# Some novel perspectives on risk classification

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This paper considers a number of novel perspectives on risk classification, primarily in the context of life and
critical illness insurance.

I first make some observations regarding the approximate and cyclical nature of insurance pricing in practice, and
the idiosyncratic variations in risk classification practices across different products and markets.

I suggest that the terminology of "adverse selection" is unhelpful, because from a public policy viewpoint in many
markets adverse selection may not be adverse.  I introduce the concept of "loss coverage" as a criterion for risk
classification systems.  I suggest that public policy should target a socially optimal level of adverse selection, and
that in many markets this means maximising the loss coverage.

I argue that competition between insurers in risk classification is often deleterious, and generally does not have the
same clear benefits as competition in many other areas.  Public policy should direct competition away from risk
classification towards areas which are more clearly beneficial to all insurance customers.

Econometric tests for adverse selection have often struggled to demonstrate the practical existence of phenomena
predicted by the theory.  This suggests that the theory is incomplete, and leads to a consideration of propitious
selection, and various psychological perspectives on risk classification.

I also consider risk classification as blame, the conflict between risk classification and human rights, and the
fallacy of the one-shot gambler.

Keywords: adverse selection, propitious selection, loss coverage, competition, psychology, one-shot gambler

## 1. Introduction

This paper considers a number of novel – or at least, seldom-aired – perspectives on aspects
of risk classification.  These perspectives arise mainly by considering risk classification and
its consequences from viewpoints other than those typical of insurance actuaries or
economists.    Some of the material was originally developed in a response[1] to a public
consultation[2] initiated by the Human Genetics Commission in the United Kingdom, and in a
related presentation.[3]  Hence the ideas have been developed primarily with term life and
critical illness insurance[4] in the UK in mind.  They may well be less applicable to some other
types of insurance.

Most discussion and research on risk classification and public policy, at least in the UK,
suffers from structural bias, in that it tends to be funded or directed by the insurance industry.
Money not only buys political influence; used cleverly, it can also buy intellectual influence.
This is not always because the insurance industry exercises direct control over research and
publication (although in many cases it does). It is also because the career-minded actuary or
researcher recognises, implicitly or explicitly, that the surest route to research grants,
publication, promotion and peer esteem is to conform to an industry perspective – or at least,
not to pursue an overtly critical one.   Through circumstances rather than virtue, I am
indifferent to these considerations (although no doubt prone to others).

The structure of this paper is as follows.   Section 2 provides some context in the form of
elementary observations on insurance pricing in practice.  Section 3 discusses the idea that

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[1] Thomas (2001).
[2] Human Genetics Commission (2001).
[3] Thomas (2004).
[4] Critical illness insurance is a long-term policy which pays a fixed cash sum on diagnosis of any of a list of
illnesses (heart attack, cancer, stroke, multiple sclerosis, major organ transplant, etc).

adverse selection is not adverse, and introduces the idea of loss coverage as an objective for public policymakers. Section 4 discusses competition in risk classification, the malevolent invisible hand. Section 5 considers empirical studies of adverse selection. The difficulties which are often experienced in observing adverse selection in practice lead to Section 6, which discusses propitious selection. Section 7 discusses psychological aspects of risk classification, and some ways in which asymmetric information might be to the advantage of the insurer rather than the insured. Section 8 discusses the concept of risk classification as blame. Section 9 discusses risk classification and anti-discrimination laws. Section 10 comments on adverse selection and large policies. Section 11 summarises the paper.

## 2. Insurance pricing in practice: some elementary observations

### 2.1 Variations in prices between companies and over time

This section of the paper says nothing about risk classification. It is intended to provide some context for the rest of the paper, and perhaps for other discussions at this conference. Much commentary on life insurance risk classification gives the impression that individual assessment of risk is the primary determinant of insurance prices, and that it is a highly precise matter. The impression often given is that any regulation of risk classification practices would transform the market, leading to a devastating effect on prices and market outcomes. For example, many expositions give the impression that a cycle of rising prices and declining coverage – the so-called "adverse selection spiral"- must be the inevitable consequence of any regulation of risk classification.

However when we examine actual premium rates in the market, a rather different picture appears. As an example, take the recent history of life insurance prices in the UK. This appears to be a competitive market with a large number of insurers, and virtually no regulation of premium rates or risk classification practices. The underlying risks, particularly in the case of mortality, are relatively stable and well-understood. The market is large, with perhaps 45% of the country's population holding some life insurance.[5] Comparative quotations are readily obtainable on the internet. Nearly half of new policy sales are through independent financial advisers, who can select the cheapest rate for a customer from all rates in the market.

One might expect that customer search costs in such a market would be low, with competition leading to standard premium rates for a given age and term of policy converging in a narrow band, with little business being written by insurers with uncompetitive rates. One might also expect the premium rates for mortality risks to be relatively stable over time (although perhaps trending slowly downwards with declining mortality, offset (in recent years) by falling interest rates).

In practice, there seem to be surprisingly large market variations in insurance premiums for identical risks between companies and over time. Some indications of these variations are given in Figure 1 and Figure 2, which have been extracted without adjustment from industry sources.

Figure 1 shows that in term life insurance, the mean of the ten cheapest standard premium rates available to financial advisers in the UK declined by between 25% and 60% over the five years to 2003, with the largest reduction for male 45-year old non-smokers, and the smallest for female 30-year old non-smokers. Premiums then rose by an average of about 20% in the following year.

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[5] Source: Scottish Provident/MORI, reported in *Money Management*, January 2004.

Figure 1: Life insurance: mean of 10 cheapest rates for various age and term combinations, 1999-2004

- each line is a different age/sex/term/smoking/sum assured combination
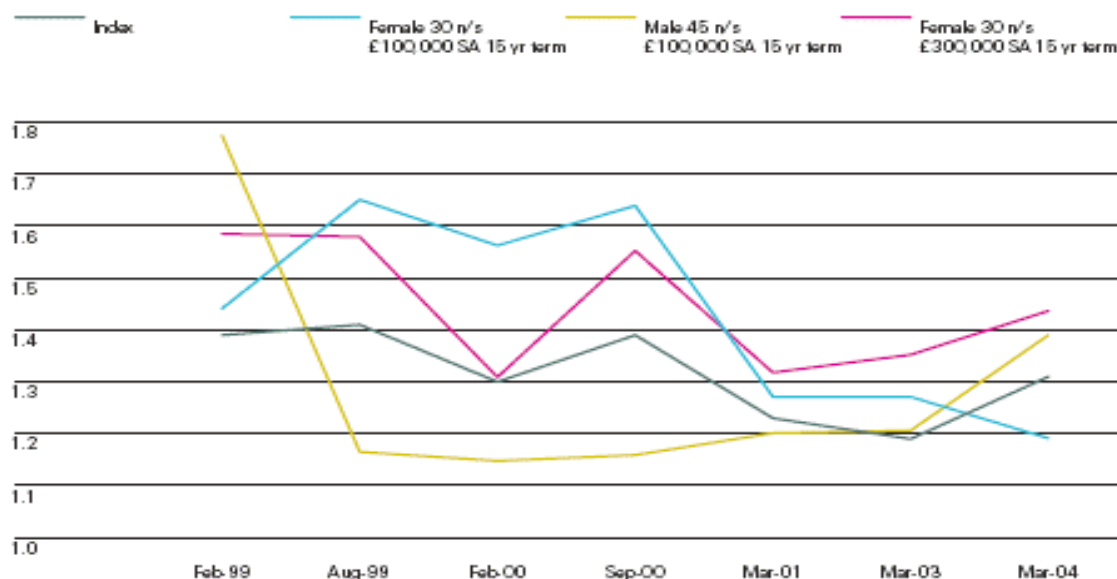- each line is indexed to 100 in Spring 2003
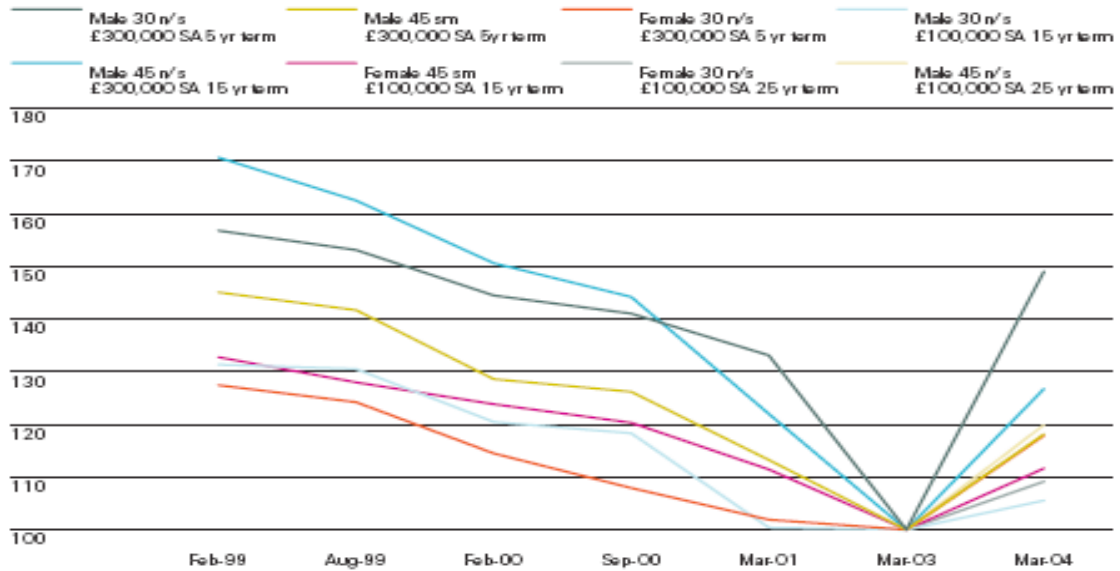


Source: Swiss Re, 2004
All rates sourced by Swiss Re from The Exchange (electronic quotation system of rates available to independent financial advisers).

