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Health Market Inquiry

Promoting Healthy Competition

Report on analysis of claims data – Initial cost attribution analysis

1 December 2016

CONTENTS

Executive summary

The analyses reported here attempt to identify the 'unavoidable drivers' of cost escalation in the private sector, thus isolating a residual segment of increased costs that are amenable to intervention. This document then serves as a reference point for further analyses by the HMI to investigate some of these addressable drivers of cost escalation.

Analysis of five years of medical schemes claims data does suggest that South Africa has a problem with cost escalation. The average private medical scheme spend per member increased by 9.2% per annum over the study period. After adjusting for inflation, change in the age profile of members contributed to the greatest proportion of that increase (for the factors that we have data) and was more pronounced for open medical schemes. However even after taking into account changes in member's plan type, gender, disease profile and membership movement, the unexplained (or residual) increase in spend per member was still greater than 2% per annum in real terms – once again higher for open medical schemes. To put this in context, 2% of spending amounts to around R3b in 2014 terms i.e. R330 per beneficiary per annum, or a total of R1650 per beneficiary over the five-year period studied.

Little of the unexplained cost increase appears to be for out-of-hospital care – this increases by around 1% for open schemes and 0.16% for restricted schemes after inflation adjustments. In-hospital care is a far more important driver – with an unexplained increase of 3.2% per annum on average. Levels of increase were slightly higher in open vs closed schemes, (3.45% vs 2.8%). This stands in sharp contrast to flat or declining hospital-based spending in many countries, once risk factors are adjusted for. Both utilisation and unit cost increases appear to be driving cost increases. On the utilisation side we see roughly 2.2% annual increase in utilisation rates, approximately half of which can be explained. Overall utilisation rates and the unexplained proportion of these are very similar between open and closed schemes.

Somewhat surprisingly, however, given that tariffs[1] have not increased much above CPI, there was a significant increase in the average cost per admission (~2% unexplained increase per annum). Rates of increase were very similar between open and closed schemes, but were substantially higher for surgical episodes than medical ones (2.9 vs 1.3% respectively). Based on the discrepancy between tariff increases and total cost per admission increases, we suspect that much of this

[1] Including hospital tariffs, costs of consumable and drugs and doctor tariffs.

increase is due to increasing intensity of care for the same condition (e.g. length of stay, ICU use, consumables use)

The results of these analyses do not point to immediate policy solutions. They do however direct us to investigate specific areas of the private sector more deeply than others, in particular:

- In-hospital care, and the players involved in providing this,
- Adverse selection and changes in risk profile of members in the open schemes sector,
- Hospitalisation rates for open and closed scheme members, examining the role of supplier induced demand, the effectiveness of scheme managed care interventions and reimbursement policies, and regulation, such as PMBs and
- Trends in service intensity – including assessing to what extent these are quality enhancing or not.

These will be dealt with in subsequent HMI reports

Glossary & abbreviations

CPI	Consumer Price Index – a weighted index of consumer price inflation across all goods and services purchased
HMI	Competition Commission Health Market Inquiry
ICD10	International Classification of Diseases version 10
NAPPI	National Pharmaceutical Product Interface – a unique identifier owned by MediKredit, for all pharmaceutical, surgical and healthcare consumable products in RSA to enable electronic transfer of information throughout the healthcare delivery chain. https://www.medikredit.co.za/index.php?option=com_content&view=article&id=21&Itemid=31)
PMBs	Prescribed Minimum Benefits legislation, which requires that all medical schemes must cover the costs associated with care of particular types of illness

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Introduction

1. The Competition Commission's Health Market Inquiry (HMI) is an inquiry into the state, nature and form of competition within the South African private healthcare sector. The HMI was initiated as there was reason to believe that there are features of the private healthcare sector that prevent, distort or restrict competition, and in order to achieve the purposes of the Competition Act[2]. The Statement of Issues, published on 1 August 2014, identified a number of potential sources of harm to competition in the South African healthcare sector. Subsequently, the HMI published a Revised Statement of Issues on 11 February 2016, which further elaborates on the HMI's areas of focus. The HMI seeks to assess whether, and (if so) to what extent, these potential sources of harm exist. The HMI will then make recommendations on how competition within the private healthcare sector can be promoted.
2. To allow the HMI to understand expenditure various data were requested from industry stakeholders.
3. The Competition Commission, through an open tender, appointed Willis Towers Watson (WTW) to assist with the storage, warehousing and analysis of part of the data collected.
4. This report specifically deals with medical scheme claims data from the period 2010 – 2014 submitted by medical schemes and/or their administrators.
5. This report, the second in the series using the claims and related data, provides an overview of the drivers of cost escalation. The analyses provide some insight into the differences in trends between in- and out-of-hospital claims, as well as the split between cost and utilisation for in-hospital claims in particular. This report should be read in conjunction with the first analysis report which dealt in detail with the dataset used for our analyses as well as the methodology used to build the datasets. The analyses reported here attempt to identify the 'unavoidable drivers' of cost escalation in the private sector, isolating a residual segment of increased costs that are amenable to intervention. The HMI has then sought to identify what drives this residual cost increase, and hence what policy initiatives might be necessary. These detailed analyses are covered in subsequent reports.
6. This report is based on analytical work undertaken for the HMI by WTW.
7. Comments are welcome.

