Institute of Actuaries of Australia

An Analysis of Australian Health Insurers' Claims Data

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1. Synopsis

The paper will present the results of an examination of claims data from various private health insurers.

It will identify underlying patterns and trends in the data and include an analysis of the claim profile for various market segments – age group, gender, state, etc. The paper should be useful in considering:

- Recent changes in healthcare provision and funding
- The implications of an ageing population
- The impact of increases in retirement age.

Although Accident Compensation insurance is unlikely to face exactly the same issues, or at least not in exactly the same way, the ageing population will have an impact on claim costs and trends. The retirement age is likely to increase at some stage. People are likely to stay in work longer either as a result of this or from a need to save more to support a longer retirement due to greater life expectancy.

Older people may be more prone to accidents at work and take longer to recover and return to work. The medical costs of older people are significantly greater than those of younger people, and to the extent that these costs may be attributed in some way to work-related causes, may lead to associated increases in claim costs across a variety of insurance classes.

In this paper, we present a detailed pricing analysis, similar to that which would typically be performed for a Motor insurer, where individuals are rated according to a large number of factors. This analysis estimates the benefit costs for different segments of the market (e.g. by age, gender, state, membership type, etc.). Although the current regulations do not allow different premium rates to be charged for a number of these variables, this analysis may assist with:

- A better understanding of which segments of the market are profitable and which are not
- Marketing initiatives
- Modification to some benefit types
- Development of new products
- A better understanding of the impact of an ageing population.

Although much technical work has been performed to arrive at the results presented in this paper, the technical discussion of the models involved is intentionally brief. Many papers and textbooks provide technical details underlying Generalised Linear Models as used for this analysis, and there is little need to repeat those here.

Key Words

Health Insurance, Accident Compensation, Trends, Analysis, Ageing Population

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2. Overview of the Private Health Insurance Industry

The Australian Health System

Australia's public health insurance, Medicare, is funded through general taxation and a specific income-related Medicare levy. The cover provided by Medicare can be grouped into three high-level categories:

- Hospital cover, which is limited to treatment in public hospitals. The patient has no choice of doctor or when he/she can be admitted to hospital.
- Medical cover includes:
  - Doctor consultation fees
  - Doctor's tests and examinations
  - Eye tests
  - Most surgical and therapeutic procedures performed by doctors
  - A number of other specific items.
- Medicare also pays a proportion of some service costs incurred by private patients.

Ambulance cover is not provided under Medicare but this can be purchased as part of Private Health Insurance ("PHI"). In Queensland and Tasmania, the state government provides free ambulance service. In New South Wales and the Australian Capital Territory, free ambulance cover is provided for pensioners and low income earners only.

Private health insurance cover can be grouped into Hospital and General (or Ancillary) treatment.

- Hospital cover: Policyholders can reduce their premium by purchasing limited cover or opting for a deductible or co-payment arrangement. The policyholder has a choice of hospital, doctor and admission date. This paper considers the total cost incurred by each health insurer, net of any deductibles, co-payments and benefit limits.

  As defined at http://www.privatehealth.gov.au, Hospital policies fall into four general categories:

  - **Top Private Hospital Cover** - has no restrictions or exclusions on items payable under the Medical Benefits Schedule ("MBS") (medical services provided by doctors in hospital),
  - **Medium Private Hospital Cover** - does not exclude any items on the MBS, but has restrictions on some items,
  - **Budget Private Hospital Cover** - excludes one or more MBS items,
  - **Public Hospital Cover** - covers default benefits for treatment in public hospital only.
    - General treatment cover provides insurance against some or all of the costs of treatments such as dental, chiropractic, optical and home nursing.
- As for Hospital cover, General treatment policies are grouped into the following categories:
  - **Comprehensive Cover** – includes at least general dental, major dental, orthodontics, optical, physiotherapy, chiropractic, occupational therapy, pharmaceuticals, podiatry, and hearing aids,
  - **Medium Cover** - includes at least general dental, major dental, optical, physiotherapy, chiropractic, podiatry, occupational therapy, but does not include orthodontics, health management, appliances, etc,

- **Budget Cover** - includes at least one of general dental, optical, physiotherapy and chiropractic.
  - Like all insurance covers, there will be some limitations depending on the health insurance policy and these will vary by insurer and policy.
  - There are waiting periods in place to discourage abuse of the PHI system, as well as potential premium loadings (Lifetime Health Loading), tax penalties (Medicare Surcharge Levy) and a PHI premium rebate to encourage people to purchase and maintain PHI.
  - Ambulance cover may be available separately or combined with the Hospital or General treatment cover. In states where ambulance services are provided by the state government, it may not be necessary to take out ambulance cover.

Some high level industry statistics and observations

The Australian Institute of Health and Welfare publishes various statistics on the Australian Health System. In 2007/2008, total health spending in Australia was $103.6 billion – equivalent to 9.1% of Australia's Gross Domestic Product (ref 1).

PHI relates to a subset of this total. The Private Health Insurance Administration Council ("PHIAC") has published statistics (ref 2) showing that Health Insurers paid $11.2 billion in benefits to 30 June 2009 – an annual increase of 8.2% on the prior year.

The above PHIAC report makes a number of useful observations on the data. The following two comments are of particular interest:

> *"There is a marked difference between the distribution of benefits over age groups between hospital benefits and ancillary benefits. The major difference is the higher claiming rate in older age groups for hospital benefits while benefits per person for ancillary benefits are more evenly spread over the age groups."*

We have examined this in some detail in our analysis and present our findings later on in this paper.

> *"There was a notable decrease in hospital coverage during the June quarter of 10,570 persons for people aged 20 to 24" and, "The increases in the older age groups are partly due to ageing of the insured population with people moving from younger to older age cohorts."*

Australian's ageing population is a known phenomenon and the impact of this is likely to be very significant in the healthcare industry. We touch on the impact of this later in the paper, as the analysis performed provides a useful insight into why this is such a matter of importance in healthcare.

Community-rating vs. risk-rating

Unlike other types of insurance policies, the premiums for PHI policies are community-rated i.e. premiums are not calculated on the basis of the risk factors attaching to the individual taking out the insurance policy. Under the Australian Health system, very few rating factors are permitted. These include Membership Type (single, couple, family, etc.), State/Territory and Product.

Other risk factors that might be expected to have a significant impact on claims costs such as gender, weight, health status, race, claims history and smoking / drinking habits are not allowed in the rating of PHI policies. There is a very limited, prescribed, age-related premium loading (Lifetime Health Cover), to encourage individuals to take out cover before the age of 30 and to maintain their cover beyond that age, but this is not intended to be a true reflection of the underlying risk.

Health insurers attempt to attract members with different risk profiles to different products through marketing and product design. However, irrespective of the risk profile of the individual purchasing the cover, each person pays the same premium for any given product. The main intent of community-rating is to ensure affordable access to private health care for all Australians.

A consequence of community-rating is the concept of risk equalisation, the intended purpose of which is to compensate for the inability to risk rate, i.e. to compensate when the risk premium is higher than the premium that can be charged. This is discussed in more detail later in the paper.

3. Comparisons between Private Health Insurance and Accident Compensation

Before we discuss the key trends observed from a selected group of Australian health insurers, it is instructive to compare and contrast PHI and Accident Compensation ("AC") insurance classes – the key ones include workers' compensation, compulsory third party bodily injury for motor accidents, public liability and medical indemnity.

The following table summarises the main features of this comparison "at a glance". Some of the key differences and similarities are discussed in more detail in the sections following.

Table 3-1: Comparison of Health Insurance and Accident Compensation Insurance

Aspect	Health insurance	Accident compensation
Basis of insurance	Treatment for disease or illness	Restitution for injury or damage
Liability term	Very short tailed (weeks)	Very long tailed (years)
Claim distribution	High frequency of small claims	Some small claims, but a low frequency of large claims
Main claim types	Hospital – accommodation Medical – doctor fees, medicine General treatment – mostly dental and optical	Statutory – no-fault, often based on table of maims Common law – prove fault
Pricing	Community rating disallowing use of certain rating factors	Range from no restrictions (PL), use of price floor/ceiling (CTP) or prescribed factors (WC)
Regulator	PHIAC	APRA (mainly)
Financial reporting	AASB1023	AASB1023 or AAS26
Discounting and inflation	Usually negligible effects	Often very material assumptions
Projection methodology for outstanding claims	Payment based methods for portfolio in aggregate due to high volume and stability (and generally no case estimates)	Frequency and size based (PPCI, PPCF) in aggregate and GLM for statistical case estimates
Safeguards to moral hazards	Deductibles and co-payments Waiting periods for pre-existing conditions Benefit periods limiting duration and claim amount for general treatment cover	Deductibles when claiming Entry point assessment for access to common law and judicial process for quantum Benefit rules and table of maims for statutory amounts
Tax	Insurance profits (if applicable)	Insurance profits

3.1. Similarities

It may be surprising to some readers that there are also substantial similarities between PHI and AC insurance classes. These similarities provide the context for the analyses presented in this paper. They also illustrate why the trends observed in PHI are likely to be of some relevance to understanding the trends in the AC insurance classes.

