Oxera

Why the use of age and disability matters to consumers and insurers

Executive summary

Objectives of this study

Insurance Europe, the European insurance and reinsurance federation, commissioned Oxera to conduct an independent and objective economic study of the use of information on age and disability in insurance underwriting, product design and pricing in Europe. The study covers six products: term life insurance; pension annuities; motor insurance; disability insurance; long-term care insurance; and private medical insurance.

The objectives of this study are to:

- help understand why risk-based pricing is important to the functioning of private insurance markets and its impact on consumers;
- identify how information on age and disability is used in insurance underwriting, product design and pricing, and explore whether its use is relevant and to the benefit of consumers; and
- consider the potential implications for consumers and the wider insurance market of limitations on the use of age and disability as risk factors in insurance.

Key findings of the study

The use of information about age and disability is fundamental for assessing risk, and therefore it brings benefits to consumers of insurance products because:

- it creates a direct link between the premium and the expected insurance benefits, which means that consumers who pay higher premiums are also expected to receive, on average, greater benefits; this is the case with all the insurance products considered in this report;
- it mitigates the impact of adverse selection, which could otherwise lead to insurance products being limited in scope or availability, as explained below;
- it encourages competition between insurance companies, which benefits consumers through lower prices and higher levels of cover;
- it leads to innovation, enabling insurance companies to offer a wider range of services to an increasing proportion of the population.

In contrast, without the use of information on age and disability:

- some insurance products would be limited in scope or availability or, in more extreme situations, no longer be available at all, because of the process of adverse selection, which would mean that only the consumers with the highest risk and therefore the highest expectation of an insurance benefit would be interested in purchasing the products;
- there is a risk that average premiums would increase and/or cover would diminish for all consumers, as the additional risk to insurers resulting from the removal of the ability to use risk factors to set their prices creates additional costs; and
- consumer choice would be reduced as insurance companies would not be able to offer some products and there would be less incentive for innovation.

Insurers need to be able to assess risk accurately

In essence, insurance involves the transfer of risk of financial loss from the insured individual or entity to the insurance company. In return for payment in the form of a fee or premium, the individual or entity can claim compensation from the insurer for financial loss as a result of specified events that may occur (such as a car accident). So, in return for paying a smaller, known premium, the possibility of a larger, unknown loss, which could be financially disastrous for the individual, is removed and insurance companies accept the risk instead.

When determining premiums, terms and conditions, and product design, insurance companies need to use information about the characteristics of the insured individual or entity (for example, the insured person or company, or the insured car or property). The use of this information allows insurers to offer products that are tailored to the needs of the individual and competitively priced.

For private insurance markets to function, insurers need to collect sufficient income from premiums so that they can cover anticipated claims from the insured and to ensure that the insurance scheme remains solvent. This means that they must be able to calculate accurately the average expected cost of claims and their frequency, and to charge a premium for insurance accordingly.

Insurers estimate the risk that the insured event may occur for the applicant, through a process called underwriting. They use the results of statistical analysis and medical knowledge (for example, published medical studies) to assess information provided by the consumer in the application form and, if necessary, in additional questionnaires or from examinations. The premium is set according to the estimated degree of risk. Underwriting ensures that similar risks are pooled and premiums reflect the likelihood of the insured event happening.

Information about age and disability is fundamental for assessing risk

As this study shows, information about age and disability is essential for an accurate and appropriate risk assessment. Insurers only use this information if it is relevant to the risk assessment, and this information is relevant for many insurance products.

Age is found to be a fundamental risk-rating factor:

- Age is well-defined, predictable over time, and easy to verify. It is a fundamental determinant of ‘mortality risk’, the risk of dying during a certain time period, and is therefore a crucial risk factor in term life insurance (life insurance that provides coverage at a fixed rate of payments for a limited period of time — the ‘term’). Younger consumers are typically less likely to die during the period covered by the life insurance product than older consumers, and therefore the insurer is less likely to have to pay out on the policy. Accordingly, the premium level for term life insurance is age-sensitive. Without age as a risk factor, individual term life insurance could not exist.
- Similarly, pension annuity products need to take account of age and life expectancy. With pension annuities, insurers guarantee payments for the lifetime of the consumer. To obtain an accurate estimate of the total amount of payment that the consumer will receive, it is essential to take into account the life expectancy.
- Age is also a key factor in determining the likelihood of a person becoming ill, disabled or unable to work. Medical studies and statistical analysis by underwriters have shown that the risk of these events occurring typically increases with age. Age is therefore an essential factor when estimating risk for disability insurance, long-term care insurance and private medical insurance.
- Age is also a very important risk factor for motor insurance. On average, young drivers (aged 25 or under) are more likely to have car accidents and hence make claims. Older

drivers (aged over 70) may also be more likely to make claims than other drivers. Statistical analysis shows that even after taking into account driving experience, age is still a very important risk factor. A person without any experience aged 40 is significantly less likely to have a car accident than a person aged 20 (also without any experience).

Similarly, insurers use information on **disability**, where it is often essential to understand the risks involved and make an effective assessment of them.

- If there is evidence that a disability shortens life expectancy, underwriters will take it into account for term life insurance. For example, medical studies show that the life expectancy of someone with paraplegia is shorter than for someone without paraplegia; as such, paraplegia is taken into account by life insurers. Medical underwriters use up-to-date data and medical studies to inform their assessment, which allows them to offer term life insurance products to people with reduced life expectancy.
- Information on disability is relevant when developing and underwriting disability and long-term care insurance. Disability insurance protects the insured person's earned income against the risk that future sickness, injury or disability might prevent them from being able to work. Thus, if a person becomes disabled, this could directly trigger the insurance payout. This can also be considered to be the case with long-term care insurance. If someone becomes disabled, they may require long-term care as a direct result. When assessing risk, insurers will therefore consider existing disabilities, and may alter the premiums or terms and conditions of products accordingly.
- Insurance products are designed to provide insurance against an unlikely but significant event. Therefore, some insurers may be unable to offer cover for more severe disabilities because the risk is too big that the insured event (eg, incapacity to work) will occur.
- Private medical insurance also provides examples of the potential implications of a restriction on the use of information on disability. Where insurers have not been able to set premiums according to risk factors, there are past examples of adverse selection severely affecting the provision of private medical insurance products.

Furthermore, insurers balance the importance of information about a risk-rating factor against the possible disadvantages, either to the insurer or to the consumer, of collecting and using that information. If additional information provides only a small improvement in the ability to categorise a risk more appropriately, but incurs significant disadvantages of some form (eg, collecting the information is very expensive), insurers are likely to choose not to use that information.

Limitations on the assessment of risk can have severe consequences for private insurance provision and consumers

Importantly, insurance products that do not take account of risk properly are likely to suffer from 'adverse selection', with the result that those products become less attractive to consumers that have a low risk profile. If the insurer does not offer lower premiums to consumers who are less likely to claim, these consumers are likely to shift to an insurer who does recognise their lower likelihood of claiming and charges less for the same product. Alternatively, they may simply decide to reduce their insurance cover. This 'adverse selection' results in the insurer having an unbalanced portfolio of consumers that is becoming increasingly dominated by high-risk consumers because the low-risk consumers have gone elsewhere or have decided not to purchase insurance. For example, a pension annuity product that did not take account of age would be highly unattractive for older-than-average consumers, as the product would not offer them higher pension payments due to their lower life expectancy at the start of the pay-out phase.

In competitive insurance markets, adverse selection can be swift and damaging for the insurer, threatening both their viability and the position of their existing consumers. A ban on

the use of age and disability in insurance pricing would be likely to result in serious problems arising from adverse selection for all of the insurance products considered in this study, and could lead to the breakdown of the market for certain insurance products.

Insurers are well aware of the problem of adverse selection, and competition among private insurance companies drives them to price according to risk (and hence to offer lower premiums to low-risk consumers and consequently higher premiums to high-risk ones), which in turn helps them to mitigate the impact of adverse selection. Risk-based pricing brings benefits to consumers that could be lost through restrictions on insurance companies using specific risk factors.

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1 Introduction

Insurance Europe, the European insurance and reinsurance federation, commissioned Oxera to conduct an economic study of the use of information on age and disability in insurance underwriting and pricing in Europe and the benefits it brings to consumers. The study also evaluates the potential impact of a ban on the use of age and disability as risk factors in insurance. This report presents the findings of the study.

The objectives of the study and the approach that Oxera used are set out below, together with details of how the report is structured.

1.1 Objectives

Insurance Europe has been actively involved in the debate on the draft EU Anti-Discrimination Directive on age and disability of July 2008, which is still pending in the EU Council.[1]

In this context, Insurance Europe commissioned Oxera to conduct an independent and objective economic study into the use of information on age and disability in insurance underwriting, product design and pricing in Europe, from the point of view of the consumer. The study also evaluates the potential impact of a ban on the use of information on age and disability as risk factors in insurance. Insurance Europe asked Oxera to consider the use of information on age and disability in six EU member states — the Czech Republic, France, Germany, Italy, the Netherlands and the UK — for six insurance products — term life insurance, pension annuities, motor insurance, disability insurance, long-term care insurance and private medical insurance.

The aim of the study is to inform the debate about the use of age and disability in insurance pricing and to describe the benefits that consumers gain from risk-based pricing of this form. The results from this study also assist in understanding the potential implications of any such limitations on the use of risk-based pricing, which can be quite severe in some circumstances.

The main objectives of this study are therefore to provide robust, evidence-based economic analysis to:

– understand why risk-based pricing is key to the functioning of private insurance markets and how it benefits consumers;

– identify how information on age and disability is used in insurance underwriting, product design and pricing, and explore whether its use is relevant and to the benefit of consumers;

– explore the potential implications for consumers and the wider market of limitations on the use of age and disability in insurance prices; and

– inform the debate on the draft Anti-Discrimination Directive about the use of age and disability in insurance pricing.

[1] The position of Insurance Europe on this debate can be found on its website, at http://www.insuranceeurope.eu/key-issues/anti-discrimination

1.2 Approach

To provide the required robust, evidence-based analysis, this study examined consumers' current experience of popular insurance products in different European markets, for six of the main products in the European insurance sector:

– **term life insurance**—which provides financial protection to beneficiaries in the event of the death of the insured person, as the insurer pays out a lump sum of money if the insured person dies during the policy term in return for a stipulated premium paid at regular intervals;

– **pension annuities**—which convert pension funds into a regular stream of payments from a given age over the remaining life of the insured person(s);

– **motor insurance**—which, for this report, refers to motor third-party liability (MTPL) insurance, covering the third-party liability risk associated with the insured car being involved in a traffic accident;

– **disability insurance**—which protects the insured person's earned income against the risk that sickness, injury or disability prevents them from being able to work;

– **long-term care insurance**—which covers the expense of long-term care through the provision of a monthly income that is triggered by the need for such care;

– **private medical insurance**—which reimburses the insured person with all or some of the expenses of applicable private medical treatment.

A number of work activities were undertaken for the study, including the following:

– Interviews with a large number of major European private insurance and reinsurance companies and the six national insurance associations in order to collect data and to discuss a series of questions about how insurance markets currently use information on age and disability. These interviews included detailed discussions of the practices of underwriters.

– The interviews collected data for the six countries, including both data that was suitable and data that was not suitable for public dissemination, as it could be deemed commercially sensitive. This report presents only the former, with the latter solely being used to inform Oxera's understanding.

– Collection of data on insurance premiums and average claim cost per policy from insurance companies, insurance associations, price-comparison websites and other public sources; premium data for a specific, yet relatively typical, hypothetical consumer was collected for the countries in the study using price-comparison websites.

– Desk-based research using the data collected, including comparisons of premium data with claim cost data.[2]

1.3 Structure of the report

The report is structured as follows:

– Section 2 looks at why private insurers use risk-based pricing to ensure that premiums reflect expected benefits, and the way in which such pricing benefits consumers. Section

[2] Price analysis based on data from price-comparison websites should be interpreted with care, as it is not necessarily representative of overall prices in the market. The extent to which insurance is purchased online varies by country.

2 also examines both when and why insurance companies use age and disability as relevant risk factors.

– Sections 3 to 8 examine how age and disability are used with regard to the six insurance products in the six countries covered in the study. The report presents evidence of the different prices paid according to the age of the beneficiary and considers hypothetical consumers with selected disability.

– Further information on all countries for the products included in this study is provided in a separate appendix.

The report provides an assessment that summarises the benefits that consumers derive from the use of age and disability in insurance pricing.

2 Risk-based pricing in insurance

Risk-based pricing brings benefits to consumers by giving them better incentives to purchase an appropriate level of insurance and by improving the economic efficiency of insurance provision. The analysis presented in this report suggests that some insurance products would not be provided by the private insurance market if certain risk-rating factors could not be used for pricing.

This section explains how risk-based pricing works in practice and the benefits it brings to consumers. Following a general overview of risk-based pricing, section 2.2 focuses on the use of information on age and disability.

Key findings

- In private insurance markets, consumers have a choice of provider and often a choice about whether or not they buy insurance. This choice drives companies to offer products that are tailored to individuals' needs, in order both to offer the most competitive product and to cover the expected claim cost. Consequently, insurers are driven to charge premiums based on the risk of the insured.
- Choice and competition result in risk-based pricing, which leads to premiums that correspond with the (probability-adjusted) expected benefits received by the policyholder. Economic theory suggests that this encourages consumers to purchase an appropriate amount of insurance based on their needs and risk appetite.
- Importantly for insurance, risk-based pricing also limits adverse selection. Adverse selection occurs when premiums do not reflect risk factors that are known to the consumer, and therefore low-risk consumers are discouraged from buying insurance, while demand for insurance from high-risk consumers is excessive. The result is that the risk profile of the insurance portfolio worsens and consequently premiums increase, exacerbating the problem of adverse selection.
- In more extreme situations — for example, if age were not used as a risk factor for term life insurance — adverse selection could result in the breakdown of private insurance markets should only the highest-risk consumers demand the insurance product, bringing to an end the provision of products.
- Moral hazard, where insurance cover encourages the insured individual to behave in a more risky manner, can also be a problem if risk factors are not reflected in premiums.
- In practice, insurance underwriters use only information that has been shown to be relevant in determining risk. In a competitive market, insurers are incentivised to improve their use of risk-rating factors and use this information to adjust not only premiums but other terms and conditions.
- The improved use of risk-rating factors drives competition in insurance markets and results in innovation. This can be expected to lead to private insurance markets offering extended cover to a growing range of consumers and insured events, as it makes improved risk management possible.
- Risk-based pricing also helps insurers to avoid other or undetermined risk-based costs, which results in savings for consumers in the competitive market.

2.1 The benefits of risk-based pricing to consumers

This overview of risk-based pricing explores its role in private insurance provision, how it is used in practice and the benefits it brings to consumers.

2.1.1 Insurance allows risk to be shared between individuals

Individuals purchase insurance in order to protect themselves from costs arising as a consequence of unfavourable events. Insurance transfers the risk of financial losses as a result of specified but unpredictable events from an insured to an insurer in return for a fee or premium. If a specified event occurs, the insured can claim compensation or a service from the insurer. For example:

- term life insurance provides financial protection to beneficiaries, such as family members, in the event of the death of the insured individual during the term of the insurance coverage;
- a pension annuity product ensures a steady income throughout an individual's retirement, irrespective of how long they live (the unfavourable event in this case would be the exhaustion of savings for retirement);
- motor third-party liability (MTPL) insurance covers the costs arising from the individual's liabilities if they cause an accident and injure a third party.

Insurance is therefore a means of reducing risk faced by consumers. Risk is shared between individuals within 'risk pools', and the premiums of those who are fortunate in the pool and do not suffer the unfavourable events meet the cost of those who do. This **risk solidarity within the risk pool** is a central principle of insurance provision.

The amount that each insured individual contributes to the risk pool is typically determined according to their likelihood of claiming from the pool. This is **risk-based pricing** — pricing of insurance on the basis of the risk of the insured, including the probability of a claim being made against the policy and the likely cost of that claim.

In order for private insurance markets to function, insurers need to earn sufficient income from premiums to cover anticipated claims from the insured. This means that insurers must be able to calculate accurately the average expected loss, and charge a price for insurance accordingly.

2.1.2 Premiums need to reflect the risk of individuals

In private insurance markets, consumers have some degree of free choice. For example, they can decide whether to take out life insurance, determine the size of the policy and choose between different insurance providers. Even with MTPL insurance, which is compulsory for all drivers in the EU, consumers can still choose between different insurance providers and different terms and conditions (eg, the level of excess), even though the (minimum) extent of insurance cover is set by law.

Private insurance provision to individuals differs from most social insurance schemes and group insurance schemes,[3] as the latter typically involve a much lower degree of consumer choice. Typically, all workers must pay into a national public pension system, with payments into the scheme set according to a system of taxation (eg, a percentage of wages). Similarly, social health insurance schemes generally require employees and/or employers to pay into the scheme according to the income of the insured. Participation in social insurance

[3] Some insurance products are bought by groups on behalf of their members — for example, companies. For such group schemes individual underwriting is often not necessary as the insurer can apply risk-based pricing by estimating the likely level of claims based on the past history of claims from the group scheme (or similar group schemes). Membership of group schemes is typically restricted, such as to employees of a company, and this restriction of membership limits the extent to which the lack of individual underwriting causes adverse selection. This is because the number of additional high-risk consumers that could be attracted to the group scheme is limited to the number of high-risk consumers that are eligible to join the scheme, rather than the whole population.

schemes is usually either compulsory or the programme receives sufficient subsidy that most eligible individuals choose to participate.[4]

2.1.3 Risk-based pricing results in premiums that correspond with expected benefits

As in all competitive private markets, competition between providers pushes prices down towards the cost of providing the product, while the need to cover claim costs deters insurers from pricing products below the cost of provision. The result is that insurance premiums reflect the expected cost of providing the insurance product, which is primarily determined by the 'expected value'[5] of the claims made, based on the information available to the insurer. The claims made represent a 'benefit' to the consumer. This means that risk-based pricing produces premiums that correspond with expected benefits.

The precision with which insurers are able to estimate the expected value of claims for a consumer depends on the information that is available to the insurer and their use of that information. Insurers are incentivised to use relevant information to estimate the expected value of claims owing to the combining effects of competing with other insurers for custom and the need to ensure that premiums cover costs overall.

For consumers, this consistency between premiums and expected benefits means that consumers who pay higher premiums are also expected to receive, on average, greater benefits. This is the case with all the insurance products considered in this report.

2.1.4 Risk-based pricing is efficient from an economic point of view

In economic theory, cost-reflective prices encourage the optimal allocation of resources, as the quantity of a product demanded by consumers is driven by the economic resources required for production. This is the expected outcome in a competitive market. Risk-based pricing produces cost-reflective premiums, and therefore encourages the optimal allocation of resources by consumers on insurance and leads to economic efficiency — a large body of academic literature exists to demonstrate this.[6]

In insurance markets, limitations on risk-based pricing through relevant information (which is known to the consumer) not being available to the insurer are often seen to result in adverse selection. Limitations on risk-based pricing can also, in some instances, exacerbate moral hazard, where insurance cover encourages the insured individual to behave in a more risky manner if the increased risk-taking does not have any direct consequence for their insurance premiums. These two concepts are discussed in more detail below.[7]

2.1.5 Risk-based pricing can avoid adverse selection, thereby increasing the scope of insurance markets

In insurance markets, the problem of adverse selection arises if the insurance company is less informed about the risks of its consumers, if insurance companies cannot set premiums based on risk factors that are known to the consumer, or if the insurance company chooses not to use the relevant risk factors.

The absence of or inability to use information about risk factors for individual consumers has the implication of insurance companies having to set uniform premiums that do not reflect the risk of individual consumers. If consumers are charged a uniform (risk-neutral) premium, and they know whether they are relatively high-risk or low-risk, it is likely that high-risk consumers

[4] Consumer choice is also limited for corporate group insurance schemes, as typically only company employees (and their families can be members of the group scheme.

[5] Referring to the definition of 'expected value' in statistical analysis, which is the probability-weighted sum of all possible outcomes.

[6] For an overview of moral hazard, adverse selection and the economics of insurance more generally, see Rees, R. and Wambach, A. (2008), 'The Microeconomics of Insurance', *Foundations and Trends in Microeconomics*, **4**, pp. 1–163.

[7] These concepts were established as early as 1976 for insurance markets in the seminal paper by Rothschild and Stiglitz, in which they consider the implications of asymmetric information on behalf of the insurer, regarding the risk type of individuals. Rothschild, M. and Stiglitz, J. (1976), 'Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information', *Quarterly Journal of Economics*, **90**:4, 630–49.

will increase their demand for the insurance product, while low-risk consumers will decrease their demand. These changes in demand can be expected because high-risk consumers recognise that the expected benefits of insurance are high relative to the premium, while low-risk consumers conclude that expected benefits are low relative to the premium.

These changes in demand will result in an increase in the proportion of high-risk consumers in the portfolio, which, in turn, will result in a higher level of claims. More and/or larger claims will result in insurance companies having to raise premiums in order to cover the higher claim costs. Higher premiums will, in turn, further exacerbate this problem of deterring the low-risk consumers from adopting the insurance product. This process, which can therefore be iterative in nature, is known as adverse selection.

The process of adverse selection can result in the private provision of insurance cover being effectively limited to high-risk consumers only (they are the only ones for whom the premiums represent value for money) or even ceasing to exist. Box 2.1 explains adverse selection in greater detail, and provides examples of adverse selection occurring in insurance markets.

Adverse selection is well documented.[8] While one might not expect the complete breakdown of the market for insurance products in all circumstances, adverse selection could result in other limitations, such as limitations to the amount of cover provided, restrictive terms and conditions, exclusions of certain events, and limitations of availability based on other criteria. These limitations can have significant negative implications for consumers. For instance, the consumer might find that the insurance product is no longer available, or that it has restricted terms or does not suit their needs to the same extent as it did previously.

Box 2.1 Adverse selection

Risk-based pricing allows insurance companies to set premiums reflecting the risks of individual consumers. If a ban were to be imposed on the use of a relevant risk factor, insurance companies would not be able to set premiums reflecting the risks of individual consumers, and instead would set a uniform premium.

If premiums do not reflect the risks of individual consumers, the problem of adverse selection is likely to arise: high-risk consumers will purchase more insurance, whereas low-risk consumers are likely to purchase less insurance. In order to explain how adverse selection affects insurance markets, it can be convenient to distinguish two stages.

In the first stage, insurance companies set a uniform premium reflecting the average risk of the insured population before the ban on the use of a relevant risk factor. The establishment of a uniform premium entails a change in premium for most consumers. The response of consumers to a changing premium depends on their risk relative to the average risk.

Low-risk consumers realise that the uniform premium is high in comparison to their low risk, and that, when purchasing insurance, they are cross-subsidising high-risk consumers. Low-risk consumers may be deterred from purchasing insurance and instead prefer to bear the risk themselves.

However, high-risk consumers realise that purchasing insurance is attractive, since the premium to be paid is low in comparison to their high risk (and, therefore, high expected average value of claims). Anticipating high expected benefits, high-risk consumers will be encouraged to purchase more insurance.

The changes in demand — fewer low-risk consumers, more high-risk consumers — increase the proportion of high-risk consumers in the insured population, which, in turn, increases the average claim cost of the insured population. Premiums are insufficient to cover rising claim costs, since these premiums were set assuming a lower proportion of high-risk consumers. In order to cover rising claim costs, insurance companies need to set a higher uniform premium.

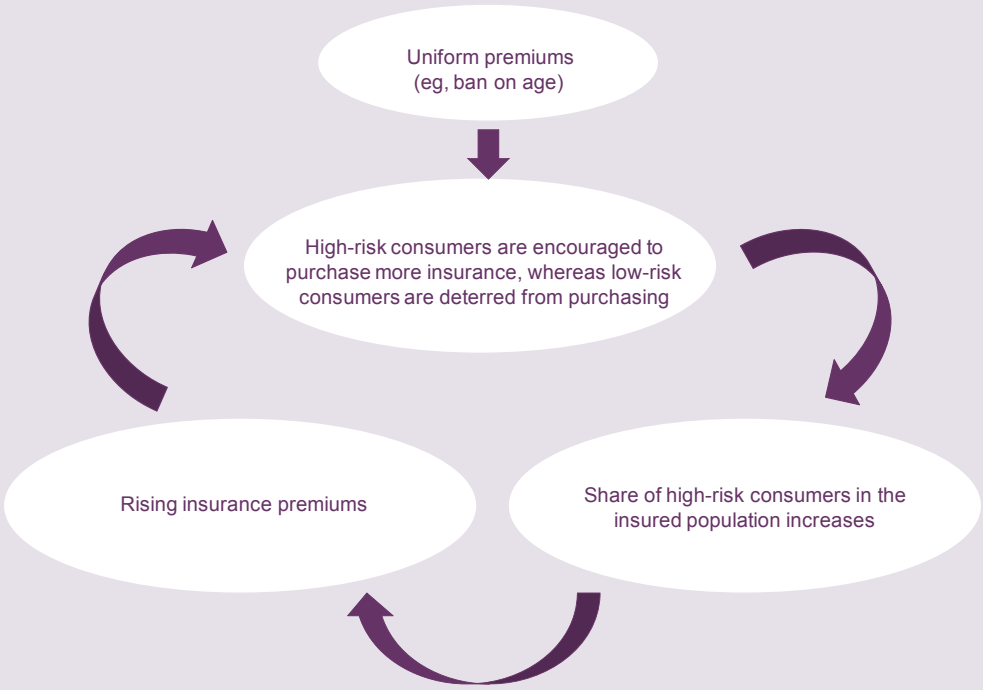
In the second stage, consumers (of any risk) face a higher uniform premium. The response of consumers to an increase in premium depends on their risk. Low-risk consumers are more likely to

[8] See Rothschild and Stiglitz (1976), op. cit., and Rees and Wambach (2008), op. cit.

be deterred from purchasing insurance, since the expected benefits of insurance are lowest for them. The deterrence of low-risk consumers has the effect of increasing the proportion of high-risk consumers. The increase in average claim costs accompanying the proportion of high-risk consumers implies that an increase in premium is needed. The increase in premium will again spur a response from consumers.

The process of adverse selection is a reiterative process resulting in a 'vicious circle' of increasing proportions of low-risk consumers being deterred from purchasing insurance by higher premiums.

Figure 2.1 The 'vicious circle' of adverse selection



Note: The above chart is an adaptation of a chart provided by the German insurance association, Gesamtverband der Deutschen Versicherungswirtschaft (GDV).
Source: Oxera analysis.

There is evidence that adverse selection occurs in many markets, not just insurance markets.[9] In insurance markets, adverse selection takes the form of consumers with higher risk purchasing more insurance, and consumers with lower risk purchasing less insurance.

For an overview of adverse selection in insurance markets, see Cohen and Siegelman (2009).[10]

There are numerous examples of adverse selection affecting private medical insurance markets, with a number of studies from the USA in particular. In one academic study, Lo Sasso and Lurie (2009)[11] demonstrated that adverse selection arose following the introduction of state community rating regulations in the 1990s. There was an overall decrease in the number of insured persons, with healthier individuals opting out of private medical insurance and less healthy individuals opting in.

Studies from the USA have also linked the relative weakness of the market for long-term care insurance with adverse selection.[12] Uncertainty and lack of information known to the insurer about the likelihood of an insured person requiring long-term care in the future can result in the insurer requiring high premium levels to cover this uncertainty. The potential consumers typically have more information than the insurer, leading to adverse selection.

[9] Akerlof, G. (1970), 'The Market for "Lemons": Quality Uncertainty and the Market Mechanism', *The Quarterly Journal of Economics*, pp. 488–500.
[10] Cohen, A. and Siegelman, P. (2009), 'Testing for adverse selection in insurance markets', *Harvard Law School Discussion Paper*, **651**.
[11] Lo Sasso, A. and Lurie, I. (2009), 'Community rating and the market for private non-group health insurance', *Journal of Public Economics*, **93**, pp. 264–79.
[12] Brown, Jeffrey, and Amy Finkelstein. 2007, "Why Is the Market for Long Term Care Insurance so Small?", Journal of Public Economics, 91(10).

These results are not restricted to the USA. For example, the Institute for Fiscal Studies have found evidence that adverse selection affects the market for private medical insurance in the UK.[13] In Germany in the late 1980s, health insurance products that provided cover for overseas medical treatment for existing medical conditions at a uniform tariff were quickly impacted by adverse selection and product redesign was required.[14]

2.1.6 Risk-based pricing helps address some problems of moral hazard

In economic theory, a moral hazard is a situation where an individual is encouraged to take undue risks because some of the associated costs are not borne by the party taking the risk. Moral hazard is often a problem in insurance because once the individual has insured themselves against a specific risk, they have less incentive to continue to behave in a way that will minimise the risk. For example, a driver who has insured their own vehicle against any damage (eg, 'comprehensive' or 'own car' insurance cover) may have less incentive to drive carefully because if they have an accident and damage the car, they need to pay for the excess only. While most people would not increase their risk-taking behaviour in this way, it is possible that some people might increase it once insurance is in place.

Risk-based pricing helps to address some problems of moral hazard in insurance, where risk-rating factors are able to reward policyholders who engage in low-risk behaviour with lower premiums (as in the case of encouraging drivers to be more careful). In this way, risk-based pricing can produce wider benefits to society, by discouraging risk-taking behaviour that can arise from insurance.[15]

2.1.7 Insurers use information that is relevant to risk

As noted earlier, the process by which insurers assess the level of risk of the insured person is called underwriting. The premium and terms of the insurance contract are based on the insurer's assessment of the level of the risk posed by the prospective consumer. Each individual or entity wishing to be insured brings a different level of risk to the insurer.

To make sure that each insured person pays a fair premium, insurers use a series of rating factors designed to assess the level of risk posed by the prospective consumer. Insurers typically collect the information required by the rating factors from the insured person at the point of sale or enrolment. In general, the higher the risk is assessed to be, the higher the premium the insurer will charge. Insurers collect different information for different products depending on the nature of the insured event, and the predictive power of the information in terms of the frequency and magnitude of future claims. Underwriters determine which risk factors are relevant based on statistical analysis as well as medical knowledge (eg, from published academic and peer-reviewed medical studies). Section 3 explains the type of information that is typically used for the six products considered in this study.

Underwriters do not, however, use all information that is potentially relevant based on statistical and medical knowledge. There are several reasons why insurers may choose not to use relevant information that is potentially available in insurance pricing, including:

– the cost of collecting the information;
– consumer sensitivities to providing information, which could deter consumers from buying a product at all. People are used to providing certain types of information to third

[13] Institute for Fiscal Studies working paper 06/02, 'Testing for adverse selection into private medical insurance', 2006.

[14] 'Medizinische Risikoprüfung', GDV report, September 2006.

[15] Academic literature has shown that, by requiring individuals to bear the cost of their actions, risk classification can provide incentives to mitigate risky behaviour and therefore reduce moral hazard. For example, see Schwarze, R. and Wein, T. (2005), 'Is the Market Classification of Risk Always Efficient? Evidence from German Third Party Motor Insurance', CARR discussion paper no. 32. There are other instances of moral hazard that cannot easily be addressed by risk-rating, as the risk behaviour cannot easily be picked up after the insurance is taken out, although the tendency for insurance premiums to be based on past insurance claims does create a similar deterrent.

parties (eg, date of birth) — and are reasonably happy to do so — but not other types of information (eg, aspects of their private lives);
– information that consumers find hard to provide or insurers have difficulty verifying;
– information about a characteristic of the insured party that is uncertain and could change over the course of the policy.

Ultimately, insurers have to balance the importance of information as a risk-rating factor against the possible disadvantages of collecting and using that information. If (additional) information provides only a marginal improvement in risk-rating while incurring significant costs in some form, insurers are unlikely to choose to use that information — indeed, it may be uneconomic to do so.[16]

The underwriting process will differ between insurance companies, depending on the level of risk and risk differentiation they are prepared to accept and their underwriting methodology. Terms and conditions may be applied to policies to reduce the risks by removing particular events or circumstances under which claims would be paid. Typically, information about risk factors is used by underwriters to determine:

– the level of premiums;
– the types of insured events to be covered by the policy;
– other terms and conditions; and
– the level of cover, and whether insurance cover is offered.

In practice, both the level of premiums and the terms and conditions are important for ensuring that premiums correspond to expected benefits and thereby reducing the impacts of having premiums that are not competitive or subject to adverse selection by higher-risk consumers. Adverse selection is avoided because low-risk consumers continue to demand insurance products as they are offered at lower prices (and/or greater coverage or product characteristics) than with risk-neutral pricing. Similarly, consumers with higher risk pay higher premiums to reflect that risk. Their demand for insurance with risk-based pricing therefore reflects the benefits they expect to receive. Moral hazard may also be avoided in some cases where risk-reflective pricing deters risk-taking behaviour.

The underwriting process can be complex and based on in-depth analysis and expertise, but ultimately it exists to make sure that premiums reflect the likelihood of the insured party making claims so that premiums paid into the risk pool reflect the best estimates of the risk of the insured making a claim. Risk-based pricing is not used to discriminate or punish people in some way, but instead to ensure the fair and proper treatment of consumers that helps to ensure the functioning of the insurance market (that in turn benefits consumers).

In some cases, the underwriting process does result in the prospective consumer being declined cover on the basis that they present a level of risk that is above the risk threshold of the insurer. This issue is discussed further in this report with regard to the six products. Insurance companies design their products with a certain risk level in mind — it is often the case that high-risk consumers are able to find insurance cover with niche providers that have designed policies suitable for high-risk situations.

2.1.8 Risk-based pricing drives competition and innovation

Risk-based pricing encourages competition between insurance companies, which in turn encourages innovation. By developing additional, or more efficient, risk-rating factors, insurers can offer more competitive rates to specific segments of the consumer base that have lower risk ratings based on the additional rating factors. Insurers that do not use the additional rating factors will suffer from adverse selection as their competitors' lower prices

[16] The economic literature finds that differentiation in pricing by insurance companies that is not justified by statistical data will tend to be competed away. See Becker, G.S. (1971), *The Economics of Discrimination*, 2nd edition, University of Chicago Press.

for lower-risk consumers attract those lower-risk consumers away from their portfolio, leaving them with mainly the higher-risk consumers. As a result, insurers that do not use the additional rating factors are likely to incur a loss; the consumers who do not switch away from them are likely to be higher-risk consumers paying premiums estimated for a mix of lower- and higher-risk consumers, and therefore priced too low for remaining higher-risk consumers. In response, the insurance company not using the risk-rating factor will raise its price if it is to remain in business, and so becomes uncompetitive for lower-risk consumers even if it remains competitive for high-risk consumers. The ultimate consequence of this process is for competition to encourage all insurers to adopt the additional risk-rating factor, either explicitly by differentiating their prices for low- and high-risk consumers, or by being competitive only in the high-risk market (and so getting only high-risk consumers).

