Growing Pains
Selection Effects in Private Health Insurance

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Abstract

The purpose of this paper is to examine selection effects in private health insurance claims experience, particularly during periods of significant membership change.

Australia’s community rated private health insurance system relies on young and healthy members subsidising the health costs of old and sick members. Health insurers focus heavily on increasing their appeal to these young and healthy members and government regulation has also played a role in changes in the participation rate for this segment.

The lower claims costs of young and healthy members combined with the selection effects of members joining and leaving affects aggregate claims experience. An understanding of these impacts is crucial to pricing decisions, profitability analysis and forecasting.

Key words: private health insurance, selection, growth, claims experience

1. Experiencing Growing Pains

_Growth is a painful process_ - Wilma Mankiller

When I was a child I experienced sporadic aching pains in my legs. My mother told me “they are just growing pains, they will go away”. Up to 20% of children suffer these growing pains at some stage, especially during their primary school years. These pains have no obvious cause, there is nothing than can be done to prevent them and there is no specific treatment. The pain or discomfort is transient, irregular and unpredictable. The pains reduce in severity over time.

Despite their name, growing pains in children are not believed to be caused by the growth process. However, in a business environment growth, while generally highly sought after, can similarly be associated with some level of pain and discomfort.

In Australia’s community rated voluntary private health insurance environment, most health insurers actively seek out opportunities for membership growth, particularly amongst young and healthy members. This paper explores the impact of membership growth on Australian private health insurers, including the gain and pain that can come with growth.
2. Selection

2.1 Selection theory

All growth is a leap in the dark, a spontaneous unpremeditated act without benefit of experience - Henry Miller

Actuaries are familiar with the concepts of selection and select lives. Selection usually refers to a sub-group of policyholders who exhibit lower mortality or morbidity. It can arise in response to the insurance application process where lives are ‘selected’ from the general population of risks following an underwriting or sales process. More generally it describes a situation where one group of people have different claims experience from another group.

Selection is generally considered to mean that claims experience for the select group will be lower than that for those who are not part of the select group. However selection also covers the specific case of anti-selection where the claims experience of a group is higher than that for the non-select group, generally as a result of an action taken by the insured.

Most actuaries would have first encountered selection in their study of life insurance mathematics. Neil (1983) describes selection in the actuarial textbook Life Contingencies as follows:

“Where attention is also paid to the duration for which a member has been within the group the table is called a ‘Select’ table. … the more common use is with assured lives and annuitants’ tables where it is reasonable to assume that the lives concerned have been ‘selected’, and are likely to experience lighter mortality than the group as a whole at the same age – the assured lives because of the medical evidence obtained before a life assurance office accepts a proposal, and the annuitant lives because a person who is ill is unlikely to purchase an annuity (this is known as self-selection, being exercised by the lives themselves). While normally select mortality is lighter than ordinary it is possible for the mortality to be heavier, for example, the mortality of ill-health retirals from pensions schemes is likely to be particularly heavy for the first few years after retiral, in which case it may be referred to as reversed or negative selection.”

Generally selection effects will persist for a period of time since a certain event (such as commencing insurance cover). This phenomenon is referred to as temporary initial selection as claims experience will temporarily be different from other similar groups of people who have not recently commenced insurance. The effects of temporary initial selection tend to reduce after a few years, so that persons with the same attributes (eg. age) generally represent similar risks. Once the effects of temporary initial selection have worn off, all persons are considered to be “ultimate lives”.

In actuarial notation, selection is indicated by the use of square brackets. For example the mortality for a person aged x+k who joined the insured population at age x is denoted by $q_{[x]+k}$ indicating that mortality rates are a function of age and time.

After the select period the mortality rates of select lives are assumed to revert to the mortality rates of the broader group so that $q_{[x]+n+k} = q_{x+n+k}$ for n greater than the chosen select period.

While traditionally applied to life insurance, selection theory is a convenient technique that can be applied in numerous demographic situations.

Selection effects can also be observed in member selection of products. The impact of this type of selection was discussed in Gale (2005), however only durational selection effects are examined in this paper.
2.2 Selection in Private Health Insurance

I believe in growth, but right now I’m feeling terrific growing pains - Meredith Vieira

While community rating regulations require private health insurers to accept all applicants and new members are not subject to medical examinations, selection effects occur due to the operation of waiting periods.

