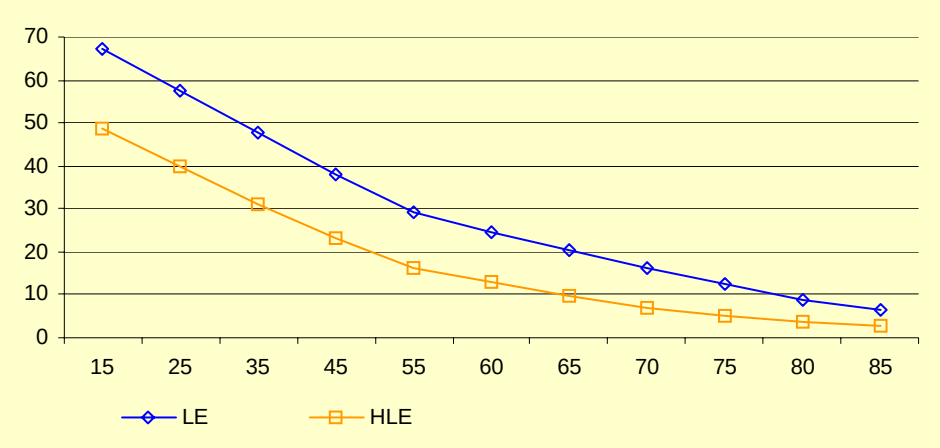
Although women expect to live longer than men do, they should spend a bigger part of their remaining life years in bad health than men do. Thus, women live longer, but not in better health. This is shown even more clearly on figures 51 and 52, which give the life expectancy and the life expectancy in good health of men and women at different ages.

FIGURE 51 - LE and HLE, men, 2001



Source: FPB Mortality tables, HIS - 2001.

FIGURE 52 - LE and HLE, women, 2001



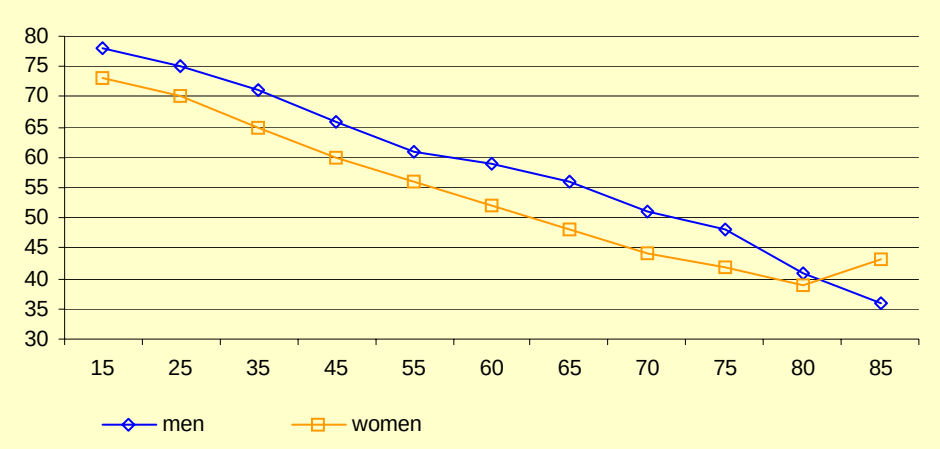
Source: FPB Mortality tables, HIS - 2001.

Women's LE is higher than the LE of men, at all ages. However, the gap between the life expectancy and the life expectancy in good health is greater for women than for men. For example, at age 15, the gap for men is 13.63 years, whereas for women it is 20.32 years. Women spend more years of their lives in bad health.

This is confirmed by the proportion of years in good health in the total remaining life years (= HLE / LE*100). Men aged 15 can expect to spend 78% of their remaining years in good health, women the same age 73%. At the age of 85, men can expect

to spend 36% of their remaining life years in good health, women 43% (Table 5). This is also shown in figure 53.

FIGURE 53 - Proportion of years in good health in remaining life years, by age group and gender, 2001



Source: Health Interview Survey, 2001.

The conclusions can be:

a) There is a negative relation between age and HLE. As people get older, they can expect to spend a lower proportion of their remaining life years in good health.
b) There is a difference between gender. Women live longer, but they do so in worse health.

According to this analysis, the ageing of the population can have a negative effect on its global health status.

Compression or expansion of morbidity?

The HLE was calculated for 1997 as well. Comparison between the HLE in 1997 and 2001 allows to study the evolution over time and to maybe give an answer to the question whether there has been *compression or expansion of morbidity*, or, whether people have been living longer in better or in worse health.

This is an important question. If people live longer due to a higher life expectancy, but do so in worse health, then demand for and cost of health care will increase. If, on the other hand, people live longer in the same or even in better health, than the ageing of the population doesn't necessarily put pressure on health care cost and use.

At each age and by gender, the following calculations were done:

a) The change (increase / decrease) in HLE between 2001 and 1997 = HLE2001-HLE1997. A positive number means HLE increased, a negative means a decrease.
b) The change (increase / decrease) in LE between 2001 and 1997 = LE2001-LE1997. A positive number means LE increased, a negative number means a decrease

Then the difference between the change in HLE and the change in LE is calculated. For example, if HLE increased more then LE, that means that people can expect to spend more of their remaining life years in good health, inducing a *compression of morbidity.* On the other hand, if HLE increased less then LE, people can expect to spend fewer of their remaining life years in good health and this means an *expansion of morbidity.*

$$\text{compression} = (HLE_{2001} - HLE_{1997}) - (LE_{2001} - LE_{1997}) = \Delta HLE - \Delta LE$$

Expansion of morbidity at older ages

Table 6 shows the results for men and women by age. (change in HLE – change in LE). A '+' means compression of morbidity, a '-' means expansion of morbidity.

TABLE 6 - Compression/expansion of morbidity, HLE, by age and gender, 1997-2001

	Men	Women
15	0.22	1.98
25	-0.14	1.97
40	0.13	1.51
50	-0.24	0.60
60	-0.22	0.26
65	-0.44	-0.06
70	-0.50	-0.49
75	-0.35	-0.47
80	-0.91	-0.83
85	-0.94	-0.04

Source: Health Interview Survey, 1997 and 2001, FPB mortality tables and calculations.

For younger people, there has been a compression of morbidity: the figure is positive, which means HLE increased more than LE did. For women this is the case until the age of 60, for men, until the age of 40, except for men between 23 and 31. At older ages, the number becomes negative, which means people may have more years left to live, but they will do so in worse health. Obviously, these are preliminary conclusions since these are only based on two years of observation and on subjective surveys that used sample populations.

Thus, at young ages there should have been a compression of morbidity, at older ages an expansion. If this is verified in the coming years, then population ageing could put serious pressure on health care and health care costs.

Comparing health status in 1997 and 2001

To check this conclusion, the following question asked in the HIS can be used: "How would you describe your health compared to last year?" Five possible answers could be given; they are here regrouped into three categories:

- Category A: a lot to a little worse;
- Category B: more or less the same;
- Category C: a little or a lot better.

The results are shown in table 7, for men and women, in 2001.

TABLE 7 - Evolution of self-reported health, by age group and gender, 2001

	Men			Women		
	Worse (A)	Same (B)	Better (C)	Worse (A)	Same (B)	Better (C)
15-24	6.1	76.6	17.3	9.2	77.0	13.7
25-34	8.5	76.3	15.2	10.0	72.5	17.4
35-44	9.5	78.6	11.9	9.8	75.6	14.6
45-54	10.7	77.0	12.3	12.8	73.5	13.7
55-64	11.4	77.1	11.4	13.8	74.8	11.4
65-74	17.0	73.6	9.4	19.9	71.6	8.5
75+	29.8	62.3	9.4	31.3	59.6	9.0

Source: Health Interview Survey, 2001.