Competition in turn drives insurance companies to make best use of information on risk factors and not to use irrelevant or misused risk factors. Underwriting can be a costly exercise, which discourages the use of irrelevant information. Using information to estimate risk incorrectly is also discouraged by competition, as a competitor using information appropriately will be able to offer lower premiums to the lower-risk consumers.

Risk-based pricing also encourages innovation in the breadth of consumers to which insurers offer products. The use of additional rating factors helps insurers to offer insurance for risks that were previously uninsurable. Due to improvements in diagnosis, prognosis and treatment, it has become possible for insurers to offer certain insurance products (such as term life insurance) to consumers who would have previous been placed into an uninsurable category.

Product innovation may also be supported by risk-based pricing, as risk-based pricing helps the insurer to manage risk. New products are often developed by insurance companies in an evolutionary process, which allows the insurer to build up statistical data on the likelihood of claims before offering the product to a broad consumer base. Demand for the product during its development can be managed through the use of risk factors.

Medical advancements in the treatment of diseases have been achieved in many cases, and medical underwriters continually refine their procedures to reflect these advances. As these advances increase life expectancy, term life insurance becomes an economic product, and competition between insurance companies provides an incentive to provide it. This important issue is discussed further in the context of term life insurance in section 3 below.

As discussed further in section 7 with regard to long-term care insurance, the use of risk-based pricing may be important for the development of some insurance products that are currently not widely adopted at present but could have an increasingly important role to play in the future. Risk-based pricing helps the insurer to manage the risk of the portfolio and therefore to offer competitive premiums, supporting the development of products.

There is typically a small proportion of very high-risk consumers who are likely to be declined cover by the majority of insurance companies,[17] as their risk level is too great and uncertain. As the probability of the insured person claiming on the policy reaches many multiples of the risk of a 'standard' consumer, the risk faced by the insurer typically becomes much more uncertain (as well as high) and the problem of adverse selection increases.[18] However, the use of more risk-rating factors helps to reduce the proportion of consumers to which insurers are unable to offer cover, as it helps insurers to better understand and manage the risks, and it helps to reduce the problems of adverse selection.

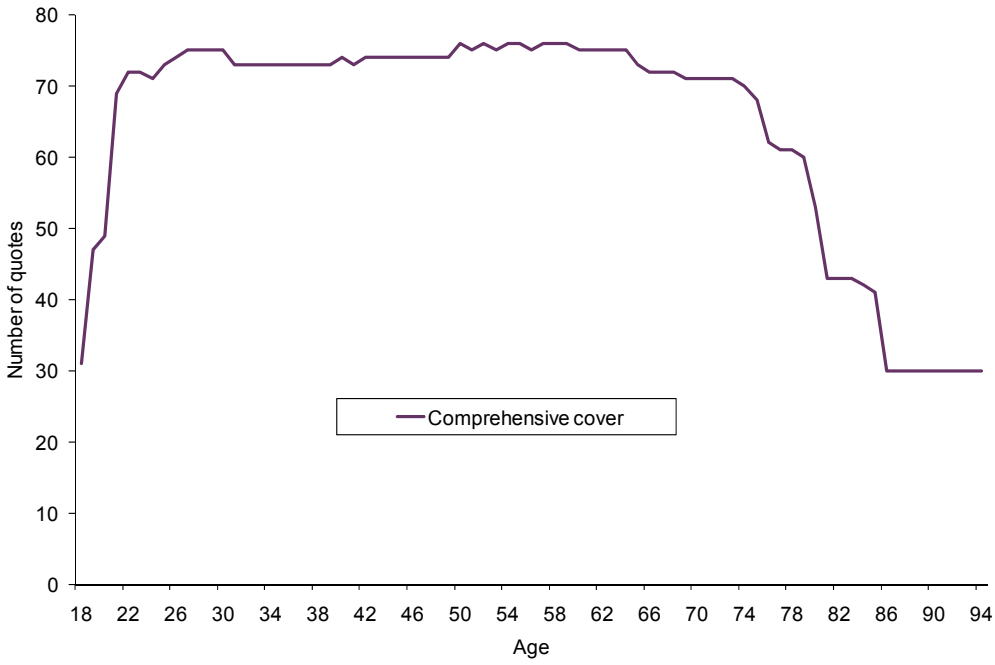
[17] Insurance cover may be offered to very high-risk consumers by specialist insurance companies focusing on that market, but this report focused on the likely actions of what may be referred to as 'mainstream' insurance companies, which make up the majority of the insurance market.

[18] This is because high risk is often associated with the consumer having more information about their risk of claiming than the insurer. For example, life insurance consumers with serious medical conditions may know more about their mortality risk than the medical underwriter is able to estimate based on available information.

Arguably, it may be appropriate for the majority of insurers to exclude very high-risk consumers on the basis that their insurance products are primarily designed to offer relatively large payouts in the event of relatively unlikely outcomes (such as is normally the case with term life insurance). If the insured event is highly likely to occur, the product design may need to be altered to reflect this. This may explain why high-risk consumers may be declined by most insurers but can obtain insurance products from niche insurance companies that have developed products specifically for those consumers' needs. High-risk consumers may require a more detailed examination and tailored products. Mainstream insurers typically have a high-volume, low-cost business, which means that they may reject the very high-risk consumers. Niche insurers, on the other hand, may specialise in certain types of risk and consumer, and therefore be able to offer insurance to high-risk consumers.

The outcome is typically that fewer insurance companies offer products to high-risk consumers than low-risk consumers, but there are still plenty of products available. In a previous Oxera study,[19] analysis of the availability of insurance products by age was conducted for motor insurance in the UK by recording the number of insurance quotes that were obtainable. The findings are summarised in Figure 2.2. While fewer products are available to the high-risk groups (under 25 years and over 80 years old) — as the number of quotes provided was lower — there were still around 30 quotes available compared with around 70 for low-risk groups.

Figure 2.2 Number of motor insurance quotes by age



Source: Oxera analysis based on quotes obtained from websites, presented in Oxera (2009), 'The use of age-based practices in financial services', May.

2.1.9 Risk-based pricing reduces the cost of volatility risk for insurance companies

As risk-based pricing results in premiums that correspond with expected benefits, it means that the insurance company can expect the premiums it receives to cover the cost of claims, albeit on the basis of expectations at the start of the insured period. There will always be unexpected events and volatility within a portfolio, with which the insurance company has to deal. However, additional volatility creates costs that will ultimately have to be passed on to

[19] Oxera (2009), 'The use of age-based practices in financial services', report prepared for the UK Government Equality Office, May.

consumers, and therefore it is in the interests of consumers that additional volatility be avoided if possible.

If risk-based pricing cannot be used, the insurance company must accept the additional risk of attracting proportionally more high-risk consumers to the portfolio than expected. This additional risk factor in terms of the additional uncertainty of the outcome creates an additional cost for the insurance company (and therefore ultimately the consumer). This is because, in business, increased risk is associated with increased compensation to those who face that risk (typically the owners of the business).

The EU's new Solvency II regulatory rules make this link between risk and cost explicit. Insurance companies must hold liquid capital in their reserves based on the level of risk that they face. Holding liquid capital creates significant costs for insurance companies. In effect, Solvency II means that risk-based pricing also aligns premiums with the increased capital requirements. The logical consequence of the Solvency II requirement that capital levels be based on risk is that premiums should also be based on risk.

2.1.10 With restrictions on risk-based pricing, insurance companies may adopt other, more expensive, methods for managing their consumer base

With restrictions on risk-based pricing, insurance companies can also be expected to react to the risk of an adverse portfolio mix (ie, more high-risk consumers than expected) in other ways. For example, insurance companies may be able to manage their portfolio mix to a limited extent through their sales and marketing activities. These sorts of activities can create additional costs, which arguably could end up being passed on to consumers in the dynamics of a competitive market. It should be emphasised, however, that marketing cannot replace risk-based pricing and would typically be expected to influence only the relative distribution of consumers between different providers. Furthermore, the evidence for limitations on risk-based pricing resulting in increased marketing to target consumers is rather limited, as noted in previous Oxera studies.[20]

Previous studies[21] on the potential impact of a ban on the use of gender in insurance pricing examined evidence for how such a ban had affected average prices in various countries that have introduced this restriction (in particular, Belgium, the Netherlands and the USA). The evidence showed that where a ban was introduced, average premiums appeared to be higher than would otherwise be expected. This would suggest that the impact of a ban is not just distributional (ie, shifting premiums from the high-risk gender to the low-risk gender), but also creates additional costs for all consumers. This additional cost could be due to a number of factors, including uncertainty about the mix in the portfolio.

2.1.11 Risk-based pricing produces benefits for consumers

The focus of this study is on consumers and the analysis described above identifies a number of potential benefits that consumers receive as a result of the use of risk-based pricing in private insurance markets. These benefits include:

– the correspondence between premiums and expected benefits that risk-based pricing produces, which encourages consumers to purchase an appropriate amount of insurance cover. This is referred to in economic literature as an efficient allocation of resources;
– the reduction of the impact of adverse selection, which can lead to insurance products being limited in scope or availability, or even, in more extreme situations, not being available at all;
– the competition between insurance companies, which risk-based pricing tends to encourage. This benefits consumers through lower prices and higher levels of cover;

[20] For example, see the Oxera report, 'The impact of a ban on the use of gender in insurance', November 2011. Information on the experience in the USA can be found in National Highway Traffic Safety Administration (1987), 'Unisex auto insurance rating: How auto insurance premiums in Montana changed after elimination of sex and marital status as rating factors'.

[21] 'The impact of a ban on the use of gender in insurance', Oxera report, November 2011.

– innovation, which benefits consumers through insurance companies offering a wider range of services to an increasing proportion of the population;
– the reduction in the costs of volatility risk for the insurance companies, which will typically be passed on to consumers in a competitive insurance market;
– the avoidance of other, more expensive, methods that insurance companies may adopt to manage their consumer base, which would be likely to produce additional costs or reduced cover for consumers.

These benefits for consumers can also be seen to produce benefits for society as a whole, which can include:

– a reduced requirement for society to provide financial support to dependants receiving life insurance payments; and
– a reduction in incentives for risk-taking behaviour by insured people.

This study focuses on the specific risk factors of age and disability. Section 2.2 therefore explores how insurers use these risk factors in general, before the more detailed assessment of the six insurance products included in this study, which are discussed in sections 3 to 8.

2.2 How is information about age and disability used in risk-based pricing?

Before exploring how information about age and disability is used in underwriting, product design and pricing of the six products included in this study (see sections 3 to 8), it is helpful to consider how information on age and disability is used in general.

2.2.1 Age

Age is an important risk-rating factor for many popular insurance products because it is closely linked to the underlying causes of the insured event. For example, age is:

– an important determinant of mortality risk (for life insurance products);
– an important determinant of morbidity risk, and hence the need for medical services (relevant for health insurance, disability insurance, etc); and
– an important indicator of driving behaviour, and therefore an indicator of both the frequency and severity of motor accidents.

There are some non-life insurance products in which age is not a factor because the insured event is not as closely linked to the behaviour or well-being of the policyholder — property insurance can be an example of this. Where age is not a relevant risk factor, insurance companies do not use it as a risk-rating factor. However, for all of the products included in this study, age is a relevant risk factor.

Statistical analysis indicates that age is a relevant risk for many insurance products. From a practical perspective, it is also a useful risk factor because it is well-defined, predictable over time, and easy to verify. It is also information that consumers are used to providing (for example, for the purposes of social insurance). As discussed further in the following sections, where age is used, insurers typically view age as a vital risk factor for determining insurance premiums, terms and conditions, and product design.

In this study, the use of age as a risk factor is examined by looking at the experience of insurance markets of consumers of different ages for the six products and six countries.

2.2.2 Disability

Insurance products that insure events that are triggered by mortality risk or morbidity risk usually involve medical underwriting. Typically at the point of enrolment, prospective consumers provide information about:

– current medical conditions;
– past medical conditions;

– disabilities; and
– their lifestyle, notably including whether they smoke.

Medical underwriters use this information, combined with standard actuarial tables showing the level of risk versus age, to advise on the mortality or morbidity risk of the prospective consumer. They also use this information to determine the premiums, level of cover, and terms and conditions that will be offered to the consumer.

Medical underwriters do, in some cases, use information about insured persons that can relate to a disability, when this information has been found to be relevant to the risk of the insured event occurring. An example of this process is described in section 3, with medical underwriters drawing on both medical studies and their own statistical analysis and underwriting experience to ensure that relevant information is used appropriately to assess risk.

In this context, medical underwriters use available information that can be shown to be a predictor of the likelihood of an insured event happening, using sound underwriting principles (supported by medical evidence in this case). Medical underwriters identify information that may have an influence on the insured event occurring. Such information may lead to an assessment of the effect that disabilities have on insured events. Although definitions or concepts of disability are in use elsewhere, they are not used in medical underwriting.

In this study, the use of information related to disability is examined by looking at the experience of insurance markets of consumers with selected disabilities that could be considered to be disabilities in the countries concerned for the six products. There are different classifications of disability. This report does not attempt to examine all of them, but instead considers selected examples (eg, paraplegia and blindness) that help to highlight different ways in which disability can affect the provision of each product considered.

The use of information on age and disability in insurance underwriting, product design and pricing is examined empirically in sections 3 to 8 for each of the six products. This examination involves two stages. Stage 1 involves verifying whether claim costs vary in age and disability; in other words, whether age and disability are risk factors. Stage 2 involves an assessment of how insurance pricing responds to the variance in claim costs driven by the age and disability risk factors.

Data was collected on:

– the underlying drivers of claims, such as mortality rates, which were mainly obtained from publicly available and official data sources;

– claim costs, which was typically provided by national insurance associations, where available; and

– premiums, which were mostly obtained through price-comparison websites.

3 Term life insurance

This section examines how information on age and disability is used in insurance underwriting, product design and pricing for term life insurance products in the six countries. The approach to risk-based pricing is considered in the context of the broader discussion in section 2.

Key findings

– Mortality risk is the key risk factor for term life insurance, which insurers typically estimate based on age, the findings of a medical questionnaire or examination and lifestyle factors (eg, smoking).

– Competitive market pressure drives insurers to use risk-based pricing that results in premiums that correspond with expected benefits, and therefore expected mortality rates.

– The close relationship between age and mortality rates and premiums is clear from the data collected for term life insurance in the six countries.

– Medical underwriters make decisions on a case-by-case basis; there does not tend to be fully automated pricing (eg, online quotes from websites) for relevant medical information with term life insurance[22]. In response to relevant risk factors, insurers may choose to offer standard premiums, increase premiums, make exclusions, and postpone[23] or decline cover.

– Insurers typically have a high-risk threshold for term life insurance, as risk-factor data is relatively well-developed and the risk of moral hazard is low. This means that insurers are able to offer term life insurance products to a wide range of consumers, including some who have suffered from serious life-threatening diseases.

– Information about disabilities may be relevant for predicting mortality rates. Medical underwriters use medical studies and statistical analysis to support their findings. In the examples considered in this study, underwriters informed the study that blindness is not by itself a relevant factor for mortality rates, and therefore does not affect premiums or terms; and in medical studies paraplegia is linked to increased mortality, and can therefore result in higher premiums.

– If insurers were unable to price according to age, it would be difficult to envisage how individual term life insurance could continue to exist as a product, owing to the very large difference in mortality risk between young and old consumers, and therefore the severe potential impact of adverse selection.

– If insurers were unable to use information about disabilities then, again, adverse selection would be a serious threat for private insurance provision.

[22] Online quotes provided by websites typically take account of age, but are based on the assumption that the consumer does not have relevant medical conditions that affect mortality risk compared to 'standard' life tables.
[23] For example, by postponing cover for death in the first 12 months following enrolment.

3.1 Risk-based pricing for term life insurance

Life insurance provides financial protection to beneficiaries in the event of the death of the insured person. This study considers term life insurance, which provides coverage for a specified term of years (a ten-year term is considered in this study, although the results hold for different terms). In return for paying periodic premiums, beneficiaries are guaranteed to be paid a lump sum if the insured person dies during the period covered by the insurance. Basic term life insurance policies do not accumulate cash value, and are typically purchased by policyholders aiming to guarantee their families' financial resources in the event of their death.[24] Term life insurance products are relatively homogeneous across Europe.[25]

Since insurers have to pay out in the event of death, they regard mortality risk as the relevant risk. In expected terms, claim costs are the product of the probability that an insured person will die during the cover period and the lump-sum payment to be made in the event of the death. Probabilities of death are typically presented by mortality rates (depending on the cover period).

Insurers estimate mortality rates by identifying risk factors and assessing their effect on mortality rates. Risk factors considered include age, pre-existing medical conditions and smoking habits.[26] In practice, insurers typically begin with a standard life table of the expected mortality rates for people of different ages who do not have relevant medical risk factors, and then make adjustments for any such risk factors. These tables are typically based on the insured population, which may have a different life expectancy than the whole population owing to socio-economic impacts on mortality rates.

Risk-based pricing entails premiums representing mortality risk since this is what drives claim costs. Robust and concise estimations of mortality rates are important in competitive insurance markets. Should they overestimate mortality rates, insurers would set high premiums that would not attract consumers, whereas should they underestimate mortality rates, insurers would set too low premiums, possibly insufficient to cover claim costs. Competitive pressures force insurers to set premiums that reflect the mortality risk of the insured, as described in section 2.

3.2 The use of age as a risk factor in term life insurance

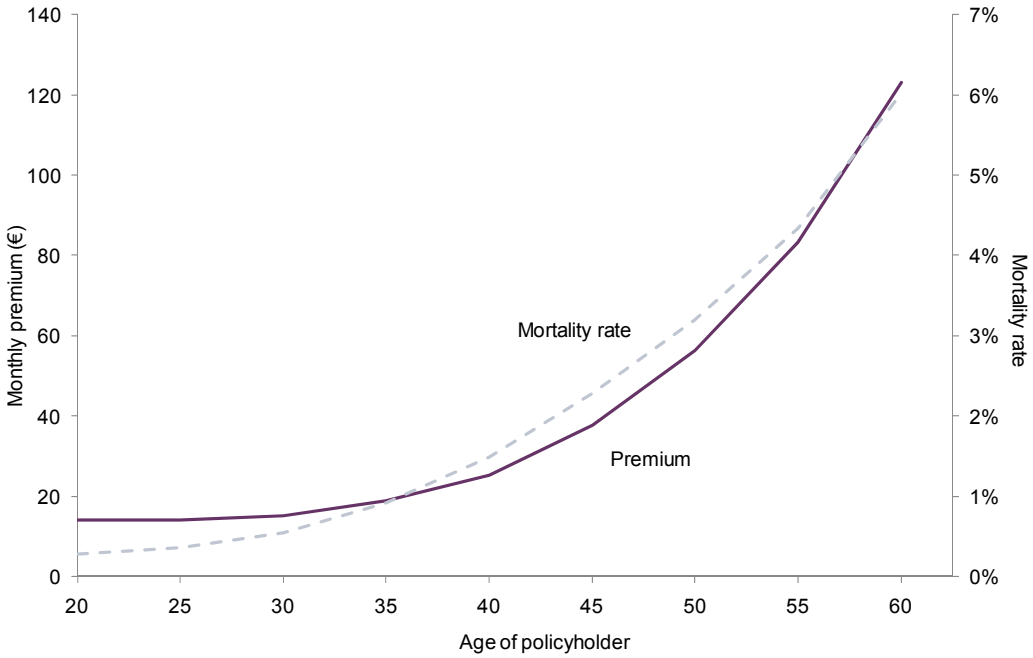
Mortality rates increase with age; moderately for young age, accelerating for older age. Since claim costs are driven by mortality rates, it follows that such costs increase with age. Premiums therefore increase with age. The charts below compare monthly premiums for €200,000 term life insurance with the probability of death over the next ten years for France and the Netherlands. They demonstrate that premiums follow mortality rates, and thus that policyholders pay for the risk they represent. The relationship is close, although not perfect, in part because there are administrative costs (which are incurred even without death). As mortality rates increase very sharply in later life and demand for term life insurance from older consumers is limited, insurers typically have an age limit for term life insurance policies. Age limits vary across different insurers, and some niche insurance companies provide term life insurance to much older consumers as they are able to tailor suitable products for a relatively small base of high-risk consumers.

[24] For example, term life insurance is often purchased to cover the cost of a mortgage if the main income earner in the family were to die.

[25] There are, however, differences in the determinants of demand for life insurance products between European countries. The take-up of various types of life insurance product also differs between European countries, eg, in terms of group contracts and ancillary add-ons, such as disability coverage.

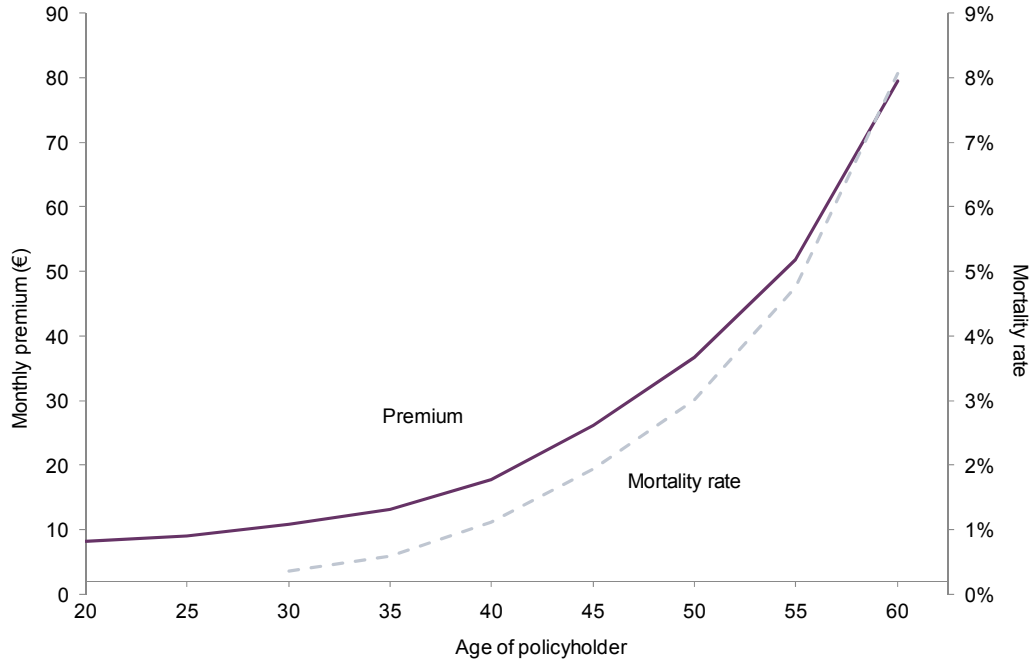
[26] At the time of writing, gender was used as a risk factor in term life insurance.

Figure 3.1 Term life insurance in France: premiums and mortality rates by age (females)



Note: The chart presents the close correlation between monthly premiums and the expected future mortality rate for policyholders of different ages. Monthly premiums were calculated based on the quotes of numerous insurers. These are quoted premiums for the point of inception (the start of the contract), which remain fixed for the duration of the term life insurance product. Mortality rates have been calculated as the probability that individuals will die in the next ten years. The appendix contains charts presenting premiums and claim costs by age for each of the selected countries, and for both genders.
Source: Premiums obtained from http://assurance-deces.assurprox.com/formulaire, varying in age keeping other factors fixed. Mortality rates presented in 'Tables de Mortalités 2007-2009'.

Figure 3.2 Term life insurance in the Netherlands: premiums and mortality rates by age (females)



Note: The chart presents the close correlation between monthly premiums and the expected future mortality rate for policyholders of different ages. Monthly premiums were calculated based on the quotes of numerous insurers. These are quoted premiums for the point of inception, which remain fixed for the duration of the term life

insurance product. Mortality rates have been calculated as the probability that individuals will die in the next ten years. The appendix contains charts presenting premiums and claim costs by age for each of the selected countries, and for both genders.
Source: Premiums have been obtained from http://www.independer.nl/, varying in age keeping other factors fixed. Mortality rates provided by the Verbond van Verzekeraars (2012).

3.3 The use of disability as a risk factor in term life insurance

Insurers in all selected countries include information on current and past medical conditions, disabilities and smoking habits in their pricing decisions if medical underwriters have shown these factors to be relevant risk factors for mortality risk, based on medical studies and their own statistical analysis. In order to obtain this information, insurers typically ask potential consumers to fill in questionnaires, and may require them to provide a report from a doctor,[27] in order to learn about the relevant medical conditions to which they are subject.

Recommendations from medical underwriters can include offering standard terms as the disability is not considered to be a material risk factor, offering increased premiums to reflect higher risk, excluding a particular benefit from the cover, or postponing or declining to provide insurance cover to the person as the risk is too high. Mark-ups to premiums entail commonly used classifications such as +50, expressing that the mortality risk of the person is 50% higher than that in the standard life tables for a person of the same age who is in good health.

With regard to potential consumers with disabilities, as discussed in section 2, insurers use this information only if it is relevant to mortality rates.

– **Blindness** — insurers do not typically treat blindness as a relevant risk factor on the basis that blindness is not a material driver of mortality rates.

– **Paraplegia** — insurers do typically treat paraplegia as a relevant risk factor since there are medical studies showing that paraplegia due to trauma is associated with reduced life expectancy, and thus higher mortality rates (see Table 3.1). This medical evidence, possibly combined with evidence gathered from insurers' own portfolios, supports upward amendments of premiums reflecting increased risk.

[27] Typically, insurers request a report from the consumer's doctor or a medical examination if the amount to be insured is relatively large or there are material concerns about relevant medical conditions.

Table 3.1 Remaining life expectancies for differing classes of spinal cord injuries

Group	Remaining life expectancy (y)
General population	50.9
C1–3, grade A	25.4
C1–3, grades B and C	32.2
C4, grade A	26.4
C4, grades B and C	34.9
C5, grade A	30.0
C5, grades B and C	35.7
C6–8, grade A	34.7
C6–8, grades B and C	36.7
T1–S5 (paraplegia), grades A, B and C	37.6
All grade D	44.7

Note: The table reproduces the results of a medical study showing how different degrees of spinal cord injury are linked to reduced life expectancy. The table presents sample life expectancies for 25-year-old men in the United States with non-violent etiology (causes of injury) and time since injury of three years by injury level (known as ASIA Grade in medical studies).
Life expectancy indicates the expected lifetime in years for individuals subject to differing classes of spinal cord injuries. Group T1–S5 concerns paraplegia. C grades concern more severe spinal injuries, and D grades less severe spinal injuries, relative to paraplegia.
Source: Strauss, D.J., Devivo, M.J., Paculdo, D.R. and Shavelle, R.M. (2006), 'Trends in Life Expectancy after Spinal Cord Injury', PhD Archives of Physical Medicine and Rehabilitation, Volume 87, August.

For the two illustrative consumers, therefore, one might expect:

– Case 1: the person with blindness caused by trauma to be offered term life insurance on standard terms;

– Case 2: the person with paraplegia caused by trauma to be offered term life insurance with increased premiums, reflecting the increased risk of mortality.

It needs to be stressed that the approach to relevant risk factors varies between insurers and there are specialist niche insurers who may offer cover in cases that go beyond the risk thresholds of other insurers.

3.4 Increasing risk thresholds with term life insurance

Advances in medical underwriting, driven to a large extent by advances in medical science and the availability of data on mortality rates for different health risks, have allowed insurers to accept higher levels of risk and offer term life insurance products to a broader range of potential consumers. This has resulted in insurance companies typically having a relatively high risk threshold for term life insurance, meaning that they offer policies (with increased premiums) to consumers with significantly higher mortality rates than would be expected for consumers in good health.

The problem of adverse selection, as described in section 2, can be reduced by effective underwriting, which reduces the extent to which policyholders have more information on their likely risk of mortality than insurance companies. With less effective underwriting, insurers may not be able to offer policies to consumers with some types of disability or other factors affecting life expectancy, as there would be an increased risk of adverse selection.

In the case of term life insurance, the problem of moral hazard (also described in section 2) is less material, owing to the severity of the insured event. It would seem unlikely that consumers would increase their risk of death because they have life insurance.

Consequently, term life insurance products can be offered, for example, where consumers have mortality rates many times greater than the average for a person who is in good health.

3.5 Potential impact of a ban on the use of information on age and disability for term life insurance

Without the use of relevant risk factors, which include both age and disability, the viability of private provision of term life insurance would be put at risk.

3.5.1 Age

If insurers were unable to price according to age, it would be difficult to envisage how term life insurance would continue to exist as a product. The strong correlation between age and mortality rates would mean that an age-neutral term life insurance product would be much more attractive to older consumers than to younger consumers. The resultant strong demand for term life insurance from older consumers who have much higher expected mortality rates would mean that insurers would have to increase premiums. Term life insurance would become unattractive to younger consumers, and the process of adverse selection would result in an increasingly old consumer base, because there are many potential consumers in the higher-risk group.

The sharp difference in mortality rates by age, as presented in the charts above, makes the process of adverse selection highly likely to occur, and to continue until only those consumers who expected to die during the term period would apply for term life insurance.

This large variation can be illustrated by comparing mortality rates for differing ages. For example, in France the mortality rate of a 60-year old male is more than ten times than that of a 30-year old male, with that of a 75-year old male being more than 35 times higher than for 30-year old male. The magnitude of these factors illustrates the relevance of age as a risk factor for term life insurance covering mortality risk. If an insurer decided to set the age-neutral price at the current price for 60-year olds, there would be large price increases for younger people. At the same time, the new price would seem to be cheap for older people. The result would be a considerable incentive for younger people to stop buying term life insurance and for older people to buy more. Adverse selection would result in only older people being incentivised to buy term life insurance and the insurer would be likely to make a loss even with a price set at the highest observable level at present. The end result would likely be that younger consumers do not buy term life insurance and all consumers would be paying higher prices.

It may be that insurers in this age-neutral scenario would react by making significant changes to product design and terms and conditions, as well as pricing. Most term life insurance products at present are designed to provide the policyholder's dependants with a relatively large pay-out in the unlikely event of them dying. In an age-neutral pricing scenario, any policies that continue to exist would presumably offer much lower pay-outs relative to premiums, perhaps with the requirement that no claims can be made until a number of years after enrolment. Even with these changes in conditions, it may be challenging for insurers to offer term life insurance, and it would seem likely that most, perhaps even all, of the private insurance market for term life insurance would collapse under this scenario.

3.5.2 Disability

In the examples used in this study of consumers with disabilities, some involved higher mortality rates and therefore higher premiums. If risk-neutral pricing meant that these individuals could not be treated differently from other individuals without disabilities that reduce life expectancy, then term life insurance would become more attractive to the

individuals with reduced life expectancies. The same problem of adverse selection that arises in the case of age-neutral pricing also applies to the use of information on disability.

The severity of the impact of adverse selection depends on the proportion of the relevant population that would currently be deemed by medical underwriting practices to have reduced life expectancy, but would not be deemed to have reduced life expectancy if information on disability could not be used. The severity of the impact of adverse selection also depends on the extent of this reduction in life expectancy (which is comparable to the extent to which mortality rates vary with age in the above example).

The extent to which a hypothetical ban on the use of information about disability could have an impact on term life insurance products therefore depends crucially on the interpretation of the term 'disability', which can vary significantly. It is possible to envisage scenarios in which such a hypothetical ban could have a severe impact of adverse selection, which could even put the existence of term life insurance at risk.[28]

A hypothetical example (informed by actual data for Germany) in the market for term life insurance can illustrate the effects of adverse selection on demand, claim costs and insurance premiums. In this illustration, the impact of adverse selection (due to information on disability not being used) results in the majority of consumers having to pay much higher premiums (more than double) for the term life insurance product, and significant reductions in consumer demand overall. This hypothetical example highlights why adverse selection can have a very severe impact on insurance provision.

Hypothetical example: term life insurance

Consider term life insurance policies for 50-year-old female German consumers with an average mortality risk of 2.2%[29] over the ten-year period covered by insurance. The insurance policy commits to paying a benefit of €100,000 in the event of death. For simplicity, suppose that consumers, varying in mortality risk, can be classified into three categories:

1. **'standard' mortality risk**—no disabilities suggesting increased mortality risk;

2. **'double' mortality risk**—disabilities suggesting moderately increased mortality risk;

3. **'high' mortality risk**—severe disabilities suggesting much increased mortality risk.

This hypothetical example considers the scenario in which the total population consists of 1,000 potential consumers, 80% of which are 'standard' risk, 15% of which are 'double' risk and 5% of which are 'high' risk.[30] Suppose that insurance companies apply risk-based pricing, and that insurance is available to consumers with 'standard' and 'double' risk (but not 'high' risk), with premiums being twice as high for the 'double' risk consumers than for 'standard' risk consumers. Moreover, it is assumed that insurance is purchased by 50% of the population for which insurance is available.[31] Table 3.2 presents costs per consumer, total claim costs, premiums over the ten year term and revenues for this scenario arising under risk-based pricing.

[28] Insurers in all of the countries considered use information about medical conditions in underwriting their standard term life insurance products. There are some types of life insurance policies that pay out in the event of death where no medical examination is required and/or medical information asked for. One example of this would be the 'simplified issue' whole of life (ie, not term life) products in the UK for older customers. These pay out in the event of death, but provide much lower levels of cover than is the case with standard term life insurance products. However, these policies are not substitutes for standard term life insurance as the amount of cover is capped at relatively low levels (to manage the adverse selection risk) and they have significantly higher premiums relative to the amount of cover (reflecting the much higher risk customers that can purchase these policies).

[29] Based on the mortality rate assumptions used for the age illustration above.

[30] These assumptions were broadly based on terminal illness, cancer and other morbidity statistics for women in their fifties in the UK. These numbers were used as a proxy for Germany in this hypothetical example. They are only illustrative numbers, however.

[31] This assumption was based on statistics provided by insurance companies for mature markets.

Table 3.2 Risk-based pricing: differentiation based on risk level

Risk	Mortality rate	Population	Insured population	Expected cost per consumer	Total claim costs	Premiums	Revenues
'Standard'	1.4%	800	400	€1,400	€560,000	€1,400	€560,000
'Double'	2.8%	150	75	€2,800	€210,000	€2,800	€210,000
'High'	14.0%	50	0	€14,000			
Total		1,000	475		€770,000		€770,000

Note: The table presents the first step in a hypothetical example for a term life insurance product, based on mortality data for a German woman aged 50 years. The example shows claim costs and revenues being equalised with risk-based pricing.

Source: Mortality rates obtained from https://www.destatis.de/ in May 2012. Illustration by Oxera.

When applying risk-based pricing, premiums are set that are equal to the expected cost per consumer. Premiums therefore increase according to the risk represented by consumers. The figures presented in Table 3.2 are for the total premiums over the ten year term, so that they can be compared directly to the expected cost per consumer.[32]

Now suppose that insurance companies are no longer allowed to differentiate on the basis of disabilities. Instead of premiums varying in the risk categories ('standard', 'double' and 'high'), insurance companies have to set uniform premiums for consumers aged 50.

