

Issue  
No 9

Hannover Re's Perspectives –  
Current Topics of  
International Life Insurance

**Nicola-Alexander Sittaro**

*A long life is the key to living longer  
Underwriting for the elderly*

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## 1. Introduction

### Why the need for underwriting at higher ages?

For many years the changing demographic composition of the population across a broad spectrum of countries and regions has been the subject of discussion around the world. This transformation is commonly associated with a change in social structures, especially within the family. Over many generations children have traditionally grown up to look after their parents' and grandparents' generations, but this pattern of care is no longer feasible against the backdrop of the evolving nuclear family. The proportion of the population aged over 60 is steadily rising in both industrialised nations and developing countries. More and more elderly people are finding themselves compelled to provide for their old age and protect against

risk. This development has hitherto received too little attention, and specific insurance products have still to be launched on an adequate scale. Yet there can be no doubt that such products are on the way and thus they will pose a new challenge for underwriting. From the medical underwriting perspective, the range of tools available for assessing mortality, long-term care, personal accident and health risks is severely lacking in the case of elderly people. Statistics, standard values and empirical observations are to a large extent unavailable. Nevertheless, insurance companies will undoubtedly be faced with such risks and solutions for dealing with them must be found.

## 2. Demographic change

### 2.1 Population trend and life expectancy

According to a 1999 Eurostat bulletin (Eurostat, News release, No. 75/99), in 2050 10% of Europe's population will be aged 80 or older. The number of European residents aged 60 or older will climb from 21% in 2000 to 34% in 2050.

This is due to the dramatic increase in life expectancy in European countries. Depending on the specific age cohort and country, the annual increase in life expectancy varies between 0.1 and 0.3 years.

Table 1: Age trend in the populations of Germany, the UK and the USA

Country	Year	Age Groups		
		< 30	30–64	> 64
Germany	1990	38%	47%	15%
	2040	27%	47%	26%
UK	1990	42%	42%	16%
	2030	35%	41%	24%
USA	1980	–	–	11.3%
	2040	–	–	20.5%

Source: Eurostat, News release, No. 75/99

The reasons for this marked growth in the over-64 population are manifold. First and foremost, the following factors may be mentioned:

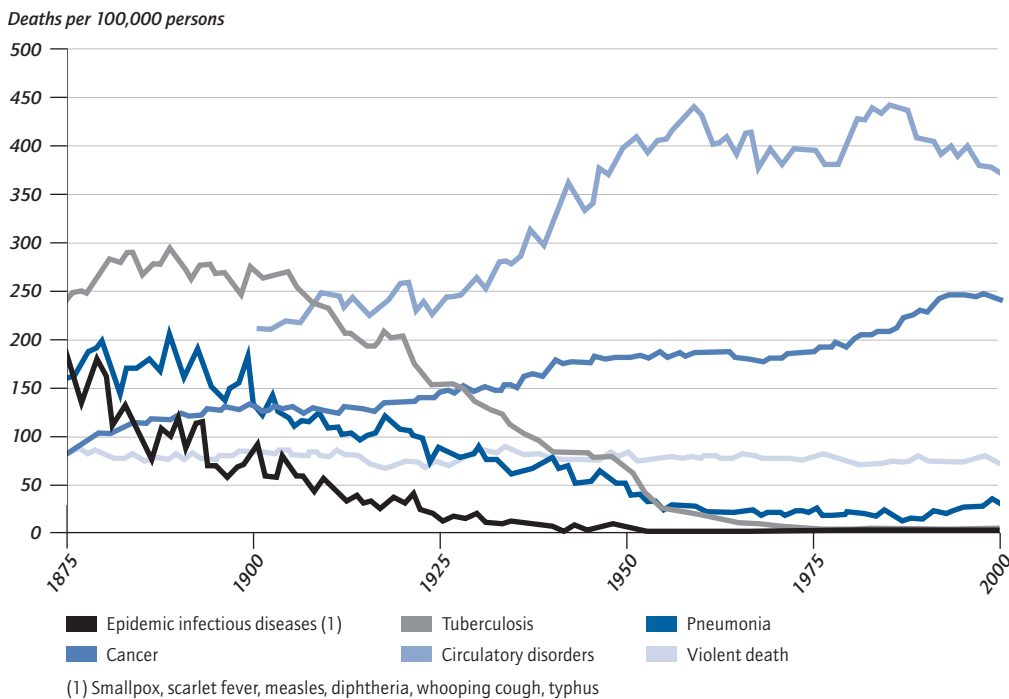
- ◆ Improvements in medical care
- ◆ Improvements in hygiene standards
- ◆ Changes in the burdens of working life
- ◆ Improvements in the general living standard

## 2.2 Changing causes of death

Parallel to the increase in life expectancy – and possibly one of the explanatory factors – there has been a comprehensive shift in the causes of death over the past 100 years. In 1875 250 to 300 of every 100,000 Swiss residents died of tuberculosis. By 1995 this figure had fallen well below 10 in 100,000. Similar changes have occurred with other infectious diseases, such as

pneumonia. On the other hand, in 1895 220 of every 100,000 Swiss residents died of cardiac and circulatory disorders. By 1995 this figure had risen to approximately 400 per 100,000 each year. Cancer-related deaths have also more than doubled, rising from 90 to 250 in the observation period from 1865 to 1995.