Figure 2 gives an impression of the variations which exist between companies in the standard rates quoted for a range of age and sex combinations for a 15 year term assurance for a non-smoker. For a given risk, the 10th cheapest premium rate in the market at any time is between 1.2x and 1.6x the cheapest premium rate.

Figure 2: Life insurance: 10th cheapest rate/cheapest rate for various age and term combinations, 1999-2004 – each line is a different age/sex combination (all 15years, sum assured £100k, non-smoker)
– grey line is a representative index for range of age/sex combinations



Source: Swiss Re, 2004
All rates sourced by Swiss Re from The Exchange (electronic quotation system of rates available to independent financial advisers).

Looking at Figure 2, the thought occurs that the spread between the cheapest and 10th cheapest rates might be attributable to clientele effects. For example, there might be one company with stricter underwriting or distinctive marketing channels which attract lower risks, and which is therefore able to offer lower premium rates than other companies consistently over time. However, further investigation reveals no obvious evidence of consistent "price leaders": companies appear to move in and out of the "cheapest 10", and the ordering of the "cheapest 10" appears to change, from one year to the next.[6]

Why are some insurers apparently able to sell a commodity product such as life insurance at prices 50% higher than their competitors? One practical reason may be the contexts in which life insurance is often sold, where life insurance is a small adjunct to a much larger transaction, and therefore the customer pays relatively little attention to the cost of the insurance. For example, the purchase of life insurance often occurs at the time when a person decides to buy a house.[7] In these contexts the customer's sensitivity to price may be relatively low.

For critical illness insurance, the variations between companies and over time appear even larger than for life insurance. This is as one might expect, given the less mature nature of the market, but the size of the variations is still surprising. Figure 3 gives an impression of the variations over time, and has again been extracted from an industry source without

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[6] More details in Thomas (2004).
[7] In the UK most people buy their homes with a 25 year loan secured on the property. Lenders often require an assigned insurance policy to guarantee repayment of the loan if the borrower dies.

adjustment. It illustrates the variation over time in the cheapest guaranteed[8] premium rate for critical illness insurance available to all independent financial advisers. It can be seen that the cheapest rate declined gradually around 20% over the 3 years to 2002, but then rose very sharply between 50% and 100% during 2003.

Figure 3: Cheapest critical illness insurance premiums, 2000-2003

– based on a range of age/sex/term combinations
– Indexed to Q1 2000 = 100
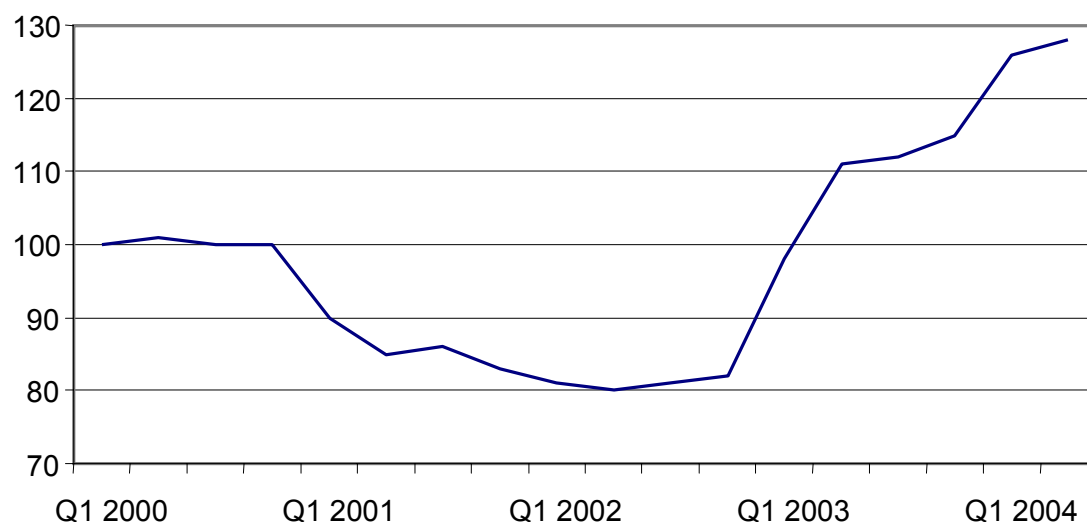
All rates sourced from The Exchange (electronic quotation system of rates available to independent financial advisers).

It is natural to ask why the cheapest available critical illness rates increased by more than 50% during 2003 (and indeed some companies increased rates by over 100%). This is difficult to explain by reference to radical new information about future critical illness claims. The reasons probably lie more in commercial dynamics of the insurance and reinsurance markets. Much critical illness insurance is reinsured. In 2001-2002 there appear to have been substantial losses in reinsurer capital, combined with increasing attractions of deploying remaining capital in fields other than critical illness insurance (eg very strong markets in casualty/property insurance). In late 2002, two of the largest reinsurers withdrew from offering guaranteed critical illness rates. The reduced supply of reinsurance led to rising rates, which was passed on to customers in the direct insurance rates indexed in Figure 1.3.

Another impressionistic insight into the turbulent nature of the critical illness market in the period 2002-2004 is provided by tracking changes in individual companies' typical rates. This is illustrated for four major companies in Table 1.

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[8] Guaranteed rates are non-reviewable, ie the premium is fixed for the life of the policy. Some insurers offer reviewable rates where the premium may be raised say every 5 years, dependent on the insurers' general experience.

Table 1: Changes in individual company critical illness insurance price schedules, 2002-2004

| | Company A | Company B | Company C | Company D |
|---|---|---|---|---|
| Dec 02 | +40% | | | |
| Feb 03 | | | | |
| March | -19% | | | |
| April | | +14% | | |
| July | | | +36% | |
| October | | +20% | | +30% |
| Jan 04 | | | -7% | |
| Feb | | +11% | | -20% |
| March | | | -8% | |

Companies A to D are large UK direct insurers.

Sources: Redmayne (reassurance advisers), Lifesearch (independent financial advisers), various trade press cuttings. These sources usually quote single numbers (reported in the table) as "average" or "typical" changes across the premium schedule.

*2.2 Variations in risk classification between markets and countries*

Separately from observing the variations in insurance prices in practice, we can also observe variations in insurers' risk classification practices (and government regulation thereof) across different products and different countries. For example, private health insurance in Ireland has effectively no underwriting; life insurance in several European countries is unisex; in the UK gender differentiation exists in life insurance, but usually not in health insurance; and so on. These differences often seem to be largely matters of custom and practice, without compelling technical rationales. The general inference is that private insurance seems to be workable under a wide range of risk classification schemes.

*2.3 Summary: an imperfect but robust market?*

In summary, elementary observation suggests that there are very substantial variations in life insurance and critical illness premium rates in the United Kingdom, both between companies and over time. The variations seem larger than can be plausibly explained by variations in underlying risk factors, or by financial factors such as interest rates. This suggests that "commercial" factors – alternative uses of capital, market cycles, and so-called "market pricing" – are important in explaining changes in premium rates. There are also very substantial variations between countries in their approaches to risk classification for particular products.

These observations are unlikely to be a surprise either to practitioners or to thoughtful observers. However, these observations have been made here because they often seem to be overlooked when risk classification is discussed, leading to unrealistic rhetoric about a highly precise pricing process which could be devastated by any changes in risk classification practice. In reality, changes in risk classification are not the only – and probably not even the main – determinant of changes in individual insurance prices. Perhaps the reality of insurance pricing is both less precise, and more robust, than many discussions of risk classification suggest.

## 3. Optimal (adverse) selection: maximising loss coverage

### 3.1 Adverse to whom?

Actuaries and economists talk a great deal about *adverse selection* or *anti-selection*. This vocabulary betrays a particular perspective or bias: "adverse" selection means primarily *adverse to the insurer*.

From a public policy viewpoint, it is not obvious that adverse selection is always adverse. From a public policy viewpoint, some types of insurance are probably social (or merit) goods[9], which public policy should ensure is available widely. A degree of adverse selection in some insurance markets may then be seen as desirable: it means that the right people, people more likely to suffer loss, tend to buy insurance.

The extent to which adverse selection is seen as desirable from a public policy viewpoint may depend on the insurance market in question. For example, some people might regard a degree of adverse selection in life or health insurance as positive; but the same people might (or might not) regard adverse selection in motor insurance as negative. However, the important point is that the assumptions implicit in much commentary – that adverse selection is always unwelcome, and that policy should be directed towards its elimination – may be inappropriate from a public policy viewpoint.

Economists often suggests that adverse selection is also adverse in a different sense, in that it reduces the efficiency of contracting. In the classical model of insurance under asymmetric information, it leads higher risks to receive full coverage at an actuarially fair price, whilst lower risks receive less than full coverage, so that a Pareto improvement would be possible from accurate risk classification.[10] A similar result obtains under some alternative concepts of equilibrium.[11] But this type of theorizing often seems at best tenuously connected with the reality of life insurance markets, in which higher risks are charged higher prices or excluded from insurance, and there is no rationing of insurance for lower risks.