Basis of insurance

For both AC and PHI, an insurer receives a premium for assuming the consequences of random claim outcomes in place of the insured. Arguably for both AC and PHI an insured can often exert indirect control over the claims outcome, e.g. through changes to lifestyle, or exercising due care or recklessness. However, accidents and illnesses are generally regarded as being sufficiently "random" to be insurable (although this is perhaps questionable for General treatment). The concerns for moral hazards are also broadly similar.

PHI in some aspects also conceptually mirrors AC on a no-fault basis, in that a schedule of benefits is usually well defined for PHI General treatment similar to a table of maim for statutory benefits under workers' compensation insurance. The concept of "fault" is problematic (but not an issue) for PHI, and ultimately the same claim benefit amount is paid under PHI even if "fault" can reasonably be attributed to another party.

Medical related costs

Although the scope of coverage for AC and PHI do not overlap, the philosophy underpinning AC insurances is usually the restitution in monetary terms of someone's injuries (which may include property damages) as a result of the adverse event that caused them. Similarly for PHI, as well as for other types of insurance, the insurance payout represents a reimbursement of the medical costs for treating an illness or injury.

It can be inferred that both AC and PHI ultimately (usually) involve a component of medical or treatment costs on persons.

In this respect both AC and PHI are subject to largely the same socioeconomic and technological forces that influence medical advancements and changes in treatment costs. A key example is the issue of the ageing population (discussed in more detail later in this paper), others include changes in longevity, general awareness of safety and healthy practices, and the economic climate and phase in the market cycle which may affect an individual's propensity to claim and the tendency for claimants to maintain symptoms in order to stay on benefit for longer.

Government involvement

Compared to other insurance classes like Motor or Home, there is a high level of government involvement in prescribing the operational aspects of both AC and PHI. The common drivers for such an extent of government involvement across these classes appears to be related to public issues such as affordability and availability of cover.

Some examples for AC insurance classes include the compulsory nature of CTP and workers' compensation insurances; the widely acknowledged sensitivity of public liability claims experience to the legal proceedings process as well as past and future reforms; and the government's claims and premiums subsidy schemes for medical indemnity insurance.

Similarly for PHI, imposed community rating and risk equalisation are the key mechanisms used by the government to sustain the level of cross-subsidies required to ensure availability of cover for those who may be most in need of, but otherwise cannot afford, cover if the full extent of their risk profile is reflected in the premium charged.

3.2. Differences

As one would expect, there are many differences between AC and PHI. Some of the key distinguishing features are discussed in turn below.

Regulations

AC classes are often written by entities regulated by APRA while private health insurers are regulated by PHIAC. The underpinning legislation is different in that AC classes pertain to the Insurance Act as for general insurance, but health insurance policies need to comply with the Private Health Insurance Act.

However it is of note that the overall intention of the different regulations and the principles involved are similar, e.g. both PHI and AC insurers are required to hold provisions for insurance liabilities, and both are subject to prudential regulations with a conceptually similar risk-based capital framework.

It is interesting to note that in some jurisdictions (such as the UK), PHI is treated as a class of general insurance business and it is therefore covered by the same legislation and regulator.

Claims

AC classes are usually long-tailed when bodily injuries are involved, but PHI is very short-tailed by comparison. However when the underlying perils are considered this distinction is somewhat superficial and could be a result of convention on how a "claim" is defined.

To illustrate, under PHI separate visits to a psychiatrist by a mental health patient are treated as separate episodes and appear as different "claims". Under AC if the mental illness is attributed to one insured event, these visits will be treated as the ongoing care costs of the same "claim". In this way, PHI is more similar to "claims made".

Under this example, the same set of costs for illnesses that can take many years of ongoing treatment before an individual fully recovers, will show very different apparent "tailedness" between PHI and AC. For PHI, the claim payments will be made under different policies (for different years) and potentially by different insurers if the insured changes insurer during the treatment period.

Pricing

AC classes are somewhat more restricted in terms of the range of premiums an insurer is able to charge for different risks compared to other general insurance classes of business. For some states, the government predefines a ceiling and floor for premiums for AC classes. This allows some cross-subsidy between risk groups to ensure general affordability for compulsory coverage.

For PHI there is also a high degree of cross-subsidy, achieved through the use of community rating. This is one of the key distinguishing features compared to typical general insurance products. PHIAC has the following description on community rating:

> *The principle of community rating is that people should not be discriminated against in obtaining or retaining private health insurance for hospital treatment coverage. Under the [Health Insurance] Act, in setting premiums or paying benefits, insurers cannot discriminate in relation to a policy holder or their dependants on the basis of: health status, age (other than age at entry under LHC), race, gender, sexuality, use of hospital treatment, medical or general treatment services, or general claiming history. This means that insurers cannot risk-rate, or price premiums for individuals at actuarially justified prices.* (ref 8*)*

For AC, insurers are usually not precluded from using rating factors such as age, gender and occupation which are often significant explanatory factors of the claim experience differentials between risks.

As will be shown later in this paper, PHI claim costs are still heavily dependent on the risk characteristics of individuals being covered, and the community rated premiums are not a good guide to "riskiness".

Reinsurance

For AC reinsurance usually takes the form of another (re)insurance company, often with a more diversified risk profile, insuring an insurance company.

For PHI this type of reinsurance is non-existent, but risks are "shared" through a risk equalisation mechanism across the whole industry through a central fund (Risk Equalisation Trust Fund) in each state. PHIAC is responsible for administering the Risk Equalisation Trust Funds, which transfer and share risk across all private health insurers within each state, with the intention that the insurers with an older and less healthy membership are not disadvantaged. (ref 8)

4. Underlying factors influencing Private Healthcare Insurance benefit costs

We have used Generalised Linear Models (GLM) to examine health insurance claims data across a number of private health insurers in order to gain insights on the cost drivers of health insurance claims. We were limited to some extent by the data available – for example, we did not have data on smoking status, socio-economic background, education, weight and a host of other factors which might be expected to have a bearing on an individual's likely propensity to claim. However, we were able to analyse a number of key factors that appear to explain a significant amount of the benefit variation.

4.1. Background on GLM

This section provides some background for readers who are less familiar with the actuarial application of GLMs to insurance. We do not provide a technical discussion of the intricacies of GLMs and would point readers towards the many textbooks that cover these topics should they be interested in reading further.

Use of GLM in Insurance

GLM is used extensively in general insurance when performing Motor pricing, as competition is high and missing a risk factor can lead to severe anti-selection consequences. Pricing in other general insurance classes is increasingly making use of GLMs as the benefits experienced from using GLMs in Motor pricing are realised, and the detailed data required to perform a GLM is captured for those classes.

GLM is also used in reserving in general insurance in the context of statistical case estimation, i.e. how claim characteristics explain the ultimate cost of that claim. In accident compensation, examples include workers compensation modelling of return to work rates for on benefit claimants; modelling how likely reported incidents will become claims for medical indemnity; and CTP modelling of ultimate claim size based on injury types and severity.

Historically, GLMs have not been used (at least not to a significant degree) in health insurance. In many markets, PHI pricing is relatively unsophisticated and typical rating factors might include just Age, Product Cover, Excess and (for groups) past claim experience. Moral / ethical considerations also explain why some factors are not used – rating by gender or race, placing reliance on any genetic or other medical tests, or using an individual's past claims experience to influence their future premium can be seen as socially unacceptable, even if statistically there may be good reason to rate using these as factors.

In Australia, many risk factors that have a bearing on the claims cost are disallowed for use in pricing. Risk equalisation covering both high-cost claims and older persons also means there is less of a disadvantage than in some other jurisdictions for insurers to have less sophisticated pricing.

However, when significant cross-subsidies exist, it is very important to monitor any shifts in the risk profile. Cross-subsidies are usually not sustainable for the long run – for PHI in Australia, they are currently being maintained by regulation and government policies. Significant pressures from macro issues such as the ageing population are likely to increase further the level of cross-subsidy that exists between insurers and between individuals. For the current system to operate effectively, a number of other incentives such as government contributions to premiums, tax penalties for not purchasing PHI and premium loadings if cover is not maintained are used. It is important to understand sources of risks and the underlying drivers of the actual healthcare costs. GLM provides a natural platform for this.

The benefit of GLM over a one-way analysis

Section 5 discusses the results of our GLM analysis and shows the impact of changing individual factors whilst keeping the other factors constant. This is a significant improvement on the more typical one-way analysis.