Suppose insurance companies set the uniform premium equal to the average claim cost per policyholder as experienced before the ban on the use of disability as a risk factor. By dividing total claim costs by the number of insured, the average claim cost per policyholder can be determined. The premium will be equal to €1,621.

Following the ban, consumers with high risk are no longer denied access to term life insurance. Suppose that, in the first instance, the proportion of high-risk consumers purchasing term life insurance is equal to the proportion of standard and double risk consumers purchasing term life insurance — ie, 50%.

Table 3.3 Uniform premiums: proportion of consumers purchasing term life insurance does not depend on their degree of risk

Risk	Mortality rate	Population	Insured population	Expected cost per consumer	Total claim costs	Premium	Revenues
'Standard'	1.4%	800	400	€1,400	€560,000	€1,621	€648,421
'Double'	2.8%	150	75	€2,800	€210,000	€1,621	€121,579
'High'	14.0%	50	25	€14,000	€350,000	€1,621	€40,526
Total		1,000	500		€1,120,000		€810,526

Notes: The table presents the second step in a hypothetical example for a term life insurance product, based on mortality data for a German woman aged 50 years. The example shows how uniform premiums (regardless of differences in mortality rates) result in claim costs exceeding revenues, given the same average rate of premiums.
Source: Mortality rates obtained from https://www.destatis.de/ in May 2012. Illustration by Oxera.

Table 3.3 shows that the expected cost per consumer is lower than the uniform premium for consumers of standard risk, and higher for consumers of double and high risk, indicating that insurance is poor value for consumers of standard risk. Moreover, it can be observed that

[32] This simple illustration ignores administrative costs and interest rates, both of which would to some extent alter the relationship between premiums and costs. This simplification does not affect the key messages, however, as both of these factors are not directly affected by the issue of adverse selection.

revenues, collected through premiums, are now insufficient to cover claim costs, implying that insurance companies would incur a loss if they do not raise premiums. Premiums are too low to cover claim costs, since the average cost per consumer has increased following the influx of high-risk consumers purchasing term life insurance.

Table 3.4 takes this illustration a step further by considering the potential implications of adverse selection in this example. The insurance companies must raise premiums in order to cover increased claim costs, but this will result in changes in demand. Low-risk consumers will be discouraged from buying insurance, whilst the high-risk consumers will have above average demand for insurance. This results in a further increase in the average claim costs, which means that in order for the insurance company to balance its books, premiums must rise very substantially.

Table 3.4 Adverse selection with uniform premiums: more high-risk and less low-risk consumers purchase term life insurance

Risk	Mortality rate	Population	Insured population	Expected cost per consumer	Total claim costs	Premiums	Revenues
'Standard'	1.4%	800	200	€1,400	€280,000	€3,333	€666,667
'Double'	2.8%	150	75	€2,800	€210,000	€3,333	€250,000
'High'	14.0%	50	40	€14,000	€560,000	€3,333	€133,333
Total		1,000	315		€1,050,000		€1,050,000

Note: The table presents the final step in a hypothetical example for a term life insurance product, based on mortality data for a German woman aged 50 years. The example shows that premiums would need to be more than double the original 'standard' premium in order to balance claim costs and revenues.
Source: Mortality rates obtained from https://www.destatis.de/ in May 2012. Illustration by Oxera.

The rise in premiums may restore an equilibrium position. In the illustration above, if there are no further changes in demand, the stable premium is €3,333. The impact of adverse selection has changed the distribution and price of the insurance. The 800 'standard' consumers have seen their premiums more than double, with the expected value of their insurance now less than half of the premium they pay. 'Double' risk consumers have seen a small increase in their premium (even though the example has shifted to a situation where their higher than standard risk of mortality is no longer considered). Most of the 'high-risk' consumers now get access to insurance at a premium of €3,333, but with an expected average return of €14,000.

The above sequence illustrates how adverse selection can result in the majority of consumers paying higher premiums for insurance products, with very significant increases in premiums for 'standard' risk consumers resulting in significant reductions in consumer demand for insurance.

4 Pension annuities

This section examines how information on age and disability is used in insurance underwriting, product design and pricing for pension annuities in the countries included in the study. The approach to risk-based pricing is considered in the context of the broader discussion in section 2.

Key findings

– The key risk factor for insurers providing pension annuities is longevity risk, which is the opposite of mortality risk. The same risk factors therefore apply as for term life insurance, except in reverse and for a generally older consumer group.

– National regulations impose differing requirements on pension annuities, however, which has resulted in different use of risk factors. Age is used in all countries, but medical underwriting is less common.

– As with term life insurance, the relationship between age and longevity and pension payments from an annuity is clear, as one would expect.

– The market for pension annuities is well developed in the UK, Germany and the Netherlands.

– The use of information on age is vital to the functioning of the private insurance market for pension annuities, just as it is for term life insurance. Without age-based pricing, only the youngest consumers would wish to buy annuities.

– The lack of the use of medical underwriting does not pose the same problems of adverse selection for pension annuities as it does for term life insurance. This is because the 'standard' consumer with no medical issues is effectively the high-risk consumer for annuities, and therefore a lack of medical underwriting is not likely to attract new consumers with sharply higher risk profiles (as it can with term life insurance).

4.1 Risk-based pricing for pension annuities

Pension annuities enable policyholders to convert pension savings into a guaranteed income for the rest of the insured person's life. By offering this conversion, pension annuities provide insurance against the exhaustion of savings for retirement since pensions are paid to insured persons for the rest of their lifetime. Most policyholders of pension annuities are in the age category 55+, having accumulated pension savings and wish to have insurance against exhaustion of savings.

Pension annuities are commonly offered in the UK, Germany and the Netherlands, yet less so in Italy, France and Czech Republic. Because pension data could be more readily collected (using websites) in markets that are relatively mature, the analysis focuses on the UK, Germany and the Netherlands.[33]

[33] Data is available for other countries but only for a small sample of different providers.

National regulations impose differing requirements on the purchase of annuities and the use of risk factors, and there are also differences between pension products, notably in Germany. These regulations have important implications for the use of information on disabilities as a risk factor in this case, as discussed below.

The costs incurred by insurers concern the accumulated sum of pensions to be paid out over the lifetime of insured persons. Costs increase given the size of the pension payments and the lifetime of insured persons.

– The size of pension payments is agreed between insurers and policyholders when selling pension annuities.

– The lifetime of insured persons, which is the primary risk factor from the point of view of the insurer, is uncertain at the time of enrolment.

The pension savings deposited by policyholders provide income for insurers, whereas the sum of pensions to be paid out concern the costs. Insurers will typically invest the premiums paid in low-risk assets, which generally provide lower rates of return but with little risk over long periods of time. While there is considerable uncertainty surrounding the lifespan of a single individual, with a sufficiently large portfolio an insurer can expect that the average lifespan of the many different insured persons is little affected by individual variation. However, it is crucial for the insurer to predict correctly the average lifespan of the portfolio, as, after enrolment, they typically have no ability to alter the size of pension payments.

Robust and concise estimations of life expectancy are therefore of crucial importance for insurers. As with term life insurance, competitive market pressures can be expected to encourage insurers to use relevant information to forecast life expectancy effectively.

While life expectancy is, of course, dependent on mortality rates, one can expect differences between the use of risk factors between term life insurance and pension annuities for several reasons:

– pension annuity consumers are typically older than term life insurance consumers, and therefore face different rates and causes of mortality;

– national regulations affecting pension annuities differ from those of term life insurance, as discussed below.

Like term life insurance, however, age is important in the underwriting and pricing of pension annuities, as discussed further below.

4.2 The use of age as a risk factor in pension annuities

Age is the most important risk factor for longevity risk, with life expectancy declining with age.

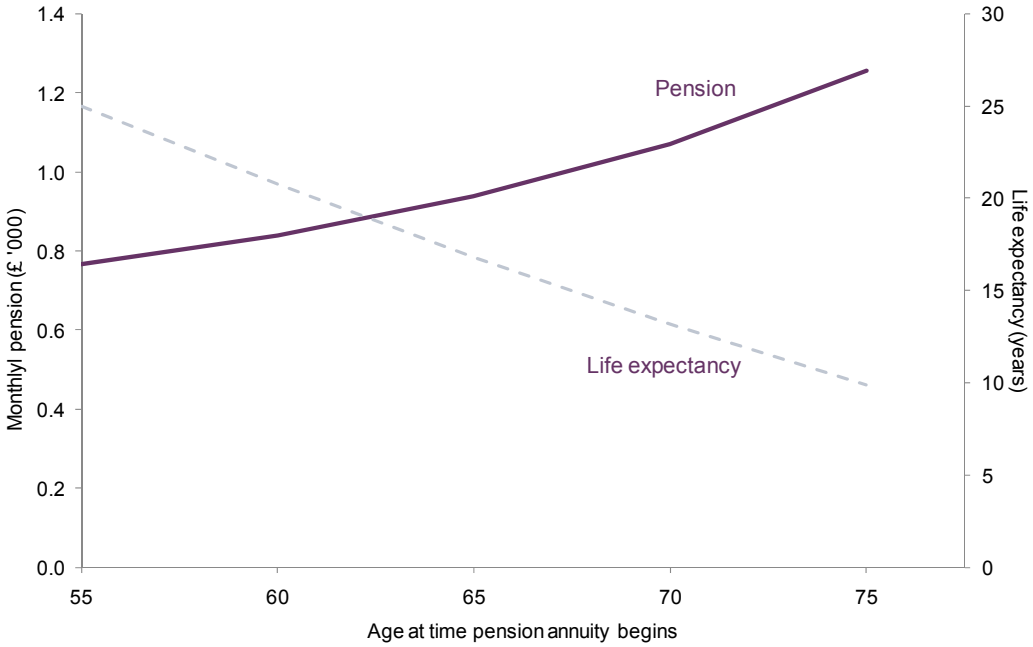
Since longevity risk declines with age, risk-based pricing envisages that higher pensions are paid to older insured persons, correcting for reduced life expectancy. From a risk perspective, the longevity risk of older insured persons is smaller. Data has been acquired in the UK and the Netherlands in order to assess the degree to which pensions follow longevity risk.

Prices concern periodic pensions received when making a lump-sum payment of €200,000 (£200,000 for the UK), and life expectancies have been calculated using publicly available mortality rates. The charts below show pensions and life expectancies as functions of age for males in the UK and the Netherlands. Pensions are paid out on an annual basis for the UK, and on a monthly basis for the Netherlands. Presenting pensions and life expectancies in the same charts shows that pensions follow the inverse of life expectancy, relative to age. Charts

for all countries in which pension annuities are commonly observed are included in the appendix.

It can be observed that pensions follow life expectancy, with higher pensions being paid to insured persons with lower life expectancy — ie, older insured persons.

Figure 4.1 Pension annuities in the UK: pensions and life expectancies by age (males)



Note: The figure compares monthly pensions paid out when making a lump-sum investment of £200,000 in pension annuities, with life expectancy (which represents the expected number of years that individuals will live depending on age, and has been calculated using mortality rates). Monthly pension payments rise as life expectancy declines. The appendix contains charts presenting pensions and claim costs by age for each of the selected countries, and for both genders.
Source: Pensions obtained from https://www.onlineannuityplanner.com/confused/CompareAnnuities/default.aspx; mortality rates provided by the ABI, 2012.

Figure 4.2 Pension annuities in the Netherlands: pensions and life expectancies by age (males)

Note: The figure compares monthly pensions paid out when making a lump-sum investment of £200,000 in pension annuities, with life expectancy (which represents the expected number of years that individuals will live depending on age, and has been calculated using mortality rates). Monthly pension payments rise as life expectancy declines. The appendix contains charts presenting pensions and claim costs by age for each of the selected countries, and for both genders.
Source: Pensions obtained from http://www.pensioenkoers.nl/direct-berekenen/; mortality rates provided by the Verbond van Verzekeraars, 2012.

4.3 The use of disability as a risk factor in pension annuities

While the approach of insurers towards age in risk-based pricing is similar for term life insurance and pension annuities — as one would expect, given that mortality risk is at the heart of both products — this similarity is not apparent with regard to medical underwriting. This is because the lack of use of medical underwriting does not pose the same problems of adverse selection for pension annuities as it does for term life insurance — as explained in section 4.4 below.

Information about medical conditions, disabilities and lifestyle (eg, smoking) remains relevant for the longevity of pensioners just as it does for the mortality rates of term life insurance consumers, but the information is used differently by insurers, with variations between countries. Of the countries included in this study, 'enhanced annuities'[34] (where higher pension payments are offered to pension annuity consumers with reduced life expectancies) are common only in the UK.

4.4 Potential impact of a ban on the use of information on age and disability in pension annuities

Age is a critical risk factor for pension annuities and, without the use of age, the private provision of pension annuities would change. Working in the opposite direction to term life insurance, the longevity risk faced by providers of pension annuities is higher for younger

[34] In the UK there are also 'impaired annuities'. This study includes 'impaired annuities' within the term 'enhanced annuity' as both reflect higher pension payments to reflect reduced life expectancy.

consumers. If a ban on the use of age meant that anyone, of any age, could buy pension annuities, the logic of adverse selection would suggest that only the youngest consumers would be interested in purchasing the product and pension payments would reflect their life expectancy.

In some countries, regulations set a minimum age for the purchase of annuities using (tax-efficient) pension funds. In the UK, it is currently 55 years old. Where such minimum age requirements are in place, adverse selection could be expected to result in the vast majority of consumers purchasing annuities at the minimum age.

In contrast with term life insurance, however, there is less reason to suspect that a ban on the use of information relating to disability would result in adverse selection (and consequent negative implications) for pension annuities. This is because consumers without specific conditions that have a negative impact on life expectancy — who represent the 'standard' consumer — are, in the case of pension annuities, the high-risk consumer group, not the low-risk group (as they are for term life insurance). Risk-neutral pricing (regarding disability) for pension annuities would result in low-risk consumers (those with reduced life expectancies) receiving a worse deal and the majority of high-risk 'standard' consumers potentially receiving a slightly better deal. This situation is not likely to put the viability of private insurance at risk, although these consequences may vary from one domestic context to another. This can be seen from the healthy markets for pension annuity products in Germany and the Netherlands, as medical underwriting is typically not used for pension annuities. A lack of medical underwriting may disadvantage some consumers, however, as those with reduced life expectancies due to disabilities would be likely to get a better deal if their disabilities were taken into account in the underwriting process.

5 Motor insurance

This section examines how information on age and disability is used in insurance underwriting, product design and pricing for motor insurance in the selected countries. The approach to risk-based pricing is considered in the context of the broader discussion in section 2. The analysis focuses on motor third-party liability insurance (MTPL) as this product is common across Europe and relatively similar in terms of product design.[35]

Key findings

- For MTPL insurance, insurers face the risk that the insured driver causes an accident (for which they are liable) and the cost of the resultant claim.
- MTPL insurance typically involves the use of a larger number of risk factors than term life insurance and pension annuities, including age, driving experience, claim history, driving licence endorsements, type of car, engine size and other factors.
- Age is one of the most important risk factors for motor insurance, as the claim costs for young drivers (typically aged 25 and younger) and older drivers (typically aged 70+) are on average higher than for other drivers. This relationship is clear from a comparison of premiums and claim costs by age.
- Driving experience is also an important risk factor, but age remains important even when driving experience is taken into account. A 35-year old new driver (zero experience) is much less likely to have an accident than an 18-year old new driver (zero experience), for example.
- Insurers do not typically consider disability as a risk factor for motor insurance, as the requirement to hold a driving licence ensures that the ability of the driver is not impaired. For example, blindness is not considered by the insurer as a risk factor, as this would typically result in no driving licence in the first place. Of course, the authorities that issue driving licences do consider relevant disabilities.
- A ban on the use of age in determining motor insurance premiums would result in a redistribution of premiums, with lower-risk consumers paying more.
- Consequently, younger drivers would be likely to pay significantly lower premiums for driving high-powered motor vehicles, which may have negative implications for road safety given the evidence that younger drivers are much more likely to have accidents while driving.
- A ban on the use of age in determining motor insurance premiums could result in significant adverse selection for non-mandatory insurance cover (beyond the minimum third-party liability cover ─ eg, comprehensive motor insurance).

[35] MTPL insurance covers, as a minimum, the cost of damage caused to a third party owing to the fault of the policyholder. Other motor insurance products provide insurance to varying degrees for the cost of damage to or loss of the policyholder's vehicles, as well as other add-on insurance products.

5.1 Risk-based pricing for motor insurance

MTPL insurance, which is mandatory for all vehicles/drivers in the EU, covers third-party liability risk associated with traffic accidents caused by insured drivers. When providing MTPL insurance, insurers face the risk that the insured driver causes an accident (for which they are liable) and the cost of the resultant claim. Claim costs therefore depend on the probability that an insured driver files a claim (ie, frequency), and on the average cost of a claim (ie, severity). Motor insurance typically involves the use of more risk factors than are used in term life insurance and pension annuities, as summarised in Table 5.1.[36]

Table 5.1 Typical risk-rating factors for private motor insurance

Details on primary driver and other drivers, if applicable	Vehicle details
Age	Vehicle group
Marital status	Vehicle value
Age of licence	Engine size
Type of licence	Immobiliser/alarm
Occupation	Rating area
Residency	Overnight parking
Convictions	Excess
Accidents/claims in last n years	Distance driven per year
No claims discount (NCD), and whether it is protected	Age of vehicle
	Policy duration

Source: Oxera, 2012.

Through statistical analysis, these risk factors have all been found to be correlated with expected claim costs, although the use of risk factors varies between countries and between insurance companies. Age is a relevant risk factor in all countries, but motor insurance underwriting does not typically involve medical underwriting in any of the countries considered.

There are also some differences in terms of public policies regarding driving licences,[37] particularly for older drivers who may be suffering from age-related impairments to their driving ability. These are considered further below.

5.2 The use of age as a risk factor in motor insurance

Age is one of the most important risk factors for motor insurance since claim costs are on average significantly greater for drivers under the age of 25 and, to a varying extent, above the age of 70 than for drivers of median age. In all countries included in this study, there is evidence showing that younger drivers (typically aged 25 or younger) are more likely to have car accidents than older drivers and therefore are more likely to make insurance claims. There is also evidence from a number of countries showing that the cost of claims tends to be higher on average for drivers above the age of 70.

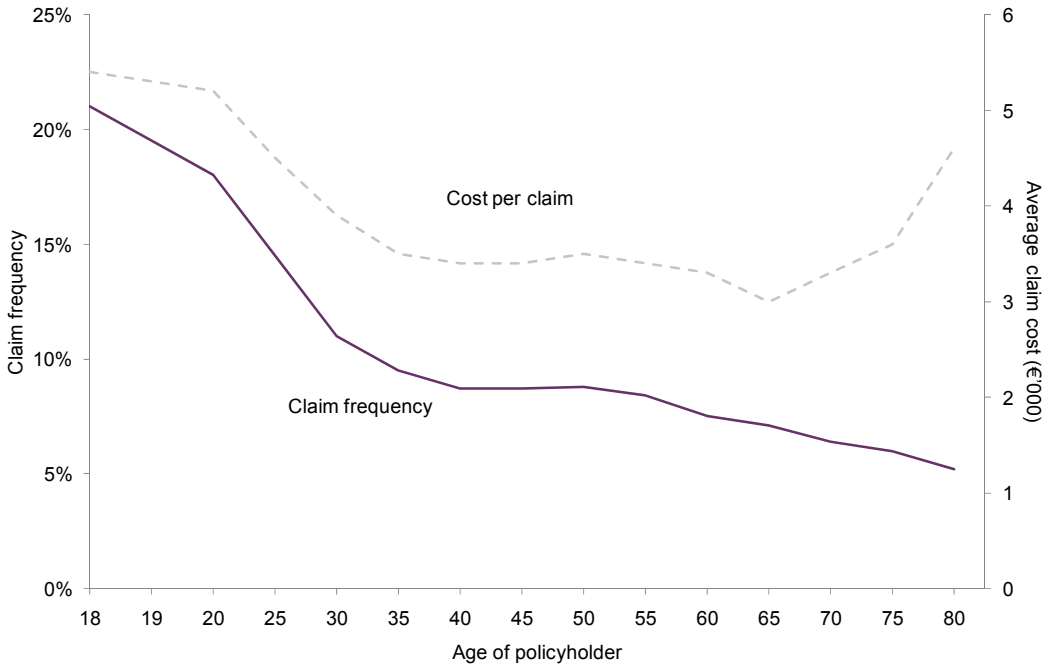
Data for Italy shows that both the frequency of claims (primarily due to car accidents) and the average cost per claim are on average higher for drivers under 25 years old — see Figures 5.1 and 5.2. There is also a notable increase in the cost per claim for drivers aged over 70.

[36] Gender was also a risk factor used at the time of writing.

[37] There are also variations between countries in the extent to which the policy covers named drivers only (such as in the UK) or whether other members of the household are included within the policy, which may include additional age restrictions.

The net consequence of these trends is that the expected claim costs for drivers under 25 years old is much higher than for drivers aged up to 70, and that there is then an increase in claim cost for drivers aged over 70.

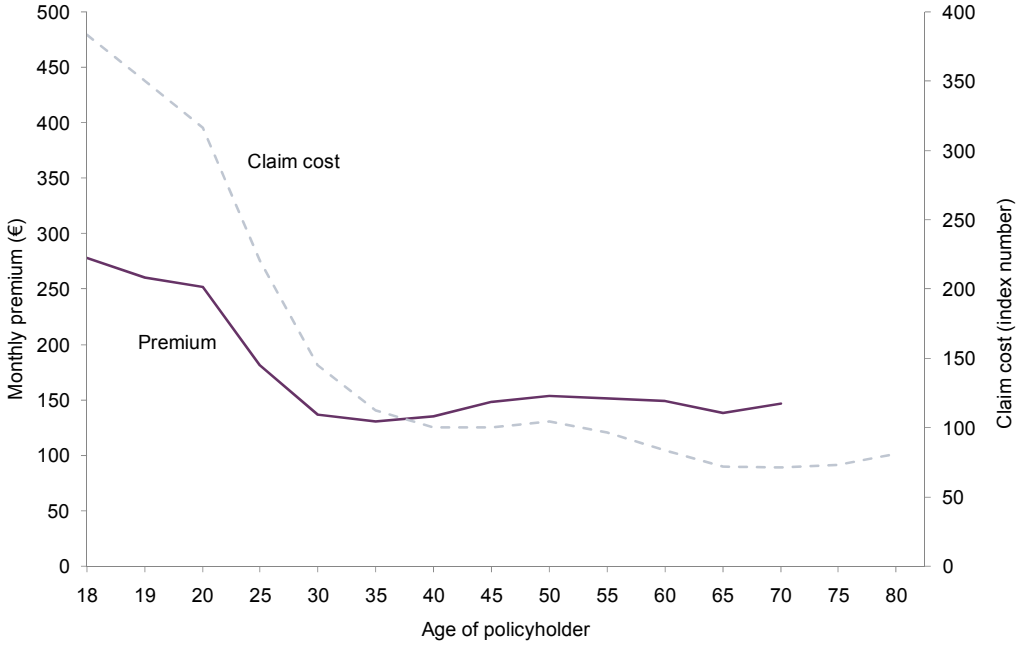
Figure 5.1 Motor insurance in Italy (males): claim frequency and average claim cost by age



Note: Claim frequency is the percentage of one year motor insurance policies that have at least one claim paid out. Average claim cost is the average size of the payout per claim. Both claim frequency and average claim costs are higher for younger drivers than older drivers.
Source: Italian national association for insurers (ANIA), presented in 'Statistica Annuale RC Auto -Esercizio 2009 e Rilevazione "ad hoc" Dati CARD', December 20th 2010.

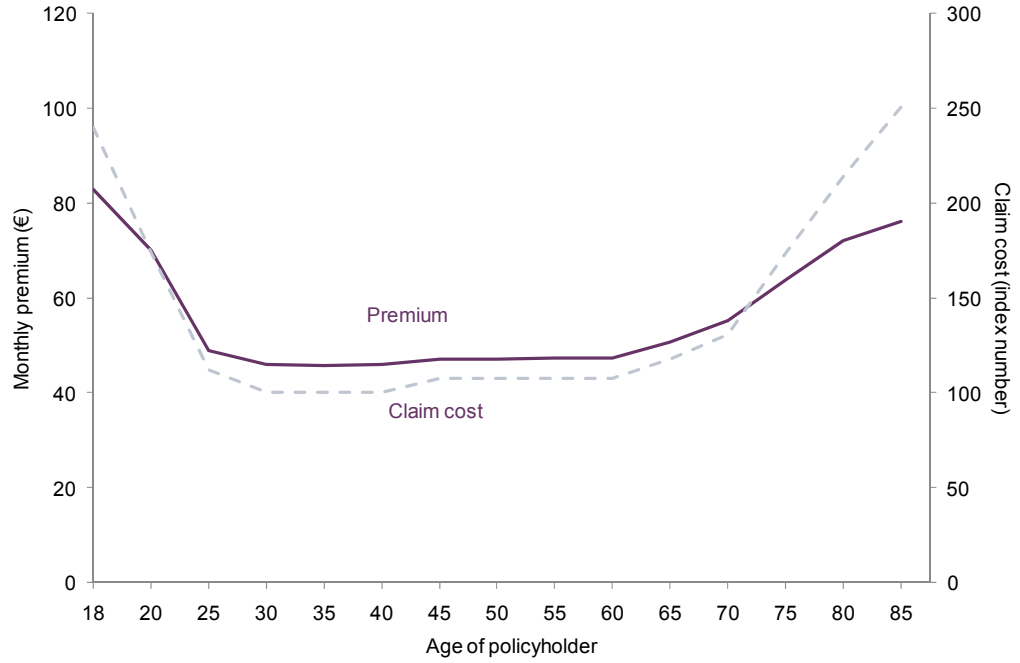
Figures 5.2 to 5.4 compare premiums for MTPL insurance for a specific driver and vehicle against average claims by age for males in Italy, Germany and the Netherlands. Claim costs of young (below 25 years of age) and older drivers (above 70 years of age) are high in comparison to those of drivers of median age (between 25 and 70 years of age). In particular, the claim costs of young drivers, aged below 25, are high compared with drivers of median age.

Figure 5.2 MTPL in Italy (males): premiums and claim costs



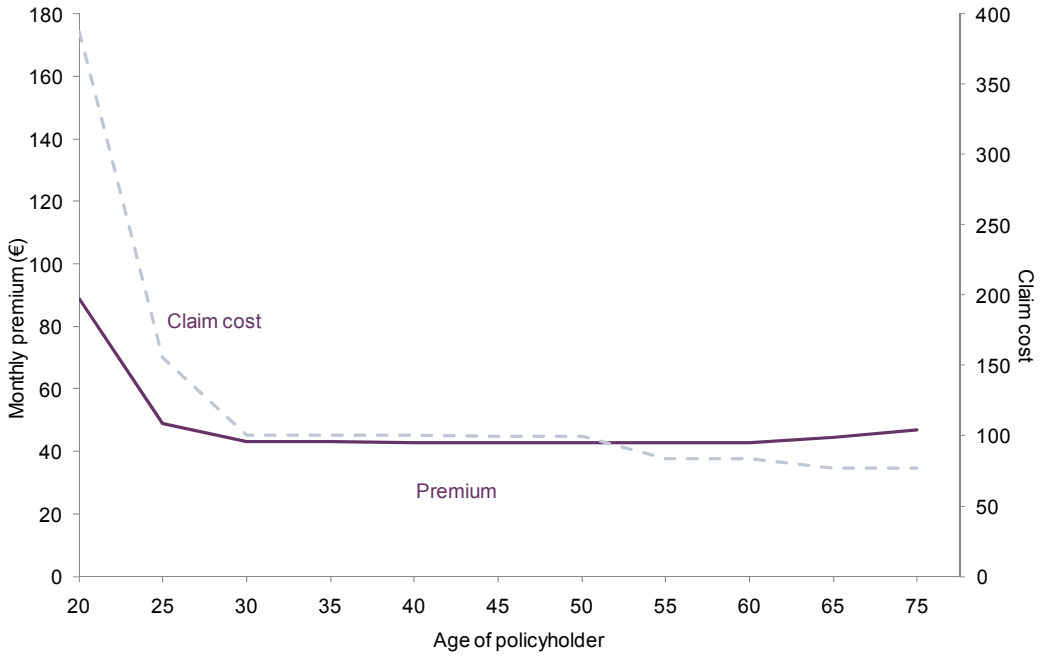
Note: Claim costs are represented by a claim index number with a value of 100 for a 40-year-old driver. The appendix contains charts presenting premiums and claim costs by age for each of the selected countries, and for both genders.
Source: Premiums obtained from htttp://www.assicurazione.it/; claim data provided by Italian national association for insurers (ANIA), as presented in 'Statistica Annuale RC Auto -Esercizio 2009 e Rilevazione "ad hoc" Dati CARD', December 20th 2010.

Figure 5.3 MTPL in Germany: premiums and claim costs



Note: Premiums have been established as averages of the premiums asked for by twelve insurance companies. Index numbers representing claim costs have been determined using claim indices. The index number has been set equal to a value of 100 for policyholders aged 40.
Source: Premiums were collected through the premium comparison website www.nafiauto.de for females and males separately keeping other relevant factors (eg, car, claim history) fixed; claim index data provided by the GDV.

Figure 5.4 MTPL in the Netherlands (males): premiums and claim costs



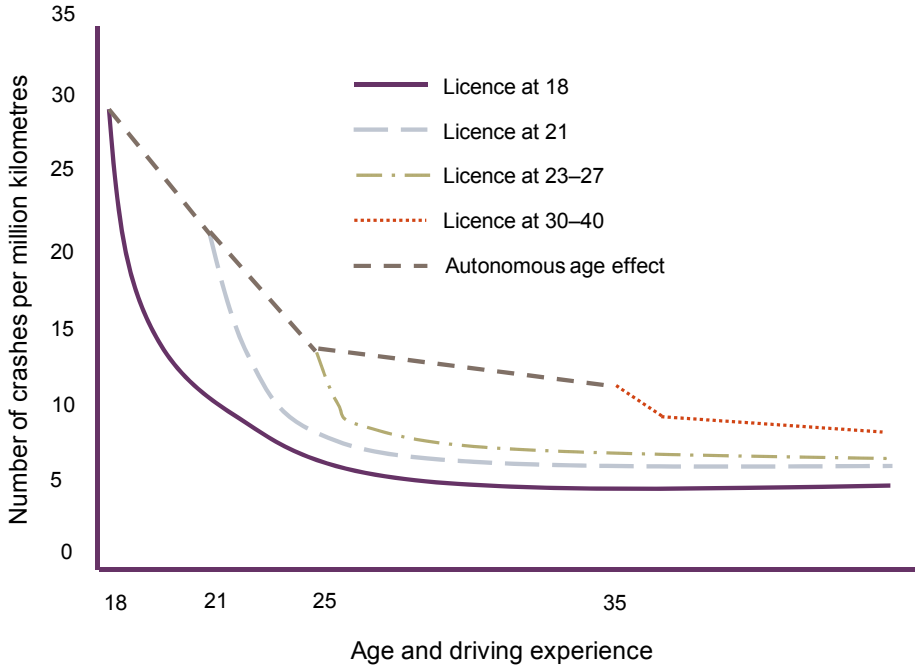
Note: Claim costs are represented by a claim cost index number with a value of 100 for a 40-year-old driver. The appendix contains charts presenting premiums and claim costs by age for each of the selected countries, and for both genders.
Source: Premiums have been obtained from www.independer.nl ; claim cost data provided by the Verbond van Verzekeraars.

There is evidence that the expected claim costs of an insured driver decreases as driving experience increases. Insurers in the selected countries regard driving experience to be an important risk factor and require policyholders to disclose the date on which they obtained their driver's licence.

Driving experience is positively correlated with age since many individuals attain their driver's licence from the regulated minimum age (commonly 18 years). The implication is that young drivers have little to no driving experience, whereas older drivers generally have considerable driving experience. This means that care needs to be taken in understanding the relevance of age as opposed to the relevance of experience in determining expected claim costs (and therefore premiums).

Disentangling the effects of age and driving experience on claim costs requires data on claim costs for differing ages, keeping driving experience fixed. Figure 5.5 illustrates the effect of driving experience and age on the crash rates of novice drivers.

Figure 5.5 Crash rates as a function of age and driving experience



Note: Lines of varying styles indicate the crash rates for drivers obtaining a driver's licence at differing ages. The broken black line can be interpreted as the autonomous age effect presenting crash rates for drivers with no driving experience.
Source: Taken from Vlakveld, W.P. (2004), 'Het effect van puntenstelsels op de verkeersveiligheid', SWOV report R2004-2.

As can be seen from Figure 5.5, the likelihood of a driver having a crash declines with age, even when driving experience is zero, as represented by the broken black line labelled 'autonomous age effect'. This illustrates that age is therefore a relevant risk factor, independent of driving experience. Driving experience is also a relevant risk factor, typically benefitting younger drivers more than older drivers, as crash rates decline more steeply with experience for the former group.

5.3 The use of disability as a risk factor in motor insurance

The granting of driving licences to people provides assurance to insurers that those people are considered fit and able to drive. Therefore, information about disabilities is not typically used by insurers in motor insurance underwriting and pricing. Information about disabilities is used by the driving licence authorities in their assessment of whether a person is fit to drive and can be granted a driving licence. This is also confirmed by statistical analysis undertaken by some insurers, which shows that there is a lack of robust statistical evidence establishing the effect of disabilities on claim costs, after the requirements for driving licences have been met.

Typically, disabled drivers with driving licences have access to insurance and pay identical premiums as drivers who are not disabled.

The treatment of disabilities can be illustrated by considering pricing in the context of the selected disabilities.

– **Blindness —** driving licences are not granted to blind people since blindness makes it impossible to drive a car safely.

– **Paraplegia —** depending on the type/severity of paraplegia, driving may be possible if cars are modified. Authorities decide whether people with paraplegia can safely drive

modified cars. Once a driver's licence has been awarded, insurers do not treat paraplegia as a risk factor.

Underwriting for disabilities is not relevant for motor insurers because of the requirements of driving licences that ensure that the person requiring insurance is fit to drive. Motor insurance therefore provides an example of how insurers do not use a risk factor if it is not relevant as a determinant of likely claim cost.

5.4 Potential impact of a ban on the use of information on age and disability in motor insurance

Age is one of the most important risk factors for motor insurance and therefore a ban on its use can be expected to have serious consequences for the private provision of motor insurance. Information regarding disability is not used by motor insurers, and therefore a ban on its use would not be expected to directly affect private provision of motor insurance.

A ban on the use of age as a risk factor would imply that insurers can no longer set premiums that depend on age. When assessing the potential consequences of a ban, a distinction can be made between the primary impact — distributional consequences when assuming that consumers do not alter behaviour — and the secondary impact — adverse consequences stemming from different behaviour.