Economists are also tends to discuss welfare losses from adverse selection in terms which can seem rather abstract and theoretical, with subtly different answers depending on which particular concept of game-theoretic equilibrium is selected; in contrast, the welfare losses of people excluded from insurance are often human, compelling and observable. This does not necessarily mean that the abstractions should be dismissed; but it does mean that one should consider carefully to what extent the abstractions represent real human phenomena.

### 3.2 Maximising loss coverage

If some degree of adverse selection may be desirable in certain markets, the question arises how much? I suggest that in many markets, a public policymaker should seek to maximise the "overlap" of insurance coverages and loss events – the "loss coverage" – that is maximise the proportion of loss events which is covered by insurance.[12]

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[9] That is, goods the supply of which generates positive externalities. For example, life insurance may reduce the need for government welfare transfers to bereaved dependants, facilitate entrepreneurial risk-taking, etc.

[10] For example Rothschild and Stiglitz (1976).

[11] For example Wilson (1977).

[12] I assume (a) the incidence of loss events is independent of levels of insurance, ie no moral hazard (b) the restitution of losses through insurance is regarded as social good, which public policy should seek to promote. I hope these assumptions are acceptable for life insurance. Both may be less appropriate for certain other types of insurance.

One way of maximising loss coverage is to make insurance compulsory. This approach is sometimes taken, particularly where the purpose of the insurance is to protect the interests of unidentified third parties or the public at large – in other words, the insurance is almost entirely a social good rather than a private good. Compulsory employers' liability insurance and third-party motor insurance are examples of this in the UK. In these cases, the perceived societal need for and benefit from the insurance are not affected by circumstances or preferences of the insured. The compulsory approach is therefore seen to be appropriate.

But there are few types of insurance which are almost entirely social goods. Most types of insurance, such as life insurance, are seen as providing some benefit to wider society – that is they are seen *partly* as social goods. However, the social good is achieved by means of providing *private* benefit to the insured or their immediate family. In these cases, the need for and benefit from the insurance are directly affected by personal circumstances and preference of the insured. For example, a compulsory requirement to purchase life insurance would be of no benefit to single persons with no dependants. In these cases, the compulsory approach may be seen as an unjustified restriction of individual choice.

Although insurances which provide a mixture of private and social good are usually not seen as appropriate cases for compulsion, this does not mean that a policymaker should take no interest whatsoever in their provision. If it is accepted that the insurance is at least *partly* a social good, the policymaker may wish to promote its availability – and in particular, its availability to persons who are more likely to suffer loss. The policymaker might wish to target adverse selection high enough that many higher risks can obtain coverage, but not so high that an adverse selection spiral develops. This may mean a higher level of adverse selection than insurers might wish. Informally, we can say that the public policymaker wants *"insurance bought by people likely to need it."*

There may be a few insurance markets where insurance is *not* seen as having any social good element, or where the social good element is seen as negligible. A clear example would be insurance against the cost of legal or regulatory penalties; a less clear example might be insurance of pet animals. In these cases, a policymaker would probably place a much lower value on maximising loss coverage than in markets such as life insurance. Indeed, the policymaker might even seek to *minimise* loss coverage, by discouraging the insurance. In extreme cases this might mean banning the insurance.[13]

*3.3 A simple example*

The concept of adjusting the degree of risk classification to maximise loss coverage is illustrated in the following model. There are two risk groups: a lower risk group with risk 1/100, and a higher risk group with risk 4/100. All insurance contracts are for a fixed sum assured.[14] In Scenario 1 (shown as Table 1), actuarially fair premiums are charged to each risk group. In Scenario 2 (shown as Table 2), insurers are not allowed to discriminate – there is a single premium rate irrespective of risk group, and some adverse selection occurs. Take-up of insurance increases in the higher risk group, and reduces in the lower risk group, and a slightly lower total number of policies is issued. The net effect is favourable, in that a larger proportion of the loss events is covered by insurance, that is the loss coverage is increased. In Scenario 3 (shown as Table 3), insurers are again not allowed to discriminate, but the adverse selection is more severe: coverage shifts further towards the higher risk group, the number of policies reduces more drastically. The net effect is unfavourable, in that the loss coverage is reduced.

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[13] For example, the Financial Services Authority (FSA) in the UK prohibits regulated firms from insuring against the cost of FSA penalties.

[14] This allows adverse selection to be represented by varying proportional take-up of insurance in each of the two groups. The assumption simplifies the presentation, but it is not necessary.

**Table 1** Scenario 1: with actuarially fair premium rates.
- − 25% take-up in higher risk group (insurance is prohibitively expensive)
- − 50% take-up of insurance in lower risk group
- − 5,500 policies issued

| Risk group | Lower risk group | Higher risk group |
|---|---|---|
| Population | 10,000 | 2,000 |
| Risk | 1/100 | 4/100 |
| Premium required | 1/100 | 4/100 |
| Take-up (members of group purchasing insurance) | 5,000 | 500 |
| (A) Expected loss events | 100 | 80 |
| (B) Loss events insured | 50 | 20 |
| Loss coverage: $\Sigma B / \Sigma A$ | **0.39** | |

**Table 2** Scenario 2: single premium rate
- − Some adverse selection
- − take-up increased to 50% in higher risk group
- − take-up fallen to 40% take-up in lower risk group
- − reduction to 5,000 in number of policies issued
- − higher loss coverage

| Risk group | Lower risk group | Higher risk group |
|---|---|---|
| Population | 10,000 | 2,000 |
| Risk | 1/100 | 4/100 |
| Premium required | 1.60/100 | |
| Take-up (members of group purchasing insurance) | 4,000 | 1,000 |
| NB some adverse selection | | |
| (A) Expected loss events | 100 | 80 |
| (B) Loss events insured | 40 | 40 |
| Loss coverage: $\Sigma B / \Sigma A$ | **0.44** | |

In my view a policymaker concerned with public welfare should regard Scenario 2, with higher overlap of insurance coverages and loss events, as superior to Scenario 2. That is, of these 2 scenarios, the case with higher adverse selection is superior. The more accurate risk classification in Scenario 1 produces a lower loss coverage.

Note that although slightly fewer policies are issued in Scenario 2 than in Scenario 1, *more policies are bought by the right people*, that is people more likely to suffer loss. The loss coverage criterion captures the net effect of the shift in coverage towards higher risk lives (good) and the reduction in number of policies issued (bad).

**Table 3** Scenario 3: single premium rate
 −  more adverse selection
 −  50% take-up in higher risk group (same as Scenario 2)
 −  25% take-up in lower risk group (cf. 40% in Scenario 2)
 −  reduction to 3,500 in number of policies issued (cf. 5,000 in Scenario 2)
 −  lower loss coverage than either of Scenarios 1 or 2.

| Risk group | Lower risk group | Higher risk group |
|---|---|---|
| Population | 10,000 | 2,000 |
| Risk | 1/100 | 4/100 |
| Premium required | 1.86/100 | |
| Take-up (members of group purchasing insurance) | 2,500 | 1,000 |
| NB extreme adverse selection, greatly reduced total coverage | | |
| (A) Expected loss events | 100 | 80 |
| (B) Loss events insured | 25 | 40 |
| Loss coverage: ΣB / ΣA | **0.36** | |

On the loss coverage criterion, Scenario 3 is inferior to both Scenario 1 and Scenario 2. Although the take-up of insurance is higher in the higher risk group (good), this is more than offset by the reduction in take-up in the lower risk group (bad). The net result is that the loss coverage is reduced.

*3.4 Loss coverage: comments, caveats and limitations*

It might be suggested that the lower number of policies issued in Scenario 2 as compared with Scenario 1 is a disadvantage, reflecting a lower efficiency of contracting. My view is that loss coverage is a more important public policy objective in life insurance than efficiency of contracting.

Nothing in the discussion above has suggested that the loss coverage will *necessarily* be increased by restricting risk classification. In other words, nothing has been said about which of Scenarios 2 or 3 is more likely if restrictions on risk classification are imposed in a market where none presently exist. It is possible that in some markets and in respect of some risk factors, Scenario 3 represents the status quo: in other words, that a higher loss coverage could be achieved if insurers were required to classify risk more accurately than market competition leads them to do. However, competition between insurers induces a tendency to more accurate risk classification, even where this has no public benefit (this is elaborated later in the paper). This makes the idea that market competition could lead to insufficient levels of risk classification seem less plausible.

The essential difference between Scenario 2 and Scenario 3 is one of *relative* responsiveness of the lower and higher risk groups to changes in price − loosely speaking, *relative* price elasticities of demand in higher and lower risk groups.[15] A better outcome from restricted risk classification (Scenario 2) occurs where the elasticity in the lower risk group is sufficiently lower (relative to that of the higher risk group) as to offset that group's larger size.

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[15] Price elasticity of demand is usually understood as a marginal measure with respect to small changes in price, which is not a good description of our scenarios, where the two groups experience changes in price of different sign and over different large ranges. However, if we define elasticity of demand as $(\Delta t/t)/(\Delta p/p)$ for the high risk group, where $t$ and $p$ are that group's original take-up and price in Scenario 1, and proceed analogously for the lower risk group, then the ratio of the elasticities thus defined in lower and higher risk groups is 0.20 for Scenario 2, but 0.31 for Scenario 3.

In our scenarios, the sizes of the lower and higher risk groups, and their respective risks, are fixed. More generally, the effect on the loss coverage of restricting risk classification will also depend on (a) the *relative* sizes of the lower and higher risk groups (b) the *relative* risks of the lower and higher risk groups.