[2] Section 43B(1)(i) and (ii) of the Competition Act 98 of 1998. See also Section 1 of the HMI Terms of Reference.

Results

Overall Industry Cost Trends per Beneficiary

8. Our first analysis looked at the extent to which member and plan characteristics explained the increase in overall claims spending from 2010-2014. Table 1 shows the % increase in claims costs year on year unadjusted, the impact of adjustments, and the residual increase that remained after adjustment. We made adjustments for member age and gender, whether they suffered from a chronic disease or not (disease profile), member movement in and off our study cohort (some members left and/or joined, and not all schemes provided data for every year), and plan mix – their choice of level and type of cover.

Table 1 All claims cost trends - all schemes

	2011	2012	2013	2014	Average
Total Increase	9.02%	8.58%	9.19%	10.16%	9.24%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	2.14%	0.68%	1.79%	1.38%	1.50%
Age	0.57%	2.81%	1.01%	0.87%	1.32%
Gender	-0.03%	-0.05%	0.05%	0.02%	0.00%
Disease Profile	1.01%	-0.48%	0.77%	0.37%	0.42%
Member Movements	1.87%	0.02%	0.07%	0.31%	0.57%
Plan Mix	-1.28%	-1.63%	-0.12%	-0.19%	-0.80%
Unexplained change	1.88%	2.30%	1.70%	2.68%	2.14%

8.1. Table 1 shows that, over the five-year period from 2010 to 2014 the average claims cost per medical scheme beneficiary increased by 9.24% per year, compared to an average CPI of 5.60%. Increasing average ages contributed 1.32% to the increase, while an increased chronic disease burden contributed 0.42% and members joining and leaving the industry, as well as moving between schemes and options, contributed another 0.57%. Changes in plan mix contributed negatively, i.e. the industry appears to have experienced a net buy-down effect, which contributed 0.80% of cost changes.

8.2. This leaves a residual unexplained increase of 2.14% per year on average. This residual is potentially as a result of price increases over and above CPI, as well as increases in the volume of services utilised per average beneficiary. Some attempts will be made later in the report and in future analyses to understand and explain the nature and potential components of this residual increase.

8.3. The next two tables show the same analysis separately for open and restricted schemes, and show that the trends have been broadly the same, although restricted schemes show a smaller ageing effect as well as a smaller residual increase. It is also noted that the buy-down effect is much larger in open schemes than restricted schemes, which is what we would expect given that joining and leaving behaviours are largely voluntary. These factors combined suggest that adverse selection – people switching their health cover up and down depending on their need at the time - may be playing a role in the relatively larger unexplained cost increase in open schemes. This will be investigated in a later analysis on risk pooling in the sector.

Table 2 All claims cost trends - open schemes

	2011	2012	2013	2014	Average
Total Increase	9.99%	5.97%	11.26%	9.81%	9.26%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known Explanatory Factors	2.76%	-0.87%	1.99%	1.04%	1.23%
Age	1.27%	3.24%	1.07%	0.83%	1.60%
Gender	-0.08%	-0.04%	0.06%	0.02%	-0.01%
Disease Profile	0.86%	-0.96%	1.78%	0.13%	0.45%
Member Movements	1.96%	-0.02%	-0.56%	0.66%	0.51%
Plan Mix	-1.25%	-3.08%	-0.36%	-0.61%	-1.32%
Unexplained Factors	2.23%	1.23%	3.57%	2.68%	2.43%

Table 3 All claims cost trends - restricted schemes

	2011	2012	2013	2014	Average
Total Increase	8.23%	11.70%	6.47%	10.47%	9.22%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known Explanatory Factors	2.04%	2.23%	1.51%	1.66%	1.86%
Age	0.03%	1.87%	0.93%	0.76%	0.90%
Gender	0.03%	-0.04%	0.04%	0.03%	0.02%
Disease Profile	0.97%	0.43%	-0.49%	0.77%	0.42%
Member Movements	1.79%	0.04%	0.86%	-0.15%	0.64%
Plan Mix	-0.77%	-0.07%	0.17%	0.25%	-0.11%
Unexplained Factors	1.19%	3.86%	-0.74%	2.71%	1.76%

Out-of-hospital Claims Trends

9. Table 4 below shows the annual increases in total out-of-hospital cost per beneficiary across all schemes included in the dataset, including the contributions of some of the key cost drivers outlined in previous sections. We note that, as outlined above, the analyses are based on claimed amounts and therefore may be impacted by benefit limitations. Insofar as providers are aware of limits, they may simply charge the member out of pocket up front, and we would be unable to pick these costs up.