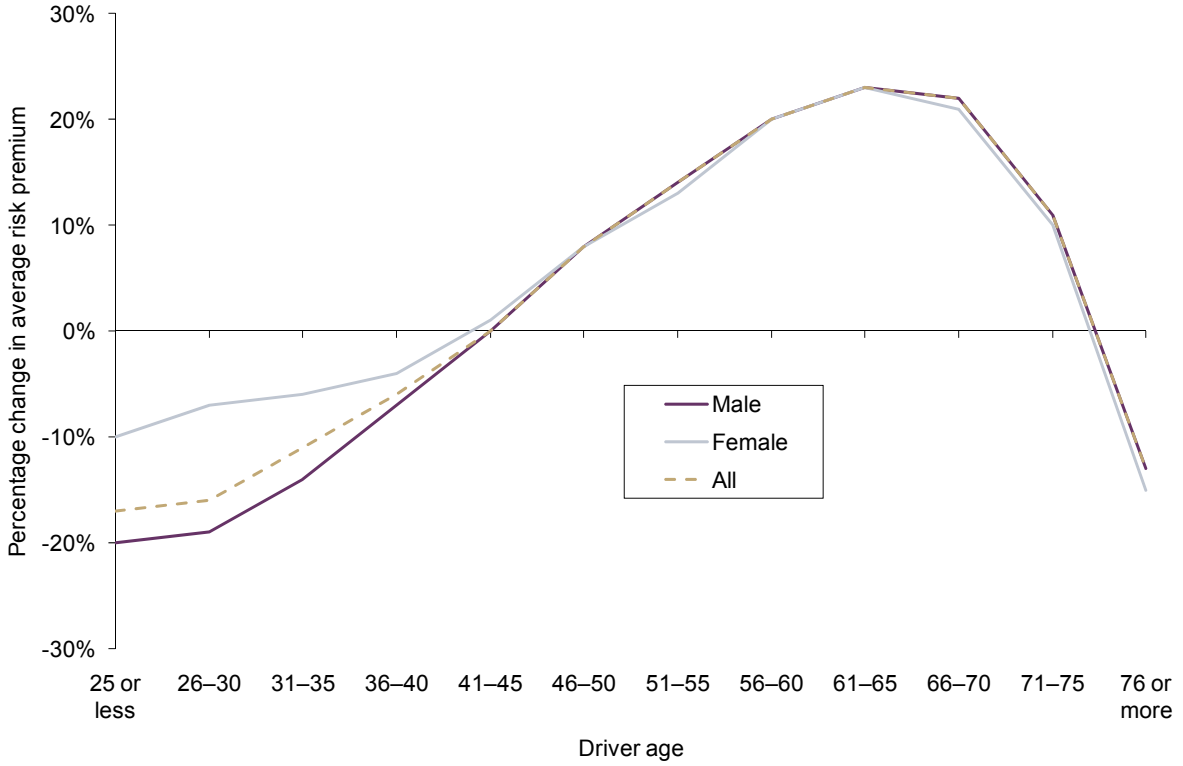
At present, young drivers pay significantly higher motor insurance premiums than older drivers (up to the age of about 70, when premiums begin to rise again), reflecting the profile of claim costs by age. The loss of the relevant risk factor of age would therefore have negative implications for economic efficiency, as the extent to which premiums reflected expected claim costs would be reduced.

The primary impact would be distributional in nature. Higher-risk drivers (younger drivers and drivers over 70 years old) would pay lower premiums and lower-risk drivers would pay higher premiums. This would mean that young drivers would likely be able to access cheaper motor insurance for more powerful, faster vehicles, which may have negative implications for road safety.

In order to better understand the distributional impact, it would be necessary to re-estimate the actuarial models to find how they would price motor insurance if age were not used. The General Insurance Reserving Oversight (GIRO) working party of the UK actuarial profession conducted analysis of this type in 2007, and the results are repeated below. The implied effect on premiums was determined by comparing the results from the models including and excluding age and the age interaction terms. Data from several major insurers was analysed for this purpose, and the results were aggregated.

Figure 5.6 shows the average percentage change in motor insurance premiums faced by different age groups resulting from the removal of the age variable from the claims models. There are clear redistributive effects between age groups, since drivers aged 41–75 would face increases in premiums of up to 24%, whereas those aged 40 or under and those aged 76 or over would see their premiums fall by up to 20%.

Figure 5.6 Percentage change in premium if age is removed from motor insurance pricing models, by age



Note: The chart illustrates what changes to motor insurance premiums might be expected if age were not used as a factor in setting premiums, keeping other factors constant.
Source: Based on data from GIRO (2007/08), Graph 1.

This evidence demonstrates that, on average, if age is not used in the risk-classification and pricing models of motor insurers, the young drivers would be cross-subsidised by the older drivers. The GIRO Working Party also notes that this analysis assumes an unchanged mix of business.

However, changes in premiums are likely to lead to changes in demand from policyholders and potential purchasers of insurance, in terms of both uptake of insurance and, potentially, consumer car selection and driving behaviour. This would be the secondary impact of a ban on age. Demand from policyholders could be subject to adverse selection: insurance should become more attractive to those individuals with higher than average risk, whereas individuals with lower than average risk should be deterred from purchasing insurance.

For MTPL, adverse selection will be limited due to its mandatory nature. For motor insurance products that include additional voluntary insurance cover, such as comprehensive motor insurance[38], the impact of adverse selection could be more significant. These selection effects can have the consequence of increasing the average risk of policyholders, and result in even more drivers with relatively low risk opting out of additional insurance.

There are examples in other countries where information on age cannot be used in determining motor insurance premiums in state-run (not private sector) insurance schemes. This is the case in some of the provinces of Canada. It would appear that the extent of adverse selection due to age-neutral pricing is limited for MTPL insurance as it is typically

[38] Comprehensive motor insurance, which provides cover for the cost of damage to the policyholders own car, is the dominant motor insurance product in some countries, such as Germany and the UK.

mandatory in nature.[39] However, academic research has found that there is no alternative to age as a classification variable within the Canadian motor insurance market,[40] and age cannot be eliminated from insurance processes without creating undesirable market disruptions and increases in moral hazard.

Box 5.1 Canadian motor insurance

The experience of different provinces of Canada provides useful information about the effect of restricting the use of age as a classification variable in motor insurance. In a number of provinces, private insurers offering motor insurance are allowed to use risk-based pricing (including age). In other provinces, motor insurance is offered through government-run schemes that use risk-neutral pricing, not classifying drivers on variables such as age, gender and marital status.

Academic research has shown that accident rates, deaths and damages are higher in provinces with public motor insurance than in provinces with private motor insurance, and that this difference is particularly marked for young drivers.[41] The explanation given by Mullins to explain this effect is that public motor insurance subsidises higher-risk drivers, thereby encouraging them to start driving and not making them aware of the risk they represent.

Further research by Mullins (2004) compared the cost of motor insurance offered by public schemes with the cost of motor insurance offered by private markets.[42] Average premiums are substantially higher in provinces in which motor insurance is offered by public schemes. This may suggest that prohibition of the use of classification factors increases average premiums by worsening adverse selection and moral hazard.

Other academics have looked at this experience and also found that prohibiting the use of age as a classification factor would result in market disruptions and undesirable increases in moral hazard.[43]

[39] More comprehensive motor insurance policies are not, however, mandatory, and therefore the impact of adverse selection would likely be more severe and may limit the development of these products in markets where they are currently less popular.
[40] Kelly, M. and Nielson, N. (2006), 'Age as a Variable in Insurance Pricing and Risk Classification', *The Geneva Papers on Risk and Insurance*, **31**:2.
[41] Mullins, M. (2003), 'Public Auto Insurance: A Mortality Warning for Motorists', *Fraser Alert*, Fraser Institute, September.
[42] Mullins, M. (2004), 'Lemons and peaches: Comparing auto insurance across Canada', *Alert*, Fraser Institute, April.
[43] Kelly, M. and Nielson, N. (2006), 'Age as a Variable in Insurance Pricing and Risk Classification', *The Geneva Papers on Risk and Insurance*, **31**:2.

6 Disability insurance

This section examines how information on age and disability are used in insurance underwriting, product design and pricing for disability insurance in the countries included in the study. The approach to risk-based pricing is considered in the context of the broader discussion in section 2.

Key findings

– Disability insurance protects the policyholders' future income against the risk that sickness, injury or disability makes them incapable of working. The product comes in many forms and varies by country.

– Age is an important risk factor for disability insurance, since the risk of becoming incapable of working as a result of a sickness, injury or disability increases with age. Disability insurance is, however, typically only relevant for working age people, as it covers risks associated with being able to work.

– Disability is not only an important indicator of risk but can also be considered a possible trigger of the insured event — the insured event materialises if the policyholder is no longer able to work, which could be the result of the insured person becoming disabled. Consequently, existing disabilities have a direct and significant impact on the risk of the insured event occurring.

– The provision of disability insurance can face more difficulties with moral hazard than other life insurance products, since consumers have more incentive to claim on their insurance policies. As a response to this, insurers often maintain a lower risk threshold for disability insurance, as the problem of moral hazard is greater for higher-risk consumers. The combined problem of moral hazard and adverse selection may result in insurers finding it difficult to offer insurance to higher-risk consumers, such as those with pre-existing disabilities (who are currently able to work).

– Risk-based pricing helps to limit the negative impact of the combined problem of moral hazard and adverse selection by identifying groups of consumers with high risks. Without risk-based pricing, the problem could affect the availability of insurance to all consumers.

6.1 Risk-based pricing for disability insurance

Disability insurance protects the policyholder's future income against the risk that sickness, injury or disability prevents them from being able to work. It comes in many forms, with variation in the type of work that is covered, the terms and conditions for the insured event and the types of payment. Disability insurance typically covers a broader range of insured events than personal accident insurance and critical illness insurance, for example. Table 6.1 summarises the characteristics of disability insurance products.

Table 6.1 Characteristics of disability insurance products

Characteristic	Examples
Period of cover	Short-term policies with premium review every year
	Long-term policies with premiums fixed throughout the multi-year contract
Type of consumer	Employer-purchased group schemes
	Individually purchased policies (often by the self-employed)
Type of employment	All types of employment
	Broad categories of employment (eg, manual labour)
	Specific professions (eg, musician)
	Other circumstances, outside regular employment
Determination of incapacity from work	Determined by insurer's medical officer
	Determined by public medical officer or doctor
Deferred period	Amount of time after being incapable of working that payments begin
Payment type	Monthly replacement of income
	Provision of mortgage payments or payments for other liabilities
	Lump-sum payment
	Waiver of premiums of other attached life insurance products

Source: Oxera, 2012.

Disability insurance is found in all six countries included in this study, but both the nature and the popularity of products vary. For example:

– in the Netherlands, employees are covered by a combination of social and corporate group schemes. Risk-based pricing is used for self-employed coverage, which is typically defined by profession and normally delivers monthly payments to those incapable of working for a predefined period of time;

– in France, disability insurance is often provided through company group schemes and is often linked to death benefits (term life insurance) or credit facilities (to provide a form of payment protection). The market for independent individually assessed policies (primarily for self-employed people) is rather limited compared with some of the other countries examined for this study;

– in the Czech Republic, disability insurance works alongside the social insurance system, with the state and employer typically paying wages for the first year of disability and then a public medical officer determining the need for disability insurance payouts thereafter. Payments can be in the form of a lump sum, monthly payments, or the waiver of premiums for other related insurance. Disability insurance is typically related to profession and it is common to exclude existing disabilities from cover, but still to provide cover if the disability does not prohibit the person from working in their profession;

– in Germany, disability insurance provides benefits in the form of an annuity that stops if the claimant dies or returns to work. Insurance products vary according to the degree of inability to work (eg, length of time that the individual is incapable of working), the profession occupied and some optional features for which the choice is left to the policyholder;

– in the UK, disability insurance is most typically purchased in the form of income protection insurance;

– in Italy, disability insurance is often provided through group schemes, although individual insurance is purchased by self-employed people as in other countries.

The risk that the insurer is trying to assess in this case is commonly referred to as morbidity risk, although strictly speaking it is the risk of not being capable of working as a result of a sickness, injury or disability. The claim costs incurred by insurers depend primarily on the probability that policyholders become incapable of working, eg, owing to disability. Once this happens, insurers make contracted payments to policyholders for as long as they remain incapable of working during the period referred to in the policy (typically until retirement age).

The risk factors commonly used for disability insurance are similar to those for term life insurance, and include age, past and current medical conditions, disabilities and lifestyle factors. In addition, disability insurance often also takes account of type of employment. Certain types of employment may result in a higher probability of being incapable of working, because such work may put a strain on the employee's health, and require the employee to be physically fit and able. For example, a back problem may lead to inability to work for a person employed in the construction industry, but not for a person doing office work.

The provision of disability insurance can be affected by moral hazard, since the insured event (receiving a pay-out due to being incapable of working) is more appealing to policyholders and since it is easier to meet the criteria for claiming than it is for the insured event for term life insurance (death). This is particularly the case for disability insurance products that provide payments for temporary disability (rather than a lump sum in the case of permanent disability), which typically have lower thresholds for payment, and start paying monthly payments only a few months after persons have become incapable of working.

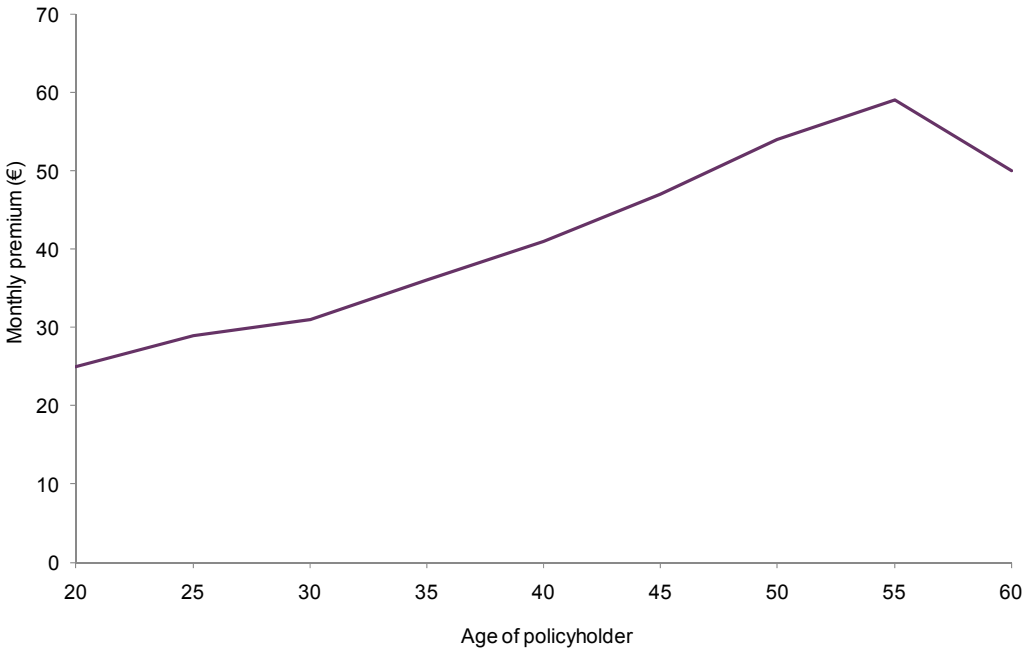
The consequence of this increased risk of moral hazard is that insurers tend to have a lower risk threshold than they do with term life insurance. Consumers with disabilities that make working difficult for them could be considered to be meeting some of the criteria for the insured event already. Combined with the threat of moral hazard, this has resulted in insurers being less able to accept risk factors than they are with term life insurance, although there is variation between countries. This issue is discussed further in section 6.3 below.

6.2 The use of age as a risk factor in disability insurance

As with the other products included in this study, age is an important risk factor for disability insurance. The risk of an event that results in the policyholder being incapable of working increases with age. Once a policyholder has been recognised as being incapable of working, the costs incurred by insurers depend on the periodic amount contracted between insurers and the policyholder. Furthermore, the time that a policyholder remains incapable of working owing to an illness, injury or disability also tends to increase with age, raising the cost to the insurer given the insured event. On the other hand, the time that a policyholder remains incapable of working is bounded by the contracted age (commonly the retirement age), until which insurers are obliged to pay out to disabled policyholders. This implies that the length of time over which a policyholder is likely to receive periodic payouts from a disability insurance product decreases as they approach their contracted age.

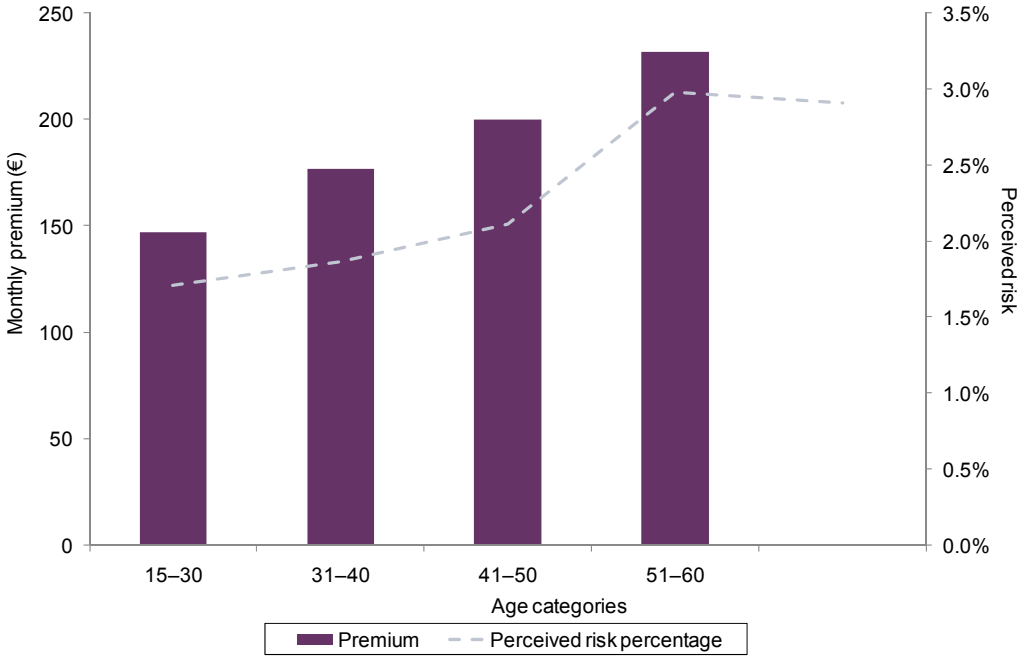
Data on premiums and claim costs for disability insurance reflect the fact that age is an important risk factor. Figure 6.1 presents data collected from internet-based insurance quotes for Germany, which shows that disability insurance premiums increase up to a maximum for males aged 55, then decline as the period to retirement age (65) is limited. Disability insurance is typically only offered to people of working age, as it is an insurance relating to the capability of working. Figure 6.2 compares premium data with the probability of being incapable of working for people in the Netherlands, revealing a close correlation.

Figure 6.1 Disability insurance in Germany (males): premiums by age of conclusion of the contract



Note: This type of disability insurance pays out monthly amounts of €750 in the event of the policyholder becoming incapable of working owing to disability or illness, until they return to work or reach the age of 65. The fall in premiums from age 60 is likely to be linked to the insurance payment cut-off age of 65. As policyholders approach this cut-off point, the maximum amount of time they could be claiming benefits declines (thereby reducing the expected level of claims).
In addition, the demand for disability insurance decreases as persons reach the age of 65, since these persons have already retired or are willing to bear the risk of not being able to work themselves. This lack of demand explains why few insurers offer disability insurance to 60-year olds and even fewer insurers to 65-year olds.
Source: Average monthly premiums calculated using premium data collected by the GDV in July 2012.

Figure 6.2 Disability insurance in the Netherlands: premiums and risk of claiming



Note: The disability insurance considered covers disability arising from being incapable of working in one's current profession, for a gross income of €40,000 and a minimum disability percentage of 25%.
Source: Risk percentages, calculated by dividing the payment within a fiscal year by the insured amount of money of that year, were provided by the Verbond van Verzekeraars, 2012; premium data collected through http://www.datishetverschil.nl/, 2012.

6.3 The use of disability as a risk factor in disability insurance

In the case of disability insurance, disability is not only an important indicator of risk but can also be considered to be a potential trigger of the insured event. The insured event materialises if the policyholder is no longer able to work, which could be the result of being/becoming disabled. This means that existing disabilities have a direct and significant impact on the risk of the insured event. Consequently, in the case of voluntary individual policies, it is sometimes the case that the availability of mainstream disability insurance products can be restricted for consumers with significant disabilities that can affect the individual's future ability to work. While exceptions are made and each consumer is treated on a case-by-case basis, particularly with regard to niche providers, insurance cover for those with significant disabilities may be provided only with exceptions or on limited terms, or perhaps cover would be postponed or simply declined.

In the case of an example consumer with disabilities that limit mobility, the following possible approaches by insurers were noted from the discussions conducted for the purposes of this study:

– Some companies would provide disability insurance to a person with paraplegia as long as the profession covered is compatible with their resultant degree of mobility (eg, office work) and the insurance policy excludes conditions that result from their paraplegia. This approach would be more typical for less severe disabilities, such as amputation or (with reference to Table 3.1 above) disabilities classified as 'incomplete paraplegia'.[44] Inability

[44] The clinical term 'incomplete' when applied to spinal cord injury indicates that the patient has some sensory or motor function below the lesion level. In terms of the American Spinal Injury Association (ASIA) Neurological Classification of Spinal Cord Injury, as used in Table 3.1, the term indicates a person with preservation motor or sensory function in the last sacral segment (S4-5), referred to as grade B.

to work due to the excluded disability would not be covered by the insurance policy, in this example.

– Some companies would refer the consumer to a niche provider of insurance products as they would feel unable to insure the policyholder given the increased level of risk.

– Some companies would postpone offering insurance cover until the ability of a person to work in their profession had been proven.

– Some companies may provide only limited cover, for instance providing waiver of insurance premiums for other insurance products purchased from the same provider (such as life insurance), rather than protection of income.

– Some insurers would simply decline to offer cover as the level of risk would be above their threshold for risk acceptance. Declining to offer cover would be more likely for more severe restrictions on mobility, as would be the case with 'complete paraplegia'.[45]

A similar range of outcomes is likely for a consumer with blindness, again dependent on the severity of the disability and the extent to which it has impacted on the ability to work in the past.

Typically, insurance companies are less able to offer disability insurance to high-risk individuals on the basis of increased premiums as they are for term life insurance. This is because of the problem of moral hazard: in some cases, consumers who are already facing problems with working might try to portray themselves as being in a position to claim the insurance. Raising premiums may not be seen to be a useful response to this greater risk of claiming as it could exacerbate the problem through further adverse selection, eg, discouraging lower-risk consumers from purchasing insurance. This problem can result in insurance companies being less able to offer disability insurance to high-risk individuals (eg, consumers with disabilities) than they are for term life insurance (eg, consumers with disabilities that affect life expectancy), for instance.

6.4 Potential impact of a ban on the use of information on age and disability in disability insurance

Age and disability are both highly relevant factors for assessing risk for disability insurance, and therefore a ban on their use would have serious consequences for the private provision of disability insurance. Without the use of these risk factors, adverse selection could put the viability of this product at risk.

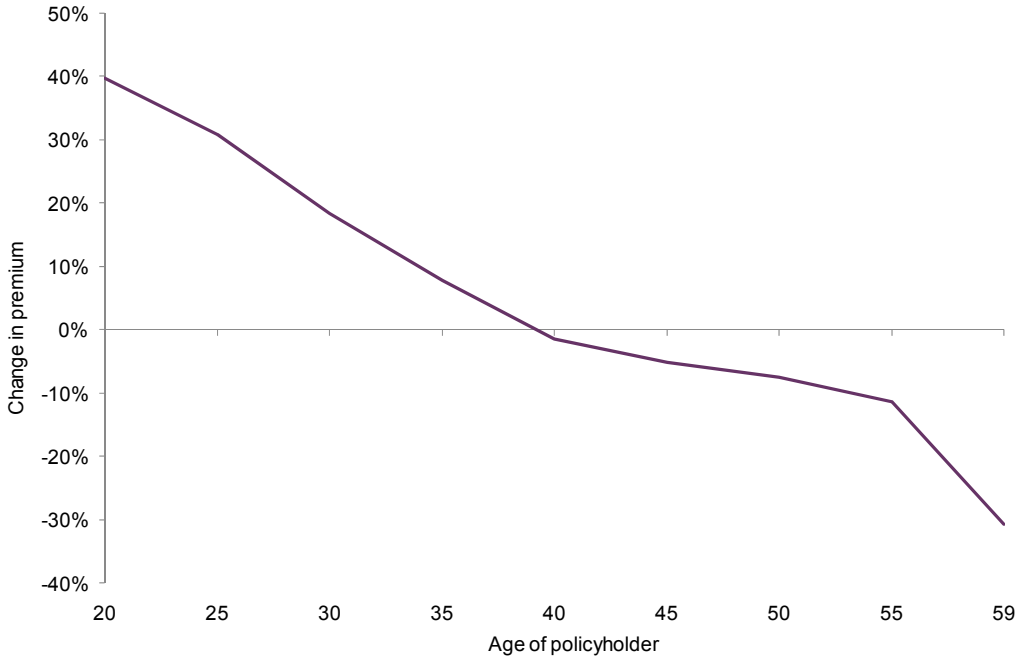
As noted above, the combination of adverse selection and moral hazard can already be seen to limit the availability of disability insurance to people with disabilities, as increasing premiums can be an ineffective way of addressing greater risk (due to moral hazard and the problem of adverse selection). Higher premiums will tend to discourage lower-risk consumers from purchasing insurance, thereby increasing the average risk profile of the portfolio (adverse selection). Risk-based pricing helps to limit the negative impact of this combined problem by identifying high-risk groups of consumers. Without risk-based pricing the problem could affect the availability of insurance to all consumers.

The first-order effects of a ban on age can be simulated by establishing the percentage changes in premium experienced by policyholders if they pay the average instead of the actual premium.

[45] Complete paraplegia is the counterparty to incomplete paraplegia, described in footnote 44. The ASIA classification, in Table 3.1, refers to grade A.

Policyholders below the age of 40 would have to pay premiums up to 40% higher than they currently do, whereas older policyholders would experience a reduction in their premium of more than 30%.

Figure 6.3 Change in risk premium by age if a ban were imposed on the use of age as a risk factor



Note: The figure illustrates what could happen to disability insurance premiums if age were not used as a factor in setting premiums, keeping other factors constant.

Source: Oxera analysis, 2012. Average risk premiums for differing ages were established using premium data collected through www.datishetverschil.nl, 2012. The distribution of population over age is corrected using demographic data from www.cbs.nl, 2012.

The increase in premium for young policyholders would instigate a process of adverse selection. Younger (and therefore lower risk) policyholders would be deterred from purchasing disability insurance if they were to pay premiums covering average risk instead of the lower risk they represent. Without lower-risk consumers, the average risk profile of the portfolio would increase, which is the problem of adverse selection. Premiums would need to rise further due to increased average claims, further exacerbating the problem.

7 Long-term care insurance

This section examines how information on age and disability is used in insurance underwriting, product design and pricing for long-term care insurance in the selected countries.

Key findings

– Long-term care insurance typically provides a pre-agreed annuity-style payment in the event that policyholders require long-term care. The product is widespread in France and Germany, and can be expected to grow substantially in the other selected countries.[46]

– Age is an important risk factor for long-term care insurance, since the insured event — policyholders requiring long-term care — increases sharply with age.

– Disability can indicate the risk of the insured event and be of use in determining whether the insured event has occurred.

– If insurers are unable to set premiums using risk factors based on age and disability, private insurance companies may face difficulties in offering long-term care insurance, due to the problem of adverse selection. This could limit the options available to both consumers and governments for paying for care, at a time when there are increasing demands for long-term care provision.

7.1 Risk-based pricing for long-term care insurance

Long-term care insurance, where it is available in the countries included in this study, typically protects policyholders against the expenses needed to cover long-term care. This takes the form of the insurance providing monthly income in the event that the need for long-term care is triggered.[47] Once the person receives long-term care, the cost to the insurer will depend on the size of monthly payments[48] and how long the person remains in care, which is often determined by their longevity. The risk faced by the insurer is primarily determined by the probability of the policyholder needing long-term care, which typically rises rapidly in older age. This study considers voluntary private long-term care insurance.[49]

Although long-term care insurance is perhaps the least common of the six products considered in this study, it may well experience significant growth in the near future. Demand for long-term care is expected to increase significantly over the next few decades due to a combination of an ageing population and higher incidence of disability and dependency for

[46] The European Commission and national authorities recognise that long-term care expenditures will increase substantially in the near and distant future in order to meet the growing demand from an ageing and more dependant population. The extent to which private long-term care insurance will develop in light of this depends on the choices of national authorities about the public provision of long-term care.

[47] Typically, persons are deemed to require long-term care (and therefore payment is triggered) if they meet a number of criteria in relation to their inability to look after themselves. Criteria can include the ability to feed oneself, wash oneself and respond to danger.

[48] The monthly payment triggered will typically be a pre-agreed amount, rather than a promise to cover the cost of care. The latter kind of expenses cover is available in other countries, such as the USA and Japan.

[49] Germany offers an example of compulsory long-term care insurance. Individuals opting out of social health insurance are obliged to purchase long-term care insurance in addition to their health insurance. This market provides coverage to 11% of the German population and is highly regulated.

persons of older age.[50] Long-term care insurance is currently more developed in France and Germany than in the other selected countries:

– France is one of the leading markets in terms of the share of its population covered by private long-term care insurance, with the equivalent of 15% of the population aged over 40 years having private long-term care insurance coverage in 2010, and the main consumer base being aged 55–66.[51] Consumers typically pay a fixed premium determined at the point of enrolment, which accrues to a personal reserve that is depreciated according to the expected claim costs for a person of that age.[52] The policy pays out if the policyholder meets the requirements for long-term care, triggering annuity-style payment of a pre-agreed amount. Policyholders can use the amounts paid to cover the expenses of the long-term care required.

– Voluntary long-term care insurance in Germany covers eligible expenses on long-term care that are not reimbursed by compulsory long-term care insurance. Providers of long-term care insurance are subject to the obligation to maintain an ageing reserve. Ageing reserves allow insurers to offer relatively stable lifetime premiums to consumers which do not increase due to the increasing age of the consumer (in fact, premiums will not increase above a certain limit[53]).

The product either does not exist at this stage or is not widely purchased in the other selected countries:

– the Czech Republic, where legislation requires that long-term care insurance is provided as part of a social insurance scheme that does not use risk-based pricing. There are expectations that private provision will develop in the future following changes to legislation;

– the Netherlands, where social insurance provision replaces private provision, although again there are expectations of demand for private insurance in the future, as the government looks for alternative sources of funding and consumers demand more choice in their long-term care options;

– the UK, where the product is not widely taken up so far, in part because of the uncertainty of what the government currently funds in terms of the cost of long-term care. Due to issues about the sustainability and suitability of this system (both politically[54] and financially), an independent Commission[55] recently recommended an overhaul of the system, which would see both the individual and the government contributing to an individual's care costs;

– Italy, where the product is new. There are few contracts at present, but it is expected to grow in popularity owing to new legislation that provides fiscal incentives for health funds to provide coverage for long-term care costs, and to long-term care insurance having been included in collective agreements for employees working in the financial sector.

[50] DG Employment, Social Affairs and Equal Opportunities (2008), 'Long-term care in the European Union'.

[51] Source: OECD (2011), 'Help Wanted? Providing and Paying for Long-Term Care', Paris: http://www.oecd.org/dataoecd/11/62/47902097.pdf. Data sourced by OECD from the FFSA. In France, the state provides means-tested benefits for long-term care, which quickly taper off for higher-income people, creating incentives for long-term care insurance.

[52] This system means that if a younger person (with a low risk of claiming the insurance) pays in at the lifelong rate for ten years and then stops paying for the insurance for example, they will continue to be covered by the insurance policy for a number of years afterwards until their personal reserve is exhausted. Effectively, they do pay out of their reserve according to their age, which is risk-based pricing. This approach allows premiums paid to be fixed over the lifetime of the policyholder whilst still maintaining risk-based pricing and hence avoiding the problems of adverse selection.

[53] Riedel, H. (2001), 'Private Compulsory Long-Term Care Insurance in Germany', *The Geneva Papers on Risk and Insurance* (2003), **28**, pp. 275–93.

[54] The system is politically unpopular as it is seen to penalise people who saved for their old age.

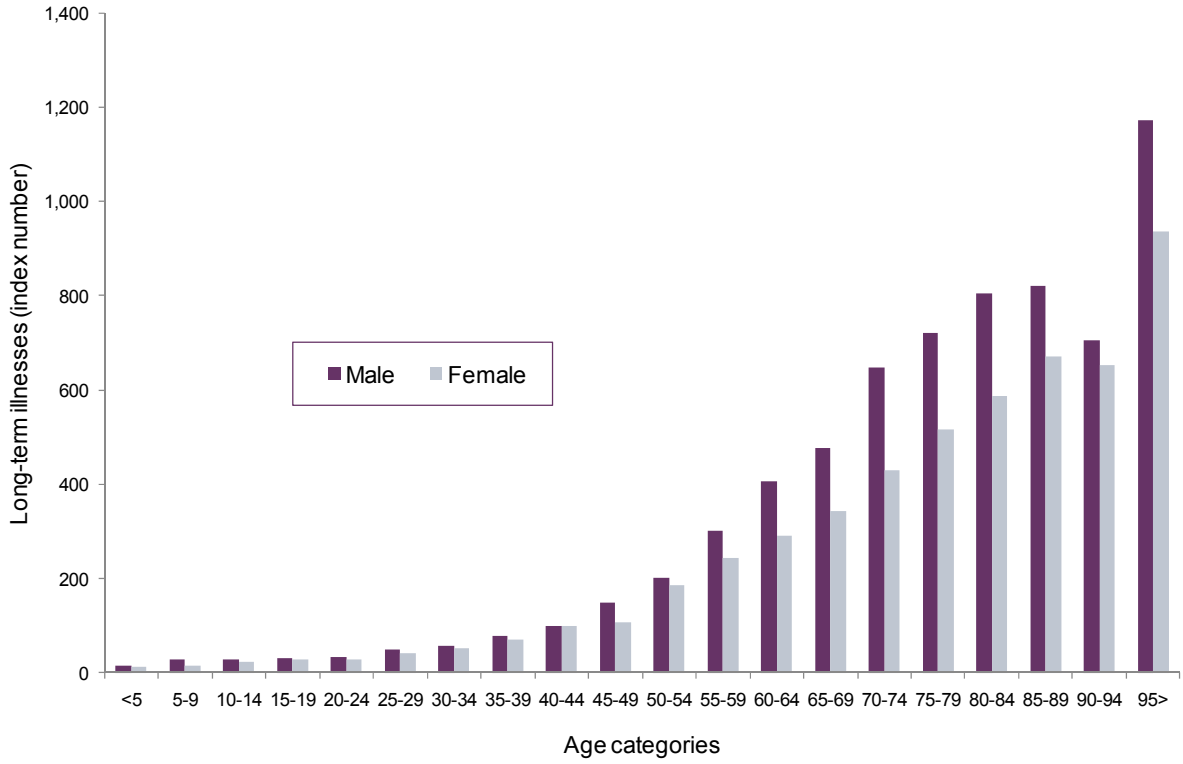
[55] The Commission on Funding of Care and Support (the Dilnot Commission), 4 July 2011

7.2 The use of age as a risk factor in long-term care insurance

Age is an important risk factor for long-term care insurance, since the likelihood of a person needing long-term care increases with age, especially from the age of about 70 years. This strong relationship with age is partially offset by the tendency for the cost of providing the annuity-style payments to decrease with age in the event of an insured event occurring (this is due to longevity decreasing with age).[56] A strong relationship between claim costs and age remains, and therefore one would expect that premiums increase with age.