In one-way analysis, interactions between variables cannot be easily examined and changes over time (such as underlying benefit inflation) are influenced by changes in other variables (such as an ageing membership profile). It is therefore very difficult to separate out whether an observed trend is due to the variable being examined, or whether it is due to changes in another variable which may be correlated with (or just co-incidentally varying with) the one under examination.

By using a GLM, it is possible to examine the impact of changing just one variable while keeping the others constant. For example, Figure 5-15 shows the underlying benefit inflation in the data analysed having adjusted for any changes in other variables (such as changes in age profile). This should allow a much better understanding of the true drivers behind benefit cost.

Limitations of GLM

Any statistical or actuarial model is subject to constraints imposed by the data – availability, sufficiency, reliability, types and extent of errors and corrections, and bias. GLM in particular requires the explanatory factors to be captured and presented accurately in the data. In this way the GLM is perceived to be relatively "data intensive" and is arguably more exposed to these data issues than other less sophisticated modelling approaches. It works best when there is a large amount of detailed data available for analysis. Private health insurers have a vast amount of data available, with details on individual insured persons, a very high claim frequency relative to other insurance products and a lack of very large claims that might otherwise distort the data.

GLM provides a platform for modelling rather than providing the answer itself. Modelling is still reliant on human interpretation of the data and analysis to detect trends, and there is a significant amount of judgement involved in assessing the most appropriate model and parameters.

4.2. Our model specification

We have used GLM techniques to analyse how the benefit per person year is affected by a number of explanatory risk factors. This section provides a summary of the model and data used.

Model

We have modelled Hospital and Medical benefits together (collectively referred to as "Hospital" from here on) as these are covered under the same insurance policy. General treatment benefits have been modelled separately as the nature of the claims are significantly different, resulting in different patterns attributed to the explanatory variables.

The variable modelled is "benefit amount per person year" before risk equalisation adjustments (see section 6.4 for further discussion). Benefit amount refers to the benefit provided by the health insurer on each claim, rather than the actual cost of the service provided. These may be different for a number of reasons, including applicable excesses, co-payments or policy limits. One person year refers to the exposure to one person's claims over a one year period. This differs from the number of members or policies as each membership or policy can cover multiple persons.

In other words, we have modelled the average annual benefit cost per person covered.

Benefit per person year is calculated as the weighted average for each unique combination of risk factor characteristics. The model is weighted by person year in order to give more credibility to the average benefit per person year from risk factor groupings with higher exposure.

The risk factors were selected based on explanatory power and data availability. These factors are not exhaustive, and analysis of additional factors (should such data be available) may explain more of the residual variability. The factors chosen are listed below and are discussed in more detail in the following sections. These are categorical risk factors, meaning that a separate coefficient is fitted for each category within each risk factor.

- Age cohorts
- Gender
- Level of cover
- State
- PHIAC Class
- Service year
- Interaction between age cohort and gender

A variable allowing for differences between insurers experience has also been included. This helps to remove any distortions that exist between insurers' membership profiles that are not captured by the data available for analysis.

We fitted a number of GLMs using different error distributions and link functions in order to obtain the best fit to the data. The best fit for both the Hospital and the General treatment data used a Normal error distribution with a log link function. The results shown below are the results of this model.

In (a slightly simplified) equation form, our model can be summarised as:

$$\log(bppy) = \tilde{\tilde{X}}\tilde{\beta} = \sum \beta_{ABi} AB_i + \sum \beta_{Gi} G_i + \sum \beta_{Hi} H_i + \sum \beta_{Ai} A_i + \sum \beta_{Si} S_i + \sum \beta_{Pi} P_i + \sum \beta_{AB*Gij} AB_i * G_j + \sum \beta_{Yi} Y_i + error$$

Where bppy = benefit per person year

β_{ki} = coefficient for the i^{th} category of the k^{th} risk factor

AB_i = indicator for i^{th} category of age cohort

G_i = indicator for i^{th} category of gender

H_i = indicator for i^{th} category of level of Hospital cover

A_i = indicator for i^{th} category of level of General treatment cover

S_i = indicator for i^{th} category of state

P_i = i^{th} category of PHIAC class

AB_i*G_j = indicator for interaction of i^{th} category of age cohort and j^{th} category of gender

Y_i = i^{th} category of service year.

Data

We have used aggregated data from 9 of the 37 Australian private health insurers in our analysis. We believe our analysis is reasonably representative of the Australian market and we were careful to include insurers with exposure across all States and ages. Due to the high claim frequency for PHI, the analysis is expected to be reasonable. Approximately 20 million claim payments relating to a total exposure of around 3.5 million person years was analysed across the period from 1 April 2006 to 31 March 2009.

Exposure data and the corresponding risk factors are obtained from person and membership file listings provided by the insurers. Each file represents a snapshot at a particular point in time. To calculate exposure for the days in between each snapshot, we have assumed that the exposure on any particular day is the same as that at the closest available snapshot date. This results in an estimate for the total person year exposure rather than an exact measure, and persons taking out cover and subsequently lapsing between adjacent snapshot dates may not be captured at all. Overall, for the aggregated data, our assumption appears to be reasonable and there is only a small proportion of claims that do not correspond with the calculated exposure.

Benefit amounts are obtained from the claims files provided by the health insurers as at 30 June 2009, filtered to only include services rendered between 1 April 2006 and 31 March 2009. As claims settle so rapidly in PHI, it was not necessary to make an adjustment for the development of the claims tail as this would be immaterial. Separate files are provided for Hospital, Medical and General treatment benefits. The first two files are combined to give total Hospital benefits in our analysis. Claims are mapped to an exposure period and associated snapshot date based on the service date.

Exposure and benefit data are then combined by matching membership and person identification codes as well as the snapshot date and service years. Benefits and person year exposure are summarised according to unique combinations of risk characteristics and the resulting benefit per person year for each combination is calculated by dividing aggregate benefit cost by aggregate person year.

Explanatory Risk Factors

Age Cohorts

Age cohort is essentially the age variable for each person, and differs for multiple persons under the same policy. Ages are grouped into 5-year cohorts to obtain a more manageable set of categories. Due to data sparcity, persons under 10 are grouped together and likewise individuals aged over 80 are grouped, rather than being further split into 5-year cohorts. A person's age is based on the age recorded at the snapshot date, and changes over the exposure period accordingly.

Exposure peaks at the age cohort 50-55, followed by 15-20, with low exposure for those older than 70.

Gender

Gender refers to the gender for each person we have exposure for, and may be different for multiple persons under the same policy. Most persons are recorded as either male or female, with marginally more females. There is a very small proportion recorded as unknown or with no record, which are both grouped under an "Unknown" category in our model.

Level of cover

As we model Hospital and General treatment benefits separately, we also categorise products in terms of level of cover for Hospital and General treatment separately. For all persons covered under the same policy, the level of cover is identical.

As discussed in section 2, Hospital products are grouped as Public, Budget, Medium or Top. General treatment products are grouped as Budget, Medium or Top (corresponding to Comprehensive in section 2). The groupings are dependent upon the benefits and limits provided under each product. Those with only Hospital or only General treatment products have "None" recorded as the level for the cover they do not have.

State

Each state and territory in Australia is a separate category, and all persons under the same policy have the same state variable. Two additional categories are Other, which includes overseas persons, and Unknown, which are policies with no state recorded.

New South Wales has the highest exposure, followed by Victoria and Queensland.

PHIAC Class

Each policy is grouped into a PHIAC Class. All persons under the same policy share the same PHIAC Class. The classes are:

- Single – covers one adult with no dependants
- Couple – covers two adults with no dependants
- Family – covers two adults with one or more dependants
- Single Parent Family – covers one adult with one or more dependants
- 3 Adults – covers three or more adults with no dependants
- 2 Persons No Adult – covers children with no adults

Family policies have the highest exposure in the data we analysed.

Service Year

We have used service year as an additional rating factor, where a year is defined as the period from 1 April to 31 March. Rate increases and product changes typically take place on 1 April for private health insurance policies. Thus, service year ends 31 March and is recorded according to the year in which it ends. For example, the year ending 31 March 2008 is recorded as the 2008 service year.

Exposure of our data covers full service years 2007 to 2009.

5. Model Results

This section details the results obtained from our GLM, summarised in the graphs below.

The graphs show how the modelled benefit cost varies by changing one, or at most two, of the rating factors. As the actual benefit cost varies according to each of the factors modelled, for the factors not being shown, each graph shows the projected benefit level for the categories with the greatest exposure. For example, if the graph shows how the benefit level varies according to age, then the graph shows this for the State, Gender, Cover, PHIAC Class, etc. with the greatest exposure.