These data confirm the earlier conclusion of a compression in morbidity among younger age groups and an expansion among older age groups. For both men and women, the proportion of people saying that their health is better than the previous year drops with age (from approximately 17% in younger age groups to 9% in older age groups). On the other hand, the proportion of people who find their health has got worse, increases with age. Less than 10% of young people say their health has worsened, compared to approximately 30% of people older than 75.

It should be reminded that the perceived health is a subjective appreciation.

5. Disability Free Life Expectancy

How many years can one expect to live without disability?

The disability free life expectancy (DFLE) calculates the average number of years one can expect to live without disability. To construct this measure, the following question in the HIS has been used: "Do you suffer from one or more longstanding illnesses, chronic conditions or handicaps?" Possible answers were yes or no.

The proportion, by age, of men and women having answered 'no' was used in association with the mortality tables, multiplying, for each age, the numbers of years left to live with the percentage of people that age without disability. The thus become life expectancies will be lower than the usual life expectancies, since not 100% of the population of a certain age is disability-free. The used methodology is explained in more detail in appendix.

Proportion of disability-free remaining life years decreases with age

Table 8 includes life expectancy (LE), disability free life expectancy (DFLE) and the difference between those two, which can be seen as the numbers of years one can expect to live with disability. It includes the proportion of years spent without disability in total remaining life years by age, for men and women in 2001. Data can be found in appendix.

TABLE 8 - LE, DFLE, (LE-DFLE), (DFLE/LE*100), by age and gender, 2001

	Men				Women			
	LE	DFLE	LE-DFLE	% DFLE	LE	DFLE	LE-DFLE	% DLFE
0	75.3	56.1	19.2	75	81.7	60.7	21.0	74
15	61.1	43.2	17.9	71	67.3	47.1	20.2	70
25	51.5	34.6	16.9	67	57.5	38.6	18.9	67
35	42.1	26.7	15.4	63	47.7	29.9	17.8	63
45	32.8	19.6	13.2	60	38.2	22.2	16.0	58
55	24.0	13.1	10.9	55	29.0	15.4	13.6	53
60	19.9	10.5	9.4	53	24.6	12.5	12.1	51
65	16.0	7.8	8.2	49	20.3	9.6	10.7	47
70	12.5	5.7	6.8	46	16.2	7.0	9.2	43
75	9.5	4.1	5.4	43	12.4	5.1	7.3	41
80	7.0	2.5	4.5	35	9.0	3.4	6.6	38
85	5.1	1.4	3.7	27	6.4	1.7	4.7	26

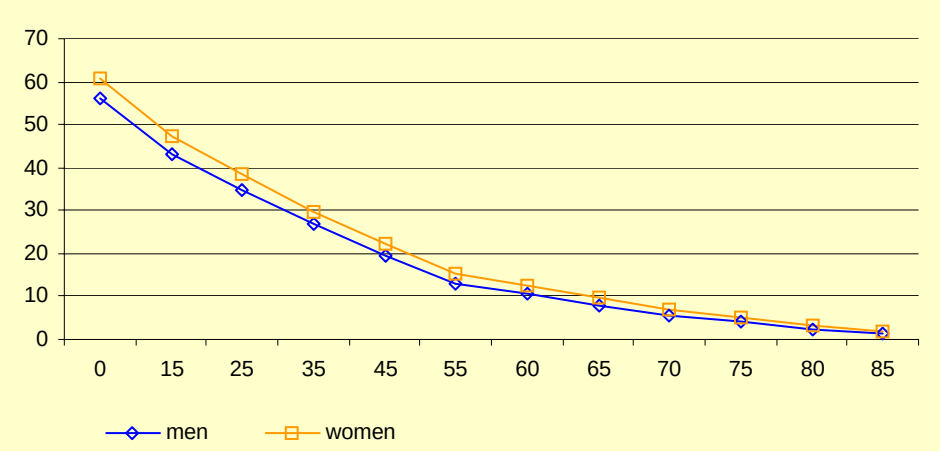
Source: Health Interview Survey, 2001.

Men at age 15 can expect to live 61.1 years, of which 43.2 without disability (71% of remaining life years) and 17.9 with disability. Women that age can expect to live 67.3 years, of which 47.1 without disability (70% of remaining life years) and 20.2 with disability. At the age of 85, men can expect to live 5.1 more years, of which 1.4 without disability (27% of remaining years) and 3.7 with disability. Women can expect to live 6.4 years; 1.7 of which disability-free (or 26% of remaining years) and 4.7 with disability.

As people get older, they can expect to spend a bigger part of their remaining life years with disability. Thus, disability increases with age. No big differences appear between genders. Women have a higher LE and a higher DFLE, therefore, the proportion of their life spent with disability almost equals that of men.

Figure 54 shows DFLE graphically, by age and gender in 2001.

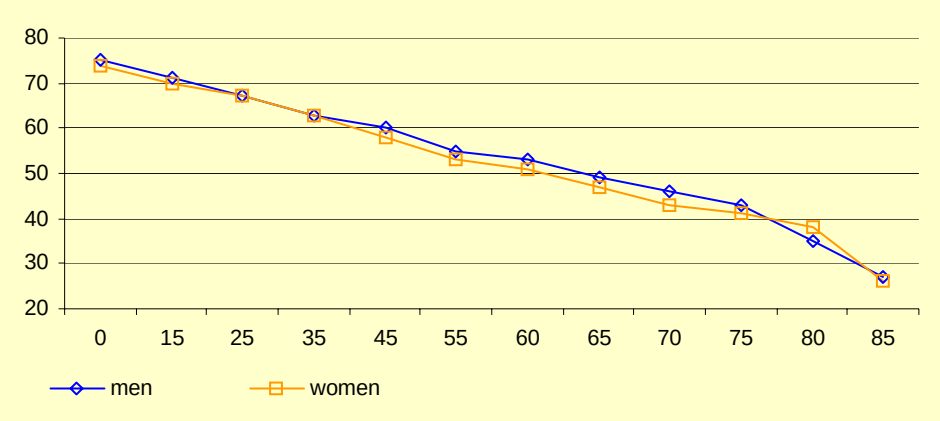
FIGURE 54 - Disability free life expectancy, by age group and gender, 2001



Source: Health Interview Survey, 2001.

The relationship between age and disability is also clear when looking at the proportion of life years without disability in the total remaining life years (DFLE/LE*100). This is shown in figure 55, by age and gender.

FIGURE 55 - Proportion of years without disability in remaining life years, by age and gender, 2001



Source: Health Interview Survey, 2001.

This picture confirms the conclusion that, as people get older, they will spend a bigger proportion of their remaining life years with disability and that there are no important differences between men and women.

Compression or expansion of disability?

Having data on disability in 1997 in the HIS 1997, the same exercise can be repeated for HLE to see whether there has been compression or an expansion in morbidity, when it comes to disability. The methodology is the same:

$$\text{compression} = (DFLE_{2001} - DFLE_{1997}) - (LE_{2001} - LE_{1997}) = \Delta DFLE - \Delta LE$$

Expansion of disability at older ages, especially for women

The results are shown in table 9. A positive number indicates a compression of morbidity between 1997 and 2001; a negative number indicates an expansion of morbidity.

TABLE 9 - Compression/expansion of disability, DFLE, by age and gender, 1997-2001

	Men	Women
0	0.32	1.51
15	0.24	1.21
25	0.06	1.57
40	0.61	1.21
50	0.65	0.15
60	0.90	-0.50
70	0.04	-1.25
75	-0.08	-1.31
80	-0.69	-0.95
85	-0.53	-2.03

Source: Health Interview Survey 1997 and 2001, FPB mortality tables and FPB calculations.