Waiting periods are a period of time before members who have joined an insurer are eligible to receive benefits. Section 75 of the Private Health Insurance Act 2007 sets out the following maximum waiting periods for hospital treatment:

- Pre-existing conditions: 12 months
- Obstetric treatment: 12 months
- Psychiatric, rehabilitation or palliative care: 2 months
- Other treatments: 2 months

A pre-existing condition is an ailment, illness or condition, for which the signs or symptoms (in the opinion of a medical practitioner appointed by the health insurer) existed at any time during the six months prior to taking out hospital cover or upgrading to a higher level of cover.

Most insurers will not apply any waiting period for claims as a result of an accident in the first two months.

There are no maximum waiting periods for general treatment benefits, however typical waiting periods are:

- Major dental, orthodontic and endodontic treatment: up to 12 months
- Optical: up to 12 months
- Psychology: up to 12 months
- Blood glucose monitors: up to 24 months
- Hearing aids: up to 36 months
- Other benefits: generally 2 months

As can be seen from this list, longer waiting periods apply to higher cost categories.

Some funds also apply Benefit Limitation Periods for some types of treatment on some hospital products. These are initial periods of membership of one or two years (after waiting periods have been served) during which only a minimal benefit (generally enough to cover a shared room in a public hospital) is paid for some types of treatment, leading to significant out-of-pocket costs for treatment in a private hospital. Typical services subject to benefit limitation periods are Rehabilitation and Psychiatric services. Benefit limitation periods do not apply to members transferring from other hospital products, either with the same or another insurer.

Portability is the ability of members to transfer from one insurer to another, without re-serving waiting periods. Portability requirements were first introduced in 1988. Section 78 of the Private Health Insurance Act 2007 requires that waiting periods already served for benefits on an existing product are counted towards the maximum waiting periods allowed when members transfer between products, both within and across insurers. However full waiting periods apply to any increased benefits as a result of a transfer to a higher level of cover.

It is typical for insurers to regularly waive short waiting periods for general treatment as part of promotional offers (ie 2 month and 6 month waiting periods) but not waive longer waiting periods (especially the 12 month hospital waiting periods).
Based on data reported to PHIAC, around 70%-90% of those taking out hospital insurance with an insurer are not currently insured at the time of joining. The remaining members currently have cover with another insurer. However these figures should be treated with caution as the number of transfers from other funds may be understated due to clearance certificate information not being processed for all members prior to the quarterly PHIAC returns being prepared. Insurers experiencing high growth would tend to have a lower proportion of new joiners who are not currently insured, as additional growth usually occurs by attracting higher volumes of members from competitors.

The existence of waiting periods has an impact on the claims behaviour of new members. It is generally well understood that claim rates of new members during waiting periods are lower that those of existing members. However it is probably less well understood that a claims spike can occur in the second year of membership following the expiry of waiting periods. In effect, the impact of waiting periods is a delay or temporal shift of some claims from the first year to the second year of membership. This phenomenon is not so prevalent for general treatment or ancillary business as some waiting periods are very often waived and the financial impact of waiting periods is less significant.

Woof et al (2002) describe similar claims patterns featuring honeymoons and spikes in accident compensation schemes where claims experience is impacted by external events, particularly changes in the legislative environment. Since health insurance benefit coverage is generally determined by fund product design rather than legislation, legislative change in private health insurance doesn’t directly produce spikes and honeymoons in claims experience. However regulatory changes can have significant impacts through a magnification of the selection effects discussed in this paper as the volumes of new members can be significantly impacted over a short period of time.

The commencement of the Lifetime Health Cover system in July 2000 was the most significant illustration of the impact of durational selection effects in private health insurance.

Woof et al (2002) conclude that:

“Actuaries also need to consider the short term impacts of spikes and honeymoons in the experience. … In hindsight, too much credibility might have been given to early indications of favourable emerging experience in recommending premium rate reductions. … It is worth noting however that even if premiums were increased earlier, whilst this would have provided more profit stability for insurers, it would not have eliminated the ‘rollercoaster’ effect of premiums observed by the general public. This premium ‘rollercoaster’ … was largely the result of the inherent nature of the scheme.”