5.1. Hospital and Medical Benefits

This section shows how the Hospital benefits vary according to the factors modelled.

Age and Gender rating factors

The first few graphs consider how the benefit cost varies with both age and gender – noting that our GLM has included an interaction between these variables, recognising that they do not vary independently of each other.

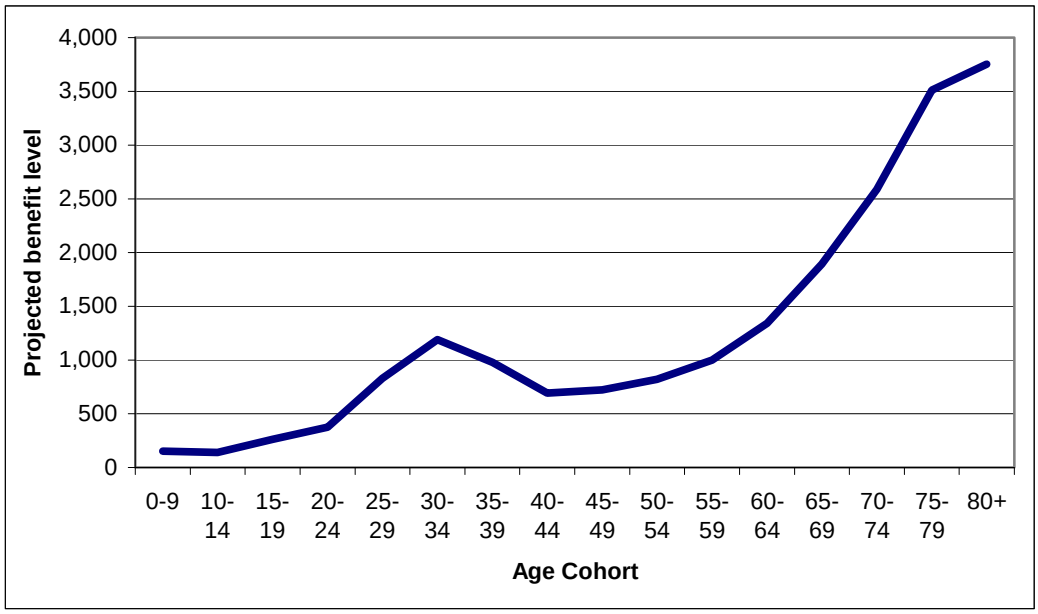
Figure 5-1: Projected benefits by Age cohort (Males only)

As noted above, the rating factors not shown in this graph are set to the category with the greatest exposure, i.e. this graph is representative of individuals in New South Wales, with Family policies, for the 2009 exposure year, etc.

The above graph shows how the projected annual benefit level varies according to Age for Males only. This graph shows the increase in benefit level from around age 45, with a rapid increase around retirement age.

The 80+ age cohort has sparse data and should therefore be treated with some caution.

Figure 5-2: Projected benefits by Age cohort (Females only)



This graph also shows an increasing benefit cost with age. However, there is also a significantly increased cost between ages 25 and 40, explained by pregnancy and related benefits that (obviously) do not influence the benefit cost for males at those ages.

Figure 5-3: Projected benefits by Age cohort (Males and Females)

This graph shows the benefit cost for both males and females by age. The pregnancy "hump" is very obvious.

The cost of Hospital treatment tends to increase as death approaches. As males tend to die at a younger age than females, this likely explains why at each age cohort for ages 60+, males have higher benefit costs than their female counterparts.

Figure 5-4: Projected benefits by Age cohort (Males and Females) - relativities

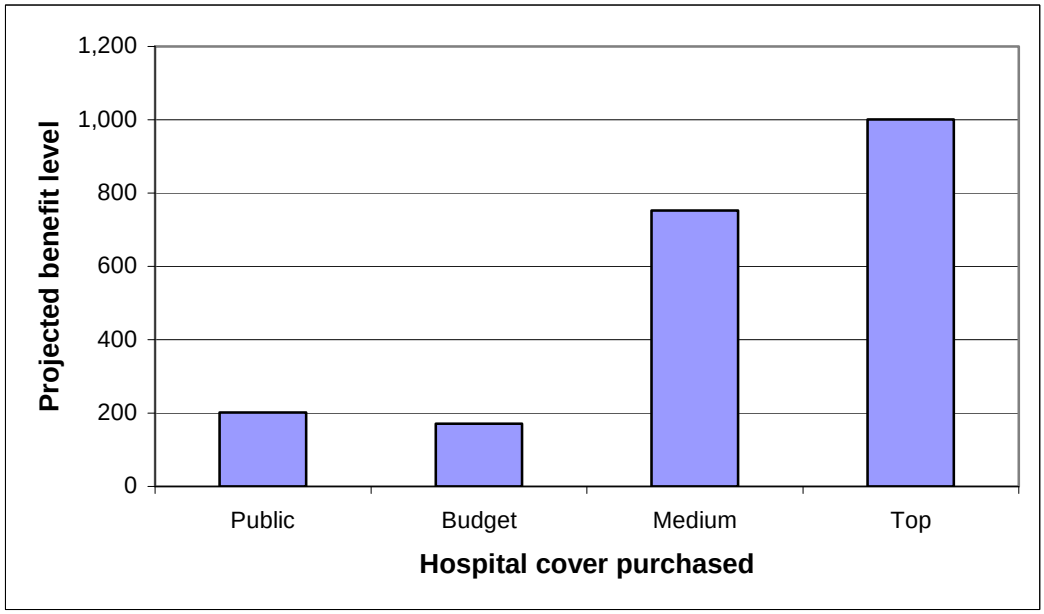
This graph shows the difference between the projected benefit costs for males and females in each age cohort. A positive column shows that females in this age cohort cost that much more on average than a male in that age cohort, whereas a negative column shows the amount by which males are more expensive for that age cohort.

As noted above, the pregnancy "bump" (no pun intended) and more rapidly escalating costs with age for male persons can be observed.

Other rating factors

This section considers a number of the other factors modelled for Hospital benefits, presenting graphs and commentary as appropriate.

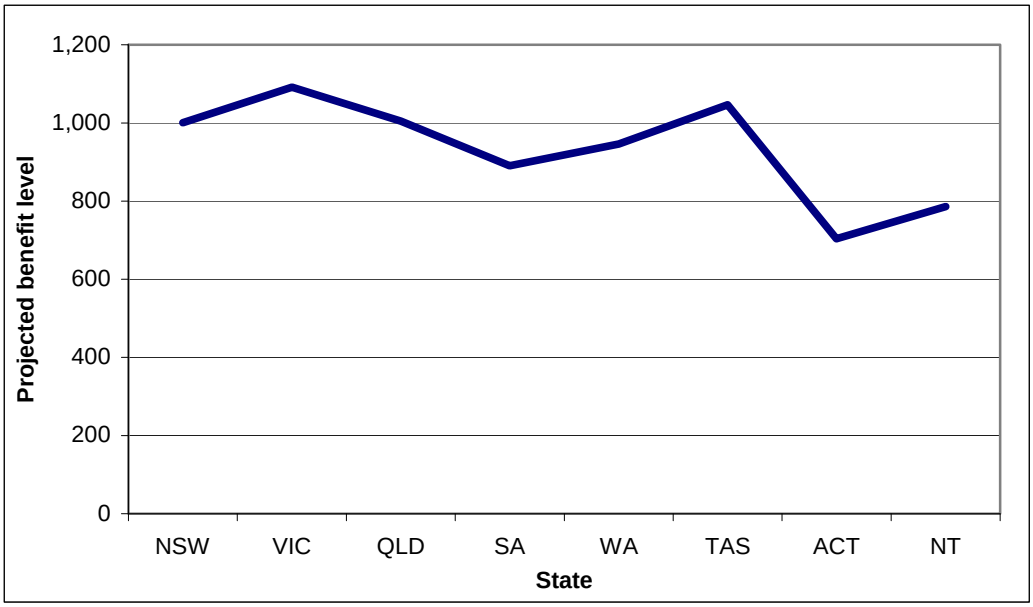
Figure 5-5: Projected benefits by Hospital cover level



As is expected, higher Hospital costs are associated with a higher level of Hospital cover purchased.