The above observations are intuitive, but we can also formalise the presentation as follows. Define $L$ and $H$ as the lower and higher risk populations, $l$ and $h$ as the respective proportions of each population taking up insurance, and $r_L$ and $r_H$ as their respective risks. Then define

$$\text{Loss coverage} = \frac{r_L.l.L + r_H.h.H}{r_L.L + r_H.H}$$

The suggested policymaker's objective can then be seen as maximising a weighted average of the take-ups of insurance $l$ and $h$ in lower and higher risk groups, the weights being the expected population losses $r_L.L$ and $r_H.H$ respectively. Dividing through by $r_L.L$, this is equivalent to maximising

$$l + (r_H.H / r_L.L)\, h$$

from which it can be seen that the suggested policymaker's objective depends on the relative risk in higher and lower risk groups, and the relative size of the groups.

In our scenarios, this objective function amounted to $l + 0.8h$. Any restriction on risk classification is expected to lead to a reduction in $l$, and an increase in $h$. The net effect is an increase in the loss coverage, provided $-\Delta l < 0.8\,\Delta h$. For example –
−   in Scenario 2, $-\Delta l = 0.10 < 0.8\Delta h = 0.2$; but
−   in Scenario 3, $-\Delta l = 0.25 > 0.8\,\Delta h = 0.2$.

Note that the quantity $(r_H.H / r_L.L)$ is the *relative loss ratio* in the higher risk group relative to the lower risk group. Hence we can say that a restriction in risk classification will increase the loss coverage provided that the magnitude of the change in take-up in the lower risk group is less than the change in take-up in the higher risk group times that group's relative loss ratio.

More generally, let the population in the $i$-th risk group be $P_i$, let the risk for that group be $r_i$, and let the proportion of the population taking up insurance in that group be $t_i$. Then we can define

$$\text{loss coverage} = \frac{\sum t_i r_i P_i}{\sum r_i P_i}\ .$$

as a criterion for the social efficacy of insurance.[16] The policymaker's objective is to maximise the weighted average take-ups $t_i$, where the weights for the risk groups are the expected population losses $r_i P_i$.

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[16] For any given market the denominator in this expression will obviously be a constant, and attention can be focused solely on the weighted average in the numerator; nevertheless it seems convenient to include the denominator as a normalising factor, to enable comparisons to be made between different markets or countries.

*3.5 Loss coverage in different markets*

It was noted above that the change in the loss coverage if risk classification is restricted depends on the *relative* responsiveness of high and low risk groups to changes in the price schedule. In the extreme, if the price elasticity of demand for insurance in the lower risk group was zero, reducing risk classification would always increase the loss coverage: more higher risks would be covered, with no reduction in coverage of lower risks.

The relative responsiveness of higher and lower risk groups to changes in price will probably be different in different insurance markets. It follows that even if loss coverage is regarded as uniformly desirable in several different markets, different levels of risk classification are socially optimal in different markets. It is difficult to say much about *which* markets: there is almost no data on price elasticities of demand for insurance, and certainly none that I know of on relative elasticities in higher and lower risk groups. Price elasticity would normally be lower in the lower risk group simply because of the lower price, but this need not mean that it is *sufficiently* lower. However, one thing that can be said is that if propitious selection as described later in the paper applies – that is, risk aversion is higher in the lower risk group – then that suggests that this group may be less responsive to price changes. This suggests the conjecture that in markets where propitious selection is stronger, restrictions on risk classification have a better chance of increasing loss coverage.

*3.6 Alternative public policy objectives*

In the discussion above the policymaker's objective was to maximise the loss coverage, with no distinction between loss events arising from the high risk or low risk groups. This utilitarian perspective is a minimum position, but additional or alternative policy objectives are plausible. For example, if members of the high-risk group are socially disadvantaged, the policymaker might well place a higher value on coverage of loss events in the higher risk group than in the standard risk group. The policymaker might also place value on ensuring the optional *availability* of insurance to members of the higher risk group, distinct from the actual take-up of the option. These approaches would be consistent with many other public policy initiatives directed at redressing disadvantages or social exclusion of the higher risk group eg disability discrimination laws.

Policymakers may also have other objectives which are not directly related to insurance, but instead derive from social policies or legal principles which the policymaker considers should override insurance considerations. For example, some questions which insurers wish to ask for risk classification may potentially impinge on public health, or may be regarded as unwarranted infringements of privacy. Statistical discrimination by reference to particular criteria may be deprecated in principle. Charging costs arising from disability to the disabled person may be deprecated in principle. (These ideas are discussed later in the paper.)

Nevertheless, whilst recognising the difficulty of practical application and that alternative or additional policy objectives are possible, the concept of loss coverage provides another way of thinking about the design of insurance systems from a public policy perspective. In many markets, loss coverage may be a useful criterion for an insurance-focused public policymaker.

*3.7 Loss coverage: the insurers' perspective*

The objectives of a profit-maximising insurer in relation to loss coverage may be different to those of the public policymaker. For example, the best case from a public policy perspective

(Scenario 2) may be unattractive to an insurer because the total number of policies sold is lower than under more accurate risk classification (Scenario 1).[17]

The potential conflict between public policy objectives and an insurer's profit-maximisation objective may run deeper than this. An insurer's objective will often be served by *minimising* the loss coverage. Informally, we can say that the insurer wants *"insurance sold to the people less likely to need it,"* or at least less likely to make a successful claim.

The insight that insurers would rationally prefer to sell insurance to people unlikely to need it tends not to be articulated in the literature (structural bias). However practical examples of the commercial success which follows from this can be observed. For example, payment protection insurance, which covers the repayments on a loan if the borrower becomes ill or unemployed, is often sold in the UK to people whose circumstances (eg self-employed, or contract workers) will foreseeably prevent them from being able to claim. Because the insurance is often sold to people who do not need it, it is an extremely profitable business for insurers, with profit margins around 75% of premiums. Some UK companies are reported to have incorporated subsidiaries in offshore centres, which has the effect of shielding these profit margins from government and public scrutiny.[18] Similar observations have been made regarding payment protection insurance in the US.[19]

The insight that insurers' greatest commercial successes are sometimes achieved by selling insurance to people unlikely to need it may also cast some light on the phenomenon of critical illness insurance. This is a relatively new type of policy in the UK: it was unknown before the 1980s, did not sell in large numbers until the late 1990s, and would perhaps not be greatly missed by consumers or policymakers if it disappeared. Insurance industry commentators often remark on the mismatch between the limited circumstances in which the policy pays out (that is, if the policyholder is diagnosed with one of a rather arbitrary list of illnesses) and policyholders' plausible real needs (that is, a payout if they suffer *any* prolonged major illness, not just an arbitrary few illnesses). However, this mismatch may be an important reason for the commercial success of the policy. At the point of sale, many customers probably perceive the policy as providing more comprehensive coverage than it really does.[20] An unlucky few will find out later that many major illnesses do not result in a successful claim. This mismatch between customer perceptions at the point of sale and the insurer's perception of what can be achieved through appropriate claims control may be an important ingredient of the policy's commercial success.[21]

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[17] Unless the insurer's expected total profit on the smaller number of customers is higher – which is possible, but not obviously likely.

[18] Inman (2004).

[19] Hunt and Birnbaum (2001).

[20] There are several reasons for this. For example, presentation and discussion of a list of salient conditions ("dread diseases" as they are sometimes aptly known) probably encourages the illusion of comprehensive cover. The many less salient (but not less common) conditions which might make the policyholder unable to work need not be mentioned.

[21] Further evidence of the mismatch between customer and insurer understanding of the policy is provided by the high percentage of critical illness claims rejected – for example, 14% at one large UK life office. The corresponding figure for life insurance at the same office is less than 0.05%. See Cudby (2004).

## 4. Competition in risk classification: the malevolent invisible hand

*4.1 Competition is deleterious*

Economists generally prescribe competition as a remedy for markets which do not work well. However competition is not always beneficial: there are some activities in which it achieves nothing, or may even be deleterious.[22] I think risk classification is one of these activities.

An unusual feature of insurance is that as well as competing in the usual ways found in most service industries – price, level of service, recruitment of employees – insurers also compete in risk classification. That is, they compete in attracting "good risks," and avoiding (or charging higher premiums for) "bad risks". An insurer which introduces a new form of risk classification – either charging less for some type of good risk, or charging more for some type of bad risk – can gain at least a temporary advantage over other insurers. Other insurers may then be forced to adopt the new classification, otherwise they will attract an increasing proportion of the poorer risks. So in general they do adopt the new classification, and the gain to the original innovator tends to be transient.

Thus competition and innovation tend over time to lead to a progressive fragmentation of broad risk classes. When a broad risk class is fragmented as a result of insurers introducing a new risk classification, there are several effects: some customers pay less for insurance, but some pay more, and some might be excluded from insurance altogether. From a public policy perspective, this is combination of effects may often be negative: the reduced cost of insurance for some customers is offset by the increased cost for others, the classification process itself has costs, and the complete exclusion of some customers from insurance give rise to problems of an "insurance underclass" of persons whom no insurer will insure. Competition in risk classification can lead to a worse outcome.[23]

This idea may appear similar – and indeed is similar – to the conventional "adverse selection spiral" story, which will be discussed further in section 5 below. However, it is interesting that the conventional story about an "adverse selection spiral" is usually recited by insurers who wish to argue *against* some proposed restriction in risk classification. The usual form of the story is that if *too little* risk classification were permitted, customer decisions would lead to a spiral of increasing prices and declining coverage. Attention is focused on the deleterious effects of restrictions in risk classification. On the other hand, the argument in this present section is that *too much* risk classification – and in particular, the process of competition and innovation in risk classification – does not produce clear benefit to customers in aggregate, and can have deleterious effects. Attention is focused on the deleterious effects of market competition.[24] A reconciliation of these two views is that a policymaker should target an intermediate *right amount* of risk classification. As suggested in section 3, one criterion for the *right amount* of risk classification is the level which maximises loss coverage.