Figure 7.1 presents index numbers indicating the prevalence of long-term illnesses across age categories in France, where long-term illnesses ('maladies de longue durée') are defined as diseases requiring prolonged treatment and particularly expensive therapy.[57] The prevalence increases with age. This illustrates that age is a risk factor of long-term illnesses, which, in turn, is one of the key drivers of demand for long-term care.

Figure 7.1 Long-term illnesses in France by age categories



Note: The increasing trend in long-term illnesses by age shows the underlying reason why the likelihood of requiring long-term care increases with age. Data on the number of long-term illnesses by age categories has been converted into index numbers indicating proportion of long-term illnesses. These index numbers allow comparison of long-term illnesses by age category. The index number has been set to 100 for 40 year old males.
Source: data on the prevalence of long-term illnesses collected through the IRDES website, http://www.irdes.fr/EspaceEnseignement/ChiffresGraphiques/Cadrage/ALD/PrevalenceALD, demographic data collected through Eurostat website, 2012.

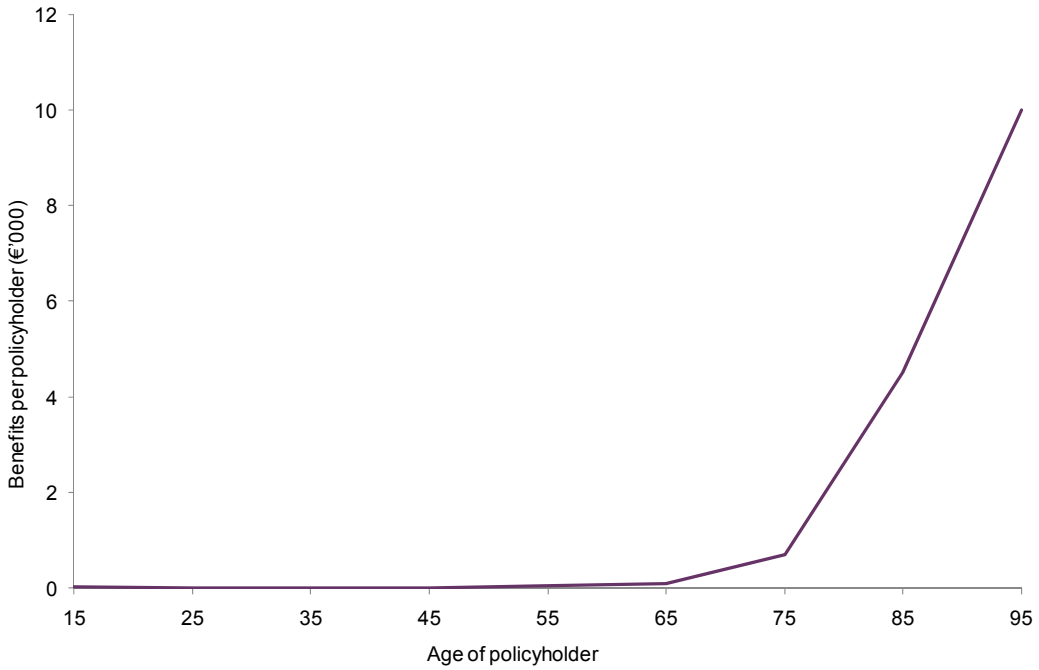
[56] As noted in section 4, the cost of a pension annuity typically decreases with age, as life expectancy decreases with age, and hence the present value of a future stream of payments until death will decrease with age. With long-term care insurance, if a person enters into long-term care on a permanent basis, the future cost to the insurer is like an annuity and will depend on life expectancy at that point in time. This life expectancy at the time of entering long-term care is considered by insurers to decrease with age (like a pension annuity). Hence, the expected cost once the insured event has occurred decreases with age, even though the probability of the insured event (needing long-term care) increases with age.

[57] This definition is translated from Article L.322-3 of the French Social Security Code. It should be noted that there is no common definition of long-term illnesses. Differing definitions are used in the selected countries.

Long-term illnesses are not the only driver of long-term care. Other drivers[58] are injuries (with long-term impairments as a result) and, particularly relevant, impairments caused by increasing age.

Figure 7.2 shows the sums that are paid out in benefits per female policyholder on long-term care insurance in Germany for varying ages. Benefits per policyholder provide a proxy of the costs per policyholder incurred by insurers, since these are expenditures that need to be covered. It can be observed that benefits per policyholder increase significantly with age: the benefit of a policyholder aged 77 is approximately 100 times that of a policyholder aged 25. This magnitude confirms the importance of age as a risk factor in long-term care.

Figure 7.2 Long-term care insurance in Germany (females): benefits per policyholder by age



Note: Benefits concern the average benefits paid by insurance companies to female policyholders of differing ages in 2001.
Source: Adapted from Figure 4 of Riedel, H. (2003), 'Private Compulsory Long-Term Care Insurance in Germany', *The Geneva Papers on Risk and Insurance*, **28**:2, pp. 275–93.

As noted above, in both France and Germany, long-term care insurance products typically involve fixed life-long premiums, determined at the point of enrolment. Fixed life-long premiums could create an adverse selection problem if they deter younger persons from purchasing insurance owing to their current risk of claiming being low.[59] In France, the problem of adverse selection is dealt with by a system that sees policyholders building up ageing reserves, which means that insurance cover continues until exhausted.[60] This system means that younger consumers can expect to receive insurance benefits that are commensurate with their payments, even though they are fixed over time (and therefore younger consumers are not discouraged from purchasing insurance).

[58] Shorter-term illnesses may trigger the threshold for long-term care in some, but not all of the selected countries.

[59] With fixed life-long premiums, a young person will typically pay an annual premium that is much higher than their expected claim cost for the following year, as they are highly unlikely to require long-term care in the following year. If the young person is placing a greater weight on immediate benefits than distant future benefits, as behavioural studies suggest is often the case, they may be deterred from an insurance product of this form. However, as explained in the text, there are ways to address this behavioural issue.

[60] The maintenance of ageing reserves even if the consumer no longer pays for the insurance product further supports the expectation of the consumer that they will ultimately benefit from the payment of premiums that are higher than their current expected claim costs, and therefore further reduces the threat of adverse selection.

Age is a vital component of the ageing reserves system, as it determines premiums at the outset of the insurance policy. Age is a highly relevant risk factor for long-term care insurance.

7.3 The use of disability as a risk factor in long-term care insurance

As with disability insurance, disability can be considered to be both part of the insured event for long-term care insurance, and a potential trigger of the risk of the insured event. The criteria for being judged to require long-term care and therefore being able to claim on the insurance policy may have already been partially met by the presence of disabilities.

Consequently, one would expect that access may be limited, cover may be restricted or premiums may be higher for consumers with significant disabilities. Naturally, the response to significant disabilities will depend on the specifics of the product of long-term care insurance offered. For example, persons with serious disabilities may want to purchase immediate care annuities.[61]

In France, where private long-term care insurance cover is typically not connected to a mandatory private medical insurance (PMI) product (as it often is in Germany), medical underwriting is an important determinant of the insurance premiums and product design. With the fixed life-long premiums (for building up an ageing reserve), it is often the case that consumers purchase the insurance product before developing any disabilities later in life. The products are primarily designed to insure the policyholder against future possible events rather than pre-existing conditions (in contrast to immediate care annuity products) and therefore the products are not typically designed for consumers with significant disabilities.

7.4 Potential impact of a ban on the use of information on age and disability in long-term care insurance

Social care is a major issue for the near future, with governments and stakeholders looking at ways to fund the needs of an increasingly ageing society. Insurers have a role in this and, moreover, this role can be expected to increase in time to meet growing demand. The restriction of the use of disability would have a negative impact on existing long-term care insurance markets, and impede the development of new long-term care insurance markets, potentially leaving fewer options for consumers and governments looking for ways to fund care.

The strong relationship between age and the likelihood of needing long-term care suggests that age is a critically important risk factor for private insurers and that, without age-based pricing, private long-term care insurance products would be unlikely to continue to be offered.

The importance of age as a risk factor is apparent in the two countries where long-term care insurance is already a well-developed product:

– In France, premiums are stable from the point of enrolment, but they continue to be based on age at enrolment, and the system of building up a reserve of premiums exists to ensure that low-risk (ie, young) consumers are not penalised and therefore adverse selection is avoided. The use of age as a risk factor remains paramount in the French system for long-term care insurance.

– In Germany, premiums depend on the obligation of building ageing reserves, which produces relatively stable lifetime premiums for consumers that do not rise due to ageing after the start of the insurance policy. The use of age as a risk factor remains

[61] An immediate care annuity is like a pension annuity, purchased with a lump sum payment and then providing a pre-agreed regular payment, except that an immediate care annuity is designed to provide payment for long-term care rather than an income for retirement.

pivotal to private voluntary long-term care insurance in Germany. Building ageing reserves would not be possible in its current form without age differentiation at the beginning of the policy.

In the other selected countries where long-term care insurance is a relatively undeveloped product, it would seem likely that the development of long-term care insurance would be seriously hindered, if not made impossible, in the event of a ban on the use of age or disability as risk factors. If insurance companies are unable to price according to risk, severe adverse selection is likely to arise. Potential low-risk consumers would be deterred from purchasing long-term care insurance, since the high premiums would not reflect their relatively low risk. In contrast, older (high-risk) consumers would find it more attractive to purchase long-term care insurance, since the premium would be low in relation to the high risk they represent. Ultimately, this process could result in long-term care insurance products being unavailable, as only those consumers that expected to require long-term care in the near future would wish to purchase the product.

8 Private medical insurance

This section examines the extent to which age and disability are used as risk factors in insurance underwriting, product design and pricing for private medical insurance (PMI) in the selected countries.

Key findings

– Since PMI is designed to work alongside state healthcare insurance systems it varies greatly between the selected countries. The use of age and disability as risk factors is, however, widespread for PMI.

– The use of age and disability as risk factors for risk-based pricing is paramount for PMI offered to individuals. In the absence of risk-based pricing, the problem of adverse selection would occur, with low-risk consumers being deterred from purchasing PMI due to high premiums, resulting in a higher proportion of high-risk consumers and hence increasing premiums.

– Both age and disability are strongly related to the likelihood of the policyholder requiring medical treatment, and therefore are relevant risk factors for PMI. Restrictions on the use of age and disability as risk factors would put the viability of the provision of some PMI products at risk.

8.1 Risk-based pricing for private medical insurance

PMI reimburses the beneficiary with all or some of the expenses of applicable private medical treatment. In Europe, the public sector typically has a significant role in the provision of medical services, although this varies by country, and therefore PMI fulfils different roles in different countries. PMI is typically subject to a high degree of regulation, and the freedom of private insurers to use risk factors to determine premiums and terms and conditions is restricted.

There are many types of PMI product available, which give consumers a choice of how to fund their healthcare and help to enable them to have access to a broad range of medical services. In most cases[62], insurers use risk factors to determine premiums, coverage and other terms and conditions for individual PMI contracts.[63] The risk factors used vary across countries, but in most cases include age and measures of health status. Information about disabilities may also be used. Other information, sometimes used in underwriting and pricing and product design of PMI, can include profession and lifestyle factors (eg, smoking).

Age and disability are important risk factors for many individual PMI products, as discussed further below. Disabilities can be an important determinant of the likely requirement for medical treatment, and it is not uncommon for PMI to restrict coverage in this respect.

[62] There are examples where risk-based pricing is not used, due to regulation. In the Netherlands, private insurers provide services that replace social health insurance but work within a system similar to the pay-as-you-go social health system and are required to charge uniform rates. Additional services (with a greater degree of consumer choice) in the Netherlands do use risk-based pricing, however. Some simple supplementary insurance products provide only a limited amount of medical treatment, such as a fixed number of visits to a dentist or physiotherapist. As there is limited risk for the insurer, these products sometimes do not involve risk-based pricing.

[63] Group PMI schemes are common in a number of countries, often provided to employees of a company. In this case, individual risk-based pricing may be replaced by estimates of claims for the group scheme based on past experience.

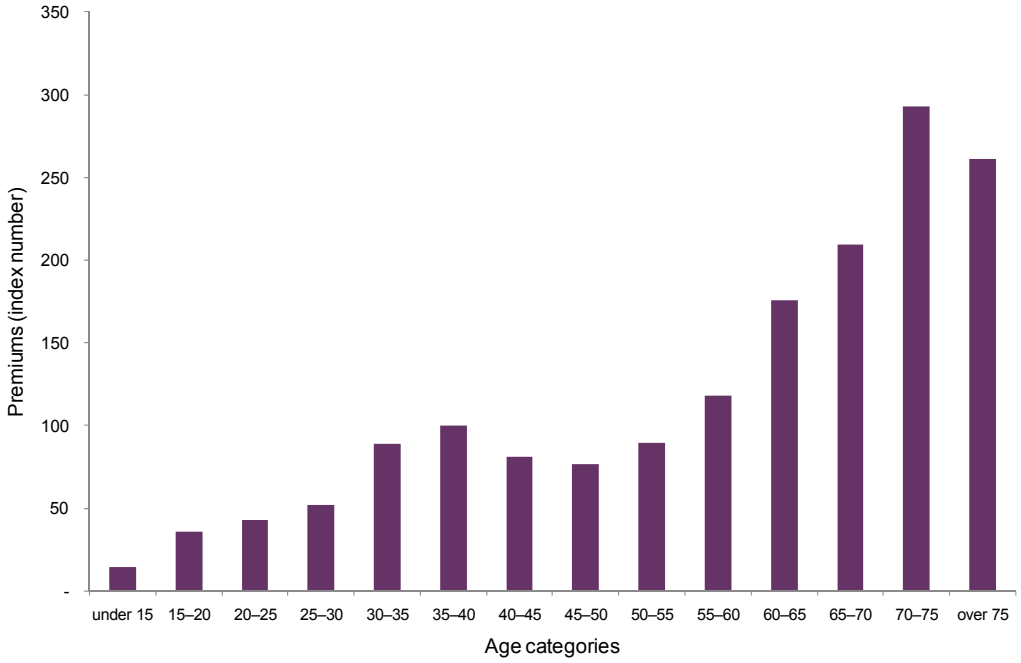
Adverse selection is a very important issue for providers of individual PMI as there is a potentially very large range in the extent to which different consumers use private medical services.

8.2 The use of age as a risk factor in private medical insurance

Age is a fundamental risk factor for PMI as the overall risk of the policyholder requiring medical treatment increases with age. The relationship between age and the risk of treatment being required can vary considerably, but the overall sum creates a generally increasing relationship with age.

Figure 8.1 presents data for PMI premiums in Italy, which does show some variation in this relationship owing to the greater use of private medical services by women in their thirties (which may be linked to childbirth and child rearing) and a decline in the use of services by those over 75. In Italy, premiums to be paid by individuals aged 60 are approximately five times higher than those of individuals aged 20, while the premiums of individuals aged 70 are approximately eight times higher than those of individuals aged 20. These factors provide testimony to the relevance of age as a risk factor, suggesting that young individuals would experience a large increase in premiums if insurers no longer varied premiums by age.

Figure 8.1 Private medical insurance in Italy: premiums by age categories

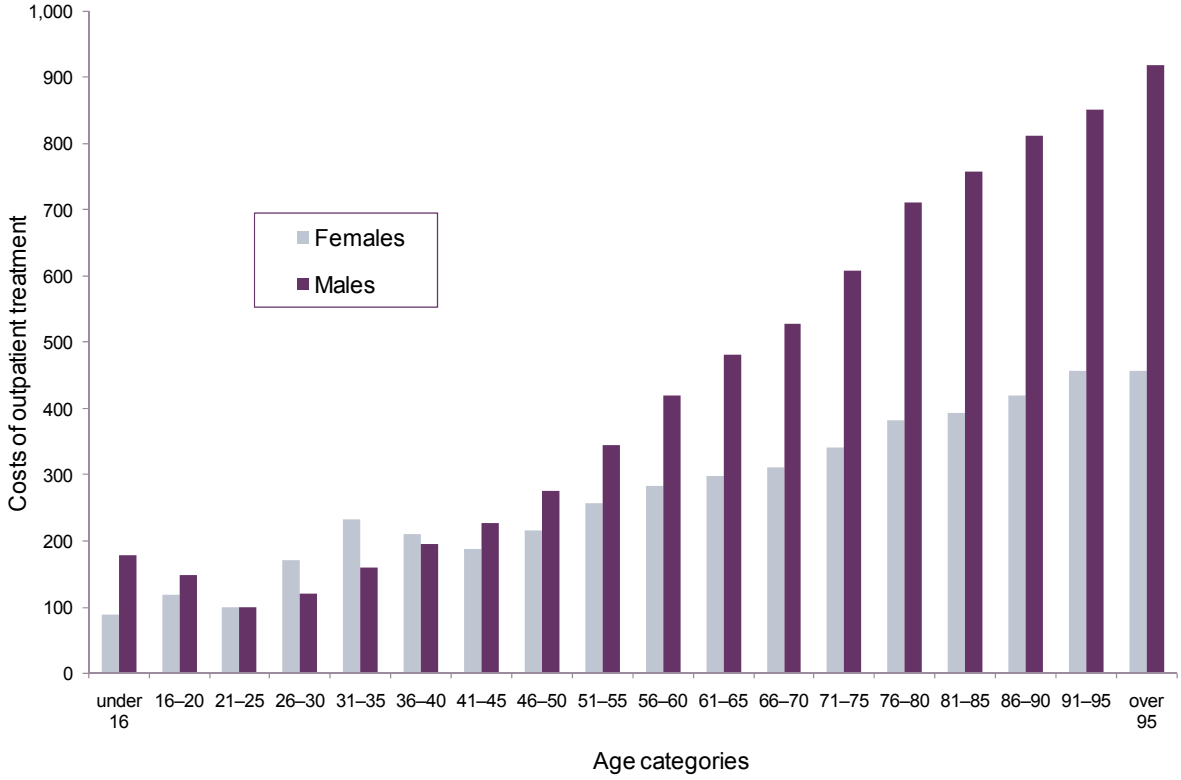


Note: Oxera has used net premium ratios provided by ANIA to establish an index number for policyholders varying by age categories. The index number has been set equal to 100 for policyholders in the age category 15-20 years.
Source: ANIA provided net premium ratios for PMI policyholders of varying age categories, 2012. These net premium ratios are not gender-specific.

Claim costs for PMI are driven by morbidity rate — ie, the probabilities of persons falling ill — increasing with age. Morbidity rates are known to increase with age. Figures 8.2 and 8.3 below, presenting data for Germany, illustrate how differing components of PMI claim costs (outpatient treatment and hospital care) vary by age. Figure 8.2 shows that the costs of outpatient treatment in Germany increase substantially with age, peaking at around age 85. Other types of expenditure (eg, pharmaceuticals and dressings, expenditures on hospital

treatment) reveal a similar relationship with expenditures increasing with age.[64] Expenditure for females in the 31–35 age category exceeds expenditure for females in the older 36–40 and 41–45 age categories.

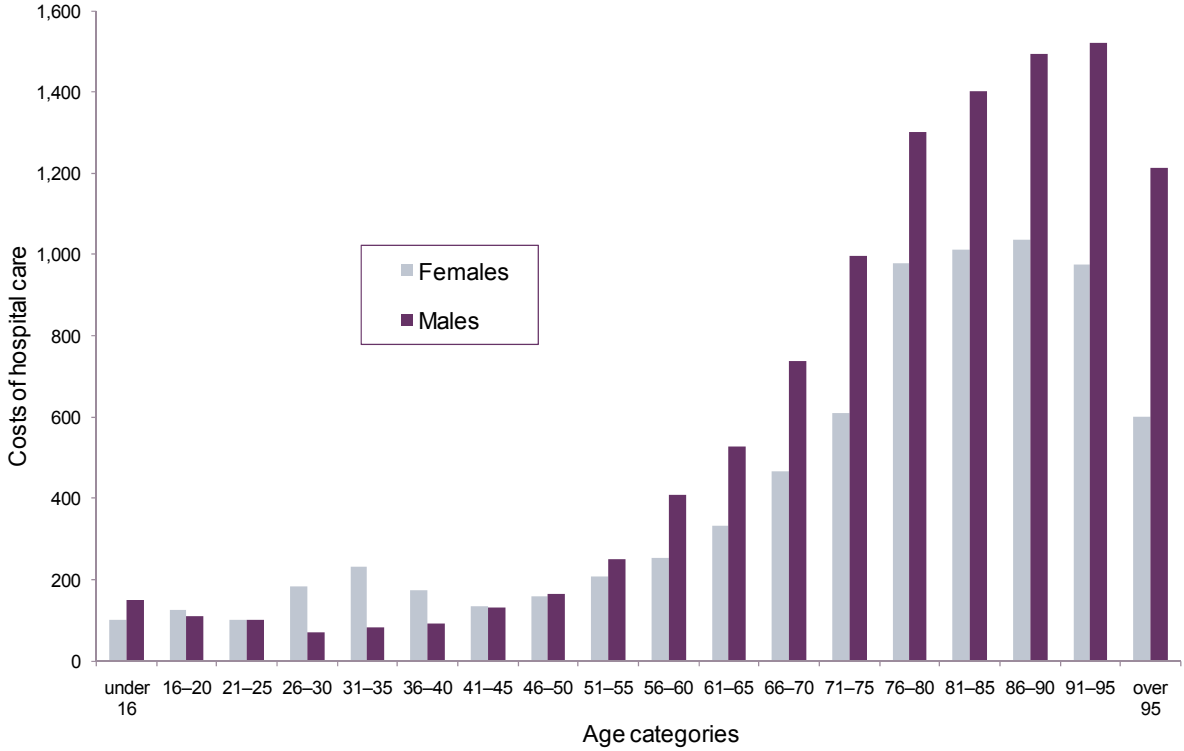
Figure 8.2 Private medical insurance in Germany: costs of outpatient treatment by age



Note: The index numbers of expenditure on outpatient treatment have been set equal to 100 for females and males in the age category 21–25.
Source: Figure reproduced with the permission of the PKV (Verband der Privaten Krankenversicherung e.V.) Data provided in 2012.

[64] Not all types of expenditure increase with age, eg, expenditure on dental treatment increases until the age of 70 and thereafter substantially decreases.

Figure 8.3 Private medical insurance in Germany: expenditure on hospital care by age

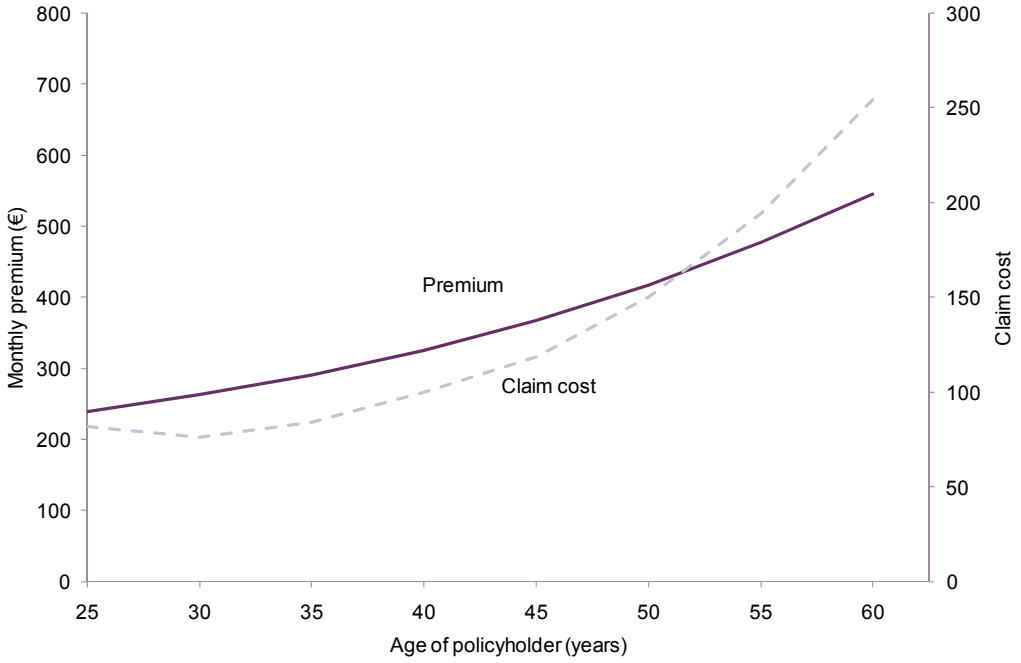


Note: The figure presents data on one of the underlying causes of claims on PMI products: the cost of hospital care. Index numbers have been set equal to 100 for females and males in the age category 21-25.
Source: Figure reproduced with the permission of PKV—Verband der privaten Krankenversicherung e.V., data collected from PKV (2011), 'Financial report for private healthcare insurance 2010/2011', November.

The relationship between morbidity and age translates into a relationship between claims cost and age. Figure 8.4 compares PMI premiums and claim costs for males in Germany, by age. There is a clear link between rising claims cost and rising premiums, although the relationship is somewhat distorted by the use of ageing reserves in Germany.[65] In Germany, the use of ageing reserves means that younger consumers joining a PMI scheme pay more than their initial expected claims cost (which will typically be low as they are young and therefore tend to require fewer medical treatments) as they are paying into a reserve that will fund their PMI later in life, when their claims cost is expected to be higher.

[65] Under the Insurance Supervision Act (Versicherungsaufsichtsgesetz), private insurance companies are obliged to make a commitment to policyholders that their premium will not increase above a certain limit if more health benefits are needed as they become older. In return, policyholders have to pay more, in the form of a reserve, when they are young and healthy in anticipation of the risk of increasing expenses that arise with age. This reserve has been compulsory for both private medical insurance and long-term care since January 2009, and is transferable if policyholders switch to a new provider.

Figure 8.4 PMI in Germany: premiums and claim costs (males)



Notes: The figure compares premiums with claim costs by age for German males. Beyond the age of 60, claim costs do not continue to rise rapidly (as witnessed for the age period 40 to 60), but instead tend to plateau.
Source: Premiums have been calculated using premium data collected through the premium comparison website, http://www.beste-private-krankenversicherung.de/, 2012. Claim cost data provided by PKV in 2012, converted into index number with a value of 100 for males aged 40 years.

In the case of PMI, the risk of the insured event — the insured person requiring medical treatment — is directly linked to any disabilities that the insured person may have. Consequently, medical underwriting is an important component of risk-based pricing for PMI.

Where the applicant has a disability, PMI may exclude this from cover, where there is a high risk of claiming. Insurance is designed to deal with possible future risks, and not with events that will take place with near certainty. For example, in the case of hearing disabilities, the insurance product may exclude cover for medical treatment in connection with the hearing disability, but would provide cover for the treatment of other new disabilities.

The way in which insurance companies alter premiums and policy design to fit consumers that have disabilities varies between countries depending on the role of PMI in the wider healthcare system and specific national regulations. For example:

– in Germany, pre-existing diseases are excluded from cover unless cover is agreed with the insurer at time of enrolment, usually in return for higher premiums;

– in France, tax incentives that discouraged the use of medical underwriting for private medical insurance were reduced somewhat in 2011;

– in Italy, pre-existing disabilities may be excluded from cover or may be covered with additional premiums, determined by medical underwriters in line with standard policies;

– in the UK, risk-based pricing for PMI is not restricted by additional regulations beyond those that apply to all insurance products;

– in the Netherlands, comprehensive PMI is part of the wider healthcare system (acting as a substitute for social health insurance) and therefore pricing and coverage is determined by the wider national system of healthcare.

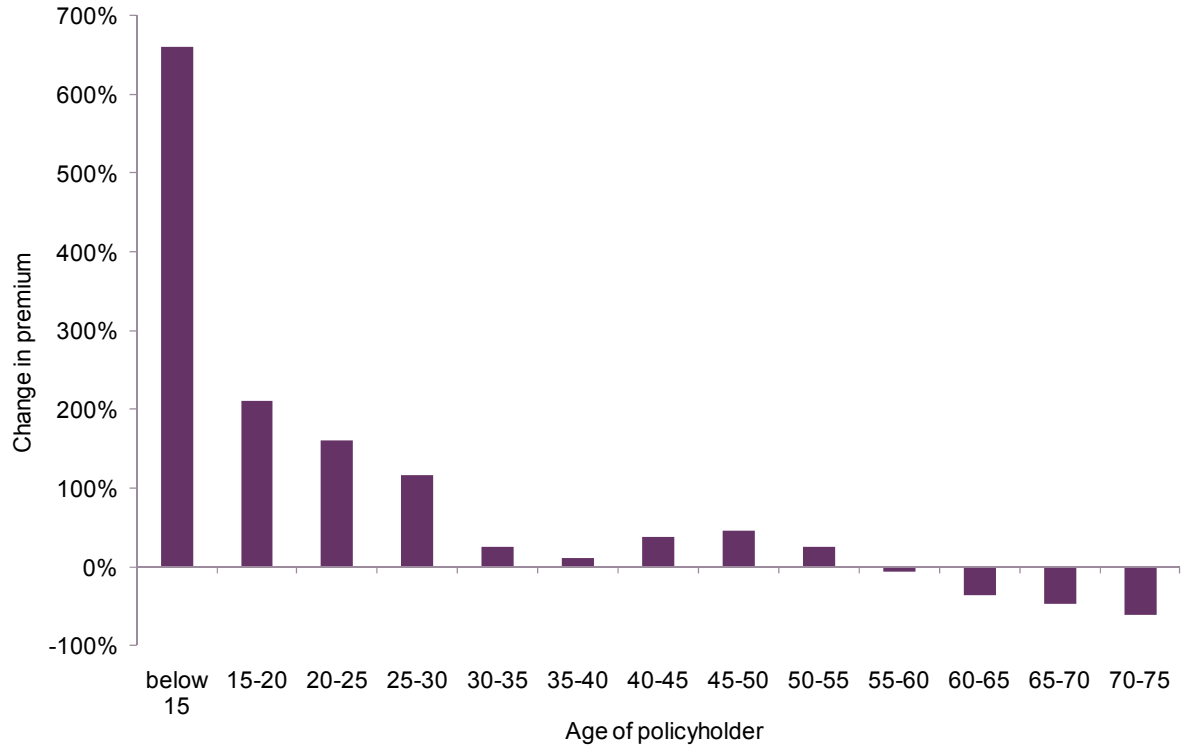
8.3 Potential impact of a ban on the use of information on age and disability in private medical insurance

Without the use of relevant risk factors, including age and disability, the viability of many PMI products would be put at risk.

The variation in PMI claims by age is significant and therefore the risk of adverse selection would be considerable if age were not used as a risk factor. More intrusive medical questionnaires or examinations might in theory be able to address part of this issue at increased cost and time to consumers, but age remains a relevant and effective risk factor for the likely need for medical treatment, irrespective of medical information at the time of enrolment.

A ban on the use of age as a risk factor has the implication that insurers can no longer vary premiums by age. By simulating the impact of a ban on age, Figure 8.5 presents the percentage change in PMI premiums experienced by individuals of varying age if a uniform premium were set for all individuals. Young individuals would experience a substantial increase in their premiums since they would be asked to pay premiums associated with greater risk than they represent. The large increase in premiums for younger individuals would suggest that the problem of adverse selection would be significant in this case, if uniform premiums were charged. As discussed before, significant adverse selection can make it difficult for insurers to offer products.

Figure 8.5 PMI in Italy: changes in average premium in the event of a ban on age



Note: The premium in the event of a ban of age has been calculated as a weighted average premium using the premiums paid by individuals of differing age categories and weighting for the number of individuals per age category.
Source: ANIA provided net premium ratios indicating the ratios of premiums for different age categories, 2012; Eurostat demographic data, 2012.

9 Conclusions

The use of risk-rating factors, including information on age and disability, by insurance companies is at the heart of competition in insurance markets. The evidence shows that risk-based pricing leads to private insurance markets offering extended cover to a growing range of consumers and potential insured events, as it allows improved risk management. Insurers use information on age and disability only when these are relevant risk factors.

For all of the products considered in this study, age is a very important risk factor and is used consistently by insurance companies to ensure that the premiums they charge correspond to the expected level of claims.

Information on disability is also used by insurance companies in determining premiums and product design when disabilities relate directly to the insured event, such as with the need for medical treatment (PMI) or the capacity to work (disability insurance). Some disabilities are related to reduced life expectancies and, where this is the case, medical underwriting takes this into account for term life insurance. Insurers draw on medical studies and statistical analysis to determine the appropriate use of this information.

Without the use of these factors, the problem of adverse selection poses a serious threat to the continued availability of some insurance products, which would have negative implications for consumer choice. The loss of risk-based pricing can also lead to higher average premiums and/or reduced cover for all consumers, as the additional risk to insurers creates additional costs. Risk-based pricing brings benefits to consumers that could be lost through restrictions on specific risk factors.

10 Glossary

This glossary provides descriptions for terms used in this study, with descriptions applicable to the context of this study only (and not for other purposes).