Figure 1: Deceased per 100,000 inhabitants in Switzerland 1876–1994



Source: Bundesamt für Statistik (Federal Statistical Office), Switzerland 1998

Although a dramatic decrease in mortality due to stroke and myocardial infarction has been observed for more than 30 years, the overall figure for cardiac and circulatory mortality has remained roughly stable in recent decades. This observation has been confirmed in numerous countries and is seen as proof of the efficiency

of medical treatment. Modern medicines and highly sophisticated cardiovascular interventions are preventing more and more myocardial infarctions and postponing heart failure until progressively higher ages. Based on the position in 2000 the following trend can therefore be assumed in the period until 2040:

Table 2: Main causes of death as a percentage of all causes of death

Year	2000	2040
Cardiovascular	45–53	42–51
- Myocardial infarction	12–15	8–10
- Stroke	12–15	10–12
- Heart failure	21–23	24–32
Cancer	20–25	18–23
Pulmonary disorders	4–5	7–8
Liver disorders	4–5	5–7
Neurological disorders	4–6	6–8
Infectious diseases	2–3	3–5
Accidents	2–3	3–5
<b>Total</b>	<b>81–100</b>	<b>84–100</b>

### 2.3 Longevity

In recent years the issue of longevity has increasingly been the subject of discussion among insurance companies. Whereas life insurers have observed this demographic change with considerable satisfaction with an eye to the death benefit, the same is not true of annuity insurers. In many countries annuity insurance has become a problem that can only be countered by cutting the accruing entitlements or raising premiums.

In Germany the number of 100-year-olds is currently growing by 7% per year. Various factors are held to be responsible for this observed longevity, including:

- ◆ genetic factors
- ◆ biological factors
- ◆ environmental factors
- ◆ social factors
- ◆ lifestyle factors

On the basis of numerous studies and observations, unambiguous and significant factors have been identified as indicators of a longer life expectancy.

The average age of the parents' generation, for example, is a clear indicator of the life expectancy of the children's generation. The probability of reaching the age of 85 or older is 20 times greater for children if both their parents have also reached this age.

There is also considerable support for the observation that the difference in attained age is smaller for monovular twins than it is for dizygotic twins.

Certain social factors are also highly significant for the attainment of an advanced age. There is substantial evidence, for example, that married people live longer than singles. Professional fulfillment also increases the likelihood of reaching

a good age. A high income and quality education are also found with significantly higher frequency among people of advanced years.

Nevertheless, there is no clear-cut factor typically found among 100-year-olds. Quite the contrary, centenarians tend to be characterized by the absence of special factors in their lives. Numerous publications and observations of several thousand hundred-year-olds have determined almost without exception that this group has led particularly fulfilled, but uneventful lives. There are no special high points, but also no notable lows. Rather, this age group tends to be characterized by a certain regularity and fixedness in daily routines over many years and decades.

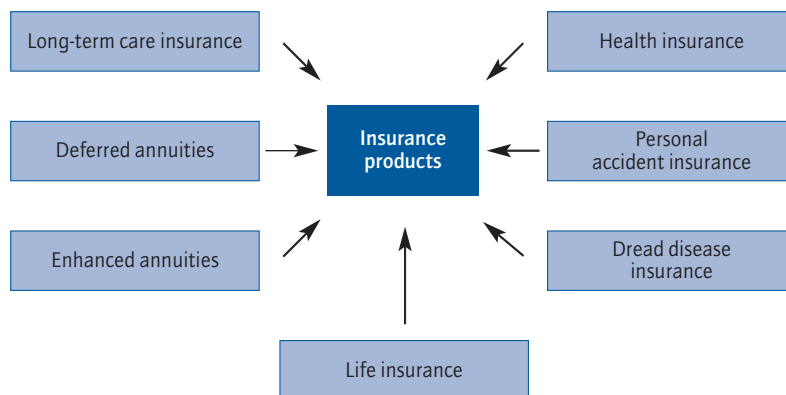
### 3. Insurance products in old age

#### 3.1 Changed needs and insurance

There can be no doubt that insurance needs in old age are fundamentally different to those in the early and middle periods of life. Whereas in the early and middle parts of life a primary goal is to protect against crises in life, for example with the aid of disability and life insurance, dread disease covers and personal accident policies, such potential crises do not present themselves in the same form in advanced years. While in middle age the focus is on wealth accumulation or paying off

the mortgage on a home, these insurances have often already been redeemed by old age. At a later stage in life risks are identified with severe illnesses, the need for nursing care, the loss of close relatives, accidents and injuries as well as the loss of self-sufficiency in general. Whilst it is true that for some needs various types of insurance can be modified and offered across the entire lifecycle, this is not true of other risks in old age.