The figures are positive until the age of 70 for men and 50 for women: until those ages, there has been a compression of morbidity; the number of years left to live without disability has increased more than LE. At higher ages, there has been an expansion of morbidity: people can expect to live longer, but will spend more of those extra years with disability.

Thus, there is a positive relationship between age and disability: as people get older, they can expect to spend a bigger proportion of their remaining life years with disability.

III Concluding remarks

This paper thoroughly studied the demographic aspects of population ageing in the framework of the first working package of the AGIR project. **T**he aim was to better understand the nature of population ageing, the underlying causes of it, as well as the impact of this phenomenon on the population's health and fitness.

Describing the Belgian population….

The analysis started with a thorough description of the Belgian population - the evolution over time and the structure of the population by gender and age. Using several indicators, such as - among others - senility indices, dependency ratios and average age of the population, it was possible to illustrate that the population is not only increasing, but also getting older. The population pyramid by age becomes thinner at the base and fatter at the top, meaning that the proportion of older people in the population increases. Population projections confirm that this evolution will continue and even amplify in the future.

… the underlying factors ….

This population ageing can be attributed to several factors. Analysis of crude and total fertility rates have shown a significant drop in fertility the past decades. Fewer children are born each year. In addition, thanks to falling mortality rates at all ages, but especially at age 0 and at older ages, life expectancy of people has increased, and people can now expect to live much longer.

… the impact on life-time decisions….

These demographic changes have had an influence on decisions people make during their lifetime. Nowadays, people tend to stay in school longer and tend to postpone marriage and parenthood. Even though life expectancies have increased, people tend to leave the labour market earlier, which leaves them with plenty of post-retirement years compared to half a century ago. And since people live longer, the average age at widowhood has increased as well.

… and finally: the relation between age and health

So, people do live longer, but do they do so in better health? And if so, to what extent? In other words, can people expect to live longer in better health, or spend more years at the end of their lives suffering diseases and illnesses?

Data of the perceived health of people, on mental health, blindness and mobility handicaps can help answer these questions. Though differences do exist between these data, they both strongly underline that health deteriorates at older ages. All data lead to the conclusion that health deteriorates at older ages and that people, as they get older, can expect to be in worse health, have mental health problems, suffer from vision impairment or handicaps. Men usually have a better health than women do.

Healthy Life Expectancy and Disability Free Life expectancy were computed in 1997 and 2001. These show the number of years people can expect to live in good

health or without disability. Comparison with the regular life expectancy showed that, as people get older, they can expect a higher proportion of their remaining life years in bad health or with disability. Again, the negative relation between health and age was confirmed.

Comparing Healthy and Disability free life expectancies in 1997 and 2001 enabled to calculate whether there has been compression or an expansion of morbidity over the period. The message received is partly a gloomy one: in younger age groups, it seems that healthy life expectancy increased more than life expectancy, so there was a compression of morbidity. However, in older age groups, the opposite holds: life expectancy increased more than healthy or disability free life expectancy did, which means one can expect to live longer, but in worse health. Again, there is a negative relationship between health and age.

To conclude...

The message is clear. The population is ageing and will continue to do so in the future: the population will include more people who live longer. What's more, there is a clear negative relation between age and health. This means that, in the future, one can expect more people to be confronted with disease, illness or other health problems. Question remains what effect this will have on the demand of health care, the cost of health care and the retirement decision of older workers. These questions will be further analysed in the following working packages of the AGIR project.

IV Bibliography

AARP, 2002, "Beyond 50.02; A report to the Nation on Trends in Health Security", 119p., Washington D.C., United States.

Bartiaux F., 2000, "Quitter ses parents … plus tard? L'évolution de 1981 à 1991" in Guy Bajoit, Françoise Digneffe, Jean-Marie Jaspard en Quentin Nollet de Brauwere (éds): 'Jeunesse et société : la socialisation des jeunes dans un monde en mutation', Bruxelles, De Boeck, pp. 157-165.

Billari F., 2002, "Becoming Adult in Europe: A demographic Perspective (Will the new demography focus on oldest-old, lowest-low and latest-late?)", Instituto di Metodi Quantitativi, Universita Bocconi, Milano, Italy, 27p., presented at Chaire Quetelet 2002, Louvain-la-Neuve, Belgium, October 22-25 2002.

Blöndal S., Scarpetta S., 1998, "The retirement decision in OECD countries", 103p., OECD, Economics department working papers no. 202, Paris.

Bradford Hale, C; University of Washington, http://courses.washington.edu/hserv545/03/03-measure.html.

De Santis G., 2002, "The cost of non-active years", University of Messina, Italy, 19p., presented at Chaire Quetelet 2002, Louvain-la-Neuve, Belgium, October 22-25 2002.

Gakidou E., Murray C., Frenk J., "A framework for Measuring Health Inequality", 30p., World Health Organisation.

Haffard T., 2002, "La mortalité différentielle des sexes", Département de Démographie, Université de Batna, Algeria, 9p., presented at Chaire Quetelet 2002, Louvain-la-Neuve, Belgium, October 22-25 2002.

Health Interview Survey, Belgium, 1997, Unit of Epidemiology, Scientific Institute of Public Health.

Health Interview Survey, Belgium, 2001, Unit of Epidemiology, Scientific Institute of Public Health.

Herdan G., 2002, "Why men die younger: causes of mortality differences by sex", 89p., www.soa.org/library/monographs/life/m-LI01-1/m-LI01-1_VII.pdf

Lambrecht M., "Notes du seminaire sur la démographie – éléments d'analyse – importance économique, sociale, politique – situation et perspectives pour la Belgique", 47p.

Lesthaeghe R., 2000, "Europe's demographic issues: fertility, household formation and replacement migrations", Working paper 2000-6, IPD, Brussels, 36p.

Lesthaeghe R., Moors G., 2000, "Recent trends in fertility and household formation in the Industrialized world", Review of Population and Social Policy, n. 9, 2000, p. 121-170.

Mirkin B., Weinberger M., 2001, "The demography of population ageing", 58p., United Nations Organisation, UN / POP / AGE / 2001,1.

Murray C., Lopez A, 2000, "Progress and directions in refining the global burden of disease: a response to Williams. Health Economics, 2000, 9(1): 69-82". World Health Organisation.

NATIONAL INSTITUTE FOR THE STATISTIC, FEDERAL PLANNING BUREAU, 2001, "Perspectives de population 2000-2050", 358p., Brussels.

NATIONAL INSTITUTE FOR THE STATISTIC, 2002, "Tables de mortalité 2000 et 1998-2000" 97p., Brussels.

Pinnelli A., 2002, "Low fertility and gender", University of Rome "La Sapienza", department of Demography, Italy, 19p., presented at Chaire Quetelet 2002, Louvain-la-Neuve, Belgium, October 22-25 2002.

Stephanson J., Scobie G., 2002, "The economics of population ageing", 34p., New Zealand Treasury, Working Paper 02 / 05, March 2002.

Streel C., Weemaes S., 2001, "Country Fiche on Pensions", 57p., Brussels, Federal Planning Bureau, Note for the Working Group on the implications of Ageing populations of the Economic Policy Committee of the European Union.

Wetenschappelijk Instituut Volksgezondheid, 2002, "Gezondheidsenquête door middel van interview België 2001", 55p., Brussels.

World Health Organisation, 2001, "Health and Ageing – a discussion paper", 40p., Geneva, WHO / NMH / HPS / 01.1, WHO department of Health Promotion.