Term	Description
Adverse selection	Also referred to as 'anti-selection', adverse selection occurs when a higher than expected proportion of high-risk consumers and a lower proportion of low-risk consumers than expected are attracted to purchase an insurance product. With more high-risk consumers, the total cost of claims tends to increase, which can result in premiums increasing, further deterring low-risk consumers from insurance.
Ageing reserve	In some countries, ageing reserves are used for some private medical insurance, long-term care insurance and pension products, in order to allow insurers to offer relatively stable lifetime premiums to consumers, despite the fact that claim costs typically rise with age. Relatively younger consumers pay more than their expected claim costs, with the excess being used to build up an 'ageing reserve' that then helps to fund insurance in later life. Consumers typically pay a fixed premium determined at the point of enrolment, which accumulates in a personal reserve that is decreased according to the expected claim cost for a person of that age.
Anti-Discrimination Directive	In 2008 the European Commission proposed an Anti-Discrimination Directive to reduce discrimination on the grounds of religion or belief, age, disability or sexual orientation. For the purposes of this study, references to the Anti-Discrimination Directive refer to this proposed Directive and in particular its provisions for financial services regarding age and disability.
Beneficiary	In the case of the insured event occurring, the beneficiary is the person (or persons or legal body) who receives the payout from the insurer.
Claim	A request to an insurance company asking for a payment to a beneficiary based on the terms of the insurance policy.
Consumer	A person who applies for, has or benefits from an insurance policy
Cover	An undertaking by an insurer to pay for loss or damage to a beneficiary due to an insured event. The undertaking includes terms relating to the size and type of payment. For example, the payment upon the death of the policyholder in the case of life insurance.
Disability insurance	Insurance that subsidises, for a set time, the beneficiary's reduced income due to a lower earning capacity caused by sickness, bodily injury or disability which makes the person incapable of work.
Group insurance scheme	An insurance scheme purchased by an organisation for a group of individuals, typically providing the same terms to all of those individuals within that scheme.
Insured	The legal entity whose risk is covered by the insurance.
Long-term care insurance	Insurance that provides a pre-agreed annuity-style payment in the event that a beneficiary requires long-term care, in order to fund some or all of the cost of that care.
Longevity risk	Financial risk associated with the probability of a longer than expected lifespan. In the context of pension annuities, for example, this refers to the risk that pension savings are exhausted during retirement.
Medical underwriting	The use of medical or health information in the underwriting process.
Moral hazard	The situation in which the protection offered by the insurance cover encourages the insured individual to behave in a more risky way because they have insurance. This can result in more claims, leading to an increase in the average claim costs and subsequently in higher premiums.
Morbidity risk	Financial risk associated with the probability of poor health due to any cause.
Mortality risk	Financial risk associated with the probability of a person dying during a certain time

	period.
Motor third-party liability (MTPL) insurance	Insurance covering third-party liability risk associated with traffic accidents caused by policyholders.
Paraplegia	An impairment in motor or sensory function of two extremities. The study looks at paraplegia caused by trauma.
Pension annuity	Pension annuities enable a policyholder to convert pension savings into an income for the rest of their life, and therefore provide insurance against the risk of the exhaustion of savings during retirement.
Policyholder	The legal entity that owns the insurance policy.
Premium	The amount to be charged for a certain amount of insurance coverage for a certain time.
Private medical insurance (PMI)	Insurance that typically reimburses the beneficiary for all or some of the expenses of private medical treatment.
Risk-based pricing	Setting insurance premiums on the basis of the risk of the insured, including the probability of a claim being made against the policy and the likely cost of that claim.
Risk-neutral pricing	Setting insurance premiums without taking account of the risk of the insured, typically because of a lack of information or regulations restricting risk-based pricing.
Risk pool	Risk is shared between individuals within risk pools. A risk pool is a collection of individuals or organisations that share their risk such that each contributes to the risk pool, which then pays out to those that suffer the risk event. Risk pooling is a central principle of insurance provision.
Risk-rating factor	Evidence of the likelihood of an event occurring that impacts on the insured risk. This information is used by insurers to estimate the risk of an insured event occurring, in the process known as 'underwriting'.
Term life insurance	Insurance that provides financial protection to beneficiaries in the event of the death of the insured, with coverage for a specified term of years.
Underwriting	The process by which insurers assess the likelihood of the insured event occurring.

A1 Appendix

This appendix presents charts showing prices and claim costs of the selected insurance products in the selected countries.

The selected insurance products are:

– term life insurance;
– pension annuities;
– motor insurance (MTPL);
– disability insurance;
– long-term care insurance;
– private medical insurance (PMI).

Charts are presented in the following order of selected countries:

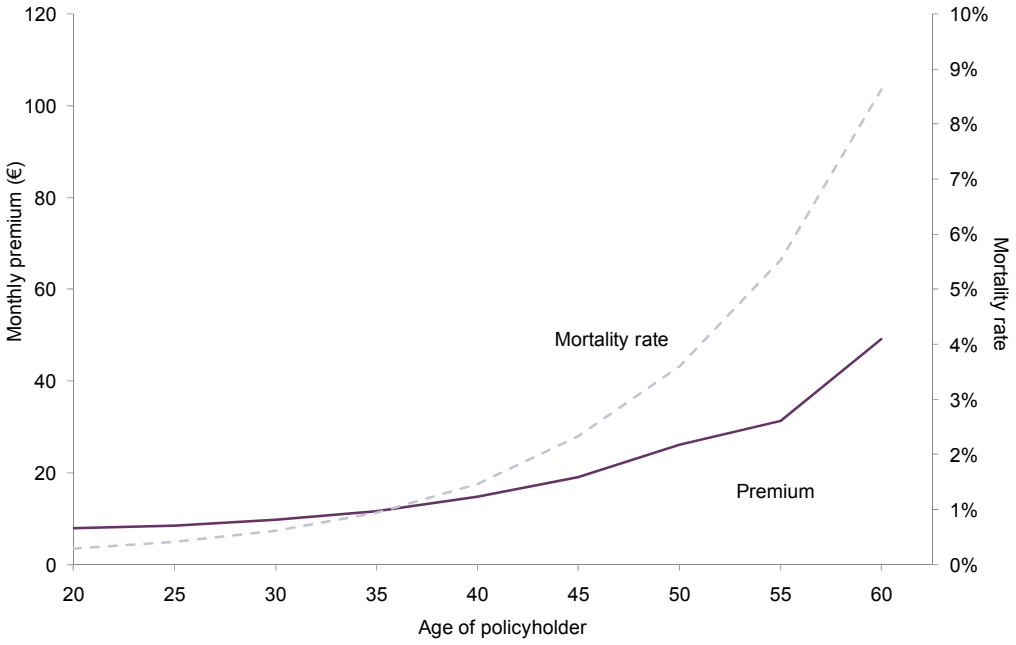
– the UK;
– the Czech Republic;
– France;
– Germany;
– Italy;
– the Netherlands.

Since gender was still treated as an important risk factor for insurance pricing at the time the price data was collected, separate charts are presented for females and males.

A1.1 UK

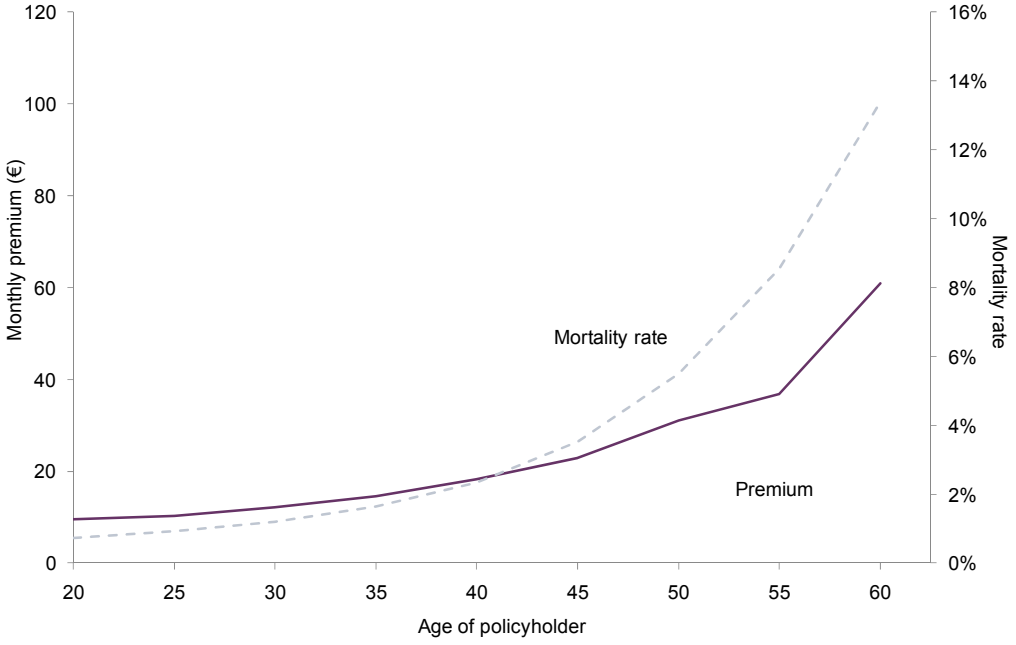
A1.1.1 Term life insurance

Females



Note: Premiums paid for term life insurance offering a cover of £200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die over the next ten years.
Source: Premiums collected from http://www.moneysupermarket.com/life-insurance/applicantdetails; mortality data obtained from http://www.statistics.gov.uk/hub/index.html.

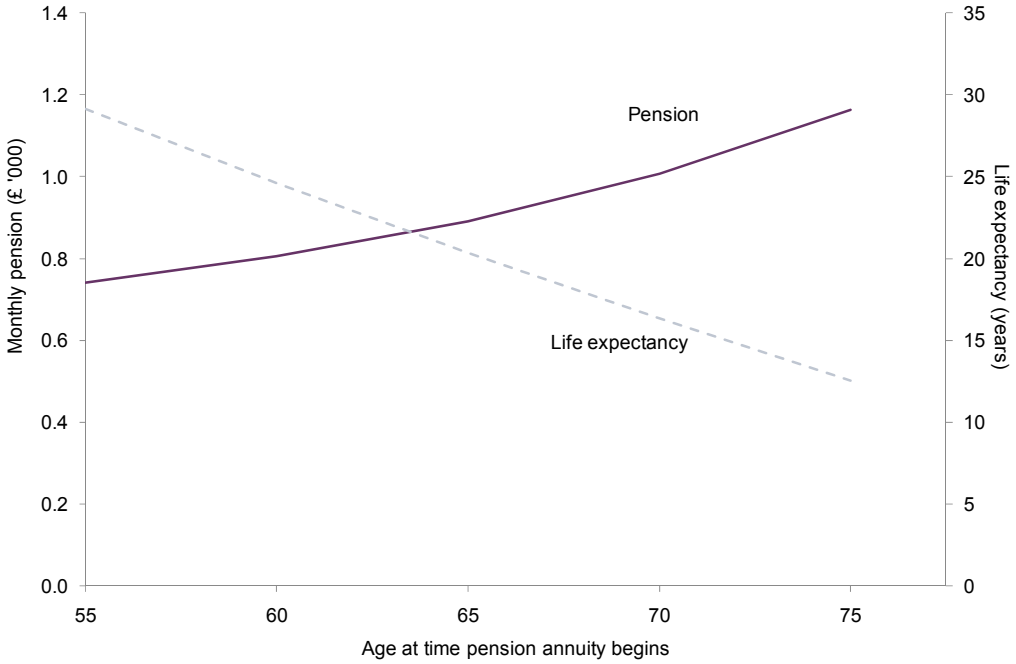
Males



Note: Premiums paid for term life insurance offering cover of £200,000 in the event of death during the next ten years; mortality rate represents the probability that a policyholder dies during the next ten years.
Source: Premiums collected from http://www.moneysupermarket.com/life-insurance/applicantdetails; mortality data obtained from http://www.statistics.gov.uk/hub/index.html.

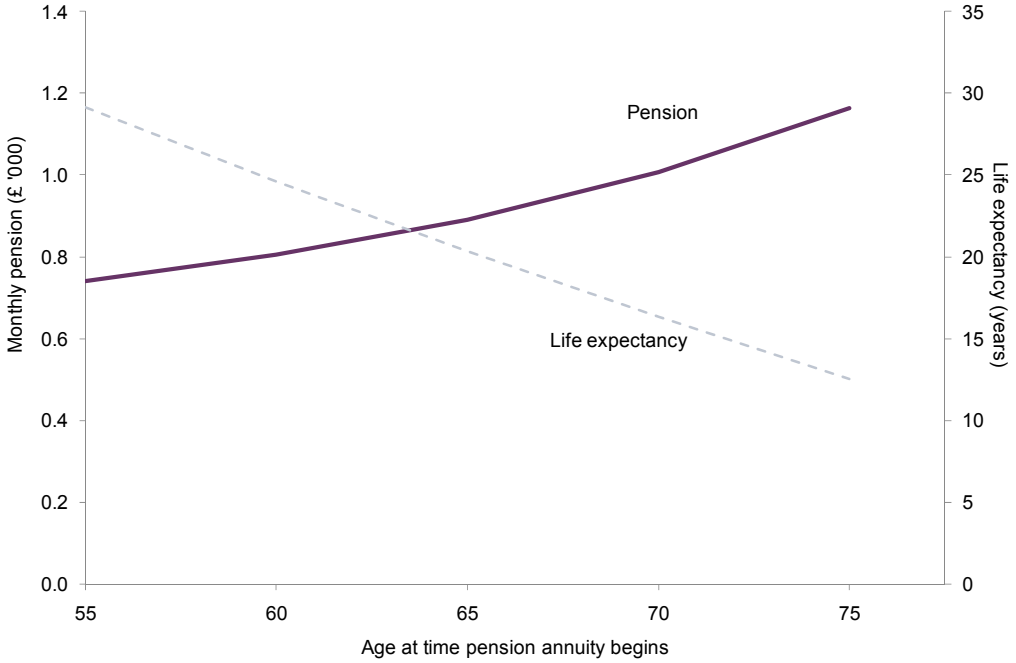
A1.1.2 Pension annuities

Females



Note: Pensions paid out when making a lump-sum investment of £200,000 in annuities; life expectancy indicates the expected number of years a policyholder will live.
Source: Pensions collected from https://www.onlineannuityplanner.com/confused/CompareAnnuities/; life expectancies established using mortality data obtained from http://www.statistics.gov.uk/hub/index.html.

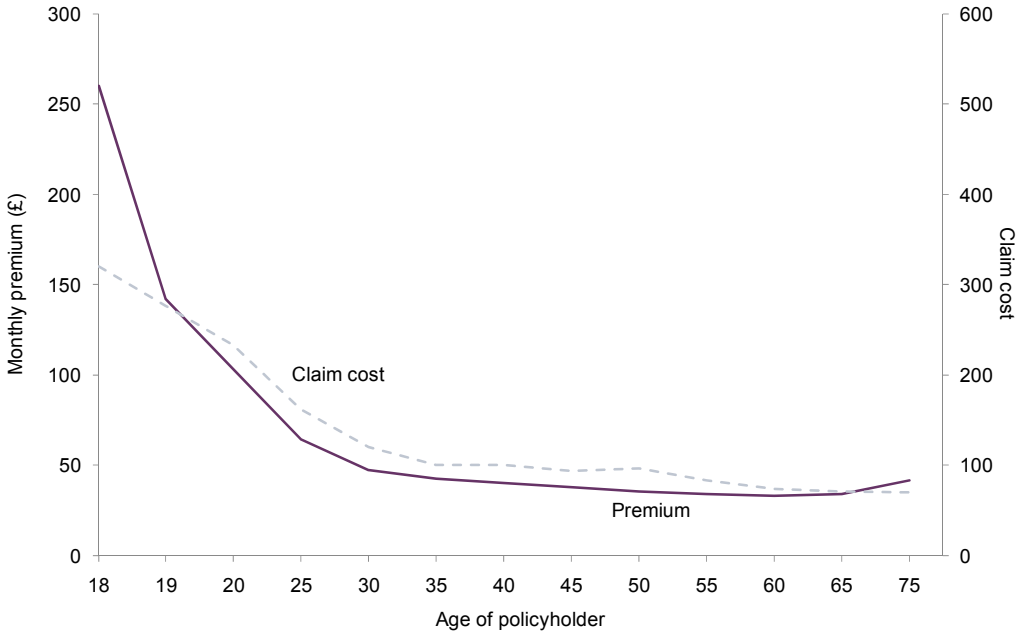
Males



Note: Pensions paid out when making a lump-sum investment of £200,000 in annuities; life expectancy indicates the expected number of years a policyholder will live.
Source: Pensions obtained from https://www.onlineannuityplanner.com/confused/CompareAnnuities/ ; life expectancies established using mortality data obtained from http://www.statistics.gov.uk/hub/index.html.

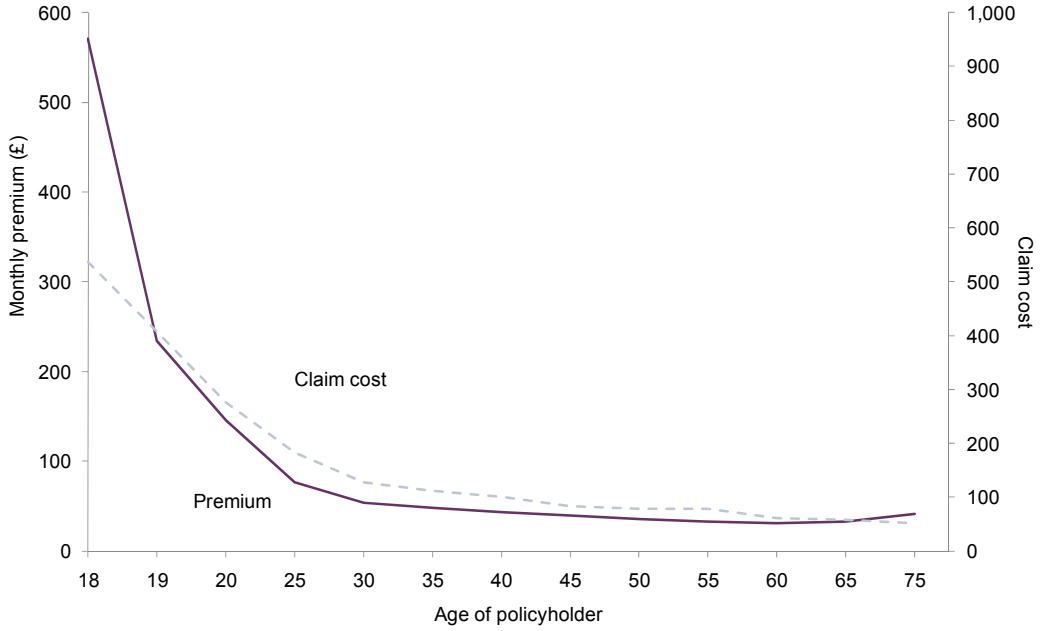
A1.1.3 Motor insurance

Females



Note: Premiums paid for motor third-party liability insurance keeping factors other than age and gender fixed; claim costs reflects relative claim costs per age category with a value of 100 for a 40-year-old driver.
Source: Premiums obtained from https://www.moneysupermarket.com/car-insurance/aboutthecar/index/; claim cost data provided by ABI.

Males

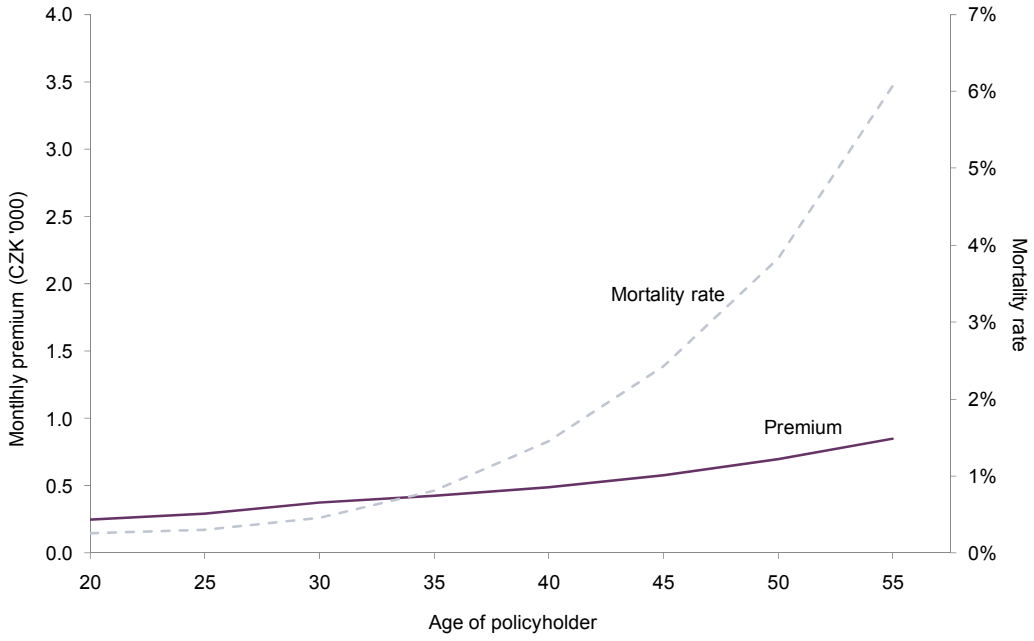


Note: Premiums paid for motor third-party liability insurance keeping factors other than age and gender fixed; claim cost reflects relative claim costs per age category with a value of 100 for a 40-year-old driver.
Source: Premiums collected from https://www.moneysupermarket.com/car-insurance/aboutthecar/index/; claim cost data provided by ABI.

A1.2 Czech Republic

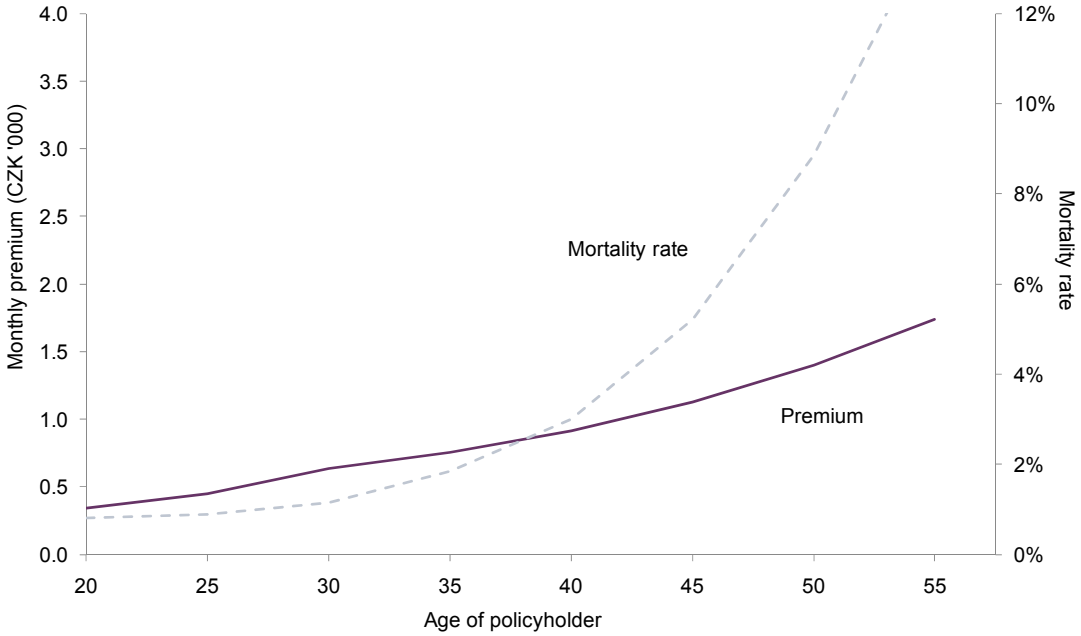
A1.2.1 Term life insurance

Females



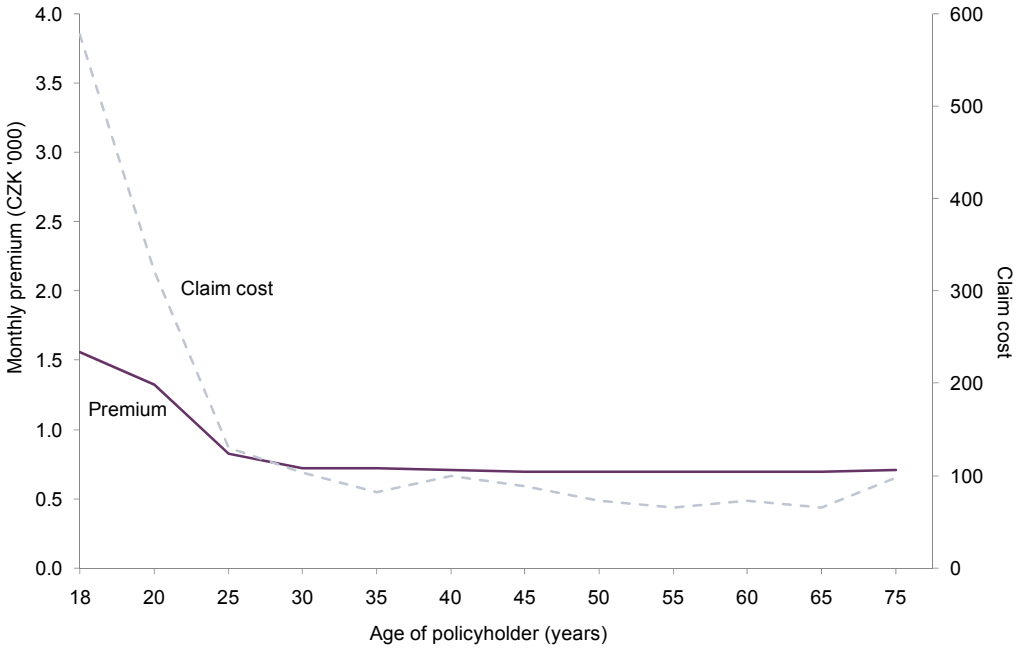
Note: Premiums paid for term life insurance offering a cover of CZK 200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Premiums obtained from www.pojisteno.cz/; CAP provided mortality data.

Males



Note: Premiums paid for term life insurance offering a cover of CZK 200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Premiums collected from www.pojisteno.cz/; CAP provided mortality data.

A1.2.2 Motor insurance

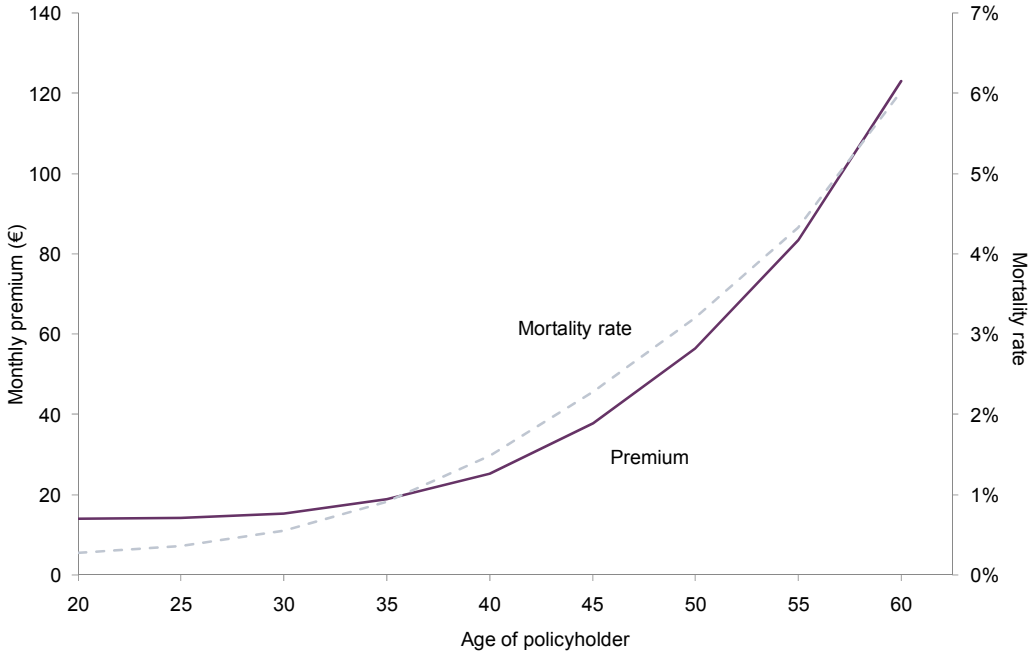


Note: Premiums paid for motor third-party liability insurance keeping factors other than age and gender fixed; claim cost reflects relative claim costs per age category with a value of 100 for 40-year-old driver. Premiums are identical for females and males since differentiation based on gender is not allowed in the Czech Republic.
Source: Premiums collected from www.top-pojisteni.cz; CAP provided claim cost data.

A1.3 France

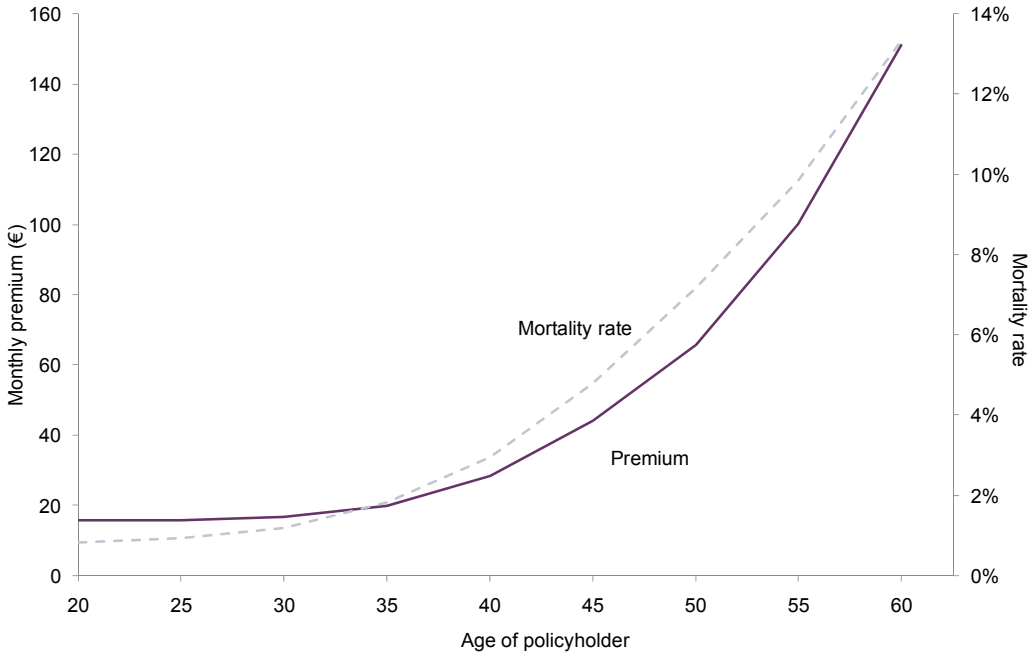
A1.3.1 Term life insurance

Females



Note: Premiums paid for term life insurance offering a cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Premiums obtained from http://assurance-deces.assurprox.com/formulaire ; mortality data presented in 'Tables de Mortalité 2007-2009' published on http://www.insee.fr/en/default.asp.

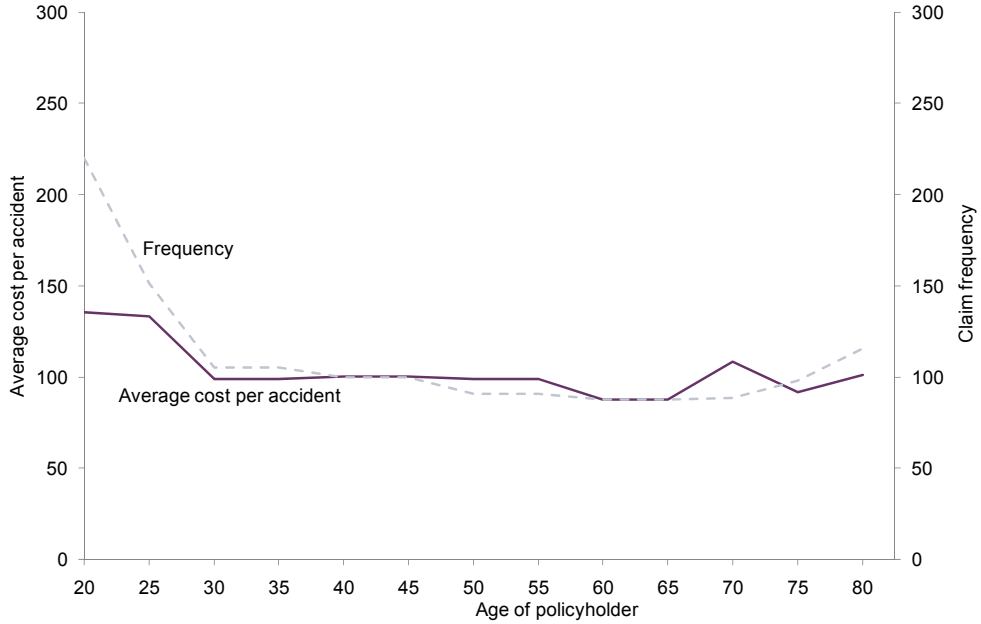
Males



Note: Premiums paid for term life insurance offering a cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Premiums obtained from http://assurance-deces.assurprox.com/formulaire ; mortality data presented in 'Tables de Mortalité 2007-2009' published on http://www.insee.fr/en/default.asp.

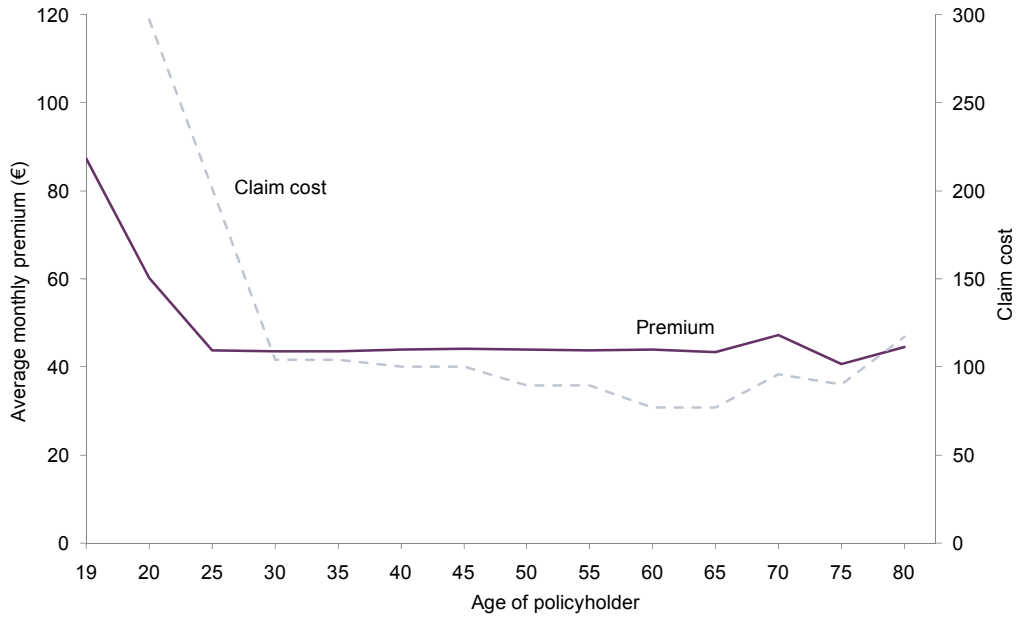
A1.3.2 Motor insurance

Claim frequency and average cost per accident



Note: The average cost per accident and the claim frequency are expressed as index numbers using data on the average cost per accident and claim frequency for varying ages. The value of index numbers has been set equal to 40-year old drivers.
Source: FFSA provided data on the average cost per accident and claim frequency.