Figure 2: Products



## 3.2 Insurance products

### 3.2.1 Life insurance

Life insurance designed to protect families against risk no longer has any significance in old age. Around the age of sixty cash value life insurance tends to mature and the released funds are either used or reinvested. One typical use is often to pay off a mortgage, although investment of the released funds in an annuity is also very popular.

While the premium level for life insurance products in old age is currently often high, it will be drastically reduced as a consequence of the sharp rise in life expectancy. The unambiguous identification of individuals with the potential for longevity will in future make it possible to offer preferred life insurance even to those over the age of seventy. Yet we should not omit to mention at this juncture that provision for the estate taxes that will accrue in the event of death is and will remain a typical insured interest in old age.

### 3.2.2 Dread disease insurance

The classic dread diseases such as myocardial infarction, stroke, cancer and kidney failure are responsible for 80% of all deaths in old age. For the survivors of such diseases, however, financial benefits are particularly important. Considerable rehabilitation expenses and possibly also long-term care costs are frequently incurred after a heart attack or stroke. In old age, then, there are even greater grounds to fear dread diseases than earlier in life. In addition, they are joined by new disorders which pose just as much of a threat to elderly people. These include:

- ◆ hip fracture (Fractures in the neck of the femur)
- ◆ blindness
- ◆ the need for nursing care

Dread disease insurance products for older people will in future encompass an additional spectrum of disorders typically associated with advanced

age. For underwriting purposes, dread disease insurance in old age will pose a special challenge since evidence-based guidelines are not as yet available.

### 3.2.3 Annuities

In advanced age annuity insurance should typically have reached its benefit phase. The funds accumulated from an active working life should now normally flow into the funds used to pay for one's livelihood. Nevertheless, it should also be possible to take out new insurance policies. Such products would include, most notably, immediate annuities with no deferment period. In this regard, one annuity product specially tailored to the needs of older people is the conversion of equity tied up in property to a regular annuity. In the United Kingdom this type of insurance is known as a "home income plan" or "reverse mortgage plan". Such a plan makes particularly good sense for elderly people who used their savings during active working life to repay a mortgage loan. When they reach old age this group of persons then has an unencumbered property, but may have too little pension income ("house-rich, cash-poor"). By including the value of their home in an annuity insurance plan such individuals can then draw a higher pension. This makes especially good sense if there are no heirs and long-term care costs are perhaps already being incurred.

Annuities will in future become an area of intense underwriting activity, since longevity poses a dramatic risk for insurance companies. The purpose of underwriting is to classify applicants with respect to their potential life expectancy.

### 3.2.4 Enhanced annuities

Enhanced annuities provide an immediate regular income in return for payment of a single premium, with the term of the benefit reflecting the applicant's state of health; in other words, this type of annuity is particularly well-

sued to converting cash into an annuity in the case of pre-existing medical conditions. Such a move may also make sense on tax grounds. The shortened life expectancy due to illness thus automatically means a higher monthly annuity.

Enhanced annuities necessitate intensive underwriting in order to correctly ascertain the remaining life expectancy. Particularly in this segment it is important to take account of dramatic changes in the field of medicine, which may lead to a significant extension of an insured's life expectancy. It can be assumed that approximately 20% of the total over-sixty population would be particularly well-suited to this type of annuity insurance.

### 3.2.5 Long-term care insurance

The need for nursing care is to older people what illness-induced disability means for younger people. Such a condition is associated with a loss of self-sufficiency, and often with having to give up one's own apartment or house and move into a nursing home. Everyone has a fundamental interest in receiving the best-quality care and greatest level of attention in this phase of life. This first-class care is expensive. The dilemma in long-term care insurance is the divergence between need and age. In early phases of life there is generally little risk awareness with respect to a need for nursing care. Yet it is specifically in this part of life that premiums for long-term care insurance are very reasonable. In later age the need for nursing care is very well known. At this stage, however, the premiums for coverage are very high. Due to these special circumstances, full or partial social provision for long-term care is – or has been – under discussion in many countries. Numerous products are available in almost all countries for private provision. These insurance products require underwriting, which has already been extensively put into place.

Also of interest to the market, however, are long-term care products offered to people already in need of nursing care. These involve immediate provision for life-long care in a nursing home in

return for payment of a single premium. The principle behind this insurance (immediate needs) is the same as that underlying enhanced annuities. In this case, too, intensive medical underwriting determines the insured's remaining life expectancy, which is then reflected in a particularly high long-term care annuity.