V Appendix

A. Past population data

TABLE 10 - Men by age group – 1950-2000 – absolute figures

	1950	1960	1970	1980	1990	2000
0 to 4	356,338	383,029	363,945	313,002	309,458	294,561
5 to 9	279,018	362,842	403,254	332,386	305,153	313,420
10 to 14	283,888	354,638	394,508	368,730	313,034	317,029
15 to 19	307,751	278,745	371,025	406,811	331,595	311,085
20 to 24	329,173	282,425	369,148	404,298	371,720	322,516
25 to 29	352,977	305,056	293,822	381,415	411,399	344,700
30 to 34	247,357	325,559	298,698	372,015	402,045	381,606
35 to 39	308,103	348,230	316,130	290,098	375,120	412,559
40 to 44	324,100	242,451	323,775	291,509	363,401	396,515
45 to 49	322,540	297,623	324,392	304,116	279,840	365,079
50 to 54	285,007	304,721	221,470	303,968	276,856	348,604
55 to 59	231,301	289,825	261,068	293,987	281,033	262,936
60 to 64	195,575	239,458	249,036	189,315	266,695	251,137
65 to 69	168,743	178,210	213,799	201,639	237,145	237,915
70 to 74	127,538	130,738	152,515	163,881	134,699	202,323
75 to 79	80,750	88,528	91,625	110,837	116,622	152,408
80 to 84	37,597	45,522	48,696	57,039	68,052	66,557
85 to 89	12,019	15,423	19,745	21,240	28,124	35,771
90 to 94	2,018	2,953	4,625	5,326	7,485	10,456
95+	204	279	590	897	1,209	1,834
Total	4,251,997	4,476,255	4,721,866	4,812,509	4,880,685	5,029,011

Source: NIS, and FPB corrections for inter-census mis-estimations.

TABLE 11 - Men by age group – 1950-2000 – in share of population

	1950	1960	1970	1980	1990	2000
0 to 4	8.38	8.56	7.71	6.50	6.34	5.86
5 to 9	6.56	8.11	8.54	6.91	6.25	6.23
10 to 14	6.68	7.92	8.35	7.66	6.41	6.30
15 to 19	7.24	6.23	7.86	8.45	6.79	6.19
20 to 24	7.74	6.31	7.82	8.40	7.62	6.41
25 to 29	8.30	6.81	6.22	7.93	8.43	6.85
30 to 34	5.82	7.27	6.33	7.73	8.24	7.59
35 to 39	7.25	7.78	6.70	6.03	7.69	8.20
40 to 44	7.62	5.42	6.86	6.06	7.45	7.88
45 to 49	7.59	6.65	6.87	6.32	5.73	7.26
50 to 54	6.70	6.81	4.69	6.32	5.67	6.93
55 to 59	5.44	6.47	5.53	6.11	5.76	5.23
60 to 64	4.60	5.35	5.27	3.93	5.46	4.99
65 to 69	3.97	3.98	4.53	4.19	4.86	4.73
70 to 74	3.00	2.92	3.23	3.41	2.76	4.02
75 to 79	1.90	1.98	1.94	2.30	2.39	3.03
80 to 84	0.88	1.02	1.03	1.19	1.39	1.32
85 to 89	0.28	0.34	0.42	0.44	0.58	0.71
90 to 94	0.05	0.07	0.10	0.11	0.15	0.21
95+	0.00	0.01	0.01	0.02	0.02	0.04
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: NIS, and FPB corrections for inter-census mis-estimations.

TABLE 12 - Women by age group – 1950-2000 – absolute figures

	1950	1960	1970	1980	1990	2000
0 to 4	343,688	367,142	347,490	299,263	293,905	281,505
5 to 9	270,678	350,789	385,561	317,136	290,435	299,258
10 to 14	280,457	345,763	378,001	352,333	299,286	301,463
15 to 19	304,675	272,505	356,728	390,770	317,126	297,826
20 to 24	322,975	281,633	353,797	387,829	357,626	316,058
25 to 29	338,352	305,514	282,582	364,193	395,478	336,411
30 to 34	240,568	323,074	292,935	354,905	387,723	369,718
35 to 39	305,725	335,937	313,572	281,046	361,710	401,265
40 to 44	325,551	238,717	325,277	289,604	350,369	388,493
45 to 49	328,792	300,954	330,538	306,618	275,127	358,540
50 to 54	305,973	316,372	230,305	313,861	281,089	343,415
55 to 59	265,593	312,611	281,784	313,636	294,113	266,697
60 to 64	227,558	281,066	286,395	213,363	294,957	267,528
65 to 69	198,310	229,743	268,236	250,590	284,760	271,949
70 to 74	154,079	175,944	217,373	235,180	183,135	260,176
75 to 79	103,266	124,286	148,335	187,807	191,037	229,189
80 to 84	52,248	68,543	83,589	115,197	143,136	124,266
85 to 89	20,093	27,840	35,650	49,810	76,009	90,634
90 to 94	4,142	6,328	9,418	13,781	24,461	37,973
95+	578	931	1,512	2,369	4,808	9,295
Total	4,393,301	4,665,692	4,929,078	5,039,291	5,106,290	5,251,659

Source: NIS, and FPB corrections for inter-census mis-estimations.

TABLE 13 - Women by age group – 1950-2000 – in share of population

	1950	1960	1970	1980	1990	2000
0 to 4	7.82	7.87	7.05	5.94	5.76	5.36
5 to 9	6.16	7.52	7.82	6.29	5.69	5.70
10 to 14	6.38	7.41	7.67	6.99	5.86	5.74
15 to 19	6.93	5.84	7.24	7.75	6.21	5.67
20 to 24	7.35	6.04	7.18	7.70	7.00	6.02
25 to 29	7.70	6.55	5.73	7.23	7.74	6.41
30 to 34	5.48	6.92	5.94	7.04	7.59	7.04
35 to 39	6.96	7.20	6.36	5.58	7.08	7.64
40 to 44	7.41	5.12	6.60	5.75	6.86	7.40
45 to 49	7.48	6.45	6.71	6.08	5.39	6.83
50 to 54	6.96	6.78	4.67	6.23	5.50	6.54
55 to 59	6.05	6.70	5.72	6.22	5.76	5.08
60 to 64	5.18	6.02	5.81	4.23	5.78	5.09
65 to 69	4.51	4.92	5.44	4.97	5.58	5.18
70 to 74	3.51	3.77	4.41	4.67	3.59	4.95
75 to 79	2.35	2.66	3.01	3.73	3.74	4.36
80 to 84	1.19	1.47	1.70	2.29	2.80	2.37
85 to 89	0.46	0.60	0.72	0.99	1.49	1.73
90 to 94	0.09	0.14	0.19	0.27	0.48	0.72
95+	0.01	0.02	0.03	0.05	0.09	0.18
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: NIS, and FPB corrections for inter-census mis-estimations.

TABLE 14 - Total population by age group – 1950-2000 – absolute figures

	1950	1960	1970	1980	1990	2000
0 to 4	700,026	750,171	711,435	612,265	603,363	576,066
5 to 9	549,696	713,631	788,815	649,522	595,588	612,678
10 to 14	564,345	700,401	772,509	721,063	612,320	618,492
15 to 19	612,426	551,250	727,753	797,581	648,721	608,911
20 to 24	652,148	564,058	722,945	792,127	729,346	638,574
25 to 29	691,329	610,570	576,404	745,607	806,877	681,111
30 to 34	487,925	648,633	591,633	726,920	789,768	751,324
35 to 39	613,828	684,167	629,702	571,144	736,830	813,824
40 to 44	649,651	481,168	649,052	581,113	713,770	785,008
45 to 49	651,332	598,577	654,930	610,734	554,967	723,619
50 to 54	590,980	621,093	451,775	617,828	557,945	692,019
55 to 59	496,894	602,436	542,852	607,623	575,146	529,633
60 to 64	423,133	520,524	535,431	402,679	561,652	518,665
65 to 69	367,053	407,953	482,035	452,229	521,905	509,864
70 to 74	281,617	306,682	369,888	399,061	317,834	462,499
75 to 79	184,016	212,814	239,960	298,644	307,659	381,597
80 to 84	89,845	114,065	132,285	172,235	211,188	190,823
85 to 89	32,112	43,263	55,395	71,050	104,133	126,405
90 to 94	6,160	9,281	14,043	19,107	31,946	48,429
95+	782	1,210	2,102	3,266	6,017	11,129
Total	8,645,298	9,141,947	9,650,944	9,851,798	9,986,975	10,280,670

Source: NIS, and FPB corrections for inter-census mis-estimations.