*4.2 When does risk classification competition have public benefits?*

There is one special case where competition in risk classification may be seen as unambiguously positive. This is where the risk class fragmented is the "uninsurable" class who were previously rejected by all insurers. If one innovative insurer decides to offer insurance (presumably at a high premium) to some group previously considered uninsurable, loss coverage is increased; and because the additional lives come from the uninsurable class,

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[22] This has occasionally been recognized by economists. For example Shleifer (2004) recognizes the role of competition and markets in encouraging various forms of unethical behaviour.

[23] This idea appears in slightly different guise in Hoy (1984), where both higher and lower risks prefer not to see a new and only partially accurate risk classification introduced, if they do not know to which risk class they will be assigned.

[24] The fact that the former possibility receives much more attention than the latter is an example of structural bias.

rather than being cherry-picked from the existing insureds, there is no effect on other insurers' portfolios. If other insurers agree that the new classification is sound, they might follow the innovation; but this would be for a "positive" reason (the profit opportunity of additional sales) rather than the "defensive" reason which applies when an existing insured class is fragmented. Other insurers can *choose* to follow the innovation, but there is no competitive dynamic which *compels* them to do so. This suggests that insurance of "borderline insurable" risks can be a niche business, in which continual innovation by one or several insurers need not destabilise existing risk classes. It is risk classification competition *within* the existing insurable class that is destabilising.

There are some instances where risk classification competition might be seen as socially positive through signalling and incentive effects: for example, insurers' competition to avoid insuring houses subject to flooding sends a useful signal to society about the costs of new building on flood plains; or motorists might be incentivised to take more care by accurate risk classification. But these signalling and incentive effects have limited applicability in life or health insurance. Furthermore, even in fields such as motor insurance, where incentive effects seem more likely to operate, they are in practice often difficult to discern. For example, Schwarze & Hein find that the although deregulation in mandatory third party motor insurance in Germany in the 1990s led to the introduction of many new risk categories, this has *not* been associated with either a decline in total damages, or a reduction in the average price of insurance.[25] In aggregate the deregulation of risk classification in this market appears to have achieved nothing, except an increase in administrative costs.

To summarise, risk classification competition does not seem to make a clear positive contribution to the aggregate welfare of customers, in the same way as competition to reduce expenses or improve levels of service. Perhaps public policy should direct competition away from risk classification, and towards more useful areas – that is, those which are more clearly beneficial to customers e.g. on operational expenses and level of service.

*4.3 Healthcare financing*

Recent developments in healthcare financing in the UK can be interpreted as an application of this insight. For the past half-century most healthcare in the UK has been provided by the National Health Service, which is centrally managed by government, and funded almost entirely from general taxation. Thus there is no risk classification, and only a few small co-payments by patients for services. (Supplementary private healthcare financed by individual or group insurance does exist, but covers less than 10% of the population.)

In recent years, there has been increasing willingness in government to involve the private sector involvement in delivering healthcare. However this increasing use of the private sector has *not* involved the introduction of insurance mechanisms such as risk classification. Instead private healthcare companies have been invited to bid for long-term government contracts to deliver high volumes of specific diagnostic services or clinical treatments (MRI scans, knee replacements, etc). This approach can be interpreted as seeking to promote competition and innovation in healthcare delivery, whilst avoiding competition in risk classification.

Healthcare systems in many other countries afford a much larger role to competition in risk classification, one extreme example being the United States. It is well known that the United States is a very rich country which spends a much higher proportion of GDP on healthcare than most developed countries (around 13%, cf. 10% in Germany, 8% in UK), and yet produces worse public health outcomes on a wide range of measures, including infant mortality, life expectancy at birth, and potential years of life lost.[26]

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[25] Schwarze and Hein (2005).
[26] For example see National Audit Office (2003).

For the detached observer it is inescapable to surmise that these observations may be connected. In other words, the poor performance of the US healthcare system in aggregate may be partly attributable to its high reliance on risk classification, and on insurance and actuarial ideas. I have no proof of this explanation, but nor can I think of a better one.

Or as one commentator puts it:

> "Think about how crazy all of this is. At a rough guess, between two and three million Americans are employed by insurers and health care providers not to deliver healthcare, but to pass the buck for that care to someone else. And the result of all their exertions is to make the nation poorer and sicker."[27]

## 5. Empirical studies of adverse selection

### 5.1 Does adverse selection exist?

This question causes some confusion, because different people interpret it in different ways. Insurance underwriters tend to interpret it as a question about *incentives*: might a prospective insured sometimes have an incentive not to disclose adverse information about his risk status? The answer to this is obviously yes; but this framing of the question offers no insight beyond a justification for the existence of underwriters. Economists tend to interpret it as a question about *information asymmetry*: do insureds have an information advantage over the insurer, after whatever screening and sorting mechanisms the insurer chooses to apply? A third interpretation is as a question not about interactions between insurer and insured, but rather about *competition between insurers*: do innovations in risk classification by insurers lead to the distinctive competitive dynamic of the "adverse selection spiral"?

The economists' interpretation leads to a possible test for adverse selection: investigate whether a positive relationship can be detected between risk level and amount of insurance purchased. Several recent studies along these lines have failed to find such a relationship for life assurance in the United States[28], motor insurance in France[29], and health insurance in the US.[30] There appears to be some evidence for adverse selection in annuity markets in the UK[31], but based on the annuity features (eg capital protection, rate of increase) rather than the amount of the annuity. A recent paper by Siegelman provides a careful summary of about a dozen studies, which he summarises, perhaps a little boldly, as follows: "In general, the literature provides little or no support for the existence of selection due to information asymmetries in insurance markets."[32]

Another observation which casts some doubt upon the relevance of "asymmetric information" variety of adverse selection stories is the linear pricing of most insurance products with respect to sum assured. If residual information asymmetry were a pervasive problem in insurance, one would expect insurers to charge higher premium rates for larger sums assured, just as market makers in financial markets quote wider spreads for larger transactions. The classical theory of adverse selection[33] predicts rationing of insurance for better risks. But no such rationing or non-linear pricing is observed in life insurance in practice.

How can the absence of measurable information asymmetry in favour of insureds be explained? There seem to be two possible explanations. First, it could be that present levels

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[27] Krugman (2005).
[28] Cawley and Philipson (1999).
[29] Chiappori and Salanie (2000).
[30] Cardon and Hendel (2001).
[31] Finkelstein and Poterba (2000).
[32] Siegelman (2004), p.1248.
[33] For example Rothschild and Stiglitz (1976).

of underwriting and risk classification are fully effective, so that after underwriting insurers have an information advantage, or at least no disadvantage, relative to their insureds. Second, it could be that insureds do retain information advantages after underwriting, but that they do not make use of this information – perhaps because they cannot, or perhaps because they have more important things to do. (Note that explanations to the effect that a researcher has not fully appreciated the subtleties of the insurer's risk classification processes are unlikely to be valid: if a researcher can show that a subset of the insurer's information set provides an information advantage over insureds, it follows *a fortiori* that the insurer's full information set provides an advantage.) .

The third interpretation of adverse selection is as a description of competition between insurers. In its extreme form, this is the story of the "adverse selection spiral" – a cycle of increasing prices and declining coverage which destroys an insurance market. This concept is familiar to all students of insurance; but for such a familiar concept, evidenced examples are remarkably difficult to find. Siegelman[34] carefully debunks several alleged instances of adverse selection spirals as "urban legends." There is one scenario where he considers that the "adverse selection spiral" story appears pertinent: competition between close but not identical substitutes (in Siegelman's example, two alternative health plans with different risk classification schemes offered to members of a university). This is as economic theory would suggest: where a close substitute is readily available, price elasticity of demand is likely to be high. But in general there are no close substitutes for life insurance.

In summary, adverse selection exists in the limited sense that some insureds have an incentive not to disclose information about their risk status. However adverse selection in the sense of information asymmetry to the benefit of insureds after underwriting has proved difficult to detect. As a concept, adverse selection is probably more useful in explaining interactions between competing insurers, rather than interactions between insurer and insureds.

## 6. Propitious selection

One of the reasons why adverse selection is difficult to observe in practice may be that purchasing (more) insurance is sometimes associated with lower risk, not higher risk. If risk aversion is sufficiently higher in lower risk insureds, the standard prediction of adverse selection theories can be reversed. This idea is described by the phrase propitious selection.[35]

### 6.1 Examples of propitious selection

One area where the phenomenon of propitious selection appears to be well recognised (albeit not by name) is in motor insurance. It has been suggested by the Association of British Insurers that around 5% of drivers in the UK are driving without insurance (this is illegal in the UK), and that these drivers are nine times more likely to be convicted of a serious driving offence. The level of evidence for these suggestions is unclear. A more rigorous case-control study in New Zealand, where motor insurance is *not* compulsory, found that after controlling for multiple confounding variables (eg age, sex, level of education, driving hours per week), uninsured drivers were around 5 times more likely than insured drivers to suffer a car-crash injury.[36] These authors also cite various descriptive surveys suggesting that uninsured drivers are more likely to engage in risky driving behaviours.