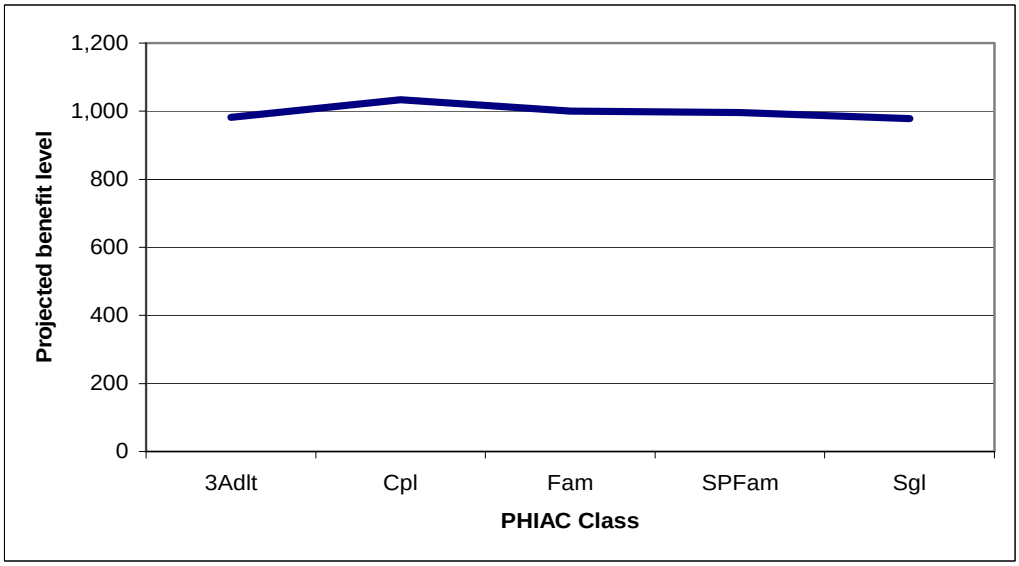
It is not clear why the projected benefits for the Budget products is lower than for Public Hospital only products (albeit that this difference is small). It is likely that this is due to sparcity of data in the data set modelled, and we anticipate that the inclusion of more data would see this anomaly reversed.

Figure 5-6: Projected benefits by State



Some volatility in benefit level appears between states. There appears to be a slight indication of higher costs in the more populated states, with lower benefit costs for ACT and NT. Tasmania appears to be surprisingly high, although this may be driven by relatively sparse data for that state. The "Other" category is not shown as data is very sparse and the focus in on Australia.

Figure 5-7: Projected benefits by PHIAC Class



The PHIAC classes are defined as follows. Each PHIAC class relates to the number and type of individuals covered under a single membership.

3Adlt:	3 or more Adults
Cpl:	Couple
Fam:	Family
SPFam:	Single Parent Family
Sgl:	Single

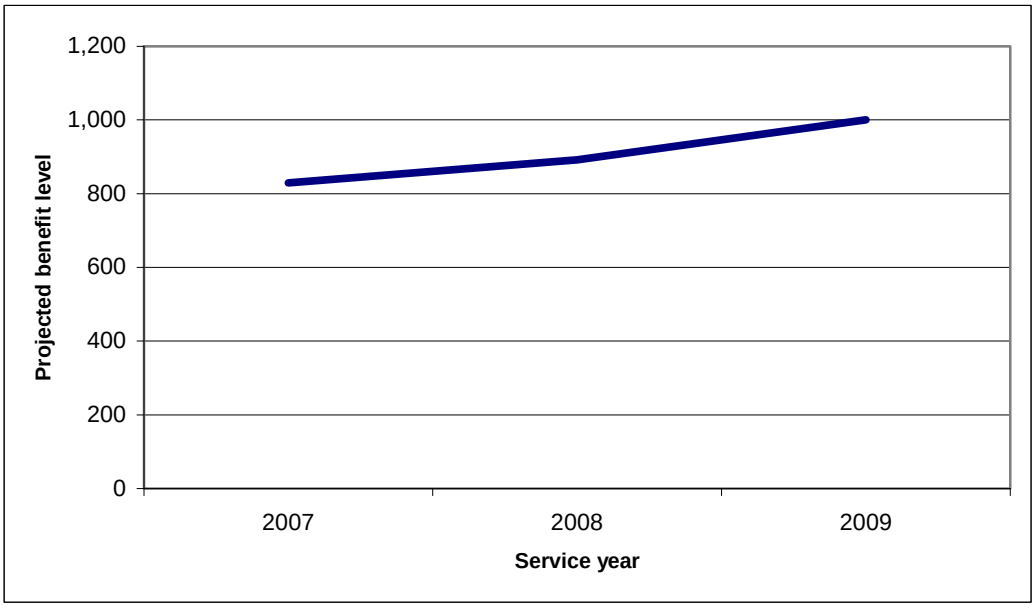
The "2 Persons no Adults" category is not shown on this graph as the data relating to this category is sparse.

The PHIAC class appears to have a relatively small impact on the Hospital benefit cost of the individuals insured although, on average, Couple policies appear to have slightly higher benefit costs and Single policies appear to have slightly lower benefit costs.

This analysis would likely show quite a different picture if it was performed as a one-way analysis. This is because other factors, such as age, may significantly impact the one-way analysis, whereas the impact of other variables is accounted for separately in a GLM.

Consider the age profile of individuals covered by Single, Couple and Family policies. In general, the age profile for Families will be highest from 25-55, and the age profile for Singles / Couples will be highest between 20-30 and 55+. Given the results in Figure 5-3 showing the expected benefit cost for different age groups, the different age profiles of Single, Couple and Family policies would have a very significant bearing on a one-way analysis by PHIAC Class. In the GLM analysis, the age-related impact is accounted for within the Age variable, so the graph above is not distorted by differences in age profile within each PHIAC Class category.

Figure 5-8: Projected benefits by Service Year

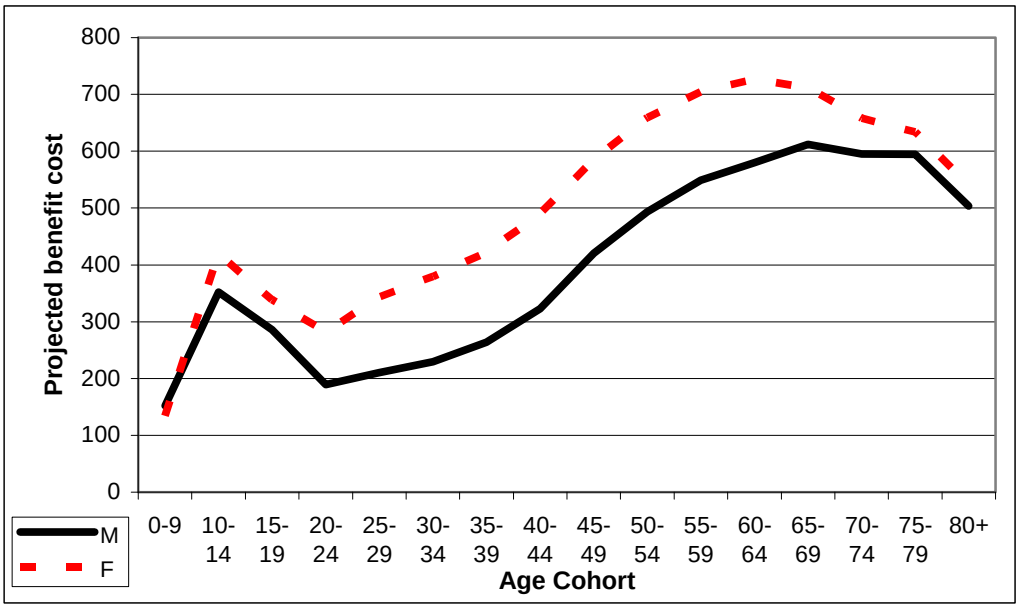


Irrespective of underlying changes in the membership profile (which should be largely taken into account through the modelling of other factors - particularly age), the Hospital benefit level appears to be increasing over time. On the data included in our analysis, this appears to be at a rate in excess of 5% per annum across the past 3 years. This is at a higher rate than consumer goods and wage inflation, and may be associated with medical advancements and increased utilisation.

5.2. General Treatment Benefits

General treatment benefits tend to be very high frequency and low average cost, relating largely to dental and optical treatments. It should therefore be expected that the analysis should provide very good indications of the relative benefit costs for the rating factors considered.