These comments are also particularly apt for health insurers and their actuaries.
3. **Growth and Selection: a powerful combination**

Most businesses aspire to grow. Growth is seen as a sign of success and sustainability. While growth is often beneficial, the selection effects described above mean that health insurance membership growth can come with a sting in the tail in the form of an increase in claims following expiry of waiting periods.

Membership growth combined with durational selection effects can mask the underlying or ultimate claims and profitability experience and make forecasting difficult.

The history of private health insurance in Australia is full of examples of the devastating financial effects of rapid growth on individual insurers. Of course, not all insurers that experience growth encounter financial difficulties. However it is important for insurers to understand the durational profit signature of new business so that the financial impact of growth is anticipated rather than a surprise.

Managing high growth in health insurance may be a bit like controlling a high performance racing car. High levels of skill are required to ensure a safe journey and that there is not a ‘crash and burn’ outcome. The racing car driver needs a lot of skill and knowledge of their vehicle compared to the sedate sedan driver who travels at a slow and steady pace.

### 3.1 Growth Stories

*We have a few growing pains, but so far so good - Adrienne Gardner*

Since the massive growth that occurred following the introduction of Lifetime Health Cover in July 2000, industry hospital membership has grown by between 0% - 5% each year. Growth has been supported by the three pillars of Lifetime Health Cover, Government Rebate and Medicare Levy Surcharge, which provide incentives for people to commence and retain private health insurance hospital cover.

However, the growth paths experienced by individual private health insurers have varied enormously from this industry average, with some insurers experiencing periods of rapid growth, rapid decline and everything in-between. In some instances growth has occurred as a result of merger or acquisition of another health insurer. Members acquired in this way are in effect existing members rather than new members, so the selection effects described in this paper do not apply to this source of membership growth.

These situations are readily identifiable and adjustments can be made to quantify only organic growth.

It is interesting to consider the range of different growth paths that have been experienced by individual health insurers. The following graphs show the membership growth path compared to the growth in the hospital drawing rate (claims per contributor) for the industry and five individual insurers in the form of a Phillips curve. This type of graph is used to visually display the relationship between two quantities over time.
In each case the open square indicates the start of the series for the 2002/03 financial year, while the open circle indicates the end of the series for the 2009/10 financial year.

In these graphs, the change in contributors has been adjusted to exclude growth by merger or acquisition of other health insurers. The graphs are based on data from the *Operations of the Private Health Insurers* published annually by the Private Health Insurance Administration Council.
The graph for the whole industry shows a strong inverse correlation between the change in hospital contributors and hospital drawing rate growth over a membership growth range of 0% - 4%.

Insurers A and B have exhibited periods of both rapid growth and decline in membership and spikes in hospital drawing rate growth.

Insurers C and E have experienced sustained periods of membership growth above the industry average and a wide range of hospital drawing rate growth outcomes.

Insurer D has experienced a wide range of membership growth together with drawing rate growth generally higher than industry average.

The outcomes illustrated in these graphs obviously have many inputs, so it is simplistic to ascribe a fixed relationship between membership growth and drawing rate growth. For example, these graphs do not take into account any changes in age mix and product mix that would obviously impact the aggregate hospital drawing rate growth outcomes.

However, what is clear is that the relatively narrow range of membership growth and hospital drawing rate growth outcomes experienced by the industry in aggregate and the strong inverse correlation between these variables is not replicated in each individual insurer.

An interesting question is whether the drawing rate growth outcomes for each of the individual insurers illustrated above were within the range expected by those insurers given the levels of membership growth experienced.

The analysis presented above could be extended to examine the relationship between membership growth and hospital drawing rate growth in smaller cells, for example by measuring this relationship for certain age/sex cohorts using the more detailed PHIAC data available. However, ultimately the quantification of selection effects requires a study to be performed of the claims experience of new members joining an insurer, with data requirements beyond that collected and published by PHIAC.
3.2 Measuring Selection

*Growth means change, and change involves risk, stepping from the known to the unknown* - George Shinn

To measure the select period and intensity of health insurance selection effects, a study of membership and claims data was conducted for a large health insurer.