The two papers[37] by Hemenway introducing the concept of propitious selection give evidence for several other examples using US data, including –

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[34] Siegelman (2004)
[35] Hemenway (1990, 1992).
[36] Blows *et al.* (2003).
[37] Hemenway, (1990,1992).

– for motorcyclists, a positive correlation between wearing a helmet and holding medical insurance;
– for car drivers, a positive correlation between purchase of non-compulsory liability insurance and not driving after drinking alcohol;
– for car drivers, a positive correlation between purchase of non-compulsory liability insurance and a range of health-related risk avoidance activities.

Another example is insurance of credit cards against loss. Around 4.8% of UK credit cards are reported lost or stolen each year, but the corresponding figure for one insurer's insured cards is reported to be 2.7%.[38] There are a number of difficulties in comparing these two numbers, and a number of possible explanations for the discrepancy; but one obvious explanation is that people who purchase insurance may also be more careful with their cards.

It is easy to think of ways in which propitious selection effects could occur in life and health insurance. It also seems plausible that they would usually be weaker than adverse selection effects. From a public policy viewpoint, this is fortunate – since if propitious selection were stronger, that would mean that the wrong people were buying (more) insurance.

*6.2 Psychology of propitious selection*

Economists usually seem to define risk aversion narrowly, to mean that the marginal utility of wealth decreases as wealth increases. Propitious selection stories require the assumption that individuals who are more risk averse according to the economist's narrow definition – and hence to the *financial* risks of injury and death – also take more care in relation to the associated physical risks. Economists often seem unwilling to contemplate assumptions of this nature, apparently for methodological reasons (such as a preference for only minimal assumptions about utility functions). But intuition suggests that the assumption might be plausible in many contexts, and there is some empirical work in psychology and econometrics – and also some insurance industry practices – which appear to support it.

For example, at least one laboratory study has reported associations between financial risk-taking, psychometric profiles and blood biochemistry.[39] Another study reported positive correlations between answers to a questionnaire designed to measure financial risk aversion and behaviours such as smoking, not having insurance, and choosing risky employment.[40] Another found that smokers select riskier jobs than non-smokers; and also that smokers in risky jobs receive less of a wage premium over smokers in non-risky jobs than the corresponding premium for non-smokers.[41] From a more psychological perspective, it has been suggested[42] that many decisions about risk are better explained in terms of emotional affect, rather cognitive assessment – the "risk-as-feelings" hypothesis – which seems consistent with (albeit not probative of) the notion that appetites for financial and physical risks are driven by the same emotions, and hence positively correlated.

In terms of insurance industry practices, the use of credit scores in motor and home insurance appears to be a tacit recognition of propitious selection. Apparently a driver or homeowner with a "worse" credit rating attracts a higher premium. This practice suggests a belief in the industry that financial risk-taking and other risk-taking are positively correlated, as required by propitious selection. The practice is controversial, and has been banned in some US states; but apparently the insurance industry believes in it. The Actuarial Education and Research Foundation (AERF) has recently sponsored a research project titled *Biological &*

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[38] De Meza and Webb (2001).
[39] Harlow and Brown (1990).
[40] Barsky *et al.* (1997).
[41] Viscusi and Hersch (2001).
[42] Lowenstein *et al.* (2001).

*psychological correlates of risk taking, credit scores and auto-losses: why insurance credit scoring works.* It is claimed that this study will show a distinct blood chemistry and financial profile for financial risk-takers.[43]

Psychological aspects of insurance purchase are discussed further in the next section.

## 7. Psychological aspects of risk classification

Adverse selection stories assume rely on assumptions that insureds have better knowledge of their risk status than the insurer, and seek to exploit this superior knowledge through probabilistic decisions. There are two strands of psychological research which cast doubt on these assumptions. The first strand is the well-known research on "decision making under uncertainty."[44] This carries the implication that whilst people might attempt to make probabilistic decisions about buying insurance (and many other matters), they are extremely bad at doing so. The second, less well-known strand might be characterised as "decision making under ignorance."[45] It carries the implication that decisions about insurance are probably not made by probabilistic thinking at all.

*7.1 Decision making under uncertainty*

Adverse selection stories about the interaction between individual customers and an insurer usually involve three conceptual stages:

- the customer has private knowledge not available to the insurer, which is potentially relevant to their risk relative to that of other customers;
- the customer processes this information to produce better estimates of relative risk than the insurer's; and
- the customer varies her insurance purchasing decisions in response to her relative risk estimates and the price of insurance.

All of these stages could occur in extreme cases. However, there are psychological obstacles to each of them.

The first stage is the lowest hurdle. Doubtless many customers do have private knowledge relevant to their relative risk status. For example, the life insurance customer may have a fuller knowledge of her medical history, her diet, and her physical activity level than is obtained by the insurer.

The second stage, processing this information into more accurate estimates of risk, is problematic for a number of reasons. Suppose we assume in the first instance that that customer is an expert in estimating relative risk. The incremental value of the additional information may be small. Most experts are poor at making probabilistic judgments.[46] In experimental studies which compare expert predictions based on full knowledge with statistical models based on a limited range of factors, simple models consistently outperform experts.[47]

More realistically, the customer is likely to have very inferior skills compared to the insurer in estimating relative risk. This reflects not only technical knowledge and abilities, but also

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[43] Presumably this claim is based on Harlow and Brown (1990) as above. Details of the proposed study taken from www.actuarialfoundation.org, accessed 28 May 2005.
[44] The seminal reference is Kahneman *et al.* (1982).
[45] For example Hogarth and Kunreuther (1995).
[46] Kahneman *et al.* (1982)
[47] In the psychological literature this is called "clinical versus statistical prediction." Meehl (1996) is a survey of the evidence, a revision of work first published as long ago as 1954.

psychological biases. For example, in motor insurance, safe driving skills appear potentially relevant to risk estimates; but results like the notorious finding that 46% of U.S. drivers believed they were among the top 20% safest drivers[48] call into question the ability of drivers to process their private information about driving skill into better relative risk estimates. In relation to life insurance, there are several studies suggesting that mortality risks are probably denied rather than over-estimated[49] (and this is why life insurance is sold, not bought). These biases may result in insurers making better relative risk estimates than their customers, even though the customers have additional private and relevant information.

The third stage, modifying insurance purchasing decisions in response to relative risk estimates, is also problematic. Clinicians find it notoriously difficult to persuade patients to modify their diet or lifestyle in response to relative risk estimates. Why should insurance purchasing decisions be different?

*7.2 Decision making under ignorance*

Theories of adverse selection implicitly assume that insurance purchasing decisions are probabilistic – that insureds think like actuaries or economists are supposed to think. Some psychological research suggests that most people probably do not think about probabilities at all, except possibly (but even then, not necessarily) when the figures are given to them.[50] Instead they are driven largely by an affect heuristic – that is, decisions are determined by the immediate and automatic positive or negative feeling which a stimulus provokes – and then use arguments such as peace of mind or sleeping well at night to justify these decisions. If people make decisions about insurance mainly in these ways, adverse selection stories may not be a good description of real decision making.

One phrase in the last paragraph was worded carefully: *"like actuaries or economists are supposed to think."* But I suspect that even actuaries and economists – or more generally, the small minority of people with a probabilistic mindset – often do not think probabilistically about very unlikely events. I suggest that there is a probability threshold below which computation of expectations across different states of the world is otiose for even the most probabilistic thinker. (In deciding to accept the invitation to this conference, how many of the present audience carefully evaluated their expected utility across all states of the world – reaching Berlin, their plane crashing, etc etc?) This is not the same as saying that all people ignore very unlikely events, all of the time (although many do, a lot of the time). Rather it is saying that decisions about insurance against very unlikely adverse events are not as responsive to price and risk changes as adverse selection stories imply.[51]

Insurers tacitly recognise that most life insurance purchasing decisions are not made probabilistically by the ways in which they approach marketing and selling of insurance. It is extremely rare for probabilistic information to be promoted to the customer in any useable manner.[52] Instead advertisements and sales procedures aim to engage emotions, either by emphasising the undesirability of the event insured against, or the reassurance provided by the insurance policy.

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[48] Svenson (1981).

[49] One well known study is Weinstein (1980) in which a large majority of people expected to live beyond 80 years.

[50] For example Hogarth and Kunreuther (1995).

[51] Symmetrically, decisions about very unlikely positive events are probably also insensitive to probability variations. The observation then offers an explanation for simultaneous participation in lotteries and purchase of insurance: both decisions are driven by affect, and hence are relatively insensitive to probability variations.

[52] On the few occasions when probabilistic information is presented, it usually appears tendentious: it is carefully selected to evoke emotions of fear and dread (eg "one in three people will die from cancer"), rather than to promote accurate probabilistic thinking.

*7.3 Asymmetric information – whose benefit?*

Summarising the previous section, the contribution of psychological research is that it highlights how insurers could often be better informed about relative risk, even when customers possess, and attempt to use, relevant private information. Information asymmetry may often be to the advantage of the insurer rather than the insured.

There is another way in which asymmetric information works to the benefit of the insurer. This is that the insurer has a vastly better understanding of the technical language of the contract, the legal context in which it will be interpreted, and the algorithms by which the premium in calculated. Insurers do not generally disclose to the customer how premiums are calculated, or the reasons why loadings have been applied. It can be very difficult for the customer to obtain this information, or indeed to establish the fact that a non-standard premium loading has been applied.