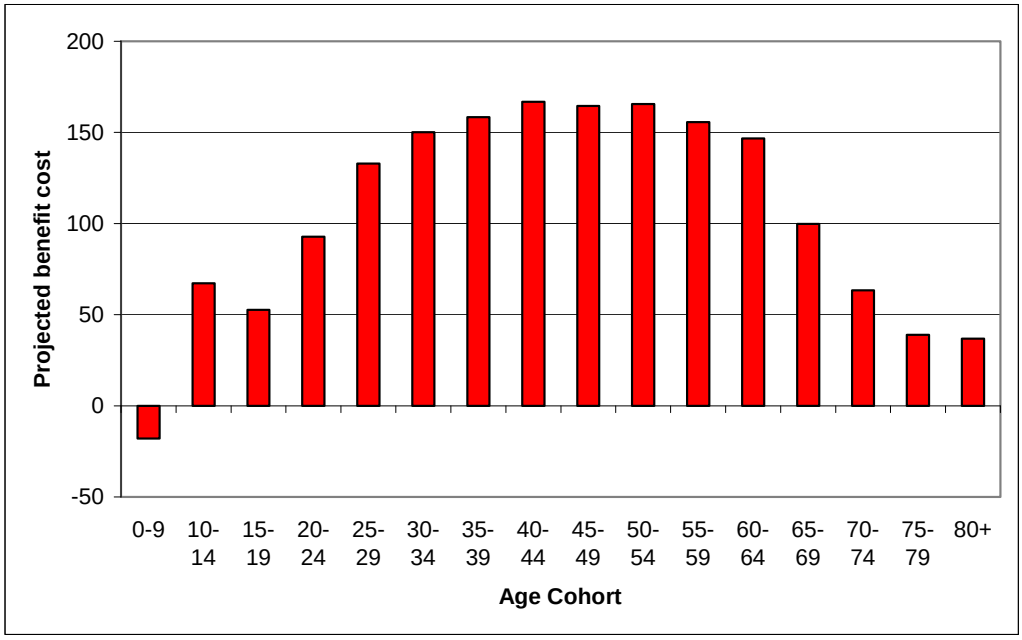
Figure 5-9: General treatment - projected benefits by Age and Gender



This graph shows the projected benefit cost for both males and females. There are a number of interesting features in this graph:

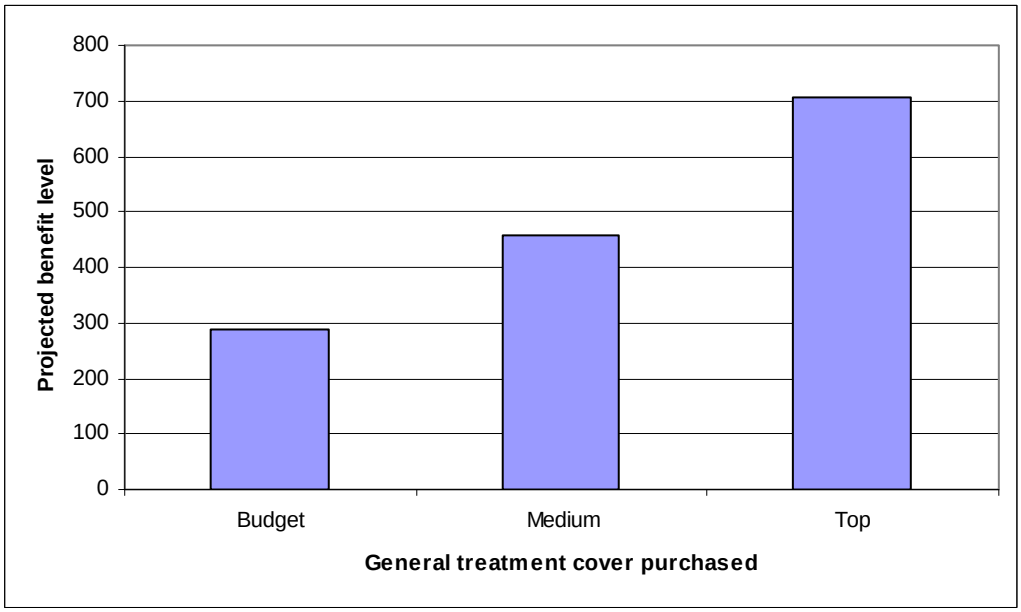
- At all ages, females appear to claim higher benefits than males. It is not immediately obvious that there is a medical reason for this (unlike the "pregnancy hump" for Hospital benefits) and so this may be more related to a general difference between genders in their attitudes to making use of dentists / opticians and claiming for such treatment.
- Although the benefit cost generally appears to increase with age, this is not as extreme as it is with Hospital benefits. The "proximity to death" cause for increased Hospital benefits will have much less significance on General treatment benefits. The high claim frequency and type of benefits available with this cover also means that insured persons are able to claim regularly for small benefits irrespective of age.
- There is a "hump" for both genders in the early teens. This likely relates to increased dental and optical benefits at these ages.

Figure 5-10: General treatment - relative benefits by Age / Gender



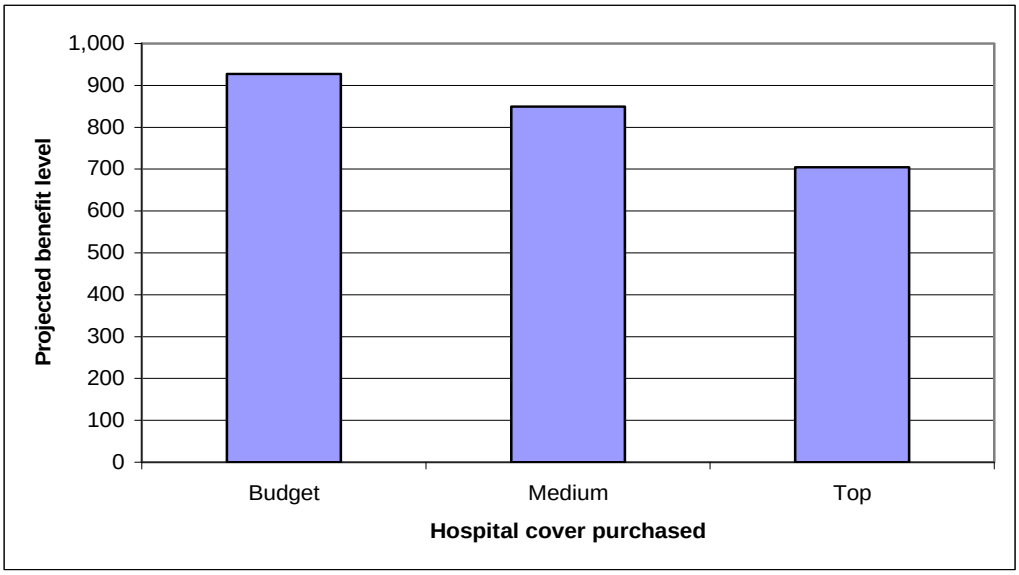
This graph shows the relative cost of males and females at each age group. The positive columns indicate that females generally claim more than males for General treatment benefits across all ages by approximately $50-$150 per annum.

Figure 5-11: General treatment - projected benefits by General treatment Cover level



As expected, a higher level of General treatment cover purchased typically results in greater benefits being claimed.

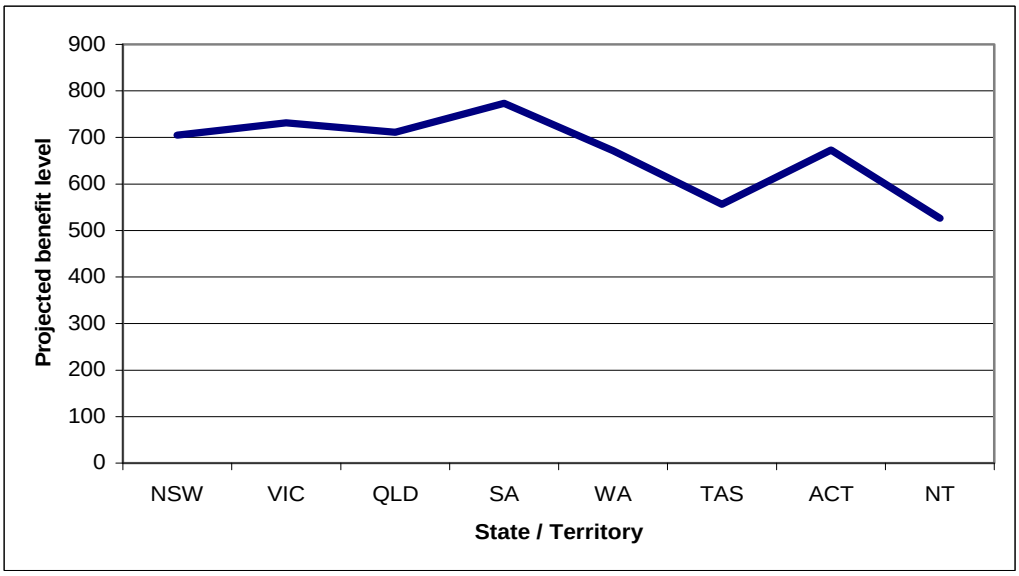
Figure 5-12: General treatment - projected benefits by Hospital Cover level



This graph shows how the General treatment benefit level varies according to the Hospital cover purchased. There does appear to be a trend, suggesting that the more expensive Hospital cover purchased, the lower the General treatment benefits are likely to be.