Table 4 Out-of-hospital claims cost trends - all schemes

	2011	2012	2013	2014	Average
Total Increase	7.59%	5.23%	6.96%	9.33%	7.28%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known Explanatory Factors	2.51%	-1.18%	1.48%	1.17%	1.00%
Age	0.43%	2.14%	1.00%	0.73%	1.08%
Gender	-0.01%	-0.02%	0.03%	0.02%	0.01%
Disease Profile	1.47%	-0.79%	0.87%	0.66%	0.55%
Member Movements	2.25%	0.03%	0.09%	0.28%	0.66%
Plan Mix	-1.63%	-2.55%	-0.51%	-0.52%	-1.30%
Unexplained Factors	0.08%	0.81%	-0.21%	2.06%	0.68%

9.1. Table 4 shows that, over the five-year period from 2010 to 2014 the average out-of-hospital claims cost per medical scheme beneficiary has increased by 7.28% per year, compared to a total cost increase of 9.24% and an average CPI of 5.60%. Ageing of the population has contributed 1.08% to the increase, while an increased disease burden has contributed 0.55% and members joining and leaving the industry, as well as moving between schemes and options, has contributed another 0.66%. Changes in plan mix have contributed negatively, i.e. the industry appears to have experienced a net buy-down effect to the extent of 1.30%. This leaves a residual increase of 0.68% per year on average. This residual is again potentially as a result of price increases over and above CPI, as well as increases in the volume of services utilised per average utilising beneficiary. The next two tables (5 and 6) show the same analysis separately for open and restricted schemes, and again shows that the trends have been broadly the same, although restricted schemes show a smaller ageing effect as well as a smaller residual increase. It is again noted that the buy-down effect is much larger in open schemes than

restricted schemes, even more significantly so in this case, suggesting more discretion is being applied to out-of-hospital cover than in-hospital benefits.

Table 5 Out-of-hospital claims cost trends - open schemes

	2011	2012	2013	2014	Average
Total Increase	8.73%	1.94%	9.61%	8.44%	7.18%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
All Explanatory Factors	2.78%	-3.33%	1.71%	0.74%	0.47%
Age	0.96%	2.46%	1.02%	0.63%	1.27%
Gender	-0.08%	-0.02%	0.02%	0.02%	-0.02%
Disease Profile	1.11%	-1.33%	1.91%	0.36%	0.51%
Member Profile	2.25%	-0.14%	-0.33%	0.73%	0.63%
Plan Mix	-1.47%	-4.30%	-0.91%	-1.00%	-1.92%
Residual Factors	0.96%	-0.33%	2.20%	1.60%	1.11%

Table 6 Out-of-hospital claims cost trends - restricted schemes

	2011	2012	2013	2014	Average
Total Increase	6.39%	9.30%	3.73%	10.44%	7.47%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	2.60%	1.37%	1.18%	1.66%	1.70%
Age	0.09%	1.41%	0.97%	0.72%	0.80%
Gender	0.06%	0.01%	0.04%	0.04%	0.04%
Disease Profile	1.57%	0.25%	-0.39%	1.17%	0.65%
Member Movements	2.25%	0.24%	0.59%	-0.29%	0.70%
Plan Mix	-1.38%	-0.53%	-0.03%	0.02%	-0.48%
Unexplained factors	-1.21%	2.33%	-3.14%	2.68%	0.16%

9.2. It is noticeable that across both types of schemes as well as the industry, increases in out-of-hospital costs are substantially lower than in-hospital costs. This suggests cost shifting towards hospitalisation, which will be further explored in the next section.

In-hospital claims trends

10. Table 7 below shows the annual increases in total in-hospital cost per beneficiary across all schemes included in the dataset, including the contributions of some of the key cost drivers outlined in previous sections.

Table 7 In-hospital cost trends – all schemes

	2011	2012	2013	2014	Average
Total Increase	10.24%	11.38%	10.95%	10.79%	10.84%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	2.64%	2.12%	1.57%	1.83%	2.04%
Age	0.67%	3.33%	1.02%	0.98%	1.50%
Gender	-0.04%	-0.07%	0.07%	0.02%	-0.01%
Disease Profile	0.77%	-0.63%	0.47%	0.25%	0.22%
Member Movements	1.79%	0.04%	-0.13%	0.35%	0.51%
Plan Mix	-0.56%	-0.55%	0.14%	0.23%	-0.19%
Unexplained factors	2.61%	3.66%	3.68%	2.86%	3.20%

10.1. Table 7 shows that, over the five-year period from 2010 to 2014 the average in-hospital claims cost per medical scheme beneficiary has increased by 10.84% per year, compared to a total cost increase of 9.24% and an average CPI of 5.60%. The changing age profile has have contributed 1.50% to the increase, while an increased disease burden has contributed 0.22% and members joining and leaving the industry, as well as moving between schemes and options, has contributed another 0.51%. Changes in plan mix have pushed costs marginally downward, i.e. the industry appears to have experienced a small net buy-down effect, of 0.19%.

10.2. This leaves an unexplained residual increase of 3.20% per year on average. This residual is again potentially as a result of price increases over and above CPI, as well as increases in the volume of services utilised per average utilising beneficiary. The next two tables show the same analysis separately for open and restricted schemes, and shows that the trends have been broadly the same, although restricted schemes again show a smaller ageing effect as well as a smaller unexplained residual.