TABLE 15 - Total population by age group – 1950-2000 – share in population

	1950	1960	1970	1980	1990	2000
0 to 4	8.10	8.21	7.37	6.21	6.04	5.60
5 to 9	6.36	7.81	8.17	6.59	5.96	5.96
10 to 14	6.32	7.66	8.00	7.32	6.13	6.02
15 to 19	7.08	6.03	7.54	8.10	6.50	5.92
20 to 24	7.54	6.17	7.49	8.04	7.30	6.21
25 to 29	8.00	6.68	5.97	7.57	8.08	6.63
30 to 34	5.64	7.10	6.13	7.38	7.91	7.31
35 to 39	7.10	7.48	6.52	5.80	7.38	7.92
40 to 44	7.51	5.26	6.73	5.90	7.15	7.64
45 to 49	7.53	6.55	6.79	6.20	5.56	7.04
50 to 54	6.84	6.79	4.68	6.27	5.59	6.73
55 to 59	5.75	6.59	5.62	6.17	5.76	5.15
60 to 64	4.89	5.69	5.55	4.09	5.62	5.05
65 to 69	4.25	4.46	4.99	4.59	5.23	4.96
70 to 74	3.26	3.35	3.83	4.05	3.18	4.50
75 to 79	2.13	2.33	2.49	3.03	3.08	3.71
80 to 84	1.04	1.25	1.37	1.75	2.11	1.86
85 to 89	0.37	0.47	0.57	0.72	1.04	1.23
90 to 94	0.07	0.10	0.15	0.19	0.32	0.47
95+	0.01	0.01	0.02	0.03	0.06	0.11
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: NIS, and FPB corrections for inter-census mis-estimations.

B. Population projections

TABLE 16 - Men – 2000-2050 – by age group

	2000*	2010	2020	2030	2040	2050
0 to 4	294,561	282,781	287,151	281,890	277,259	281,482
5 to 9	313,420	290,616	286,537	289,954	281,719	282,582
10 to 14	317,029	302,424	290,092	294,646	289,556	285,104
15 to 19	311,085	319,675	298,244	294,514	297,920	289,831
20 to 24	322,516	327,701	314,612	302,850	307,434	302,593
25 to 29	344,700	330,142	340,095	320,107	316,838	320,312
30 to 34	381,606	339,764	347,590	335,771	324,801	329,403
35 to 39	412,559	351,109	340,061	350,177	331,110	328,117
40 to 44	396,515	377,052	339,221	347,676	336,620	326,317
45 to 49	365,079	400,853	344,197	335,104	345,830	327,888
50 to 54	348,604	382,130	366,133	332,397	342,044	332,365
55 to 59	262,936	345,611	383,428	333,154	326,904	339,008
60 to 64	251,137	320,051	356,964	346,924	318,630	330,485
65 to 69	237,915	231,354	311,182	352,345	311,353	309,617
70 to 74	202,323	202,111	268,463	310,269	309,656	290,822
75 to 79	152,408	164,912	171,451	241,117	284,464	259,635
80 to 84	66,557	108,902	117,297	166,780	205,201	215,342
85 to 89	35,771	53,815	64,491	75,179	114,502	145,948
90 to 94	10,456	13,054	23,894	29,625	48,049	66,864
95+	1,834	2,876	5,471	7,980	11,317	20,180
Total	5,029,011	5,146,931	5,256,576	5,348,458	5,381,208	5,383,895

Source: NIS - FPB population projections; * Real data.

TABLE 17 - Women – 2000-2050 – by age group

	2000*	2010	2020	2030	2040	2050
0 to 4	281,505	269,995	274,225	268,980	264,503	268,579
5 to 9	299,258	276,009	272,180	275,232	267,403	268,267
10 to 14	301,463	289,356	275,628	279,977	274,899	270,593
15 to 19	297,826	307,225	284,880	281,319	284,396	276,699
20 to 24	316,058	320,620	309,190	295,957	300,393	295,425
25 to 29	336,411	323,243	333,978	312,660	309,422	312,516
30 to 34	369,718	333,374	339,548	328,927	316,465	320,799
35 to 39	401,265	343,670	332,128	342,996	322,366	319,331
40 to 44	388,493	368,402	333,132	339,744	329,670	317,710
45 to 49	358,540	395,232	338,846	328,572	339,714	319,962
50 to 54	343,415	379,741	360,420	327,647	335,147	325,915
55 to 59	266,697	347,407	383,306	330,522	322,006	333,825
60 to 64	267,528	328,332	364,974	348,234	318,524	327,088
65 to 69	271,949	250,413	329,066	366,111	317,919	311,754
70 to 74	260,176	241,488	301,621	340,343	328,391	303,513
75 to 79	229,189	227,677	216,805	291,381	330,625	291,851
80 to 84	124,266	185,731	181,315	236,411	277,012	275,131
85 to 89	90,634	119,906	129,004	133,947	190,200	227,261
90 to 94	37,973	39,331	64,027	69,312	99,934	128,161
95+	8,444	13,347	20,978	25,924	30,714	49,179
Total	5,251,659	5,360,501	5,445,251	5,524,197	5,559,703	5,543,560

Source: NIS - FPB population projections; * Real data.

TABLE 18 - Total population – 2000-2050 – by age group

	2000*	2010	2020	2030	2040	2050
0 to 4	576,066	552,775	561,376	550,869	541,761	550,061
5 to 9	612,678	566,626	558,717	565,187	549,122	550,849
10 to 14	618,492	591,781	565,721	574,624	564,455	555,697
15 to 19	608,911	626,899	583,124	575,833	582,316	566,530
20 to 24	638,574	648,322	623,801	598,807	607,827	598,017
25 to 29	681,111	653,385	674,073	632,767	626,260	632,829
30 to 34	751,324	673,138	687,138	664,698	641,266	650,201
35 to 39	813,824	694,778	672,189	693,173	653,476	647,448
40 to 44	785,008	745,455	672,353	687,419	666,290	644,027
45 to 49	723,619	796,085	683,043	663,676	685,544	647,850
50 to 54	692,019	761,871	726,553	660,043	677,191	658,280
55 to 59	529,633	693,018	766,734	663,676	648,910	672,834
60 to 64	518,665	648,383	721,938	695,158	637,154	657,574
65 to 69	509,864	481,766	640,249	718,456	629,272	621,371
70 to 74	462,499	443,599	570,083	650,612	638,047	594,335
75 to 79	381,597	392,589	388,256	532,498	615,089	551,486
80 to 84	190,823	294,633	298,612	403,191	482,212	490,473
85 to 89	126,405	173,721	193,495	209,127	304,702	373,209
90 to 94	48,429	52,385	87,921	98,937	147,984	195,025
95+	11,129	16,223	26,449	33,904	42,031	69,359
Total	10,280,670	10,507,432	10,701,827	10,872,655	10,940,910	10,927,454

Source: NIS - FPB population projections; * Real data.