### 3.2.6 Health insurance

Health insurance for older people is the weak point of all insurance products. Since sickness costs rise exponentially with age, scarcely any insurance products are available that provide acceptable protection at a reasonable premium level. Innovative products must be launched in this segment in the future in order to be able to meet the existing insurance requirements. A first step towards the development of acceptable health insurance for people in advanced years is the separation of sickness costs from long-term care costs. In the case of sickness costs a trend may be observed towards segmental covers, for example providing only for major and medium-scale operations. In such a product landscape medical underwriting is again absolutely indispensable.

### 3.2.7 Personal accident insurance

At the heart of personal accident insurance lies a contradiction. On the one hand, the incidence and severity of accidents rises with increasing age. On the other hand, however, many insurance companies terminate this coverage as early as age 65 or substantially reduce the benefits. There can be no doubt that an increased demand for this type of insurance exists in old age. Particularly in Germany, more innovative personal accident policies have been available for some years now for persons aged between 65 and 85. These policies provide a very high disability benefit following accidental injuries, albeit on an annuity basis. Especially in the case of accidents leading to a need for nursing care, the annuity payments are substantially increased or multiplied several times over. Many of these personal accident insurances include elements of dread disease coverage, for example an addi-

tional lump-sum benefit in the case of fractures to the neck of the femur. Underwriting for such personal accident policies is performed on a sim-

plified basis, but it is not dispensable. Guidelines have been introduced for this type of personal accident insurance for older persons.

## 4. Paradoxes in underwriting

### 4.1 Underwriting for the elderly

Underwriting guidelines are usually aimed at the age group between 30 and 55. Underwriters are familiar with such cases and handle them in daily practice. For older persons aged between 70 and 90 some of the familiar risk indicators change fundamentally. Thus, for example, slightly higher blood pressure values and also higher cholesterol values are more likely to be correlated with a longer life expectancy. The major risk factor studies such as Framingham, Whitehall, PROCAM and MONICA tell us the opposite for earlier life segments. Yet these large-scale prevalence and predictive studies all end between ages 60 and 65. Major studies of the health status of 100-year-olds (BOLSA, Würzburg) have shown that around 20% of this group are still smokers. Matsuzaki's report on 145 100-year-olds includes the interesting observation that 3/4 of this group never went to the doctor before

the age of 60. This risk factor has still not been incorporated into any guidelines.

A further paradox in very advanced age is the fact that after angioplasty (balloon dilatation of a coronary artery) or bypass operations patients actually have a longer life expectancy than the average population.

Generally speaking, it can be said that "*a long life is the key to living longer*". The important pointer here is that very old people already constitute the group that has passed through an intensive selection process. Only a person who has reached the age of 80 can live to be 90. Consequently, at higher ages the factors that impact mortality are not the same as those known for the middle phases of life between 30 and 60.

### 4.2 Product-related underwriting

There is no form of general underwriting for old age that could be applied in a similar manner to all insurance products. Longevity considerations play an entirely different role in all annu-

ity products compared, for example, to long-term care or life insurance products. In other words, underwriting can only be performed on a product-specific basis.

### 4.3 Underwriting tools

Depending on the specific product, sum insured and pre-existing conditions, medical underwriting

is supported by the tools set out in the table below.

Table 3: Underwriting tools for older applicants

<i>Underwriting tools</i>	<i>Costs</i>	<i>Effectiveness</i>	<i>Value for underwriting</i>
Application questions	(+)	(++)	(+++)
Personal health declaration	(+)	(++)	(+++)
Telephone interview	(+)	(++)	(+++)
Direct interview	(++)	(+++)	(+++)
Interview by a paramedic	(++)	(+++)	(+++)
Family doctor's report	(++)	(+++)	(+++)
Medical certificate (medical examination)	(+++)	(++)	(+)
Blood tests (laboratory tests)	(++)**	(+)	(++)
X-ray examination of the lungs	(++)**	(+)*	(+)
At-rest ECG and exercise ECG	(+++)	(++)	(++)
Additional technical examinations	(+++)*	(++)*	(+++)

(+) = low, small (++) = moderate, average (++) = higher, good )\* = 2<sup>nd</sup> step in underwriting process )\*\* = high sums assured

The underwriting relevance of the tools indicated in the above table for persons older than 70 can be summarized as follows:

◆ **Application questions**

are still the most appropriate way to quickly and directly obtain an initial impression of someone's state of health. The further course of action can be decided on the basis of the answers. Questions must be selected with the utmost care for point-of-sale or Internet underwriting.

◆ **Personal health declaration**

This involves targeted questionnaires tailored to specific products or compiled on the basis of the responses already supplied to general application questions. Questionnaires for specific disorders are used in such cases. The returns on the responses to such questionnaires diminish with increasing age. The best results can still be obtained with respect to diabetes mellitus.

◆ **Telephone interview**

This is a widely used underwriting method for older persons. A personal impression of the policyholder's mental faculties can be gained from a telephone interview. This method is not commonly used in Europe. The low costs of conducting a telephone interview should especially be highlighted.