Table 8 In-hospital claims cost trends - open schemes

	2011	2012	2013	2014	Average
Total Increase	11.02%	9.21%	12.50%	10.82%	10.89%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	3.15%	1.31%	1.37%	1.52%	1.84%
Age	1.51%	3.83%	1.10%	0.98%	1.86%
Gender	-0.08%	-0.05%	0.09%	0.02%	-0.01%
Disease Profile	0.58%	-0.99%	1.22%	0.05%	0.22%
Member Movements	1.90%	0.09%	-1.12%	0.71%	0.39%
Plan Mix	-0.75%	-1.57%	0.08%	-0.25%	-0.62%
Unexplained factors	2.87%	2.30%	5.43%	3.20%	3.45%

Table 9 In-hospital claims cost trends - restricted schemes

	2011	2012	2013	2014	Average
Total Increase	9.92%	13.81%	8.80%	10.49%	10.76%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	2.77%	2.52%	1.86%	2.02%	2.29%
Age	-0.02%	2.23%	0.91%	0.80%	0.98%
Gender	0.01%	-0.08%	0.04%	0.01%	0.00%
Disease Profile	0.80%	0.15%	-0.48%	0.60%	0.27%
Member Movements	1.72%	-0.10%	1.14%	-0.11%	0.66%
Plan Mix	0.27%	0.31%	0.25%	0.72%	0.39%
Unexplained factors	2.15%	5.69%	1.25%	2.37%	2.86%

10.3. It is noticeable that across both types of schemes as well as the industry, increases in in-hospital costs are substantially higher than total costs. This further suggests that there has been cost shifting towards hospitalisation across the industry over this period, which seemingly cannot be entirely attributed to changes in the risk profile or treatment needs of the beneficiaries.

Hospital utilisation trends

11. Although there are a number of possible interpretations of the term “utilisation’ we have used it here to refer to the number of care seeking/treatment episodes – and in the case of hospitalisation, the number of admissions. In-hospital cost increases can be broadly driven by increases either in utilisation (number of admissions) or cost per

admission. The next set of tables shows the same attribution analysis performed on hospital utilisation (admissions per 1 000 lives)

11.1. Table 10 shows that admission rates per 1 000 lives have increased by 2.17% per year on average, of which just under half (1.00%) is attributable to changes in the beneficiary risk profile, member movements and plan mix. This 1.00% is dominated by ageing as well as membership movements in and out of schemes. There is a residual utilisation increase of 1.18% which cannot be attributed to demographic factors. This could result from a variety of other factors, which will be explored further in future analyses and reports.

Table 10. Hospital admission trends - all schemes

	2011	2012	2013	2014	Average
Total Increase	1.89%	1.95%	2.48%	2.37%	2.17%
Known explanatory factors	2.54%	-0.06%	0.75%	0.77%	1.00%
Age	0.31%	1.32%	0.37%	0.36%	0.59%
Gender	-0.02%	0.00%	0.04%	0.04%	0.01%
Disease Profile	0.63%	-0.86%	0.35%	0.15%	0.06%
Member Movements	1.88%	0.08%	0.05%	0.23%	0.56%
Plan Mix	-0.26%	-0.59%	-0.06%	-0.01%	-0.23%
Unexplained factors	-0.65%	2.02%	1.73%	1.60%	1.18%

11.2. The corresponding tables for open and restricted schemes are again shown below (tables 11 and 12). The trends look very similar to the overall trends, although it is noticeable that open schemes show a higher ageing effect, while counter-intuitively restricted schemes have been more heavily impacted by member movements. This may be a result of the slowdown in new members joining GEMS which began during this period.

Table 11 Hospital admission trends - open schemes

	2011	2012	2013	2014	Average
Total Increase	1.54%	0.47%	3.88%	2.18%	2.02%
Known explanatory factors	2.58%	-0.86%	0.94%	0.75%	0.85%
Age	0.74%	1.58%	0.43%	0.40%	0.79%
Gender	-0.12%	-0.01%	0.03%	0.03%	-0.02%
Disease Profile	0.41%	-1.17%	1.03%	0.03%	0.08%
Member Movements	1.91%	-0.07%	-0.39%	0.56%	0.50%
Plan Mix	-0.36%	-1.19%	-0.16%	-0.28%	-0.50%
Unexplained factors	-1.04%	1.33%	2.94%	1.43%	1.16%

Table 12 Hospital admission trends- restricted schemes

	2011	2012	2013	2014	Average
Total Increase	2.39%	3.76%	0.79%	2.60%	2.39%
Known explanatory factors	2.57%	0.87%	0.51%	0.79%	1.18%
Age	-0.04%	0.82%	0.30%	0.23%	0.33%
Gender	0.07%	0.03%	0.06%	0.06%	0.06%
Disease Profile	0.66%	-0.25%	-0.47%	0.38%	0.08%
Member Movements	1.86%	0.24%	0.57%	-0.17%	0.63%
Plan Mix	0.02%	0.02%	0.06%	0.29%	0.10%
Unexplained Factors	-0.17%	2.89%	0.28%	1.81%	1.20%

Cost per admission trends

12. Although utilisation appears a significant contributor to the in-hospital cost trends outlined above, the cost per admission (CPA) appears to also have increased significantly faster than CPI. To better understand cost per admission we have introduced two additional casemix adjustment factors – the individual casemix of the episode, and whether or not the diagnosis implied a prescribed minimum benefit (PMB)[3] or not. These can explain a substantial proportion of individual level variation in cost per episode, and if we left them out we would not be able to exclude an increase in the severity of admissions as a cause of overall cost escalation. The next set of tables show the increases in cost per admission over the period analysed, broken down by various episode level explanatory factors to attempt to isolate the contribution of each of these to the overall increase.