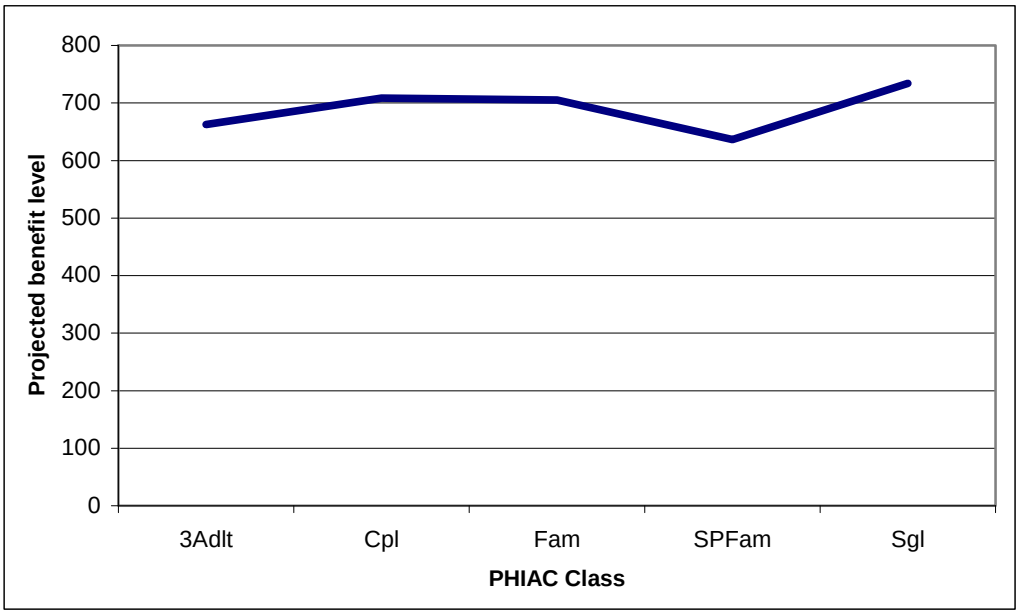
This may not immediately appear to make sense. However, the impact of other variables (such as General treatment cover purchased) has already been taken into account, so this may be more of a socio-economic or "attitude" indicator. As General treatment benefits tend to be high frequency but low value claims, less wealthy individuals may be more inclined to claim. Less wealthy individuals may also be more inclined to purchase cheaper (lower level) Hospital cover.

Figure 5-13: General treatment - projected benefits by State



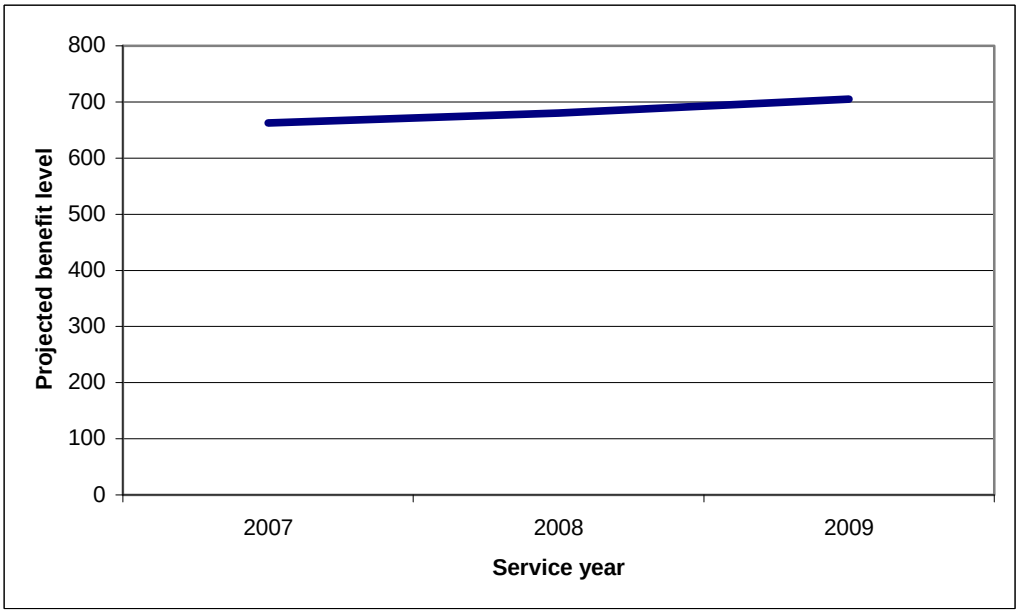
Similar to Hospital benefits, there is an indication that the Australian Capital Territory and Northern Territory have lower benefit levels. Tasmania also appears to have lower benefit levels than other states.

Figure 5-14: General treatment - projected benefits by PHIAC Class



As for Hospital cover, the PHIAC Class does not appear to have a very significant impact on the benefit cost, although the analysis does suggest that Single policies have slightly higher benefit costs than other classes.

Figure 5-15: General treatment - projected benefits by Service Year



The analysis suggests that irrespective of increases due to other variables (such as a change in age profile, which would be captured in the age variable), benefits increase with service year at approximately 3-4% per annum – reasonably consistent with consumer goods and wage inflation. This appears reasonable as many insurers tend to align increases to General treatment benefits with the Consumer Price Index.

6. What it means / bigger picture trends

6.1. Ageing population

Australian Bureau of Statistics ("ABS")

The ABS is a source of many useful statistics and commentary on the Australian population. Some of the more relevant sources are noted in the reference section of this paper.

According to the ABS, the median age of the Australian population has increased by 5.3 years over the last two decades, from 31.6 years at 30 June 1988 to 36.9 years at 30 June 2008.

Given the analysis presented above and especially the figures showing how both Hospital and General treatment costs increase significantly with age, an increase in the median age of the population by 5.3 years over a period of only 20 years is concerning in respect of the likely impact this is having on the country's healthcare costs. The trend of an ageing population together with associated higher healthcare costs is set to continue for the foreseeable future.

Like most developed countries, Australia's population is ageing as a result of lower fertility and increasing life expectancy. For some countries, there are additional concerns – China, for example, has a restriction on the number of births, which is skewing the population age even further.

Treasurer Wayne Swan and the next Intergenerational Report

The Treasurer recently released (18 September 2009) updated forecasted population figures which will be included in the next (third) Intergenerational Report ("IGR") expected to be published prior to the 2010/11 Budget.

Under the *Charter of Budget Honesty Act 1998* an IGR is required to be produced at least every five years. The report focuses on the implications of demographic change on the economy and assesses the financial implications of continuing current policies and trends over the next four decades.

Projections in the latest available figures suggest that,

- Australia's population will grow by 65 per cent to reach over 35 million people in 2049, up from around 22 million people in 2009. This is a significant increase from the previous IGR projection of 28.5 million in 2047. The increase in projections is largely driven by an increase in the number of women of childbearing age, higher fertility rates, and increased net overseas migration.
- The proportion of people aged 65 and older is projected to rise to 22 per cent in 2049. This compares with 13 per cent today (a projected increase of just under 70 per cent) and 8 per cent in 1969. The proportion of the population aged 85 and over is projected to increase most rapidly, tripling from 1.7 per cent to 5 per cent in 2049.

The report notes that, "Critically, while there are now five Australians of working age to support every person aged 65 and over – by 2050 it is forecast that there will only be 2.4 people in that crucial support role."

Our analysis above suggests that the annual Hospital costs of a typical 70-year old are of the order of 10 times those of a typical 20 year old.

6.2. Cross-subsidy and risk equalisation

We have seen from previous sections that there is a considerable level of cross-subsidy within health insurance. The greatest degree of cross-subsidy appears to be between younger and older age groups, and to some degree between individuals and families due to the use of community rating benefiting families with dependent children (e.g. a family with one child pays the same premium as a family with 10 children).

This aspect of the industry is a formally recognised feature through the risk equalisation mechanism. Such extent of recognised and sustained cross-subsidy is atypical for general insurance classes. It is difficult to predict what will happen to risk equalisation in health insurance, given the ageing population and the increased cross subsidies that will likely result.

The extent of risk equalisation necessary is greater when the cross subsidies that exist are greater. To ensure sufficient "good risks" purchase the insurance, it is necessary to offer both incentives (such as premium rebates) and discouragement from not purchasing insurance (such as additional tax loadings). As the cross subsidies increase, the extent of incentives / discouragement that is required also increases. Recent legislation has seen developments in this space with the government trying to restrict its own subsidy of private health insurance whilst at the same time maintaining strong incentives for individuals to maintain / purchase health insurance. A future possibility is for the community rating approach to be relaxed to some degree, which would remove some of the existing cross-subsidy (this may have social and political implications). An alternative to the carrot / stick approach is to make the insurance cover mandatory for certain segments (or all) of the population (arguably this then becomes similar to a federal health system funded through general taxes).