◆ **Direct interview by a paramedic**

The interview section must be structured specially for older people if it is to be efficient. Thanks to the opportunity it offers to conduct examinations (blood pressure measurement, weight measurement and even the taking of blood samples), this tool ranks in importance between a family doctor's report and a medical examination. The use of paramedics is not widespread in Europe.

◆ Family doctor's report

This tool remains the most efficient basis for medical underwriting. Particularly if these reports are structured specifically for older people, the return is very high.

◆ Medical certificate (medical examination)

The return from this tool is generally minimal. Without blood tests or other technical examinations (ECG), the costs do not justify use of this method. The quality of this tool is enhanced if it is used as a second step in an underwriting process. In this case, however, special examinations should also be required.

◆ Blood tests (laboratory tests)

The risk evaluation return from blood tests diminishes with increasing age. The interpretation of blood tests can also lead to incorrect conclusions if the results are not adjusted to the specific conditions of advanced age. Laboratory tests retain their significance for very high sums insured. Only in such cases can cancer screening also be utilised. The following special characteristics apply to laboratory values for individuals aged 75 or over:

Table 4: Laboratory values for individuals aged 75 or over

<i>Increased</i>	<i>Unchanged Consistently high</i>	<i>Slightly low</i>	<i>Very low</i>
AP	Liver enzyme	Erythrocytes	Albumin
BUN	Cortisol	Leukocytes	T 3
Creatinine		Thrombocytes	T 4
Cholesterol		Iron	IGM
Triglyceride			
HDL			
IGA			
IGG			
Gastrin			

◆ X-ray examination of the lungs

Despite the increased prevalence of pneumonia as a cause of death in old age, X-rays remain a secondary investigative tool. Indeed, it should be assumed that false positive results are rather common. An exception here would be countries with a high incidence of tuberculosis. X-rays of the lungs are also advisable for sizeable sums insured and smokers.

◆ At-rest ECG and exercise ECG

Greater significance attaches to an at-rest ECG after the age of 75. In particular, the at-rest ECG shows up myocardial infarctions that have

occurred or any other existing injuries of the heart muscle. Whilst exercise ECGs are highly revealing with respect to circulatory disorders of the cardiac muscle, there are no guidelines for the use of exercise ECGs after the age of 75. 20% of older people display cardiac dysrhythmia that has no prognostic value.

◆ Additional technical examinations

The additional performance of an abdominal ultrasound examination and a pulmonary function test must be made dependent on particular individual cases. Special examinations can only be considered for older people when large sums insured are at stake.

## 4.4 Specific disorders and underwriting

### 4.4.1 Coronary heart disease

In Germany the average age for occurrence of a myocardial infarction in men is 70. This average age has increased steadily in step with longer life expectancy. Depending on the specific country, approximately 20–30% of all deaths in the age group between 70 and 90 are attributable to acute myocardial infarction. Most notably, immediate and early mortality after a heart attack rise dramatically with increasing age. A rule of thumb states that in the first year after a heart attack the mortality in % is as high as the age of the affected person. It is with respect to this mortality that the greatest improvements are to be anticipated in the future. In most European countries and the USA the average age for a bypass operation is between 65 and 70. A dramatically improved life expectancy can in fact be observed among these patients. Long-term trends indicate, however, that the prevalence of severe coronary heart diseases will diminish while cardiac insufficiencies (weakened pumping efficiency of the cardiac muscle) will increase. Sufferers of severe coronary disease account for between 20 and 40% of all persons in need of nursing care. From the underwriting standpoint, coronary heart disease will in future tend to be evaluated more favourably, while cardiac insufficiency and the associated reduced functional capacity will be assessed somewhat more strictly.

### 4.4.2 Stroke

In the course of the past 40 years a dramatic decrease in the incidence of stroke has been observed in all western countries. Strokes nevertheless still number among the five most common causes of death. Strokes and their consequences are one of the three leading causes of a need for nursing care. Yet this segment in particular will see the most significant changes in the future, since rehabilitation successes are tending to reduce the need for nursing care after a stroke. The most common risk factor for a stroke is a previously suffered stroke, together with heart diseases, cardiac dysrhythmia and high blood

pressure. Strokes are considerably more relevant to underwriting for the elderly than they are for younger people.

### 4.4.3 Diabetes mellitus

Diabetes mellitus is one of the diseases growing most sharply in western countries and developing nations, most notably in Asia. In Europe the peak prevalence is reached at the age of 75 with 12–16% of the total population. Diabetes mellitus, in particular, will pose special problems for underwriting in the future. With diabetes mellitus type I, for example, which occurs at an early age and requires insulin from the outset, 7% of sufferers never exhibit any complications throughout their lives. Even at a high age this group would be insurable for life and long-term care insurance products. On the other hand, diabetes mellitus is the second-leading cause of blindness in old age and the leading reason for amputation of a lower leg. Underwriting practice in this area will have to be guided very strictly by the subject's complications and the quality of calibration with respect to medication doses. Diabetes mellitus has a prevalence of 25–40% among persons requiring nursing care.