One example of how this superior knowledge is exploited was mentioned above: the use of credit scores in motor and household insurance risk classification. Customers generally do not know their credit scores, or how this might be considered relevant to motor or household insurance risks. Another example is the practice of "inertia pricing", whereby renewal premiums are varied not in accordance with risk factors, but rather in accordance with statistical predictions of the propensity of a customer with particular characteristics to "shop around" (that is, to obtain alternative quotations) at renewal time. For example, if middle-aged customers living in the north of England insuring five-year old cars have a lower propensity to "shop around" than young customers in the south of England insuring one-year old cars, the increase in premium at renewal time would be higher for the former group, after conditioning for risk factors. But when asked to explain or justify premium variations, the insurer makes reference only to risk factors. This deception represents an information asymmetry in the insurer's favour.

## 8. Risk classification as blame

*8.1 Penalising misfortune*

Another perspective on risk classification is that it is a process whereby the privileged and powerful exercise judgment against the unfortunate. Risk classification can be seen as a process whereby a powerful organisation identifies and quantifies pre-existing misfortune, and then – far from seeking to help the sufferer – inflicts additional misfortune, in the form of insurance disadvantages. This is often described or justified by phrases such as "actuarial fairness" (a concept of fairness which non-actuarial commentators may regard as rather eccentric). This allocation of additional disadvantage combined with invocations of fairness suggests the concept of risk classification as blame.

This does not attribute to proponents of risk classification the naïve view that all insurance disadvantages arise from something the insured has done, or that the insured could have avoided the disadvantage by acting differently. Rather it describes a common view about the *location and origin* of insurance disadvantage. Risk classification as blame describes the view that insurance disadvantage originates from, and is intrinsic to, the individual. For example, a disabled person's insurance disadvantage is attributed to the fact that he is disabled. This is risk classification as blame.

An alternative view is that the disabled person's insurance disadvantage arises because society has adopted a risk classification scheme which creates and allocates the insurance disadvantage. Society could have chosen almost any scheme or level of risk classification – it could outlaw risk classification almost entirely (as in health insurance in Ireland), prohibit classification by sex (as for various products in various countries), proscribe certain genetic

information, protect certain disabilities but not others, and so on.  But in fact society has chosen a scheme which allocates insurance disadvantage to this particular disabled person. In this view, the problem is not intrinsic to the disabled person; it is society's adoption of a structure which allocates disadvantage to him.  The risk classification scheme – the instrument of blame – is itself the cause of disadvantage.

These contrasting views – risk classification as blame, and risk classification as the cause of disadvantage – roughly correspond to the distinction made in disability studies between the "medical model of disability" and the "social model of disability."  The medical model represents a traditional and dominant view, but most legislative and social initiatives relating to disability over the past decade or two are better understood in terms of the social model.[53]

*8.2 Identity, exclusion and Rawlsian veils*

The discussion above was framed in respect of an unspecified "disabled person."  But suppose I had framed the discussion in terms of "a smoker"?  Is the smoker's insurance disadvantage attributable to the fact that he smokes, or to the insurer's adoption of a risk classification scheme which penalises smokers?  In the year 2005, it seems few people have any hesitation in blaming smokers for smoking.  But wind the clock back to 1975: the smoker would not have had an insurance disadvantage then, because risk classification made no allowance for smoking.   This was not because the link between smoking and health was unknown – it had been known for 20 years.[54]   It was because insurers were apparently reluctant to use it in risk classification.

This example is interesting because of the movement over a relatively short period from a situation where penalising smokers was apparently unconscionable, to the adoption of a risk classification which created a disadvantage, and thence to the apparently universal and unhesitating view that smokers are themselves to blame for this disadvantage.  It highlights the variant perceptions of risk classification as a cause of disadvantage, and risk classification as blame.

Why were life insurers in the 1960s and 1970s not rushing to classify risk according to the already well-established link between smoking and mortality?  It is difficult to know, but I suggest that it may have been partly for reasons of identity – to be concrete, many senior insurance executives – or their friends, their colleagues or their family – would themselves have been smokers.  Risk classification as blame is not so comfortable if the blame is close to home.

This apparent reluctance to penalise smoking at a time when smoking was probably socially acceptable and commonplace in the insurance milieu leads to a more general point.  One of the reasons why economists, actuaries, and other commentators are often so casually comfortable with the paradigm of risk classification as blame may be that they are usually not members of the group who are blamed.[55]  It is usually some outsider – an outsider both different and emotionally distant – who is blamed, stigmatised and excluded.

Proponents of risk classification frequently assert that the penalties which they apply to outsiders are fair, and should be accepted as such by any observer who understands risk classification.  This seems to me so obviously myopic or disingenuous that it should not require comment; but since many people seem to take it seriously, let me state the objection in the most general way possible.  Imagine yourself behind a Rawlsian veil of ignorance, with a

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[53] Oliver (1990) provides an introduction.
[54] Eg Doll & Hill (1954)
[55] Of course there are exceptions, but they are rare and unrepresentative.

choice being born into a world either with or without risk classification. It seems to me that any risk-averse person must choose the world without risk classification.

Another way of putting this is that if the proponents on risk classification were to become members of a stigmatised group, they might think about fairness more carefully, and they might perceive reality differently. But since they seldom are, they do not think about this.

*8.3 Exclusion from debate*

Distinct from the exclusions inherent in risk classification itself, another type of exclusion which often applies to broadly the same people is exclusion from debate. To give a topical example, in the UK there has for a number of years been debate about the policies which insurers and government should adopt relating to genetics and insurance. The terms of this debate were initially defined by insurers and actuaries, who sought to establish a mutual understanding, influence and agreement with medics and geneticists. In doing so, the insurers and actuaries were careful to exclude or marginalize people who might be directly disadvantaged by the genetic tests which insurers wanted to use, and the charities which represented them. These voices were never heard in debate promoted by insurers and actuaries – partly because these voices suffer various disadvantages anyway in making themselves heard, and partly because insurers and actuaries carefully structured the debate to exclude them. Instead, they have obtained a hearing via intermittent external shocks to the insurers' and actuaries' carefully circumscribed discussion – for example, when parliamentary committees or other public bodies have sharply criticised the terms of that discussion, leading to externally imposed reforms of its structure and process.

The idea in this example has much wider application: the people who are most disadvantaged by risk classification tend to be excluded from debate about risk classification. One reason for this is the paradox of collective action. A second reason is the structural bias mentioned at the start of this paper. A third reason is that the same stigma which leads to exclusion in insurance can also devalue and discredit one's viewpoint, and lead to practical difficulties in making that viewpoint known. If one is disabled, it may be difficult to get insurance; it may also be difficult to attend conferences about risk classification; and one's views may not be taken very seriously if one does. The same is true of poverty, extremes of age, and most forms of insurance disadvantage. [56]

## 9. Risk classification and human rights: contrary principles

*9.1 Different principles*

In recent decades, risk classification practices have often been called into question by social views and laws which deprecate or prohibit discrimination according to factors such as sex, disability, or race. Insurers often seem to think that the controversy arises because critics fail to understand the rationale of risk classification; and hence that if only insurers could better explain themselves, their practices would be accepted. However, this notion that insurers need only explain their principles for them to gain universal acceptance overlooks the fundamental and conceptual nature of the conflicts between risk classification and many contemporary social views and laws.

It is helpful to distinguish between two categories of legislation, with different conceptual bases. On the one hand, there are laws on sex and race discrimination, which are (broadly speaking) based on the concept that persons of different sex or race *should receive the same*

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[56] The classical sociological account of discrediting stigma is Goffman (1963). As a thought experiment, it is interesting to imagine a world in which risk classification penalizes characteristics which in other contexts are associated with high social status. How much advocacy for risk classification would there be in such a world?

*treatment*.  On the other hand, there are disability discrimination laws which are based (at least in part) on the concept that persons with a disability *should receive different treatment* – in the UK legislation, the *"reasonable adjustment"* – focused on their disability.   These two categories of legislation conflict with risk classification in different ways.

Under the first type of law, statistical discrimination is generally equally offensive as "taste-based" discrimination.   The law (at least in the UK) draws no distinction between the employer who refuses to promote women as a matter of taste, and the employer who attempts to justify his refusal by adducing statistical evidence of a correlation between sex and productivity.   Statistical justification for the discriminatory practice is not regarded as sufficient grounds for permitting its use.   The conflict of this type of law with risk classification is fundamental: all risk classification is statistical discrimination.  It is therefore usual to make some special provisions or exceptions for risk classification in this type of law.

When insurers are faced with criticism of certain practices – such as charging different prices to men and women – they usually try to explain that this practice is based on averages, that it is not denied that many men live longer lives than the average woman, etc.  In other words, insurers explain that they practise statistical discrimination.  The fact that in many contexts society regards statistical discrimination *per se* as offensive helps to explain why insurers' explanations are often not well received.   The problem may not be that critics fail to understand the insurer's principle; it may be that they do understand, and recognise it as a principle which they reject.

The conflict between risk classification and disability discrimination laws is of a different nature.   In many contexts, the person with a disability may be entitled to some special treatment tailored to their disability.  For example, a partially-sighted customer may ask to receive a contract in large print; or a disabled traveller may ask may ask an airline to provide a wheelchair at the airport terminal; or an employee may ask for some part of a job to be modified.  Service providers and employers in the UK have some obligation to meet these requests (subject to a test of reasonability), and they cannot charge the disabled person for doing so.   The law recognises that service providers may incur extra costs in serving a disabled person, and explicitly prohibits the charging of these costs to the disabled person. This is the whole point of the law.