[3] Note – the % attributed to PMB diagnoses does not constitute an analysis of the changing impact of PMB regulations on cost per episode. This is a fixed adjustment derived from the 2014 year and applied to the PMB proportion of cases in prior years. An evaluation of the impact of PMB regulations on overall costs, utilisation, and unit fees is undertaken in a subsequent publication.

Table 13 All admissions cost per admission trends- all schemes

	2011	2012	2013	2014	Average
Total Increase	8.28%	9.04%	9.09%	8.73%	8.79%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	-0.16%	1.20%	2.46%	1.53%	1.26%
Age	0.57%	1.57%	1.40%	1.04%	1.15%
Gender	-0.01%	-0.03%	-0.02%	-0.02%	-0.02%
Disease Profile	-0.15%	0.19%	-0.14%	-0.12%	-0.06%
Case Mix	-0.32%	-0.44%	0.73%	0.18%	0.04%
PMB Diagnoses	-0.24%	-0.10%	0.48%	0.45%	0.15%
Unexplained Factors	3.44%	2.25%	0.93%	1.10%	1.93%

12.1. Table 13 shows that cost per admission has increased by 8.79% per year on average, compared to average CPI of 5.60%. Of the increase above CPI, 1.26% can be explained by the factors outlined above with ageing (1.15%) the largest contribution. Casemix and the PMB diagnosis factor suggest a decrease in overall case severity for the first two years of comparison, and an increase in the last two years. Even after adjusting for all of the above, 1.93% of cost increase, on average, cannot be explained. These other factors could include unit price increases above CPI (e.g. the cost of a day in a ward), as well as increases in intensity of care – i.e. length of hospital stay, level of care provided (e.g. ICU vs general ward), numbers of consumables used and the general volume of services provided per admission. These will be further analysed in future reports, most notably the facility and practitioner analyses.

The next two tables show the results for open and restricted schemes respectively. The results are similar to the overall results, although restricted schemes show a lesser ageing effect.

Table 14 All admissions cost per admission trends - open schemes

	2011	2012	2013	2014	Average
Total Increase	8.68%	8.64%	9.67%	8.66%	8.91%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	0.27%	0.78%	3.25%	1.11%	1.35%
Age	0.86%	1.63%	1.57%	0.90%	1.24%
Gender	0.02%	-0.01%	0.00%	-0.02%	0.00%
Disease Profile	-0.16%	0.11%	0.01%	-0.17%	-0.05%
Case Mix	-0.24%	-0.49%	1.06%	0.05%	0.10%
PMB Diagnoses	-0.22%	-0.47%	0.62%	0.34%	0.07%
Unexplained Factors	3.42%	2.26%	0.71%	1.45%	1.96%

Table 15 All admissions cost per admission trends - restricted schemes

	2011	2012	2013	2014	Average
Total Increase	8.06%	9.46%	8.20%	8.67%	8.60%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	-0.46%	1.64%	1.28%	2.00%	1.12%
Age	0.37%	1.41%	1.12%	1.13%	1.01%
Gender	-0.05%	-0.06%	-0.05%	-0.04%	-0.05%
Disease Profile	-0.13%	0.28%	-0.35%	-0.05%	-0.06%
Case Mix	-0.36%	-0.41%	0.24%	0.34%	-0.05%
PMB Diagnoses	-0.29%	0.42%	0.32%	0.62%	0.27%
Unexplained factors	3.52%	2.21%	1.22%	0.56%	1.88%

12.2. In order to gain some high level insights into the types of admissions which could potentially be driving the increases in the cost per admission as well as the large unexplained residual contributing to price increases, the analyses have been repeated for surgical and medical admissions. In this context a surgical admission is defined as one where a theatre claim is recorded as part of the admission.

Table 16 Surgical admissions cost per admission - all schemes

	2011	2012	2013	2014	Average
Total Increase	9.35%	11.53%	10.90%	10.64%	10.61%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	0.67%	2.47%	3.20%	2.10%	2.11%
Age	0.58%	2.31%	2.01%	1.38%	1.57%
Gender	-0.03%	0.00%	-0.01%	-0.03%	-0.02%
Disease Profile	-0.09%	0.14%	-0.16%	-0.07%	-0.04%
Case Mix	0.49%	0.10%	0.68%	0.15%	0.35%
PMB Diagnoses	-0.28%	-0.08%	0.68%	0.66%	0.25%
Unexplained factors	3.68%	3.47%	2.00%	2.44%	2.90%

12.3. The tables show that the cost per admission increase is much larger for surgical than medical admissions, and the residuals follow the same pattern. This may suggest that whichever unexplained factors are impacting cost per admission, they are more prevalent in surgical compared to medical admissions.