### 4.4.4 Dementia

Dementia is probably the most difficult condition facing medical underwriting in old age. There is no doubt that the full-blown clinical picture of Alzheimer's disease goes hand-in-hand with a substantially reduced life expectancy. On the other hand, however, the duration of Alzheimer's disease from the initial onset of early symptoms until death is put at around 16 years. In other words, the life expectancy of the affected patients fluctuates heavily according to the time when the diagnosis is made. Yet in the case of many symptoms associated with diminishing cerebral faculties there is no danger whatsoever of a shortened life expectancy or the early onset of a need for nursing care. As things currently stand, underwriting practice still has to differentiate such health impairments from the disorders typically associated with dementia.

#### 4.4.5 Conclusion

The conditions listed above are merely intended to illustrate common disorders with increased age. They demonstrate the fundamentally different nature of underwriting practice. Yet persons affected by chronic diseases in old age are always anchored in a larger social and biographical background.

The biographical background describes key variables in an individual's personal life history, car-

eer and marital status that continue to have repercussions well into old age.

The social background encompasses not only personal factors but also economic circumstances and the health insurance system.

All these factors impact life expectancy and quality of life.

### 5. *Meta-factors affecting the medical risk – Hannover Life Re's concept*

The life expectancy of people aged between 70 and 90 is not determined exclusively by the number and severity of existing chronic illnesses. The conventional definition of illness does not even apply to older people. For example, a pulmonary function measurement showing a vital capacity of 3 litres is a pathological finding for a 40-year-old; for an 80-year-old this finding would be insignificant.

Restricted mobility for a 40-year-old is virtually tantamount to uninsurability for disability coverage. For a person over 70 this factor has quite a different meaning.

In order to determine the level of required nursing care or to ascertain the risk of a need for nursing care occurring, reference is made to the activities of daily living (ADLs). These consist primarily of mobility measurements. Even the sum of several chronic diseases does not automatically mean a reduced life expectancy or increased probability of a need for nursing care. Chronic diseases in the elderly must be seen against the backdrop of other higher-order factors. Both the mortality risk and the long-term care risk of persons older than 70 can be determined using three meta-factors:

#### 5.1 *Significance of the nursing care factor (self-sufficiency factor)*

This factor describes the ability in advanced age to perform the activities of daily living. The factor can be defined as so-called geriatric staging and it links the included activities of daily living (Barthel index) with additional existing illnesses. Most well-known, however, are the ADLs (activities of daily living) and IADLs (instrumental activities of daily living), which have been incorporated into all nursing care evaluations.

- ◆ ADLs include:
  - the ability to independently prepare and eat food
  - the ability to wash and clean without outside help
  - the ability to dress and undress without outside
  - the ability to move around one's home without outside help
  - continence

- ◆ The instrumental activities of daily living (IADLs) include the following key functions:
  - performing housework without outside help
  - preparing meals without outside help
  - the ability to use public transportation
  - independence in dealing with financial matters
  - participation in social activities

### 5.2 Significance of social factors

These include marital status, integration into a secure social network and living conditions. Of particular importance is whether the individual

still lives with his/her partner. This status almost automatically means a longer life expectancy.

### 5.3 Significance of the socio-economic factor

This includes all indicators determining socio-economic status, namely the professional status previously attained in working life, the duration and type of education/training and the level of disposable income. The socio-economic factor, which in active working life is accurately reflected

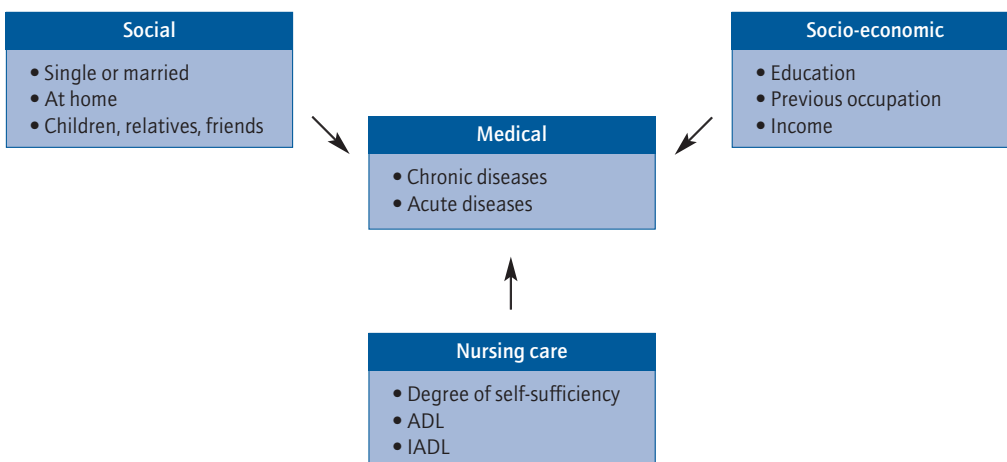
in occupational categories, has implications for life expectancy, the probabilities of needing nursing care and the individual's state of health that extend well into old age. The higher the status, the longer the life expectancy and the smaller the probability of a need for nursing care.