In risk classification, the paradigm is entirely different: the whole point of the activity is to charge any additional costs attributable to disability to the disabled person.  Proponents of risk classification often defend this as a *matter of principle*.  The fact that the principle directly contradicts the principle which the law mandates for all other services helps to explain why the explanation is often not well received.  Once again, the problem may not be that critics do not understand the principle; it may be that they do understand, and find it offensive.

In my view insurers are fighting a losing battle when they seek to justify charging disabled people for the costs of disability as a *matter of principle.*  Insurers may believe in the principle, but society seems to disagree, and indeed for most contexts has legislated to mandate a contradictory principle.  A more robust justification for the different paradigm in risk classification as compared with other areas is that it is a *matter of degree* or a *matter of necessity*, rather than a matter of principle.  Some types of disability may lead to very large additional costs in insurance; if these are large enough and relate to sufficient numbers of insureds, the whole scheme of voluntary insurance might be endangered.  Charging the costs of disability to the disabled person may be to some degree necessary to prevent this.

Adopting this justification makes it necessary grapple with questions of degree: how much risk classification do we need to make private insurance work?  Would more or less risk classification produce a better outcome?   As discussed earlier in this paper, better for the insurance industry may often not be the same as better for public policy.

*9.2 Malign theories*

The effort which economists and actuaries direct towards propounding theories of adverse selection in insurance sometimes has an unattractive aspect. Calls to restrict the use of particular risk classifications are often motivated by altruistic human rights ideals, or concerns of equity[57] relating to socially disadvantaged minorities. The economist or the actuary cautions that these concerns need to be balanced by efficiency concerns relating to adverse selection, and proffers an elaborate theory. The theory is enthusiastically adopted and promoted by the insurance industry as an argument against human rights, or as a justification for the oppression of the disadvantaged minority. Yet the economist or the actuary is often unable to demonstrate the real existence, let alone the materiality, of the phenomena alleged in the theory. Even if he were able to do so, the economist's or actuary's role might be considered malign: enormous efforts and ingenuity are directed towards highlighting minor differences in efficiency as arguments against altruism or compassion. Perhaps society would prefer not to know.

A real example of this phenomenon with which I was involved concerns the application of the UK Disability Discrimination Act 1995 to membership of defined benefit pension funds. When the Act was first drafted in 1995, the proposed exemptions included one which made it lawful for employers to exclude newly recruited disabled employees from membership of defined benefit pension funds. The justification was an "actuarial" one: it was suggested that disabled people might be more likely to retire in ill health, or die before retirement.

In consultations prior to the Act's implementation, I made a number of representations to the effect that this exemption was not necessary for the financial stability of pension funds. The possibility that employees with some disabilities might be more likely to retire early or die was unlikely to have any material effect on the viability of a pension fund; the fact that a disabled person was applying for and being offered a job would normally suggest that their immediate health prospects were at least reasonable; and in any case, the whole *raison d' être* of a defined benefit pension fund is cross-subsidy between different employees.

These representations were not accepted; the Act was implemented with the "actuarial" exemption allowing discrimination against disabled people in access to defined benefit pension funds. However in December 2000, the Disability Rights Commission commissioned a survey of employers and published a report[58] which acknowledged that the exemption could be removed, without any perceptible effect on the finances of UK pensions funds. In 2003, regulations to this effect were made. It seemed to me the influence of actuarial ideas in the Act's original formulation had been essentially malign. I say "actuarial ideas" because I do not know whether any (and if so, which) actuaries were actually consulted; but of course ideas have a life of their own, and are a force in themselves for good or ill.

**10. Adverse selection and large policies – the fallacy of the one-shot gambler**

It is often suggested that if insurers are banned from asking about certain underwriting information – for example, about the results of predictive genetic tests – customers with private knowledge of their risk status will rationally exploit this information by buying very large life insurance policies. I think this idea is misguided, because the customer cannot make the "favourable" bet 1,000 times: he is a "one-shot gambler" who can make the bet only once. When one considers plausible probabilities and premia, it seems to me that despite "favourable" odds a large bet is still unattractive to a person who can make the bet only once.

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[57] I use equity in its normal usage in the insurance economics literature. This is unfortunately more or less the opposite meaning to a UK actuary's normal usage.
[58] Disability Rights Commission (2003).

For example, suppose that an insurer offers me a life insurance premium based on an assumed risk of p=1%, but I have private information which tells me my real risk is p\*=4%. This information might make me worry more about my dependants, and make me more likely to buy life insurance. But should I, as many commentators seem to suggest, go further and buy a policy (or a number of policies) with unusually large sum assured, say £1m or £10m?

If I could make a bet of this nature on 1,000 independent lives concurrently, then it might be attractive. But in real life I can only make it on one life. I would also need to pay the very large premium, and it is almost certain (96% certain, on the true probabilities) that I just lose the premium. This seems to me an unattractive proposition. It would remain unattractive for a wide range of plausible values of the premium probability p and the true probability p\*. In my view, the "one-shot gamble" starts to become attractive only if the insured event approaches a certainty (p\*>75% say).[59]

The unattractiveness and implausibility of "one-shot gambles" in most realistic insurance scenarios is reflected in the paradigm adopted by insurance sales agents and advisers. The paradigm is about identifying the customer's insurance needs, and then recommending policies which meet those needs in a cost-effective way. The customer's needs (family structure, debts, etc) dominate the decision. The paradigm is not concerned with maximising the customer's wealth by exploiting small variations in insurance prices. Price/risk mis-pricings for particular risks can to some degree persist, because they are not exploitable by a one-shot gambler. Mis-pricings in insurance are potentially exploitable *by other insurers* through risk selection competition, but they are not easily exploitable *by customers*.

## 11. Conclusion

This paper has presented a number of novel – or at least, seldom-aired – perspectives on risk classification. Many of its observations are rather obvious, and some may not be controversial; but they tend to be seldom made. The key ideas are:

- Theoretical discussion of risk classification sometimes obscures the approximate and cyclical nature of insurance pricing in practice. Some examples from the United Kingdom were used to illustrate this. There are also wide variations in risk classification practices across different products and different countries, which often seem to have no compelling technical rationale.

- Adverse selection may not be adverse. From a public policy viewpoint, some degree of adverse selection offers a compelling advantage: "insurance is bought by the people likely to need it." The disadvantage of abstract welfare losses arising in theoretical models under abstruse concepts of equilibrium can seem less compelling.

- A public policymaker should target a socially optimal level of adverse selection. If insurance is a social good, the socially optimal level of adverse selection is probably the level which maximises the loss coverage, that is the proportion of loss events which are covered by insurance. Additional or alternative policy objectives are possible.

- The objectives of insurers are may be quite different to those of the public policymaker, and will often be well served by *minimising* the loss coverage: "insurance sold to people unlikely to need it."

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[59] Another insight into this is to consider the putative bet on over-insurance as part of the policyholder's overall portfolio of assets. The bet on insurance has a small positive edge, but a very high chance of loss; the optimal portfolio allocation is therefore very low.

- Risk classification competition gives rise to a malevolent invisible hand, because it tends to produce no benefits in aggregate.  A policymaker should try to focus competition in more useful areas.

- Theoretical models of risk classification may exaggerate of the significance of adverse selection.  In econometric studies, adverse selection is often difficult to discern.  As a concept, adverse selection is more useful in explaining interactions between competing insurers offering close substitutes, rather than interactions between insurer and insureds.

- Propitious selection arises where insurance purchase is associated with lower risk, not higher risk.  There are economic and psychological literatures supporting this idea, and some insurance industry practices which tacitly acknowledge it.

- Psychological perspectives on decision making under uncertainty, or decision making under ignorance, can help to explain why the phenomena predicted by adverse selection models are often difficult to observe.

- Risk classification often appears to involve penalising the unfortunate for their misfortune.  The common assertion that this is fair seems myopic or disingenuous: behind a Rawlsian veil, any risk-averse person would prefer to be born into a society with no risk classification.

- Risk classification is based on principles of (a) statistical discrimination (b) charging the costs of disability to a disabled person.  These principles are in direct contradiction to (a) sex and race discrimination laws and (b) disability discrimination laws, respectively.

- The fallacy of the one-shot gambler: suggestions that people with private knowledge of high risk status will rationally exploit insurers by effecting very large policies confuses the position of insurance companies, which make many uncorrelated bets, with that of the customer who can bet on only one event.  For a customer who can bet only once, the idea of "taking advantage" by effecting a very large insurance against a single very unlikely event is usually arithmetically implausible.

As noted in the introduction, much discussion of risk classification and public policy suffers from a structural bias, in that it is funded or directed by the insurance industry, or by researchers whose advancement is best served by conforming to an industry perspective.  In academic discussion of insurance there is another structural bias, which I have saved to the end of the paper to avoid losing more readers.  This is the bias arising from the predominance of economists, who believe that the world is best understood by assuming that all people are always selfish maximisers – that the world is full of rational fools, in Amartya Sen's famous phrase.[60]  Notoriously, a good deal of work in experimental economics has suggested that these assumptions might be more valid for economists themselves than for non-economists[61].  Perhaps this partly explains the gulf between what economists and actuaries typically think about matters such as genetic testing and fair and unfair discrimination in insurance, and what other people think.

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[60] Sen (1977).
[61] For a survey see Frank et al (1993).

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