Table 17 Medical admissions cost per admission - all schemes

	2011	2012	2013	2014	Average
Total Increase	7.68%	8.27%	8.35%	8.52%	8.20%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
Known explanatory factors	-0.63%	1.14%	2.50%	2.10%	1.28%
Age	0.61%	1.33%	1.16%	0.88%	0.99%
Gender	-0.01%	-0.04%	-0.02%	-0.02%	-0.02%
Disease Profile	-0.18%	0.20%	-0.13%	-0.15%	-0.07%
Case Mix	-0.89%	-0.22%	1.16%	1.00%	0.26%
PMB Diagnoses	-0.16%	-0.13%	0.33%	0.38%	0.11%
Unexplained Factors	3.30%	1.53%	0.16%	0.32%	1.33%

Conclusions

13. The initial basis for the HMI appears to be valid. Per beneficiary claims costs have increased by around 4% above CPI on a consistent basis in South Africa. Half of this change can be explained by changes in risk profile of members and their choice of plan and movement between plans. This increase in risk profile and shift in plan mix towards more hospital focused plans is more evident for open schemes.

13.1. Perhaps most obviously there is a shift towards greater hospitalisation, with in-hospital claims increasing at a rate around 3% faster than out-of-hospital claims. This is contrary to what is occurring in other middle and high-income demographic groups around the world, where, with age and chronic disease rates adjusted for, there has been a shift to out-of-hospital care.

13.2. In-hospital claims increases are being driven both by utilisation (increasing numbers of admissions) and cost per admission. Utilisation increases not explained by patient demographic and chronic illness changes might be due to supplier induced demand for services. In order to assess this, we would need to demonstrate that rates are excessive relative to both past practices and to those in other countries. We would also need to show that rates of utilisation are higher where there are more suppliers of a given service, other factors being equal. These analyses are undertaken in a subsequent report on utilisation rates and supplier induced demand

13.3. Changes in cost per admission may be due to increased services delivered during a given admission (e.g. more days of stay, more investigations undertaken) or increased unit price charged for each admission. The latter are captured by changes in the average charges per standard item billed to medical schemes. These “units” are largely standardised across the industry, and an analysis of these will be dealt with in a subsequent report on changes in tariffs.

Appendix 1 - Data Used

14. For the attribution analyses outlined in this report, the analysis datasets described in the *Report on analysis of medical schemes claims data – descriptive statistics* have been used. The process of building these datasets were outlined in detail therein. The datasets were built using the detailed claims and membership data provided by medical schemes for the period 2010-2014, which was requested by the HMI from the medical schemes and or their administrators.

Beneficiary Level Attribution Analyses

15. The majority of the analyses outlined in this report use individual medical scheme beneficiaries as the base unit of the statistical analyses. These analyses therefore use the *beneficiary file* built by HMI from de-identified medical scheme membership data.

15.1. This file is structured at an individual beneficiary level and contains demographic information about each beneficiary in each year analysed and summary details of their claims.

15.2. For each year, aggregated usage indicators have been built off the claims databases and appended to the membership data. Of specific interest for the attribution analyses are:

15.2.1. The demographic information about each beneficiary, specifically age and gender,

15.2.2. The clinical profile indicator, which is built of consultation and chronic and acute medicine utilisation data with the associated diagnoses and aims to build a picture of the disease burden within the industry,

15.2.3. The member movement indicator which captures changes in the number and mix of; and

15.2.4. Plan Mix - The medical scheme and medical scheme plan selected, which have been grouped using the method described in a descriptive analysis report.

Admission (Event) Level Attribution Analyses

16. The beneficiary level analyses outlined above aim to assess cost and utilisation trends across the entire population analysed. The event level analyses aim to understand what has happened within treatment events, usually hospital admissions. These analyses are therefore run using each individual event as a base, and use the admission file as the data input. This file is structured with one line for each hospital admission, and contains some

demographic information about the patient as well as information about the facilities and medical practitioners treating the patient, some clinical information about the admission itself as well as cost and utilisation factors within each admission. Of specific interest for the analyses contained in this report are:

16.1. the demographic information about the patients, specifically age and gender,

16.2. The clinical profile indicator as outlined above, which is transferred from the beneficiary file;

16.3. The diagnoses provided and procedures performed by the treating medical practitioners, which are used to build a so-called 'case-mix' indicator, and

16.4. A Prescribed Minimum Benefit (PMB) diagnosis indicator, built using the claims data and the PMB diagnosis list published by the Council for Medical Schemes (CMS) and taking into account the PMB flags provided by the medical scheme administrators.

Appendix 2 - Methods

17. This section outlines the statistical and further specific data aggregation methodologies used to produce the cost trend and attribution analyses the results of which are presented in this report. We note that the detail of how the data summary files are produced from the raw claims data is contained in the *Report on analysis of medical schemes claims data – descriptive statistics.* This section focuses specifically on the additional variables created from those summaries as well as the statistical modelling techniques applied to the outputs of this process.