C. Structure of population by gender

TABLE 19 - Masculinity index by age group

	1948	1975	2000	2050
0-4	104.01	105.29	104.34	104.80
5-9	102.20	104.57	104.69	105.35
10-14	102.09	104.42	105.18	105.36
15-19	101.48	104.26	104.16	104.74
20-24	104.85	105.50	102.21	102.45
25-29	104.10	105.54	102.49	102.46
30-34	102.37	103.81	103.27	102.69
35-39	100.88	101.31	102.68	102.74
40-44	99.77	99.98	101.80	102.70
45-49	97.24	98.33	102.09	102.48
50-54	91.19	96.39	101.41	101.79
55-59	88.81	92.94	98.32	101.53
60-64	88.74	87.43	93.49	101.10
65-69	87.08	79.10	86.94	99.00
70-74	84.26	70.15	77.32	95.88
75-79	79.08	60.82	65.92	88.73
80-84	69.97	53.11	52.23	77.90
85-89	57.48	51.41	38.96	63.75
90-94	46.29	46.24	27.12	51.64
95-99	34.44	41.35	19.73	40.69

Source: FPB calculations.

TABLE 20 - Share of the population that is male – by age – 1948, 2000 and 2050

	0	25	40	50	55	60	65	80
1948	51.08	51.21	50.03	48.39	47.07	47.32	46.94	42.14
2000	50.97	50.58	50.39	50.62	49.90	48.47	47.38	36.84
2050	51.02	50.55	50.71	50.38	50.59	50.31	49.85	45.35

Source: FPB calculations.

D. Population structure by age

TABLE 21 - Share of age groups in total population, 1950-2000

	1950	1960	1970	1980	1990	2000
0-19	29.65	30.52	32.64	30.00	26.27	24.87
20-44	36.06	33.00	32.78	34.31	37.49	36.11
45-65	23.30	24.52	21.29	21.39	21.42	22.27
65+	10.98	11.96	13.29	14.31	14.82	16.75

Source: FPB calculations.

TABLE 22 - Average age of population

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Total	35.38	35.72	35.41	36.30	37.73	39.15	40.76	42.18	43.44	44.49	44.93
Men	34.56	34.67	34.07	34.77	36.10	37.65	39.37	40.88	42.21	43.21	43.65
Women	36.17	36.73	36.70	37.77	39.29	40.58	42.10	43.43	44.64	45.73	46.18

Source: FPB calculations.

TABLE 23 - Relative size of age groups with 1948=100

	1948	1950	1960	1970	1980	1990	2000
<20	100.00	100.91	109.60	124.03	116.59	103.18	100.55
20-45	100.00	99.62	96.19	101.11	108.24	119.52	118.49
45-60	100.00	103.04	114.43	105.11	108.01	109.32	116.97
>60	100.00	104.06	119.52	140.59	154.83	162.00	188.49

Source: FPB calculations.

E. Population indices

TABLE 24 - Senility index, old age dependency ratio, youth dependency ratio and intensity of ageing

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Senility index	56.44	59.99	60.59	63.68	82.24	92.60	104.87	126.90	146.00	155.48	159.46
Old age dependency	28.42	33.00	37.82	33.73	37.32	40.18	43.54	52.07	62.67	66.87	68.62
Youth dependency	50.36	55.02	62.42	52.97	45.38	43.38	41.52	41.03	42.92	43.00	43.03
Intensity of ageing	8.95	10.53	11.07	14.49	17.0	15.91	21.12	21.07	21.87	27.39	31.64

Source: FPB calculations.

F. Fertility

TABLE 25 - Total number of births, by gender, 1950-2000

	Men	Women	Total
1950	74778	70894	145672
1951	73063	69251	142314
1952	75384	70680	146064
1953	75282	70843	146125
1954	76237	72301	148538
1955	76484	72711	149195
1956	76993	73217	150210
1957	78974	73897	152871
1958	79864	75184	155048
1959	81361	76876	158237
1960	79606	75178	154784

	Men	Women	Total
1961	81488	76943	158431
1962	79787	75274	155061
1963	81874	77318	159192
1964	82633	78205	160838
1965	80027	75469	155496
1966	77503	73593	151096
1967	75364	70829	146193
1968	72947	69037	141984
1969	72966	68833	141799
1970	73171	68997	142168
1971	72753	68774	141527
1972	70014	66290	136304
1973	66576	62848	129424
1974	63595	60079	123674
1975	61574	58119	119693
1976	62228	58806	121034
1977	62455	59397	121852
1978	62947	59645	122592
1979	64093	59732	123825
1980	63778	60620	124398
1981	63700	60092	123792
1982	61831	58410	120241
1983	60209	56936	117145
1984	59331	56320	115651
1985	58572	55520	114092
1986	60493	56621	117114
1987	60390	56964	117354
1988	61520	58259	119779
1989	61948	58956	120904
1990	63421	60355	123776
1991	64586	61338	125924
1992	63883	60891	124774
1993	61789	59059	120848
1994	59960	56553	116513
1995	59081	56461	115542
1996	58725	56489	115214
1997	59277	56587	115864
1998	58562	55714	114267
1999	57858	55611	113469
2000	58790	56093	114883
2001	57807	57807	113249

Source: NIS.

TABLE 26 - Crude birth rate and total fertility rate

	1950	1960	1970	1980	1990	2000
Crude birth rate	16.46	17.33	14.66	12.57	12.61	11.02
Total fertility rate	2.34	2.56	2.25	1.69	1.62	1.60 (1997)

Source: NIS.

G. Methodology mortality tables

Different methods exist to construct mortality tables. Depending on the availability of data and the desire to follow a specific cohort or not, one can chose a different approach. Either data on number of deaths by age at death, or year of birth can be used.

The FPB has decided to construct mortality tables using the second approach, namely number of deaths by year of birth. For example:

- Death at age 0 in year x includes only people born in year x.
- Death at age 1 in year x includes people born in year (x-1) and died in year x, irrespective whether they have already reached the age of 1 or not.
- ….
- Death at age 80 in year x includes people born in year (x-80) and died in year x, irrespective whether they were 79 or 80 years old at the moment of death.

Data on mortality were gathered from NIS population database, and reach up to the age of 100. We have constructed mortality tables for the total population, as well as by gender, from 1948 until 2000.

A first step is to calculate the *probabilities to die.* These are calculated by using data on mortality by year, on the number of births each year and on the population. More specifically, the probability in year x to die at age x equals the number of deaths at age x (as defined as above) divided by the population aged (x-1) at the beginning of year y. For the population aged zero, this means the number of deaths at age zero divided by the number of births that year. Or:

$$Q_x = \frac{{}_{y}^{y-x}D_{x-1} + {}_{y}^{y-x}D_{x}}{{}_{y}P_{x-1}}$$

$$Q_1 = \frac{{}_{y}^{y-1}D_{0} + {}_{y}^{y-1}D_{1}}{{}_{z}P_{0}}$$

$$Q_0 = \frac{{}_{y}^{y}D_{0}}{{}_{y}N}$$

with:

Q_x = probability to die at age x

${}_{y}^{z}D_x$ = deaths at age x in year y of generation z

${}_{z}P_x$ = population aged x on 1/1/z

${}_{z}N$ = births year z

Once we have calculated the death probabilities, it is easy to calculate the survival rates at each age. These survival rates give the probability that a person aged x in year y will reach the age x+1. The survival rates are defines as followed:

$$P_x = 1 - Q_x$$

Once we have calculated the death probabilities and the survival rates, mortality tables allow us to calculate the number of survivors of a 1,000,000 people cohort at each age. At age zero, there are 1 million people. We apply the survival rates at age zero to this population and thus become the population aged 1. Then we apply the survival rates at age one to this new population and become population aged 2, and so on. Mathematically, this means:

$$L_x = L_{x-1} \times P_{x-1} = L_{x-1} - D_{x-1} \qquad \text{with } L_0 = 1{,}000{,}000$$

$$D_x = L_x \times Q_x = L_x - L_{x-1}$$

Now we have calculated probabilities to die and survival rates as well as the number of survivors of a population cohort of 1,000,000 people. The ultimate step now is to calculate life expectancies from these data. To do so, we first calculate the accumulated number of years lived by people, LL, by adding up the L's at different ages. More specifically:

$$LL_x = LL_{x+1} - L_{x+1}$$

The life expectancy at every age, which gives the average number of years a person that age can expect to be alive can be calculated as followed:

$$E_x = \frac{LL_x}{L_x} + 0.5$$

The life expectancy is the total of life years left by people a certain age, divided by the number of people still alive at that age. We add 0.5 to the result of this equation because some people die at the beginning of the year, others at the end. This way, we correct for this distortion.

H. Longevity indicators

TABLE 27 - Life expectancy at birth, at age 65 and at age 80

	At birth		Age 65		Age 80	
	Men	Women	Men	Women	Men	Women
1950	65.00	69.98	12.68	14.43	5.42	6.08
1955	67.11	72.36	12.70	14.77	5.21	6.04
1960	67.78	73.69	12.52	15.00	5.28	6.15
1965	68.07	74.15	12.62	15.50	5.62	6.44
1970	68.32	74.66	12.46	15.64	5.67	6.55
1975	69.28	75.72	12.53	16.13	5.55	6.68
1980	70.34	77.11	13.16	17.09	6.01	7.24
1985	71.59	78.44	13.64	17.91	6.14	7.73
1990	73.19	79.85	14.64	18.97	6.36	8.32
1995	73.93	80.68	15.13	19.50	6.61	8.69
2000	75.09	81.39	15.91	20.03	6.91	8.79
2010	77.23	83.35	17.13	21.31	7.49	9.62
2020	79.18	84.95	18.29	22.39	8.05	10.25
2030	80.96	86.43	19.40	23.42	8.61	10.88
2040	82.50	87.33	20.46	24.38	9.18	11.48
2050	83.90	88.88	21.48	25.27	9.76	12.07

Source: FPB calculations.

TABLE 28 - Life endurance, median life duration and modal life duration

	Life endurance		Median life duration		Modal life duration	
	Men	Women	Men	Women	Men	Women
1950	85.52	88.26	70.91	75.62	76	77
1955	85.65	88.68	72.04	77.03	79	79
1960	85.69	89.05	71.89	77.59	78	78
1965	86.11	89.70	71.88	78.24	78	80
1970	86.10	89.96	71.97	78.48	69	79
1975	86.09	90.33	72.71	79.28	74	80
1980	87.16	91.50	73.52	80.60	77	83
1985	87.77	92.64	74.66	81.69	78	84
1990	88.99	93.72	76.51	83.15	77	84
1995	89.60	94.35	77.17	83.88	75	85
2000	90.56	94.66	78.36	84.56	80	86
2010	91.99	96.03	80.39	86.18	80	87
2020	93.33	97.02	82.10	87.54	82	90
2030	94.54	97.91	83.59	88.79	84	99+
2040	95.68	98.69	84.93	89.92	83	92
2050	96.70	99.34	86.15	90.93	86	99+

Source: FPB calculations.

I. Health indicators

TABLE 29 - Blindness by age group and gender, 1997 and 2001

	1997			2001		
	No limitations	Moderate vision impairment	Severe vision impairment	No limitations	Moderate vision impairment	Severe vision impairment
Men						
15-24	97.5	2.4	0.1	98.9	0.8	0.4
25-34	97.5	2.1	0.4	97.0	1.7	1.3
35-44	97.9	1.9	0.2	98.7	1.0	0.4
45-54	97.1	2.3	0.5	97.5	1.9	0.6
55-64	98.3	1.7	0.1	97.5	2.2	0.2
65-74	95.6	4.0	0.4	96.7	3.2	0.2
75+	94.8	3.8	1.4	93.0	5.5	1.5
Women						
15-24	95.5	4.5		98.8	1.1	0.0
25-34	97.0	2.5	0.5	96.3	3.2	0.5
35-44	95.6	3.5	0.9	96.7	2.6	0.7
45-54	95.6	4.0	0.4	94.4	4.6	1.0
55-64	94.4	5.2	0.4	94.6	5.0	0.4
65-74	93.5	3.5	3.0	93.9	5.7	0.4
75+	75.3	20.8	3.9	79.1	19.0	1.9

Source: Health Interview Survey, 1997 and 2001.

TABLE 30 - Deafness by age group and gender, 1997 and 2001

	1997			2001		
	No limitations	Moderate vision impairment	Severe vision impairment	No limitations	Moderate vision impairment	Severe vision impairment
Men						
15-24	98.6	1.1	0.2	98.4	1.4	0.2
25-34	97.3	2.7	0.0	94.9	4.2	1.0
35-44	97.1	2.9	0.0	95.7	3.8	0.5
45-54	92.3	7.0	0.7	92.5	6.7	0.8
55-64	85.0	14.5	0.5	85.7	13.5	0.9
65-74	84.8	14.3	1.0	80.0	18.9	1.2
75-79	71.4	28.3	0.3	69.8	29.3	0.9
80-84	66.7	33.0	0.3	65.9	27.9	6.1
85+	48.0	44.0	8.0	63.3	28.1	8.6
Women						
15-24	97.6	2.3	0.1	97.9	1.2	0.9
25-34	97.8	1.6	0.5	98.4	1.1	0.5
35-44	95.9	3.0	1.2	96.9	2.9	0.2
45-54	95.4	4.2	0.4	95.5	3.5	1.0
55-64	92.4	7.4	0.2	90.7	9.0	0.3
65-74	86.7	11.4	2.0	89.8	9.7	4.8
75-79	78.6	16.9	4.5	75.4	22.9	1.7
80-84	64.5	33.0	2.5	74.6	21.7	3.7
85+	60.3	31.1	8.6	65.1	22.9	12.0

Source: Health Interview Survey, 1997 and 2001.

TABLE 31 - Mental Health by age group and gender, 1997 and 2001

	Men		Women	
	Good mental health	Bad mental health	Good mental health	Bad mental health
1997				
15-24	75.6	24.4	58.8	41.2
25-34	71.7	28.3	66.4	33.6
35-44	69.4	30.6	61.6	38.4
45-54	75.3	24.7	66.0	34.0
55-64	76.0	24.0	70.1	29.9
65-74	78.0	22.0	63.6	36.4
75-84	78.7	21.3	64.6	35.4
85+	68.5	31.5	66.8	33.2
Total	73.7	26.3	64.2	35.8
2001				
15-24	78.8	21.2	69.3	30.7
25-34	81.0	19.0	68.3	31.7
35-44	81.5	18.5	72.2	27.8
45-54	76.8	23.2	73.4	26.6
55-64	82.8	17.2	73.7	26.3
65-74	77.9	22.1	74.2	25.8
75-84	78.3	21.7	65.4	34.6
85+	72.0	28.0	74.6	25.4
Total	79.7	20.3	71.3	28.7

Source: Health Interview Survey, 1997 and 2001.