### 5.4 Prediction matrix

The social, socio-economic and self-sufficiency factors form a matrix, as it were, that determines the prognosis for chronic and acute illnesses. This approach to predicting life expectancy is unusual in conventional underwriting. In ad-

vanced years, however, the linking of the aforementioned matrix with the specific prognosis for chronic diseases offers the only possibility of really capturing the special circumstances found in old age.

Figure 3: Meta-factors affecting the mortality and long-term care risk



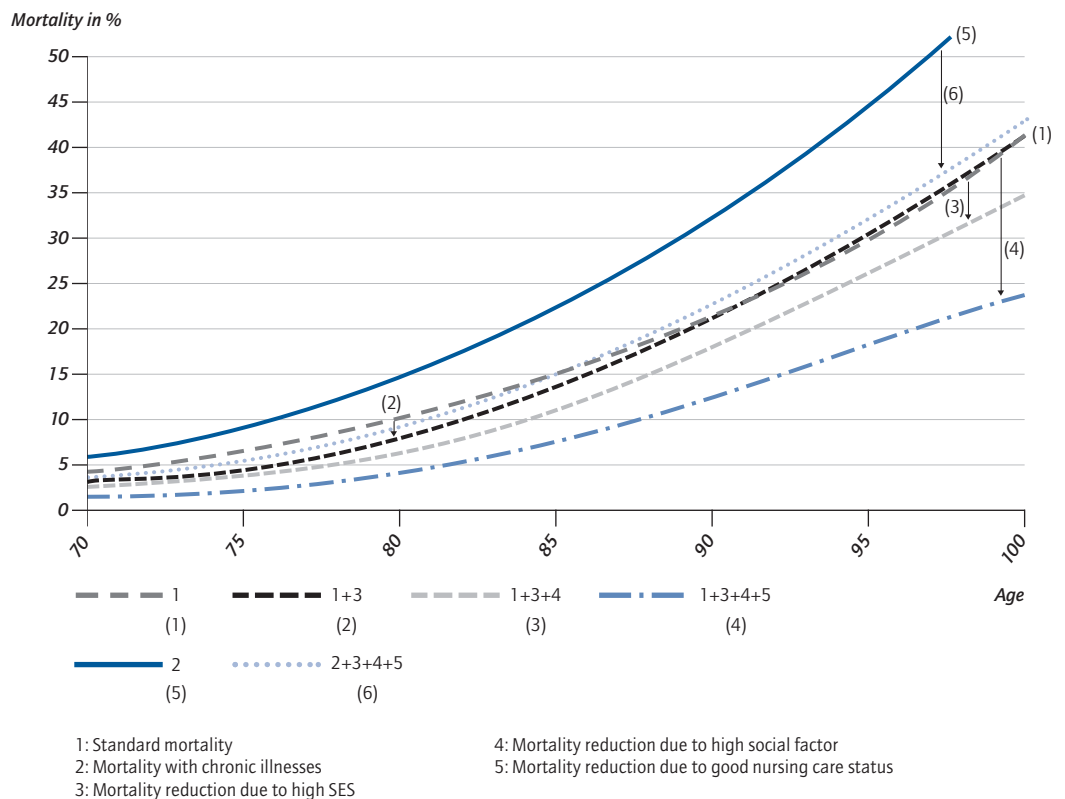
The extremely high mortality in old age from acute events such as myocardial infarction and stroke, and also including pneumonia and broken bones (fractures in the neck of the femur), can best be explained by the interaction of chronic diseases and acute illnesses. Chronic conditions impair an elderly person's life expectancy only to a minimal extent. Examples of chronic diseases include diabetes mellitus, high blood pressure, chronic bronchitis, arthrosis etc. It is true that the greater the number of existing chronic conditions, the greater the reduction in life expectancy; yet the excess mortalities at stake here are small. If an acute event such as a stroke, myocardial infarction, pneumonia or accident now occurs, it afflicts individuals whose health is, so to speak, already fragile as a consequence of disease. Only in this way can it be explained why acute events, which are largely survivable among young people, result in death among the elderly. Yet in the case of acute events it remains

the case that the higher the positive value of the social factor, the socio-economic factor or the self-sufficiency factor (nursing care factor), the lower the mortality as a consequence of an acute condition.

The effect of meta-factors is even more pronounced, however, with chronic diseases. If the three meta-factors are strongly negative, i.e. a low socio-economic status, few social ties and an already somewhat restricted self-sufficiency, mortality from chronic diseases is massively higher. Conversely, though, this also means that with a high socio-economic status (SES), good social integration and largely preserved self-sufficiency, a chronic disease produces no or merely a very small increase in mortality.