Additional Variables Created

18. The beneficiary and admission files contain a number of variables which have been created for general analysis purposes. However, for the specific analyses outlined in this report, a number of further variables have had to be created. The methodologies to create these are outlined in this section.

Medical Scheme Plan Groups

18.1. A number of stakeholders have submitted to the HMI in various forums that medical scheme cost inflation is understated as a result of so called 'plan mix' changes. Specifically, medical schemes contend that there has been a systemic movement of members towards cheaper products or benefit options which offer less cover, which is making the reported contribution and claims increases appear lower than the actual figures experienced by scheme members. In order to assess this contention, an approach was developed to compute the impact of this plan mix factor on claims trends.

18.2. This required that all of the medical scheme plans offered by the schemes included in the dataset are grouped by common benefit design characteristics. This is a complex task given the proliferation of different benefit designs within the industry, but for simplicity and parsimony two benefit design or plan mix factors were created, reflecting how expenditure is managed

17.2.1 in a hospital setting, and

17.2.2 outside of hospital

18.3. These indicators were created as objectively as possible by analysing the publicly available information on each benefit plan and creating key indicators, but an element of subjectivity will always be involved in such a grouping.

18.4. The out-of-hospital benefit design factor is defined by the main 'expenditure management' approach espoused by the plan – 7 categories were defined:

17.4.1 **PMB exempt schemes** and benefit options (the former bargaining council schemes) are placed in their own group;

17.4.2 Benefit options which offer out-of-hospital benefits through a network arrangement, usually involving general practitioners, are grouped as **'Network' plans**

17.4.3 Benefit options which offer a limited savings allocation and minimal other benefits are grouped as `**Savings' plans**;

17.4.4 Some options offer no non-PMB out-of-hospital benefits (so-called hospital plans) and these have been grouped together in the '**Minimal'** category;

17.4.5 Benefit options offering traditional block benefits with limits at a reasonably low level, are grasped as **Traditional'**;

17.4.6 Benefit options which offer extensive benefits out-of-hospital (either traditional benefit limit structures with very high limits or large savings allocations and above

17.4.7 threshold benefits) are grouped together, since logically very few members on either type of plan will experience benefit limitation, as `**Comprehensive'**: and

17.4.8 There are a group of benefit options for which no information is publicly available, and these have been placed together in the '**Unknown**' group.

18.5. A similar logic has been followed to group the benefit options in terms of the in-hospital benefits provided, as follows:

17.5.1 Any benefit options where access to hospital care is restricted through a network (either hospitals or specialists) are grouped together as '**Network**' plans;

17.5.2 **Efficiency Discount Options** (ED0s) where a discounted rate is offered in exchange for the use of a network in an otherwise identical benefit option, are grouped together,

17.5.3 Again, the **PMB exempt** benefit options (a small group) have been grouped together,

17.5.4 Options with no networks, but which pay specialists at multiples of the scheme tariff (most commonly 200% or 300%) are grouped together, **Premium plans** and

17.5.5 All other benefit options (those having no networks and paying specialists at 100% of scheme tariff) form the final groups (**standard plans**)

PMB status

19. The admissions data provided contained at least one ICD10 code (as published by the CMS) per item claimed. This allows assessment of whether a claim was a PMB or not. Since claims from an admission event can come from multiple sources, and diagnosis codes often differ between these, any admission where more than 50% of the value of the claims is made up of PMB diagnoses has been flagged as a PMB admission. As outlined above, the PMB indicator provided by the administrators has been considered, but the administrators expressed varying degrees of certainty about the process for determining these, and the accuracy of the indicator itself. Our approach is likely to overestimate the claims that were paid as PMBs

Casemix

20. The admissions file contained three data items from which casemix could be inferred:

19.1.1 The practice type (speciality discipline) of the treating medical practitioner

19.1.2 A summary diagnosis, and

19.1.3 Procedure(s) undertaken (the latter two using the Clinical Classifications Software (CCS) categorisation system[1].

These capture a large degree of what is typically called casemix. However, since over 20 separate medical practitioner specialty disciplines exist, and the CCS diagnosis and procedure coding systems contain and 231 categories respectively, the total theoretical number of casemix categories resulting is around 300,000. Such a large number of categories leads to statistical inefficiencies, so an 'admission type' grouping logic was developed to summarise these combinations. The logic is as follows:

20.1. In the first instance, admissions were grouped by the treating specialist discipline, i.e. general practitioners were considered separately from specialist physicians and general surgeons,

etc. This means that specialists were always compared to their peers when a case-mix adjusted comparisons were made;

20.2. Within each discipline the most common admission groups were identified such that the specified groups covered over 80% of admissions within that discipline. In general, for surgical disciplines these groups were defined by the procedure performed, and for medical disciplines by the patient's primary diagnosis. For some disciplines (e.g. general practitioners, cardiology) a hybrid approach that used both diagnosis and procedure was used.

20.3. These most common diagnoses and/or procedures within each discipline become admission type categories on their own, while all other admissions (less than 20% of each discipline's admissions) were grouped as '[specialty] - Other'.