TABLE 32 - Mobility handicap by age group and gender, 1997. Data for 2001 included in paper

	Men				Women			
	No restrictions	Confined to house/garden	Confined to chair	Confined to bed	No restriction	Confined to house/garden	Confined to chair	Cconfined to bed
15-24	99.9	0.1	-	-	99.6	0.1	-	0.3
25-34	99.7	0.1	0.1	0.1	98.7	0.9	0.3	0.1
35-44	99.5	0.4	0.0	0.0	97.1	1.1	0.5	1.3
45-54	97.8	1.6	0.2	0.3	97.8	1.7	0.3	0.2
55-64	96.4	2.6	0.6	0.4	96.2	2.7	0.9	0.3
65-74	90.1	6.4	3.2	0.4	84.8	12.3	2.2	0.6
75-84	81.2	8.6	10.0	0.1	70.7	16.2	10.6	2.6
85+	67.8	27.5	4.6	-	48.0	28.2	22.3	1.5

Source: Health Interview Survey, 1997.

J. Methodology HLE - DFLE

TABLE 33 - Methodology HLE - DFLE

Age	Qx	Px	Dx = death	Lx = survivors	Hx = % in good health	HLx = # of years in good health	HLE	DFx = % disability free	DFLx = # years without disability	DFLE
0	Q0	=1-q0	=L0*q0	1000000	H0	=L0*H0	=(HL0+HL1+ …+HL111)/L0	DF0	=DF0*L0	=(DFL0+DFL1+ …+DFL111)/L0
1	Q1	=1-q1	=L1*q1	=L0-D0	H1	=L1*H1	=(HL1+HL2+ …+HL111)/L1	DF1	=DF1*L1	=(DFL1+DFL2+ …+DFL111)/L1
…	…	…	…	…	…	…	…	…	…	…
15	Q15	=1-q15	=L15*q15	=L14-D14	H15	=L15*H15	=(HL15+HL16+ …+HL111)/L15	DF15	=DF15*L15	=(DFL15+DFL16+ …+DFL111)/L15
16	Q16	=1-q16	=L16*q16	=L15-D15	H16	=L16*H16	=(HL16+HL17+ …+HL111)/L16	DF16	=DF16*L16	=(DFL16+DFL17+ …+DFL111)/L16
…	…	…	…	…	…	…	…	…	…	…
20	Q20	=1-q20	=L20*q20	=L19-D19	H20	=L20*H20	=(HL20+HL21+ …+HL111)/L20	DF20	=DF20*L20	=(DFL20+DFL21+ …+DFL111)/L20
…	…	…	…	…	…	…	…	…	…	…
80	Q80	=1-q80	=L80*q80	=L79-D79	H80	=L80*H80	=(HL80+HL81+ …+HL111)/L80	DF80	=DF80*L80	=(DFL80+DFL81+ …+DFL111)/L21
…	…	…	…	…	…	…	…	…	…	…

Source: FPB calculations.

K. Healthy life expectancy

TABLE 34 - Healthy life expectancy in 1997 and 2001, by age and gender

	1997			2001	
	Total	Men	Women	Men	Women
15	46.34	46.63	46.13	47.64	48.84
20	41.85	42.14	41.66	43.00	44.50
25	37.58	37.90	37.36	38.54	40.04
30	33.18	33.37	33.06	34.13	35.63
35	28.90	29.05	28.81	29.99	31.11
40	24.89	24.89	24.97	25.79	27.15
45	21.31	21.22	21.50	21.73	23.09
50	17.86	17.61	18.22	18.06	19.46
55	14.60	14.29	15.04	14.62	16.16
60	11.70	11.45	12.07	11.77	12.87
65	9.04	8.85	9.31	8.90	9.74
70	6.83	6.52	7.20	6.42	7.13
75	4.95	4.64	5.32	4.56	5.23
80	3.67	3.50	4.00	2.86	3.50
85	2.36	2.54	2.54	1.82	2.76
90	0.99	1.60	1.32	0.00	1.95

Source: FPB calculations.

TABLE 35 - Difference between HLE and life expectancy in 1997 (data 2001 in paper), by age and gender

	Men				Women			
	LE	HLE	LE-HLE	% HLE in LE	LE	HLE	LE-HLE	% HLE in LE
15	60.27	46.63	13.64	77.37	66.61	46.13	20.47	69.26
25	50.76	37.90	12.86	74.67	56.81	37.36	19.45	65.76
35	41.31	29.05	12.25	70.33	47.06	28.81	18.25	61.23
45	32.05	21.22	10.83	66.21	37.52	21.50	16.03	57.29
55	23.35	14.29	9.05	61.22	28.45	15.04	13.41	52.86
60	19.33	11.45	7.88	59.23	24.05	12.07	11.98	50.17
65	15.52	8.85	6.67	57.00	19.77	9.31	10.46	47.07
70	12.14	6.52	5.62	53.74	15.72	7.20	8.52	45.79
75	9.24	4.64	4.61	50.14	11.96	5.32	6.65	44.44
80	6.74	3.50	3.24	51.96	8.71	4.00	4.71	45.94
85	4.84	2.54	2.31	52.36	6.11	2.54	3.57	41.56
90	3.43	1.60	1.83	46.68	4.16	1.32	2.84	31.75

Source: FPB calculations.

L. Disability free life expectancy

TABLE 36 - Disability free life expectancy in 1997 and 2001, by age and gender

	1997		2001	
	Men	Women	Men	Women
0	55.16	58.52	56.14	60.68
5	50.97	54.19	52.01	56.25
10	46.52	49.69	47.65	51.64
15	42.12	45.16	43.16	47.10
20	37.86	40.63	38.77	42.99
25	33.71	36.28	34.55	38.56
30	29.53	31.94	30.58	34.13
35	25.63	27.86	26.65	29.92
40	21.71	24.05	23.08	25.93
45	18.44	20.86	19.56	22.22
50	14.97	17.93	16.32	18.72
55	11.65	14.98	13.13	15.44
60	9.09	12.43	10.54	12.48
65	6.90	9.79	7.77	9.55
70	5.29	7.84	5.72	7.02
75	3.87	6.02	4.07	5.10
80	2.87	4.02	2.45	3.39
85	1.68	3.46	1.37	1.68
90	1.07	2.41	0.27	1.10

Source: FPB calculations.

TABLE 37 - Difference between DFLE and life expectancy in 1997 (data 2001 in paper), by age and gender

	Men 1997				Women 1997			
	LE	DFLE	LE-DFLE	% DFLE in LE	LE	DFLE	LE-DFLE	% DFLE in LE
0	74.64	55.16	19.48	73.90	81.05	58.52	22.53	72.20
15	60.27	42.12	18.15	69.89	66.61	45.16	21.45	67.80
25	50.76	33.71	17.05	66.42	56.81	36.28	20.53	63.87
35	41.31	25.63	15.67	62.06	47.06	27.86	19.20	59.20
40	36.63	21.71	14.92	59.26	42.26	24.05	18.21	56.91
45	32.05	18.44	13.62	57.52	37.52	20.86	16.66	55.59
50	27.61	14.97	12.64	54.23	32.92	17.93	15.00	54.45
55	23.35	11.65	11.70	49.88	28.45	14.98	13.47	52.66
60	19.33	9.09	10.24	47.02	24.05	12.43	11.62	51.69
65	15.52	6.90	8.62	44.45	19.77	9.79	9.98	49.54
70	12.14	5.29	6.84	43.61	15.72	7.84	7.88	49.87
75	9.24	3.87	5.37	41.88	11.96	6.02	5.95	50.30
80	6.74	2.87	3.87	42.61	8.71	4.02	4.69	46.16
85	4.84	1.68	3.16	34.78	6.11	3.46	2.65	56.55
90	3.43	1.07	2.36	31.28	4.16	2.41	1.75	57.87

Source: FPB calculations.