The figure below maps the weighting of the three meta-factors and the resulting impact on mortality.

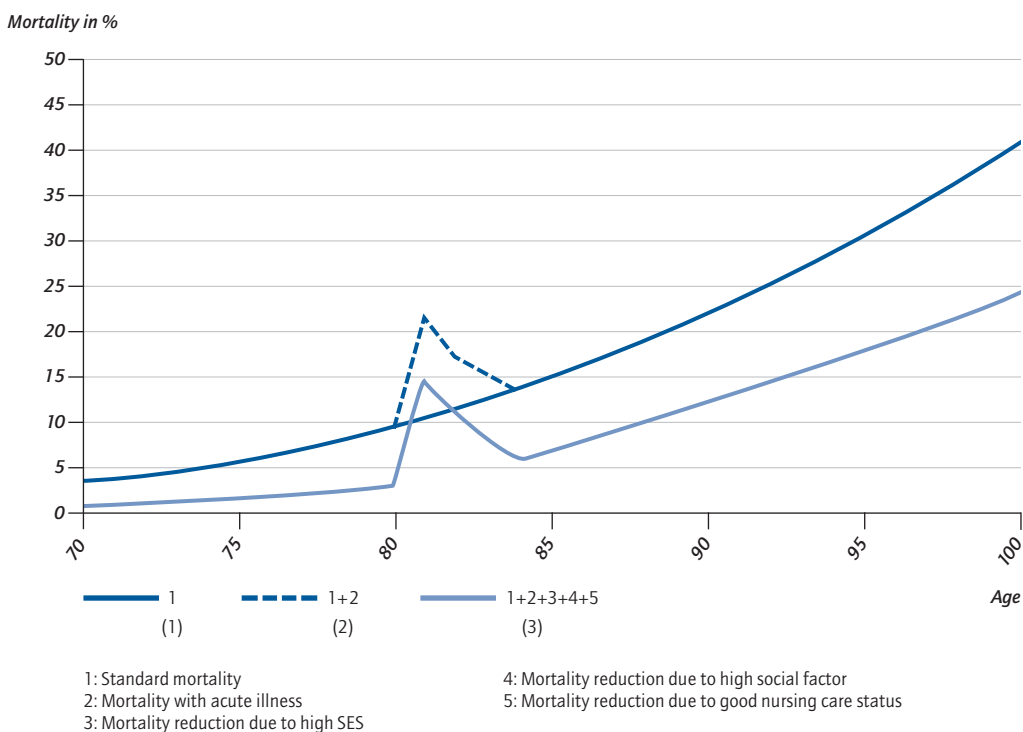
Figure 4: Chronic illnesses and meta-factors



One final aspect of the impact of the three aforementioned meta-factors on mortality that needs to be mentioned is again the mortality experience after an acute illness. The mortality is lower if the three meta-factors are positive than if they are negative. If an acute event is survived, these meta-factors – if positive – even lead to an improved mortality relative to the average population. This may be attributable, for example, to

the fact that complications after an acute illness are discovered early – perhaps by the spouse – and then treated, and that better rehabilitation and treatment facilities are used by those with a high socio-economic status; ultimately, therefore, a better socio-economic status means that self-sufficiency is more likely to be retained.

Figure 5: Example of an acute illness at age 80 and influence of meta-factors



The introduction and weighting of meta-factors in evaluating life expectancy and the onset of a need for nursing care among older people aged between 70 and 90 signals for the first time a move away from a purely illness-based underwriting concept. The underwriting process incorp-

orates higher-order factors that have long been known in geriatric research, but the quantification of which is problematic. This weakness can be circumvented by adopting a semi-quantitative model. This approach breaks new ground in underwriting practice.

## 6. Summary

The demographic change that can be observed around the world in the age structure of the population in numerous countries already has far-reaching implications for the insurance industry. It is currently the case that old insurance concepts tend to be modified and extended to older age groups instead of creating new insurance products. Yet for both traditional insurances marketed among advanced age groups and new insurance products, an innovative underwriting approach is necessary.

Hannover Life Re has created such guidelines in recent years. This is true of new products, most notably enhanced annuities for older customers, immediate long-term care annuities aimed at covering nursing home costs and personal accident policies for senior citizens. The risk assessment and underwriting guidelines for this product line have now proved their worth in practice.

New guidelines that take account of the research insights of recent years and decades must be created for risk products such as life insurance for the elderly and long-term care insurance. An innovative concept has been developed in this area to make allowance for the higher-order factors (meta-factors) that crucially influence life expectancy in advanced age in addition to disease factors. Correct underwriting for the 70-90 age group is only possible by considering these meta-factors as well as disease factors. This combined approach is valid when assessing both the risk of a need for nursing care and life expectancy.

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