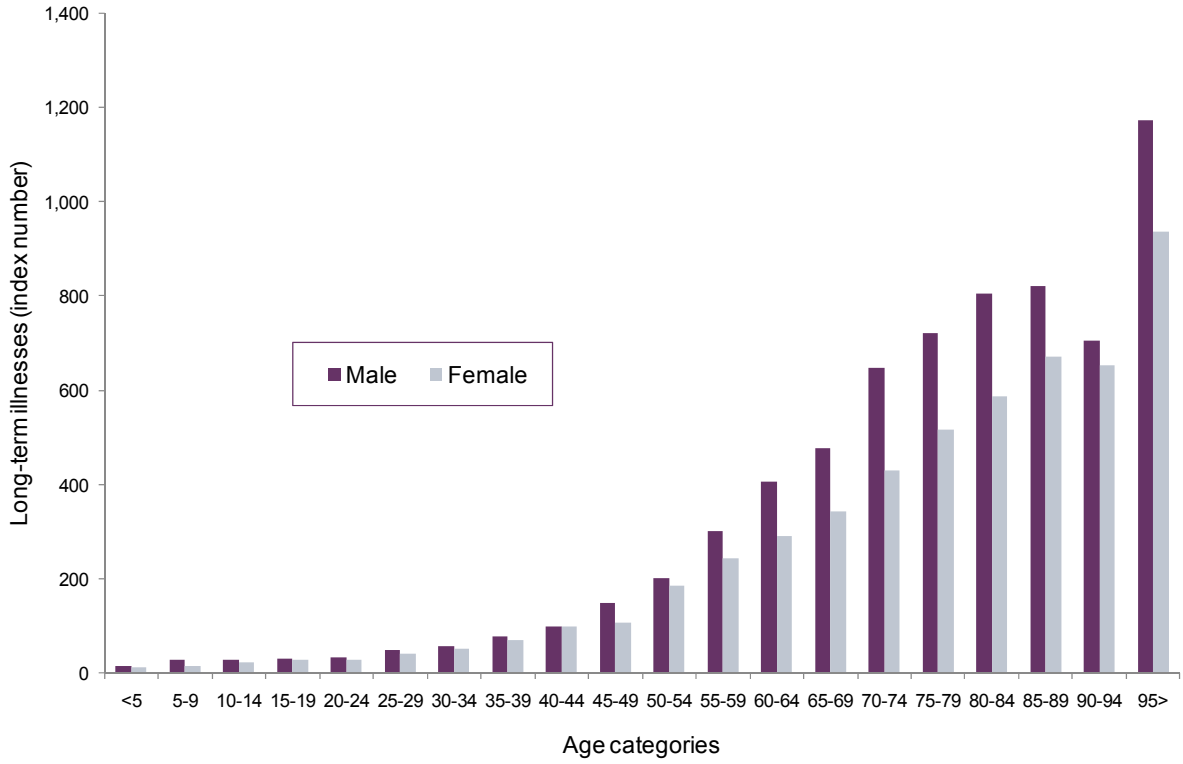
Premiums and claim costs



Note: Average premiums have been established by taking a non-weighted average of premiums for females and males. Claim costs are represented by an index number with a value of 100 for a 40-year-old driver.
Source: FFSA provided data (claim frequency and average cost per accident) allowing the establishment of claim costs. Premiums collected through http://www.assuremieux.com/assurance-auto.

A1.3.3 Long-term care insurance

Incidence of long-term illnesses by age category

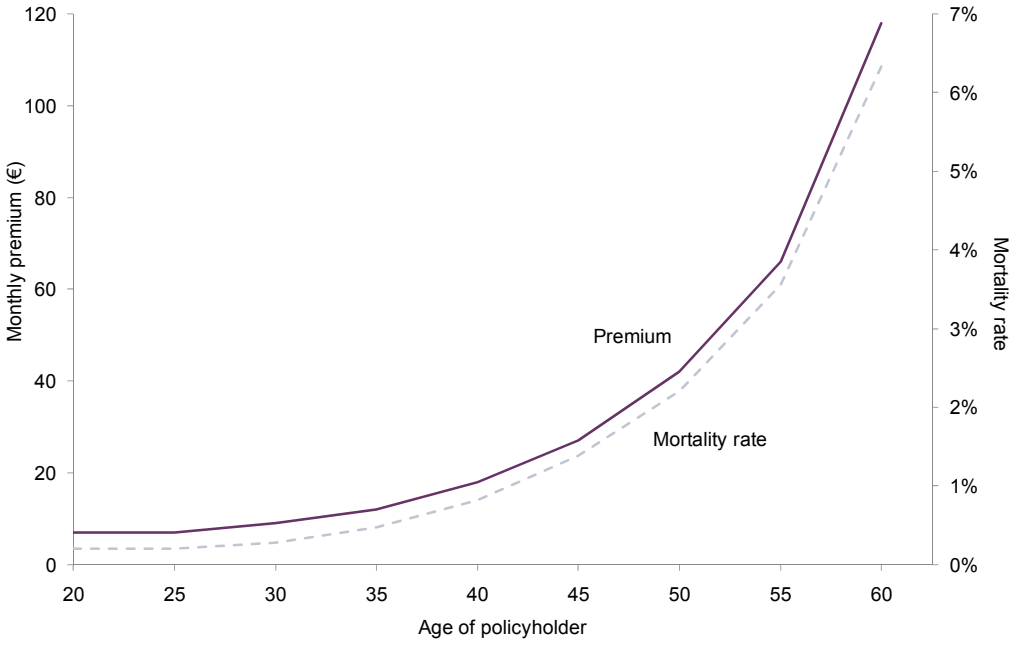


Note: Definition of long-term illnesses is provided in the report. Data on the prevalence of long-term illnesses by age categories has been converted into index numbers taking into account age distribution.
Source: Replication of a figure presented on the Institut de recherché et documentation en economie de la santé (IRDES) website, http://www.irdes.fr/EspaceEnseignement/ChiffresGraphiques/Cadrage/ALD/PrevalenceALD; suggested by FFSA data. Demographic data has been taken from http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=ccc.

A1.4 Germany

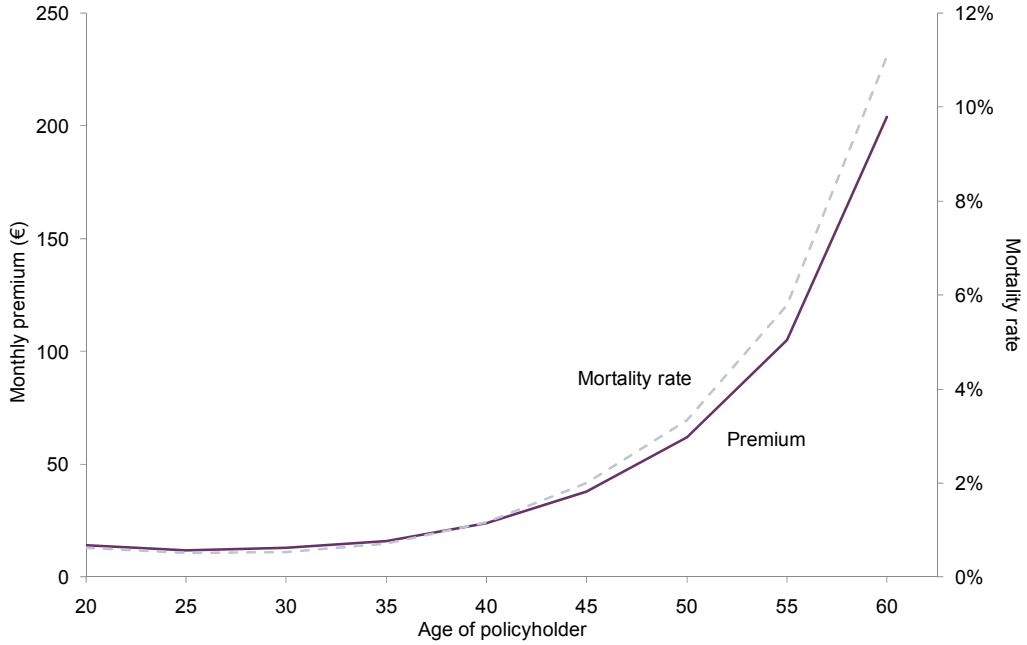
A1.4.1 Term life insurance

Females



Note: Premiums paid for term life insurance offering cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Average monthly premiums calculated using premium data collected by GDV in July 2012; DAV 2008 T mortality data is used.

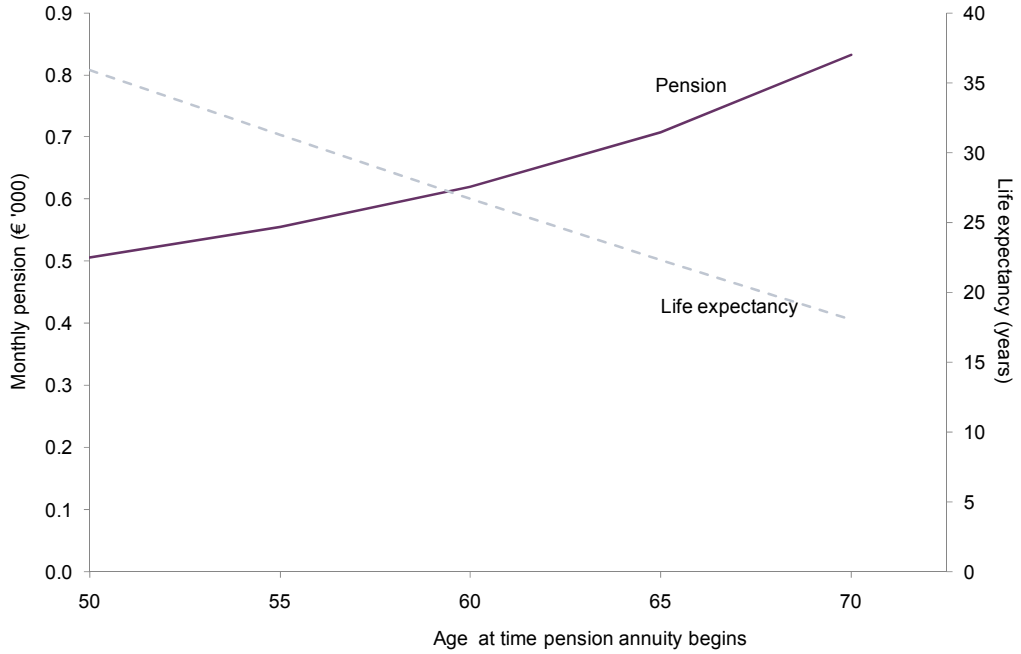
Males



Note: Premiums paid for term life insurance offering cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Average monthly premiums calculated using premium data collected by GDV in July 2012; DAV 2008 T mortality data is used.

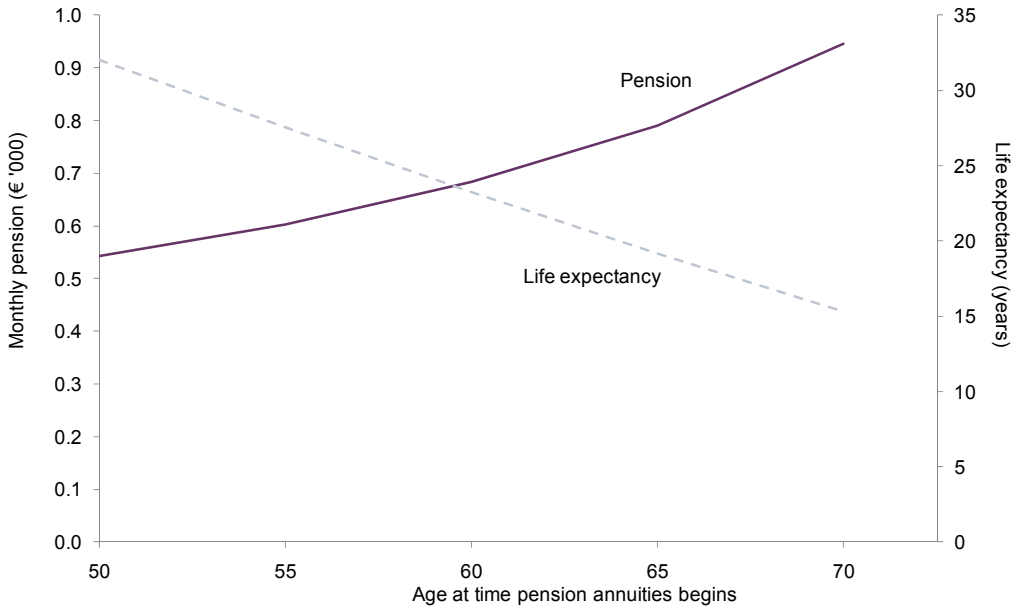
A1.4.2 Pension annuities

Females



Note: Pensions paid out when making a lump-sum investment of €200,000 in annuities; life expectancy indicates the expected number of years a policyholder will live.
Source: Average monthly pension calculated using data collected by GDV in July 2012; life expectancies calculated using DAV 2004 R mortality data.

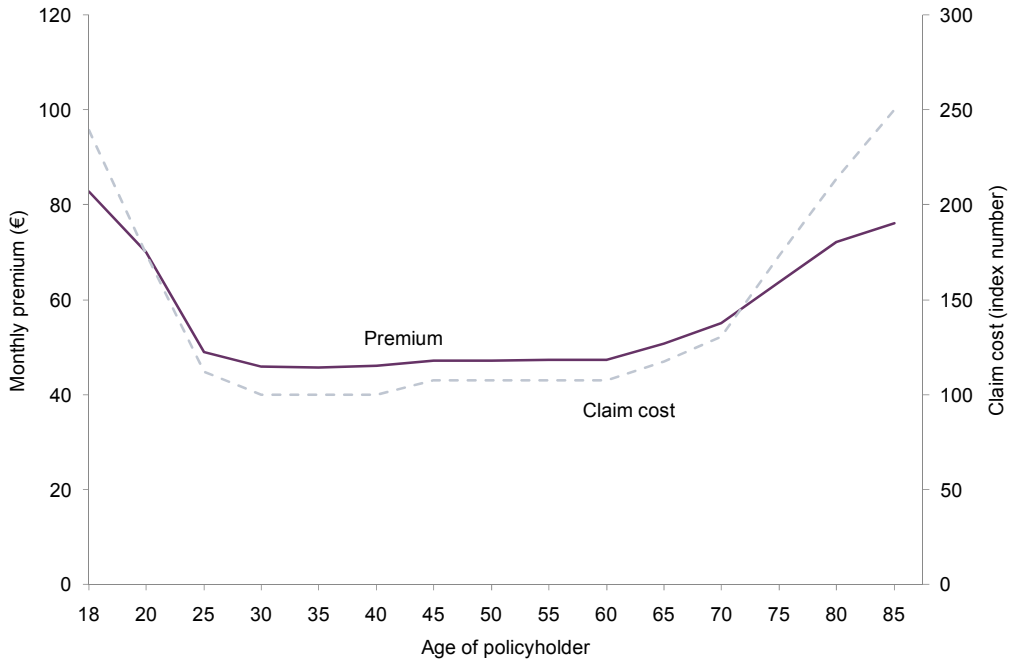
Males



Note: Pensions paid out when making a lump-sum investment of €200,000 in annuities; life expectancy indicates the expected number of years a policyholder will live.
Source: Average monthly pension calculated using data collected by GDV in July 2012; life expectancies calculated using DAV 2004 R mortality data.

A1.4.3 Motor insurance

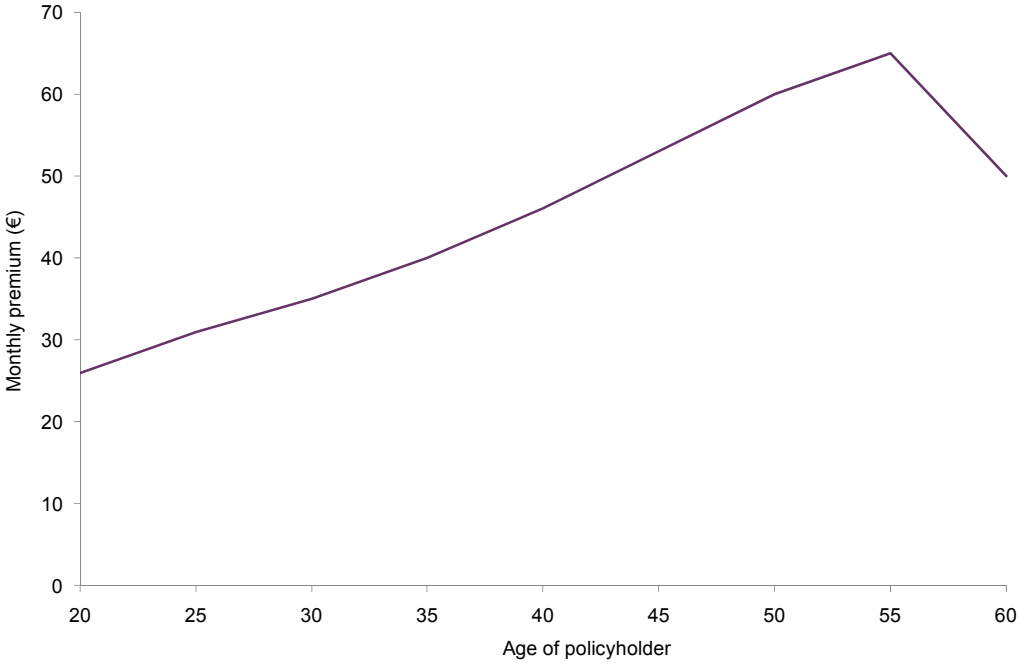
Premiums and claim costs



Note: Premiums concern premiums paid for motor third-party liability insurance keeping factors other than age and gender fixed. Claim costs, presented by index numbers, reflect the relative claim costs per age category with a value of 100 for drivers aged 40.
Source: Premiums obtained from www.nafiauto.de; GDV provided data on unisex claim cost indices, which allowed the construction of claim cost index numbers.

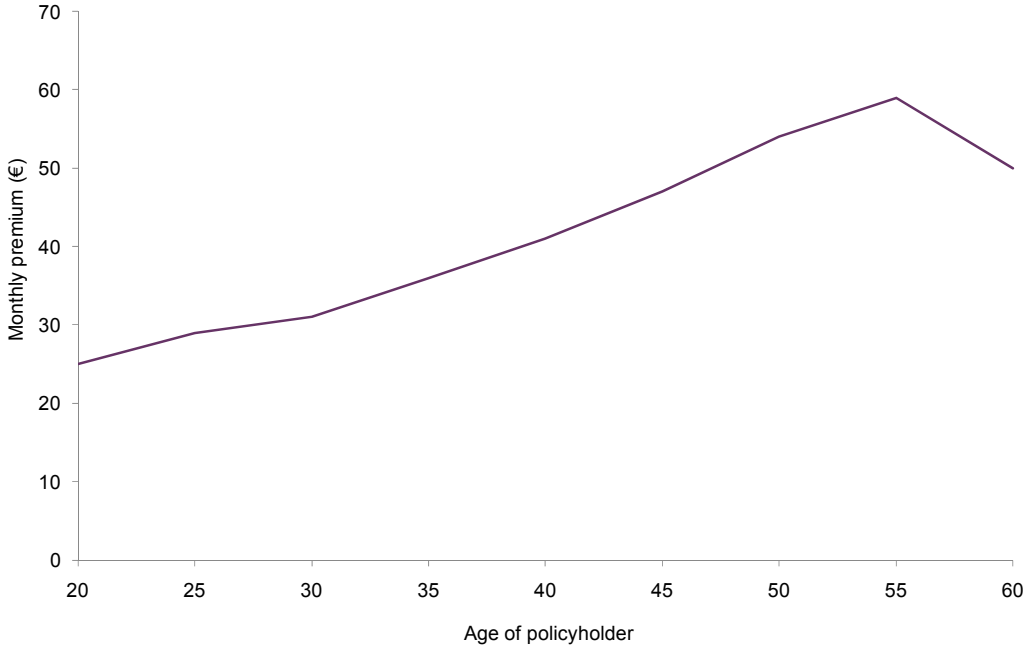
A1.4.4 Disability insurance

Females



Note: This type of disability insurance pays out monthly amounts of €750 in the event of the policyholder becoming incapable of working owing to disability or illness, until they return to work or reach the age of 65. The fall in premiums from age 60 is likely to be linked to the insurance payment cut-off age of 65; as policyholders approach this cut-off point, the maximum amount of time they could be claiming benefits declines (thereby reducing the expected level of claims).
In addition, the demand for disability insurance decreases as persons reach the age of 65, since these persons have already retired or are willing to bear the risk of not being able to work themselves. This lack of demand explains why few insurers offer disability insurance to 60-year olds and even fewer insurers to 65-year olds.
Source: Average monthly premiums calculated using premium data collected by GDV in July 2012.

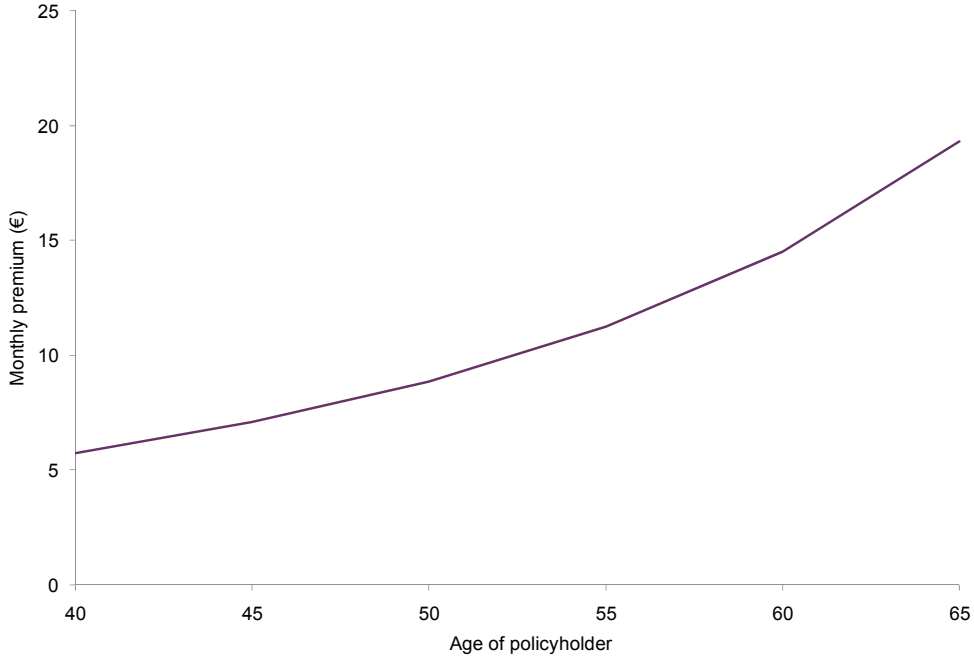
Males



Note: This type of disability insurance pays out monthly amounts of €750 in the event of the policyholder becoming incapable of working owing to disability or illness, until they return to work or reach the age of 65. The fall in premiums from age 60 is likely to be linked to the insurance payment cut-off age of 65—as policyholders approach this cut-off point, the maximum amount of time they could be claiming benefits declines (thereby reducing the expected level of claims).
In addition, the demand for disability insurance decreases as persons reach the age of 65, since these persons have already retired or are willing to bear the risk of not being able to work themselves. This lack of demand explains why few insurers offer disability insurance to 60-year olds and even fewer insurers to 65-year olds.
Source: Average monthly premiums calculated using premium data collected by GDV in July 2012.

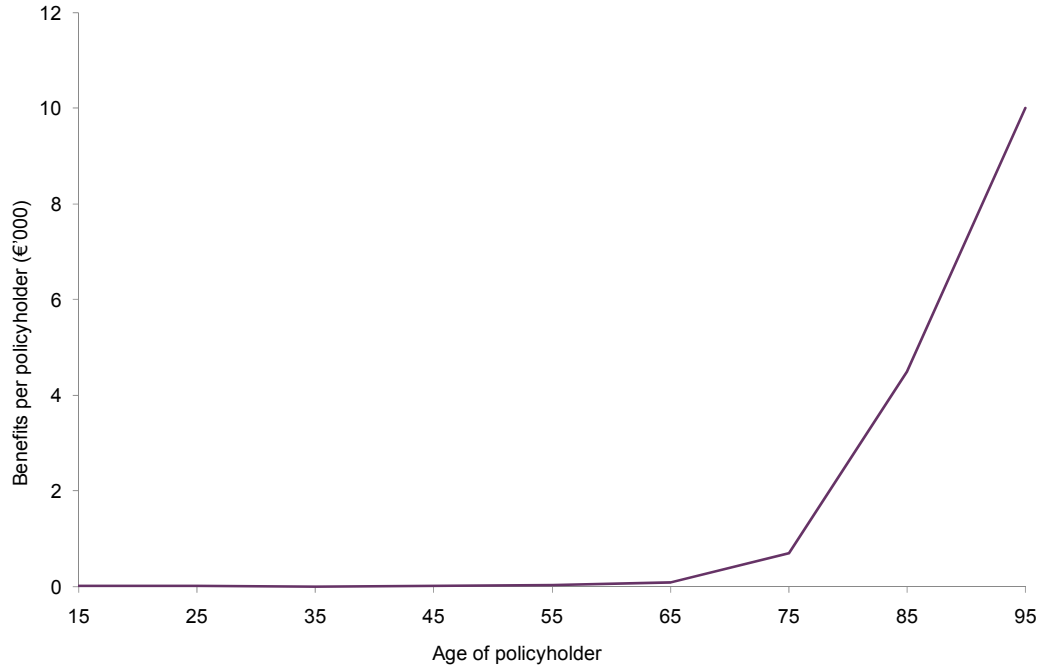
A1.4.5 Long-term care insurance

Premiums for long-term care insurance (Tagegeld in Stufe II)



Note: The type of long-term care insurance considered concerns a 'Pflegezusatzversicherung', an insurance product which pays out daily allowances to policyholders in the event they meet requirements to be reimbursed for long-term care.
Source: Premium data collected from http://www.tarifcheck24.com/pflegezusatzversicherung/vergleich/, varying in age keeping other factors fixed.

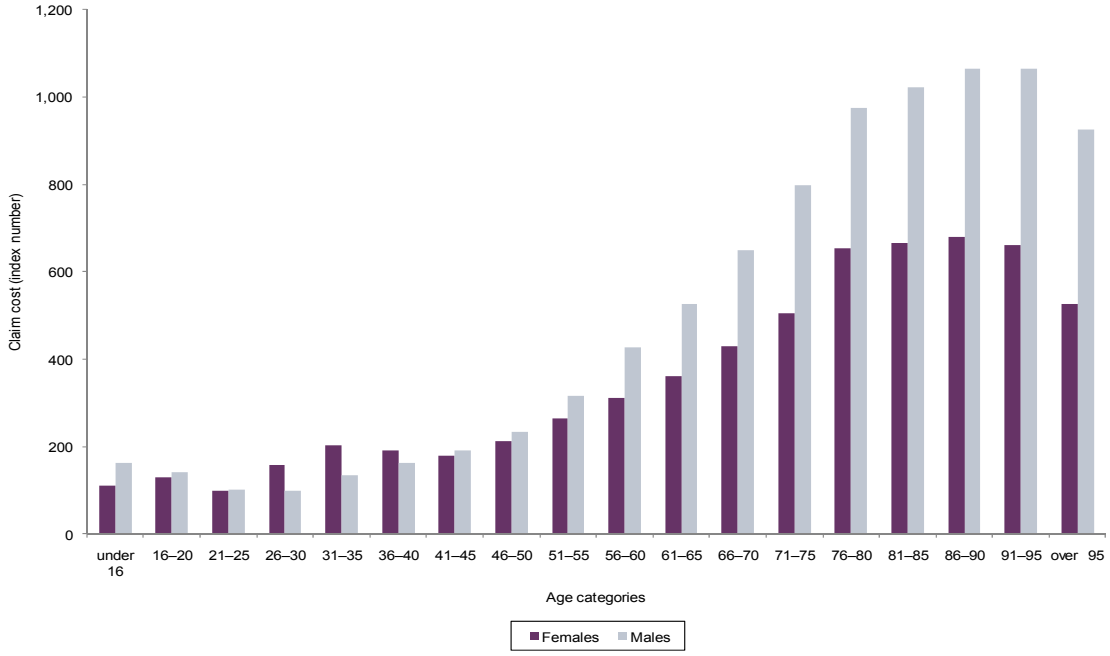
Benefits per female policyholder



Note: Benefits concern the average benefits paid by insurance companies to female policyholders of differing ages in 2001.
Source: Figure 7.3 is an adaptation of Figure 4 in Riedel, H. (2003), 'Private Compulsory Long-Term Care Insurance in Germany', *The Geneva Papers on Risk and Insurance*, **28**:2, pp. 275–93.

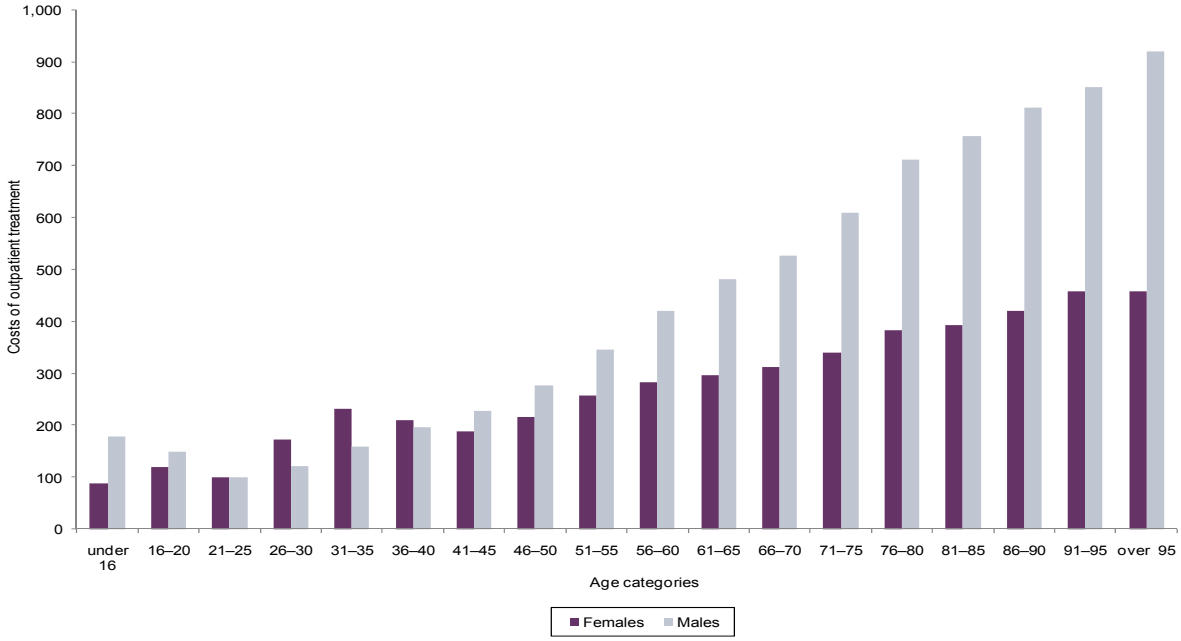
A1.4.6 Private medical insurance

Claim costs



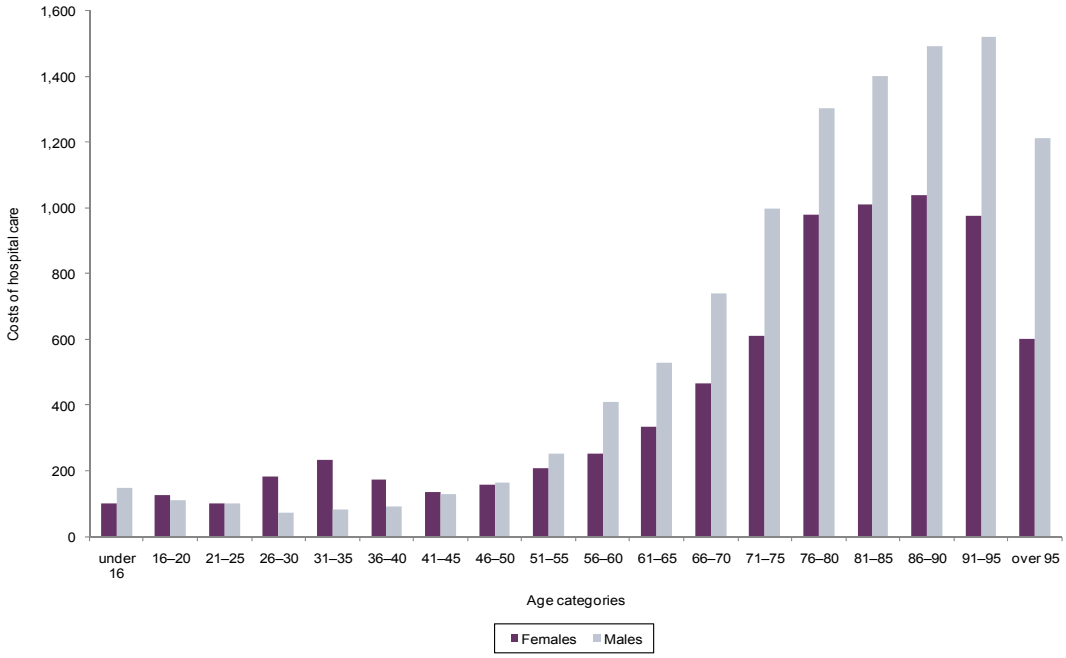
Note: Claim costs are presented as index numbers. The value of claim costs for males in the age category 21–25 has been set equal to 100.
Source: Data provided by PKV has been converted into index numbers.