The study measured the hospital drawing rates (claims per person) of new entrants to the insurer over the first five years of membership relative to the drawing rates of members who had been inforce for more than five years. A hospital drawing rate ratio of select to ultimate experience was calculated to quantify the selection effect. These drawing rate ratios were calculated for a number of age group, sex and product group combinations in order to standardise for variations resulting from age, sex and product mix. The study included all new members including both those who had previously been uninsured (and therefore subject to waiting periods) and those who transferred from other health insurers (and therefore benefited from portability rules). Therefore the results shown below reflect this new member mix, and selection effects would be greater if members transferring from other insurers were excluded from the analysis.

The results of the study are illustrated in the following ‘health insurance claims signature’ graphs:

The hospital graph shows that claims in the first year of membership are low, followed by higher than average claims in the second year, then a return to average levels from the third year onwards. The graph indicates that the select period is about two years, with claims being still slightly above average for the following three years. The spike in hospital claims experience in year two reflects the pent up demand for claims during the waiting period. In total, the average claims experienced in the first two years are about the same as that experienced by similar members at longer durations. The lower claims experience in the first year of membership is offset by a deferral of claims into the second year of membership. The effect of selection is to defer some hospital claims from the first year to the second year. An analysis of second year claims experience by type of claim would reveal useful information regarding the relative incidence of obstetric, joint and other claims for new members.

The ancillary graph shows that the selection effect is minimal, with claims in the first year of membership about 10% below average levels, with no spike in claims in the second year of membership. Ancillary claims do appear to increase slightly in the fourth and fifth year of membership.
A more detailed investigation may lead to a more precise measurement of the select period by examining the monthly incidence of claims during the first two years of membership. The select period may also vary by age, product and other factors.

The aggregate results were also examined by age group:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6+</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 34</td>
<td>65%</td>
<td>133%</td>
<td>112%</td>
<td>115%</td>
<td>114%</td>
<td>100%</td>
</tr>
<tr>
<td>35 to 49</td>
<td>57%</td>
<td>168%</td>
<td>111%</td>
<td>106%</td>
<td>106%</td>
<td>100%</td>
</tr>
<tr>
<td>50 to 64</td>
<td>62%</td>
<td>170%</td>
<td>129%</td>
<td>119%</td>
<td>106%</td>
<td>100%</td>
</tr>
<tr>
<td>All Ages</td>
<td>62%</td>
<td>147%</td>
<td>112%</td>
<td>111%</td>
<td>109%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The hospital claims spike in the second year is greater at older ages with perhaps a longer select period.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6+</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 34</td>
<td>93%</td>
<td>102%</td>
<td>102%</td>
<td>106%</td>
<td>111%</td>
<td>100%</td>
</tr>
<tr>
<td>35 to 49</td>
<td>89%</td>
<td>100%</td>
<td>101%</td>
<td>106%</td>
<td>110%</td>
<td>100%</td>
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<tr>
<td>50 to 64</td>
<td>90%</td>
<td>98%</td>
<td>97%</td>
<td>102%</td>
<td>107%</td>
<td>100%</td>
</tr>
<tr>
<td>All Ages</td>
<td>89%</td>
<td>99%</td>
<td>100%</td>
<td>105%</td>
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</tbody>
</table>

There is little variation in ancillary selection experience by age.
3.3 Financial impacts

*It is better to be vaguely right than exactly wrong.* Carveth Read

The financial impact of growth and selection will probably hardly be noticeable in aggregate experience if growth is occurring at a low or steady rate. However, the financial impact of selection may be significant when growth is variable or at a high level.

Following an increase in the rate of hospital membership growth, initially hospital drawing rate growth for a given product will slow as new members will experience a lower drawing rate than existing members. If the rate of membership growth is maintained, then the drawing rate growth will return to normal levels as the claims spike of last year’s new entrants is financed by the low initial claims of this year’s new entrants. If the rate of membership growth slows, the drawing rate growth will increase as the low initial claims of this year’s new entrants are insufficient to cover the claims spike from last year’s new entrants. Hospital drawing rate growth will stabilise about two years after membership growth stabilises. This cycle can be illustrated as follows:

![Growth and Selection example](image)

When these changes in hospital membership growth occur, it may be difficult to interpret hospital product profitability results. While the expected pattern of hospital claims by duration can be measured and forecast, these variations in claims experience are not generally considered in the determination of outstanding claims provisions as they relate to future claims costs. In theory there may be some impact on the constructive obligation portion of the liability adequacy test however this will depend on whether the expected selection effects have been accurately reflected in the forecast used for this purpose.