It seems likely that the risk equalisation mechanism for private health insurance may change at some future point, perhaps to reduce government subsidies. Currently a portion of the benefits paid for high cost claims and older age groups benefit from risk equalisation. A change in approach may increase health insurers' exposure to the issues of selection, and an understanding of the underlying risk profile and the drivers for its change will become even more important.

There are some similarities between a market that uses community rating and schemes that operate on a no-fault basis. In both cases, the individuals receiving benefits are likely to be cross-subsidised to some extent and an individual is not encouraged to become a better risk by the potential for a reduced premium. Certainly such markets do not seem to be "efficient" in the economic sense and the overall cost may be higher in the long run due to lack of incentives for individuals to improve their own risk.

6.3. Marketing implications for private healthcare insurers

Although the current regulations do not allow different premium rates to be charged for a number of the variables examined above, this analysis may assist with:

- A better understanding of which segments of the market are profitable and which are not

  For example, it appears that males are generally cheaper to insure than females at younger ages. For Hospital cover, at older ages males tend to claim more than females, but around ages 25-40, females are significantly more expensive. For General treatment cover, females appear to be more expensive than males at all ages.

- Marketing initiatives and product design

  As a result of not being able to charge a premium in Australia that reflects the underlying risk (due to community rating), for some products health insurers attempt to attract people with lower claiming tendencies. For example, a younger profile is encouraged by offering benefits that are likely to appeal more to young adults, and excluding benefits that would appeal more to older persons – such as hip and knee replacements.

  It is therefore clear, that while some rating factors cannot be used directly to alter the premium charged to members, it does affect the product design. An understanding of which are the more profitable market segments should lead to increased marketing to those segments (either through direct marketing to those segments, or in the design of products that are more likely to appeal to those segments).

- Modification to some benefit types or development of new products

  As a result of this analysis, or more specifically if a similar analysis is performed for individual insurers, some benefits could be modified to either attract more profitable policyholders, or alternatively, to create greater equity between members.

  Currently, it appears that for many products there is a significant cross-subsidy from young to old and from male to female (with young single males appearing to get a very poor deal!). It may be possible to modify some products or design new products that close these gaps. The result of this could be either (a) reduced cross-subsidies and greater equity between members, or (b) attraction of more profitable segments of the market.

- A better understanding of the impact of an ageing population.

  The ageing population will have a very significant impact on healthcare costs and how they are funded over the longer term.

6.4. Risk equalisation observations

The analysis performed in this paper has been on the benefits paid by private health insurers, gross of any risk equalisation adjustments. This is reasonable when attempting to understand the underlying drivers of benefit cost as this gives the best indication of the claiming characteristics of the individuals insured. However, it is also important (especially for the private health insurers when considering premium adjustments, new products and marketing initiatives) to consider the impact that risk equalisation has on the net benefit cost.

As risk equalisation is so important to the current operation of the healthcare market in Australia, any insurer that does not consider profitability after appropriate allowance for risk equalisation is likely to be thoroughly misinterpreting the true profitability of their products and segments of their membership.

In this paper, we have made some adjustments to indicate the likely impact that risk equalisation has on the overall benefit cost. Although there are adjustments for large claims and claims relating to people aged over 55, we have only made adjustment for the age-based risk equalisation mechanism. The impact of this is far greater than the adjustment necessary for large claims.

It is worth noting at this point that the current risk equalisation mechanism does not relate to General treatment benefits.

The following table shows the proportion of benefits that can be recovered from the central risk equalisation pool for each age group. As can be seen, this increases to 82% for claims from individuals aged over 85.

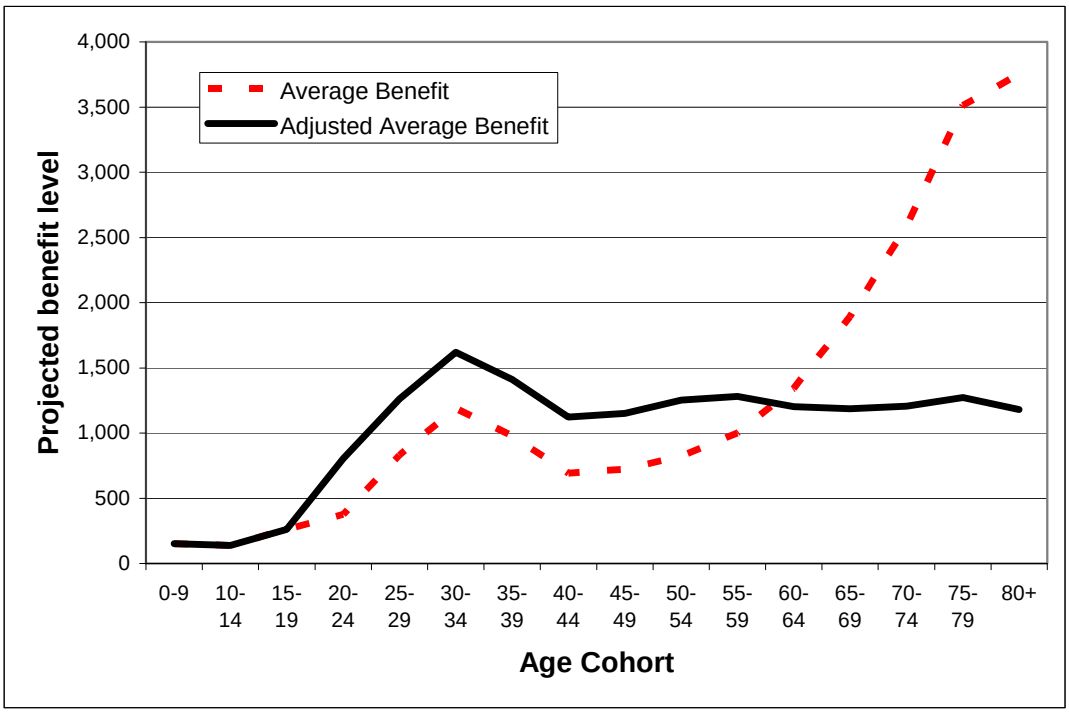
Table 6-1: Proportion of benefits that are recoverable from risk equalisation

Age	Benefit proportion recovered
85+	82.0%
80-84	78.0%
75-79	76.0%
70-74	70.0%
65-69	60.0%
60-64	42.5%
55-59	15.0%
0-54	0.0%

The total cost recovered from the pool is calculated by state on a quarterly basis by reference to actual payments made during the quarter. This amount is then recovered from health insurers in proportion to (roughly) the number of adults that each insurer covers.

The cost of benefits, net of risk equalisation, is the combination of a percentage reduction in the benefit cost for individuals aged over 55 together with a flat increase across all adult persons insured, corresponding to the total amount paid out of the pool in a year divided by the number of adult insured in the industry. The impact of this is shown in the graph below.

Figure 6-1: Net benefit cost by age for Females, after adjusting for age-based risk equalisation



The purpose of the age-based risk equalisation mechanism is to make older people equally attractive to insure as younger people. It appears from our analysis that this is operating very much as intended. The rapid growth in benefit costs seen on the earlier graphs (and the dotted red line above) is removed completely (hence the largely flat black line from around age 40 onwards).

There are a number of features that are not mitigated by risk equalisation however – on a net basis, it appears that women of child bearing age are likely to be the least profitable age/ gender group (all else being equal).

There is no risk equalisation mechanism to offset the other factors analysed, suggesting there is a real potential for insurers to be selective through their product design and marketing activities.

7. Conclusions

Our analysis has demonstrated how the annual benefits claimed by individuals vary according to known risk characteristics. The use of GLMs has enabled a more detailed investigation of this than is possible in simple one-way analyses.

The largest determinant of annual benefit cost appears to be age – especially for Hospital-related claims. It is therefore appropriate that the current risk equalisation mechanism in place is focused predominantly on mitigating the additional risk that some insurers have due to their membership's older age profile.

However, there are a number of other factors which appear to be significant factors in determining the likely benefit cost. A small number of these (such as state) can be used as rating factors. Others, such as gender (noting that there is a very clear interaction between age and gender) are not currently permitted as rating factors, but insurers do have the opportunity to design products that appeal to certain segments of the market or to market directly to those sectors of the market that are most profitable.

Should data on other factors become available (such as smoking / drinking habits of individuals) this type of analysis may provide further support for insurers to target certain more profitable sectors of the market.

The ageing population is a very real influence on current and future healthcare costs. It may be necessary for government policies to constantly develop to reflect the changes in population and that population's attitude towards a minimum level of healthcare and the extent to which members of that population continue to cross-subsidise others. Young Australians today currently pay approximately $500 of their annual PHI premium to subsidise older PHI members (Couple / Families pay $1,000). This amount is increasing, and is likely to continue increasing, at a rate much higher than consumer goods or wage inflation.

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