Costs of outpatient treatment by age



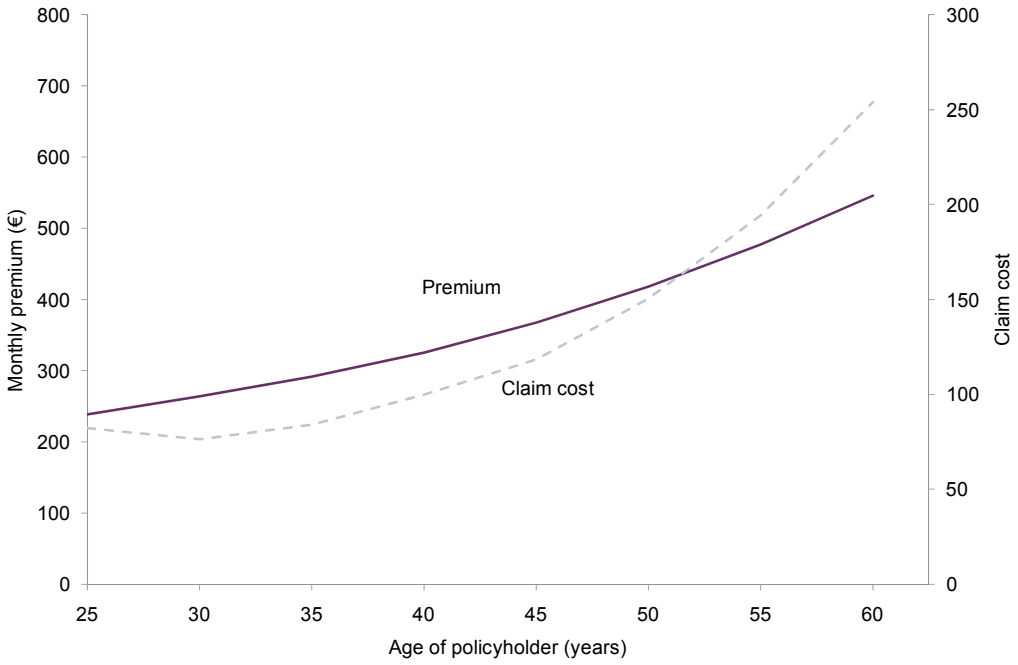
Note: Costs of outpatient treatment are presented by index numbers. The value of index numbers for females and males in the age category 21–25 has been set equal to 100.
Source: Data provided by PKV has been converted into index numbers.

Costs of hospital care by age



Note: Costs of hospital care are presented by index numbers. The value of index numbers for females and males in the age category 21–25 has been set equal to 100.
Source: Data provided by PKV has been converted into index numbers.

Premiums and claims costs for males

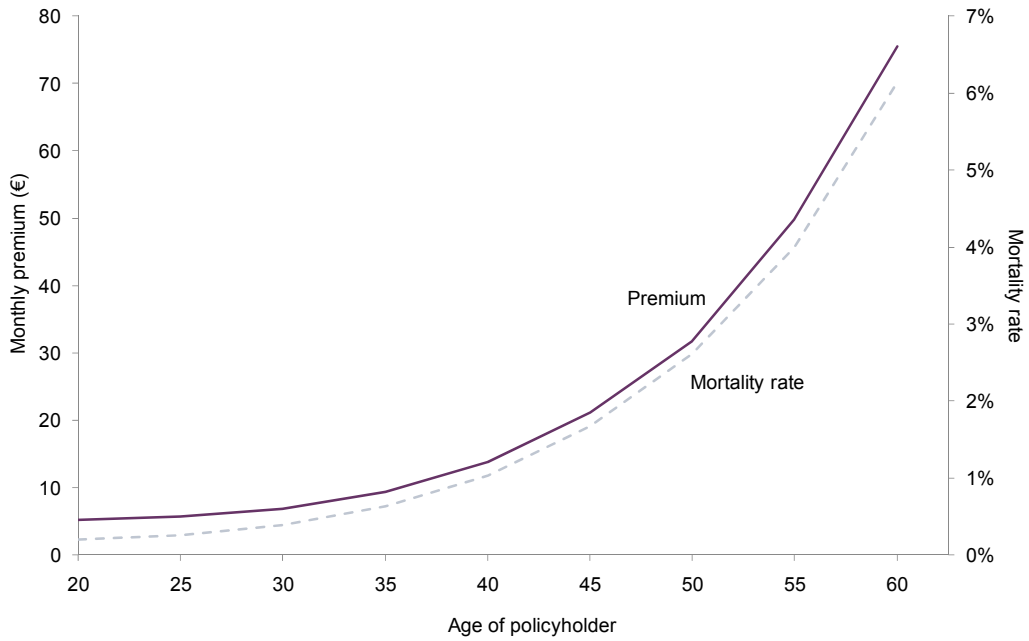


Note: Claim cost data have been converted into index numbers with a value of 100 for males aged 40.
Source: Premiums have been calculated using premium data collected from the premium comparison website, http://www.beste-private-krankenversicherung.de/. Claim cost data provided by PKV.

A1.5 Italy

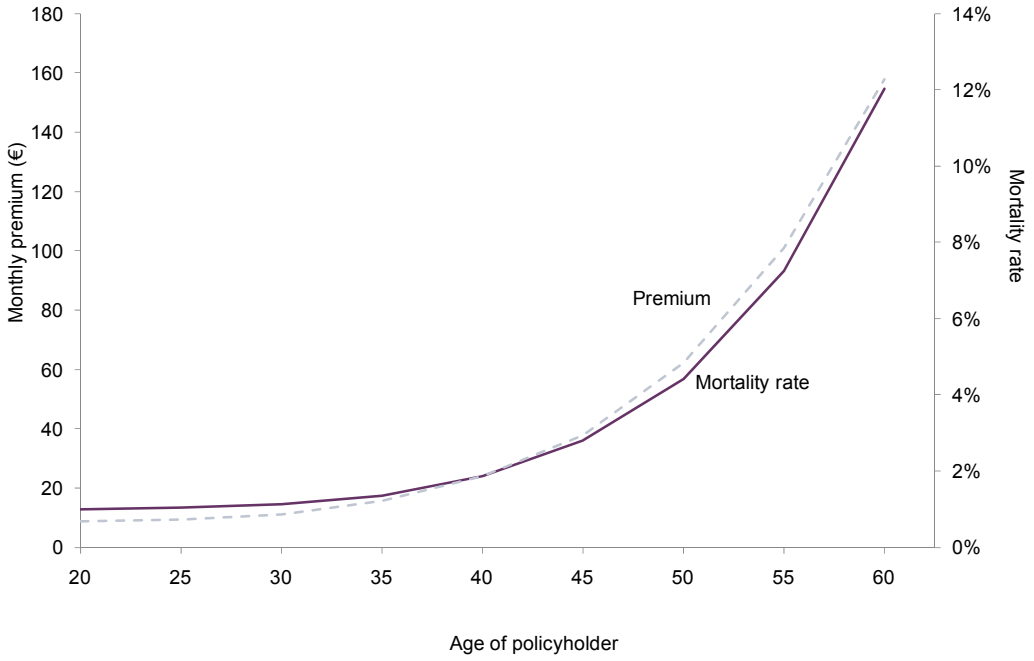
A1.5.1 Term life insurance

Females



Note: Premiums paid for term life insurance offering a cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Premiums collected from http://www.facile.it/assicurazioni-vita.html; mortality data obtained from http://en.istat.it/sanita/sociosan/index.html

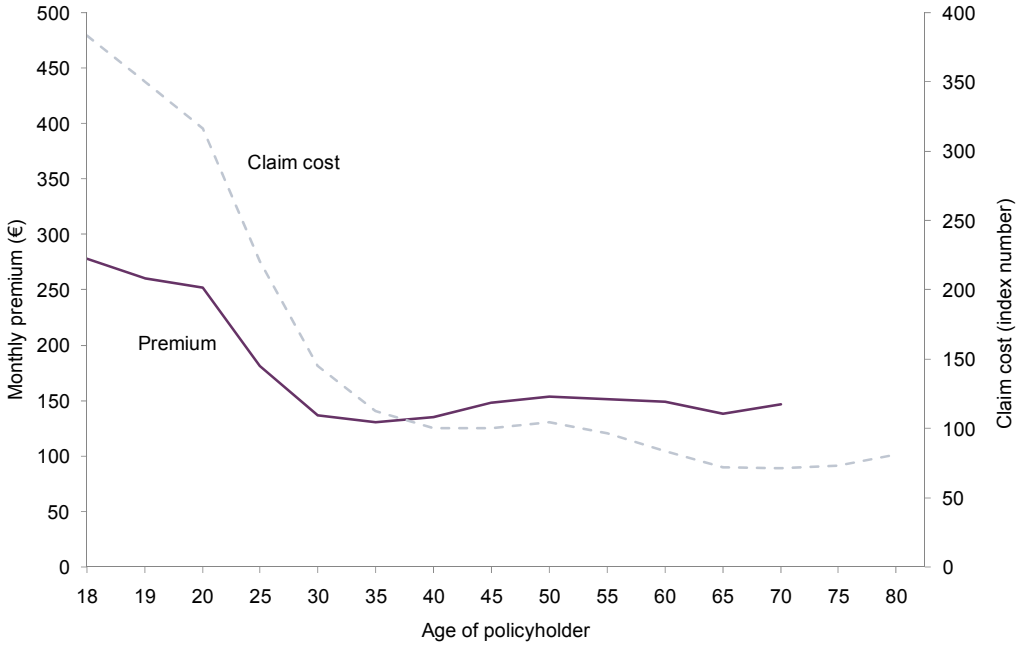
Males



Note: Premiums paid for term life insurance offering a cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder will die during the next ten years.
Source: Premiums collected from http://www.facile.it/assicurazioni-vita.html; mortality data obtained from http://en.istat.it/sanita/sociosan/index.html.

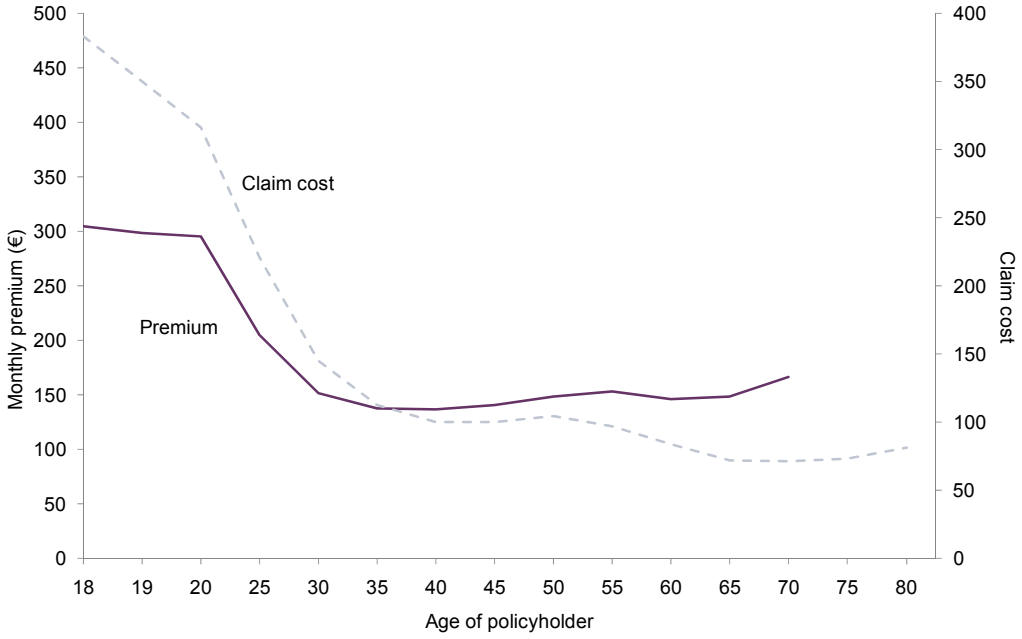
A1.5.2 Motor insurance

Females



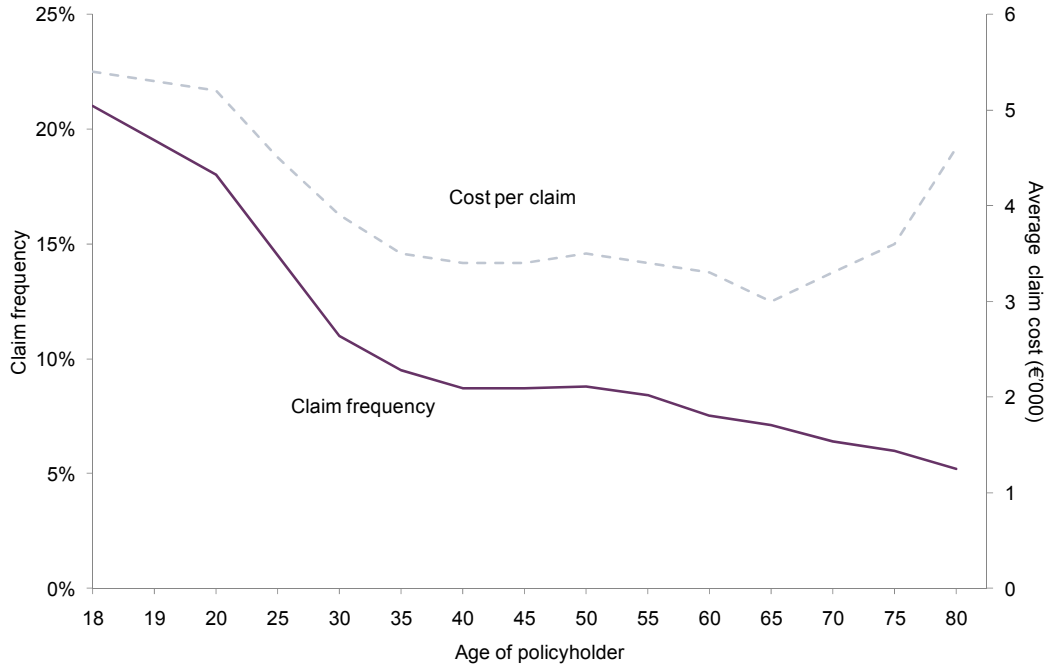
Note: Premiums paid for motor third-party liability insurance varying in age keeping other factors fixed; claim costs are presented by index number allowing the comparison of relative claim costs per age category. The index number has been set at a value of 100 for a 40-year-old driver.
Source: Premiums collected from htttp://www.assicurazione.it/; ANIA provided claim cost data.

Males: premiums and claim costs



Note: Premiums paid for motor third-party liability insurance varying in age keeping other factors fixed; claim costs are presented by index number allowing comparing relative claim costs per age category. The index number has been set at a value of 100 for a 40-year-old driver.
Source: Premiums collected through htttp://www.assicurazione.it/; ANIA provided claim cost data.

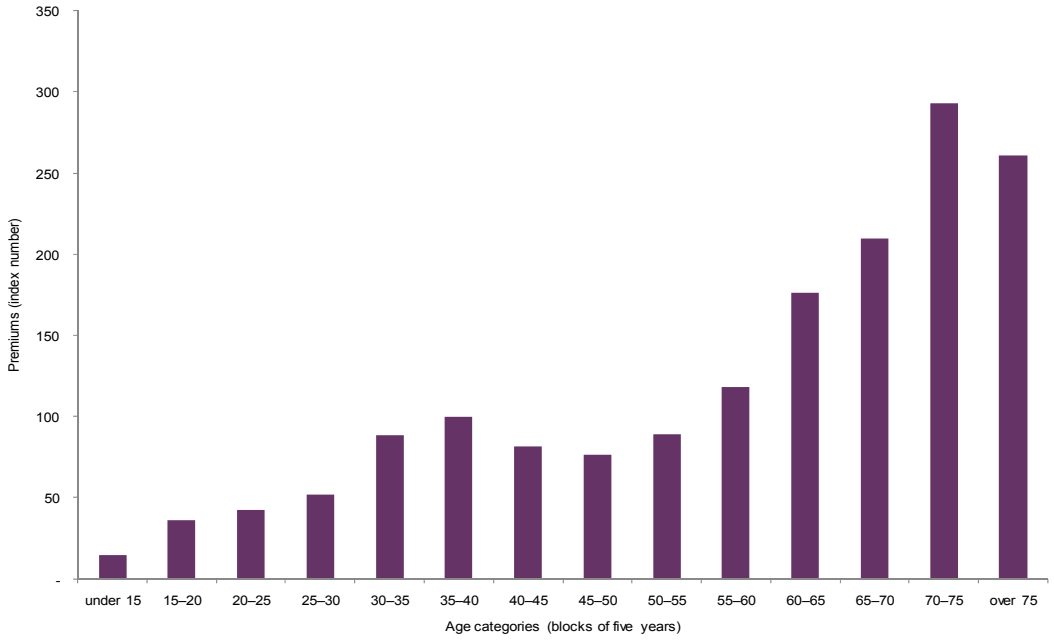
Males: claim frequency and average cost per claim filed



Note: Claim frequency represents the probability that a policyholder will file a claim; the average claim cost indicates the average claim cost in the event policyholders filed a claim.
Source: ANIA, presented in 'Statistica Annuale RC Auto – Esercizio 2009 e Rilevazione "ad hoc" Dati CARD', December 20th 2010.

A1.5.3 Private medical insurance

Premiums by age category

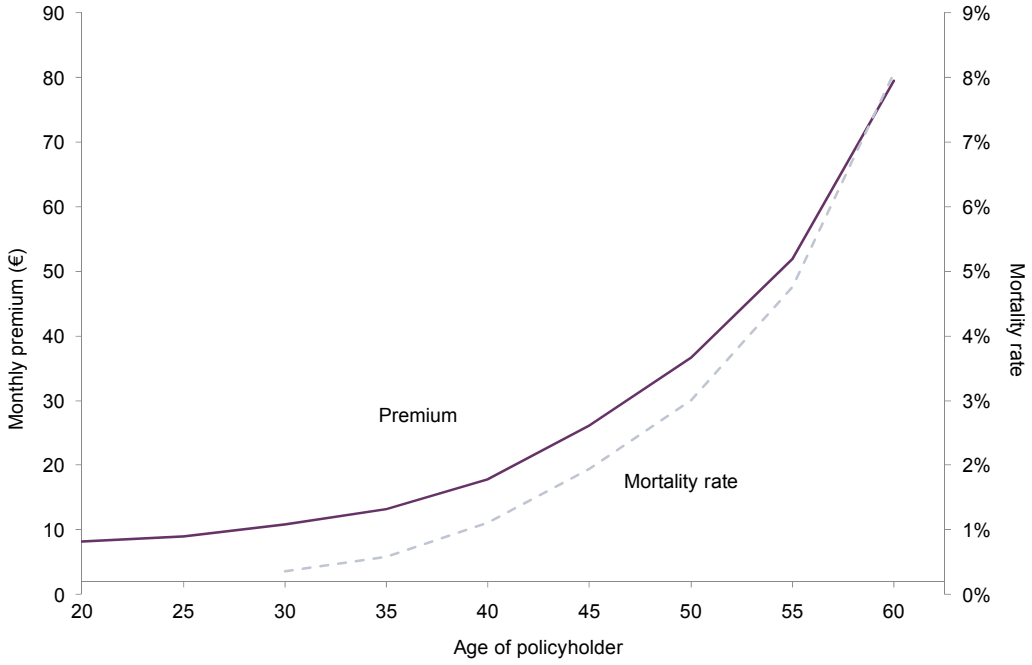


Note: Premiums are presented in the form of index numbers allowing comparison of premiums for differing age categories. The index number has been set at a value of 100 for premiums in the age category 35–40.
Source: ANIA provided net premium ratios, which have been used to establish index numbers for differing age categories.

A1.6 The Netherlands

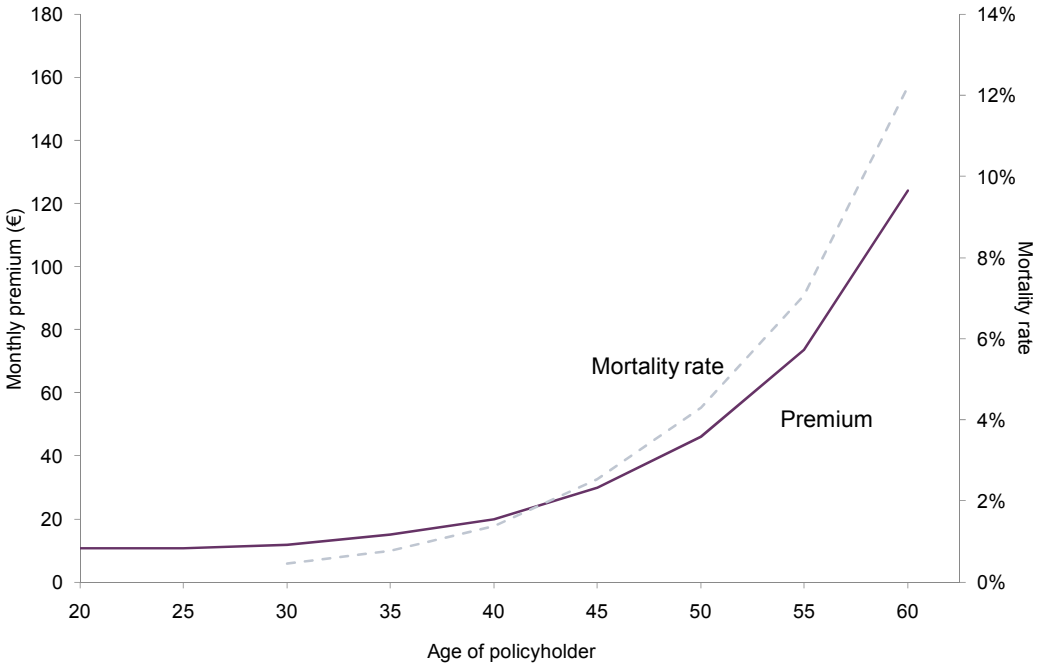
A1.6.1 Term life insurance

Females



Note: Premiums paid for term life insurance offering cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder dies during the next ten years.
Source: Premiums obtained from http://www.independer.nl/ ; mortality data obtained from www.ag-ai.nl/.

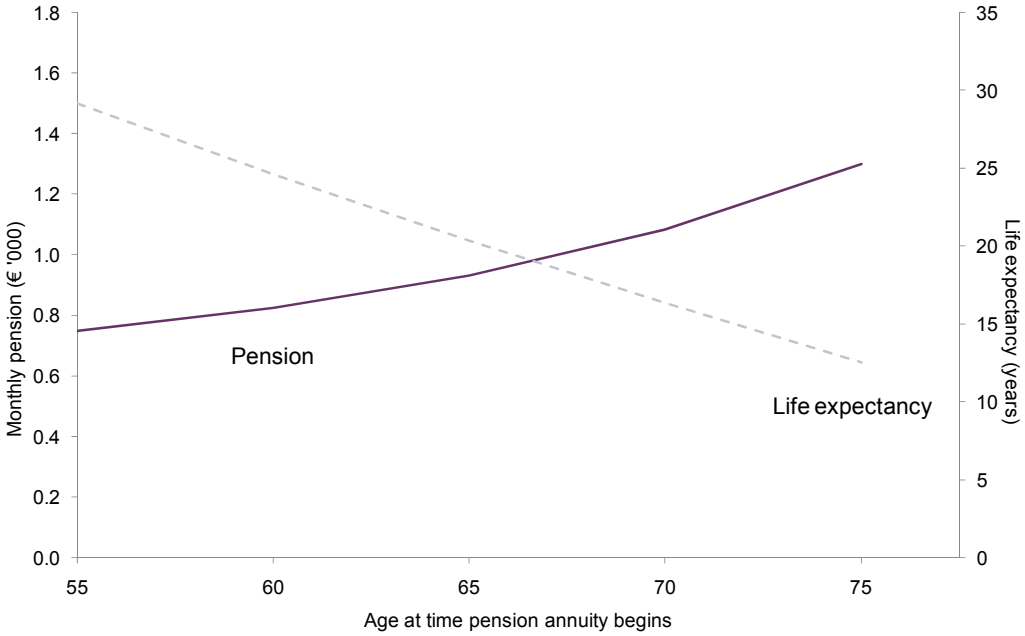
Males



Note: Premiums paid for term life insurance offering cover of €200,000 in the event of death during the next ten years; mortality rate represents the probability a policyholder dies during the next ten years.
Source: Premiums collected from http://www.independer.nl/; mortality data obtained from www.ag-ai.nl/.

A1.6.2 Pension annuities

Females



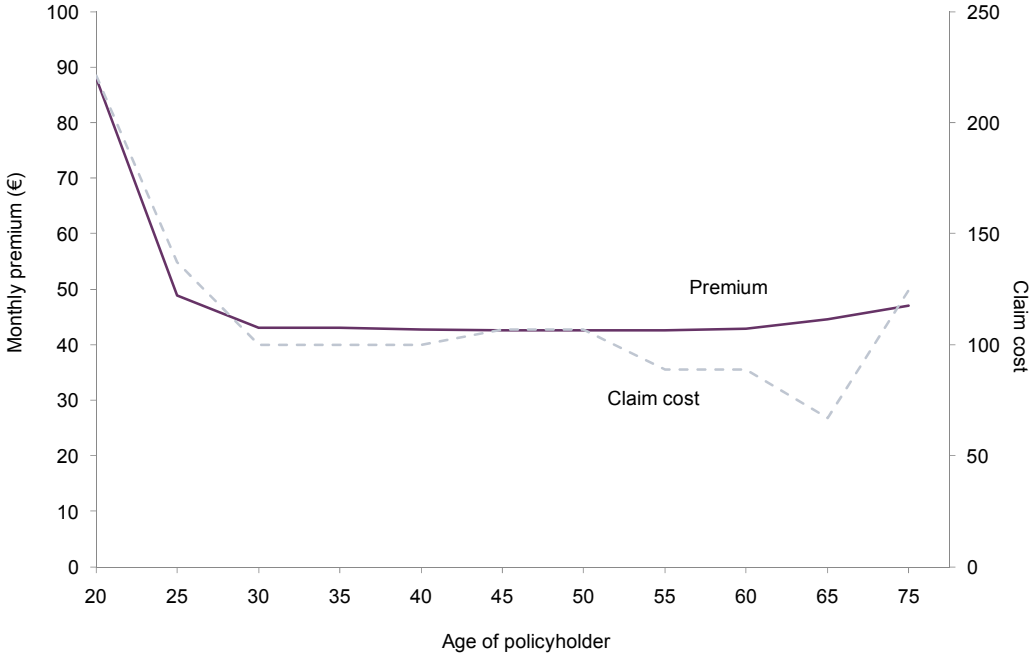
Note: Pensions paid out when making a lump-sum investment of €200,000 in annuities; life expectancy indicates the expected number of years a policyholder will live.
Source: Pensions collected from http://www.pensioenkoers.nl/direct-berekenen/; life expectancies established using mortality data attained from www.ag-ai.nl/.

Males

Note: Pensions paid out when making a lump-sum investment of €200,000 in annuities; life expectancy indicates the expected number of years a policyholder will live.
Source: Pensions obtained from http://www.pensioenkoers.nl/direct-berekenen/ ; life expectancies established using mortality data obtained from www.ag-ai.nl/.

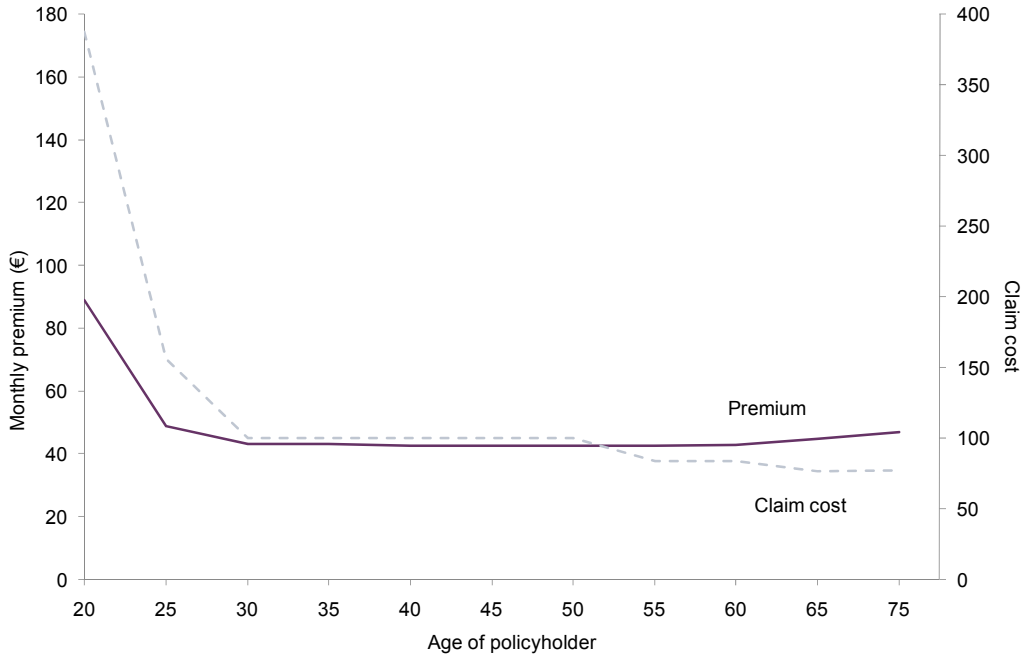
A1.6.3 Motor insurance

Females



Note: Premiums paid for motor third-party liability insurance keeping factors other than age and gender fixed; claim cost reflects relative claim costs per age category with a value of 100 for a 40-year-old driver.
Source: Premiums obtained from http://www.independer.nl/ ; claim cost data provided by Verbond van Verzekeraars.

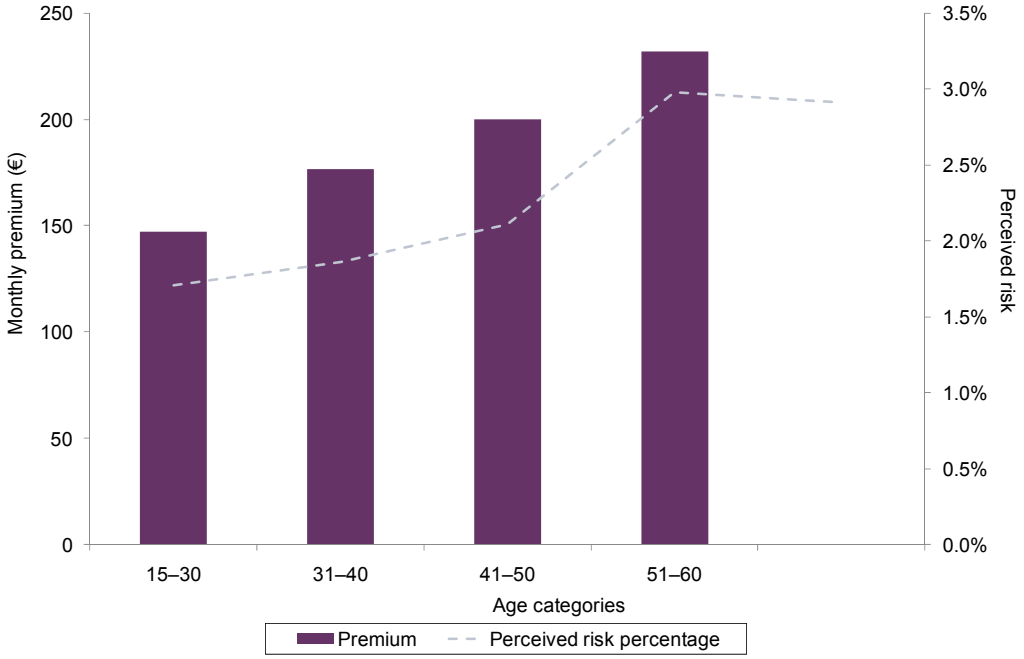
Males



Note: Premiums paid for motor third-party liability insurance keeping factors other than age and gender fixed; claim cost reflects relative claim costs per age category with a value of 100 for a 40-year-old driver.
Source: Premiums obtained from http://www.independer.nl/ ; claim cost data provided by Verbond van Verzekeraars.

A1.6.4 Disability insurance

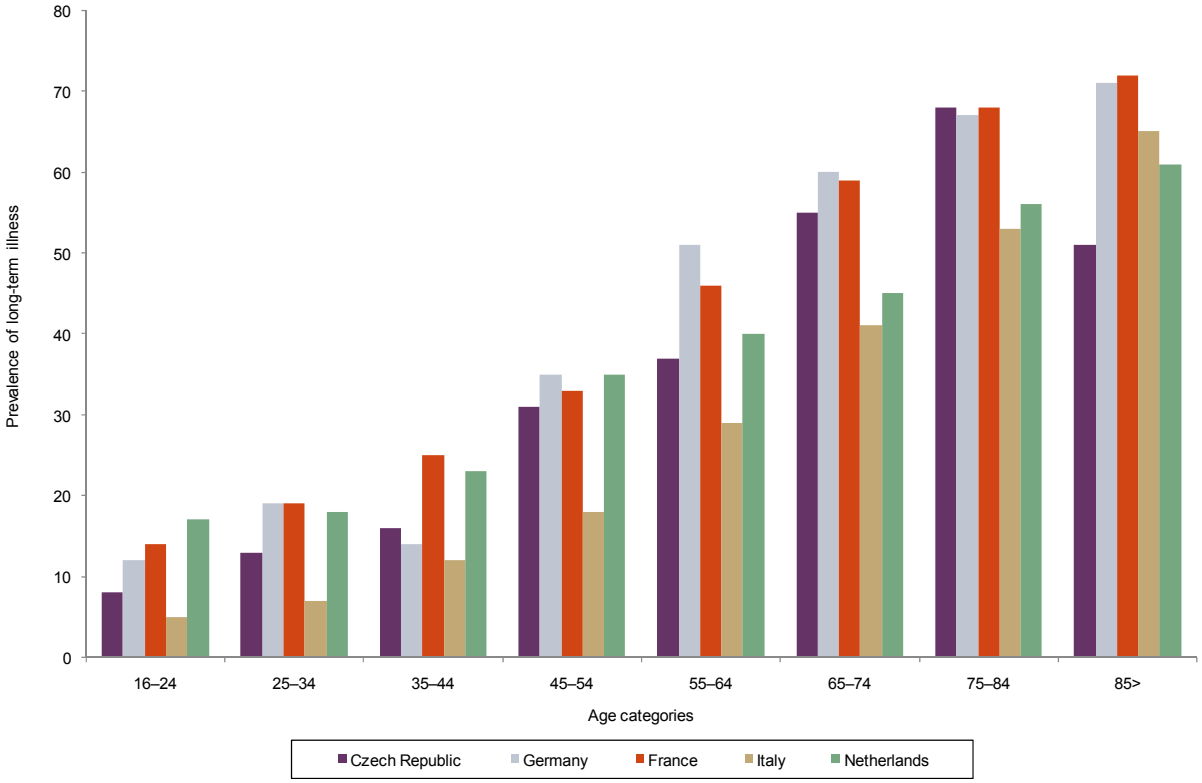
Males



Note: Premiums concern premiums paid for disability insurance providing cover to a policyholder in the event he would be unable to work in his current profession. A gross income of €40,000 and a minimum disability percentage of 25% were assumed. Average premiums for the age categories presented in the figure were calculated using premiums for differing ages.
Source: Verbond van Verzekeraars provided perceived risk percentages, which are calculated by dividing the payment within a fiscal year by the insured amount in that same year. Premiums collected from http://www.datishetverschil.nl/.

A1.7 Group of selected countries

A1.7.1 Long-term care insurance



Note: Prevalence is determined on the basis of self-reporting. No data available for the UK.
Source: Based on Figure 3 in DG Employment, Social Affairs and Equal Opportunities of the European Commission (2008), 'Long-term care insurance in the European Union'.

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