It is important to allow for the impact of selection on hospital claims in analysing past experience, preparing forecasts and making pricing decisions.

The theoretical approach is to separately forecast membership and claims by membership duration. A pragmatic solution to avoid the complexity of this approach is to forecast aggregate drawing rate growth with an adjustment to allow for the impact of membership growth and selection.
Hanning (2010) observes that:

“The extent to which new members are restricted from using their private health insurance by [waiting periods] is substantial and it is reasonable to assume such members claim virtually no benefits in their first year. Given the new members also tend to be young and low claimers reinforces this assumption – a low percent of a low average claim rate will be near zero….

Because new members have reduced capacity to claim in their first year of membership there is a lagged effect on claims…. It is interesting to consider what would have happened if the number of SEUs in a given year had not changed from that of the previous year. Given pre-existing ailment limitations on the use of PHI it can reasonably be anticipated the effect on benefits paid would have been small…. The average benefits per SEU are calculated twice. Once is for each year based on the SEU of that year and the other is based on the SEUs of the previous year. In effect this is stating that the fund benefits are virtually totally determined by the membership of the previous year but payments per SEU are determined by the current year average SEUs.”

Hanning therefore proposes that modified drawing rates be calculated by comparing current year claims with prior year membership. While a useful approach, this will not capture the selection effects observed in section 3.2 where claims are below average (but non-zero) in the first year and then above average in the second year. A more accurate approach would be to calculate a modified drawing rate $D_n$ using a weighted average membership as follows:

$$D_n = \frac{C_n}{(1-k) M_{n-1} + k M_n}$$

where $C_n =$ claims cost in period $n$

$M_n =$ average membership in period $n$

$k =$ weighting factor

The appropriate weighting factor $k$ will be impacted by the selection experience, product mix and age mix of the insurer’s new entrants and inforce membership. These factors may be obtained by fitting a model to past drawing rate and membership growth experience, providing there has been sufficient variability in past experience and allowance is made for any other factors that have impacted historical drawing rates.

This model could also be extended to separately consider the selection effect of membership lapses. It is generally the case that members who lapse have a lower drawing rate than the inforce base, so changes in the lapse rate over time will similarly impact drawing rate trends.

This discussion of drawing rates has focussed on direct claims costs without adjustment for the impact of risk equalisation. However the impact of risk equalisation is important and drawing rates can also be calculated and analysed on a net of risk equalisation basis. Most new entrants are under age 55 so would not meet the eligibility criteria for risk equalisation so there would be little impact on the selection results shown above.
4. Conclusion

Mistakes are the growing pains of wisdom - William Jordan

Too often private health insurers have found membership growth to be painful, with a period of membership growth and decline in drawing rates often followed by a period of claims growth. These ‘growing pains’ can come as somewhat of a surprise.

Accurately assessing the profitability of new member acquisitions requires a cohort analysis over several years, including the first year honeymoon and the second year spike in claims. Simply considering claims experience in the first year of membership ignores the inevitable second year claims spike.

The selection investigation results presented in this paper are fairly high level for the purposes of illustrating the phenomenon of selection in health insurance claims experience. While these results may be indicative of the selection effects experienced by one insurer, it is likely that selection effects will vary from insurer to insurer, from product to product and over time depending on each set of individual circumstances, including the proportion of new members subject to waiting periods. Therefore, the results presented should be used as a guide only.

For an insurer wishing to understand the impact of selection, there is no substitute for conducting a detailed investigation to examine selection effects. This is particularly important if membership has grown rapidly or has not been constant. In these circumstances the combination of growth and selection will mean that forecasts cannot simply be extrapolated from past drawing rate trends. Such an experience investigation should be a valuable input into more accurate financial forecasts and sensitivity assessments.

5. References


Hanning B, 2010, *Factors Causing Increases in Hospital Table Benefits paid by Health Funds*, Australian Centre for Health Research


*Private Health Insurance Act 2007*