20.4. This produced 177 admission type groups which reflect (as far as reasonably possible) clinically similar groups of admissions. After applying this approach, 83.5% of admissions by volume and 79.0% of admissions by value fell into the specific groups, with the balance falling into the various 'Other' categories. Shifts between these groups over time can then be used to assess changes in case mix received by hospitals over time.

Statistical Analysis Methodology

21. Two models were designed to explain private healthcare claims costs:

    20.1 A cost per beneficiary per annum model – which sought to explain the drivers of overall healthcare costs for insured individuals

    20.2 A cost per admission model – which examined the drivers of costs for each hospital admission.

Cost per beneficiary per annum

22. The aim of this analysis was to assess the impact of a number of "reasonable explanations" on the overall costs of healthcare for the medical scheme insured population. These are factors such as population age, chronic disease levels, gender and level and type of insurance cover. After adjusting cost increases for these factors, any residual unexplained cost increase would warrant investigation for other causes, including anti-competitive factors. If all of the cost increase could be explained, then we might conclude that market manipulation was unlikely. We

used the total annual claims per beneficiary per annum as the outcome variable of interest. A generalised linear model (GLM) was used. GL modelling was preferred because it allows impact to be measured for a variety of different dependent variable types (for example binary yes/no variables, whole number variables such as length of stay, as well as `continuous' variables such as cost) within the same model.

22.1. For all of the modelling work undertaken for the HMI analysis, the model was built using 2014 data only and then the model parameter results were applied to the full dataset for all five years. This allows for the comparison and calculation of a relative 'risk index' on the same basis to assess the impact of in the underlying 'risk profile' overtime. A single year was chosen for the model dataset to minimise the potential distorting effects of inflation, and 2014 was taken as it appears the most complete and reliable.

22.2. A stepwise process was used to add variables to the model. The process involved running the models multiple times, with one variable being removed at each stage. This allows the assessment of variables individually, since the change in the risk index with the variable included less the change in the index using the remaining variables but without the variable of interest is a proxy of the individual impact of the specific variable. This means that, for example, the factor for 'Disease Profile' in the tables in the next section actually measures residual disease profile effects once age and gender movements have been accounted for, i.e. whether people of the same age and gender are healthier or sicker over time.

22.3. When analysing healthcare data at a beneficiary level, it is usual to find a significant proportion of non-claimers i.e. members or beneficiaries who, although being on the scheme, have not claimed at all in a given year. These can distort statistical models based on cost or any other continuous variable, since these models are not designed for so called singularities (i.e. large numbers of data points with the same value). In addition, the distributions generally specified for healthcare costs (log-normal, gamma or similar shaped distributions) do not allow zero values for the variable which is being modelled.

22.4. For this reason, a two stage modelling process was used for the beneficiary models where the dependent variable was claims cost or a sub-component of it. Firstly, the probability of claiming for each beneficiary was estimated using a binomial GLM which predicts whether an event has occurred i.e. a beneficiary has claimed in a given year. Then the cost GLM was run to generate an estimated claimed amount, conditional on the beneficiary having claimed.

This cost model assumed a gamma distribution for the claimed amounts and excluded the members with zero claims.

22.5. The predictions from both models were then combined to produce the final prediction, or risk index for each life. These predictions can then be aggregated across whichever dimensions are necessary to produce the risk indices needed as an input to the attributions. These aggregations are then used as the input to the stepwise process outlined above.

Cost per admission

23. For the admission cost models, a two-step process was not necessary since the claim event had already happened (and hence there were no claims with a value of zero). Therefore, only the second step outlined above was used for the admission cost modelling, and these predictions used directly for the risk indices which are needed for the stepwise modelling process.

23.1. However, for some variables such as length of stay, a gamma distribution model is not appropriate since the output is a whole number of days rather than a true continuous variable. For these models a GLM process is still used, but the distribution specified is a Poisson distribution (which increases in steps of 1). The Poisson GLM modelling produces exactly the same output and can be applied in the same way to generate incremental risk indices.

Additional Methodological Considerations

24. When calculating the figures contained in this report, the following further definitions should be taken into account

24.1. When the report refers to members, it counts total members (head count) on any scheme in a given year, as opposed to the average exposed membership typically used in financial reporting.

24.2. Claim figures were calculated using fees charged as opposed to benefits paid. Thus cost estimates will include claims rejected and paid out of pocket by beneficiaries as well as those paid from medical savings accounts. We note that true out of pocket expenditure will still be understated in our estimates since claims not submitted to medical schemes and paid out of pocket will still be excluded.

24.3. `Open' and 'Restricted' schemes are defined as in the CMS annual reports.

24.4. All calculated inflation figures were annualised, i.e. when an inflation figure from 2010 to 2014 is quoted as x%, it should be read as x% per year. This will be consistent throughout all of the reports produced as part of the expenditure analysis, and any exceptions are noted accordingly.

24.5. Where claims figures were summarised by an analysis variable, the definition of these variables corresponds to those used in our prior report (HMI descriptive claims analysis report[2].