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Health Market Inquiry

Promoting Healthy Competition

RESPONSE TO DATA ROOM SUBMISSIONS

8 DECEMBER 2017

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INTRODUCTION

1.1. Two reports were released for comment by the Health Market Inquiry (HMI): *"Report on analysis of medical schemes claims data – descriptive statistics (21 November 2016)"* and *"Report on analysis of claims data – Initial cost attribution analysis (1 December 2016)"*. These analyses were prepared by Willis Towers Watson (WTW) for the HMI. All stakeholders were invited to comment. This report is a response to those comments; both written and reports received after access to the data room set up by the HMI. Access to the data room was done in accordance with in terms of Supplementary Guideline 2 available on the HMI website. Issues raised were grouped into seven broad themes: access to data; processes in the data room; wording, phrasing or overall structure of the reports; issues which appear to result from misconceptions or misunderstandings of the data provided; technical issues; queries related to the choice of clinical aggregation and modelling methodologies.

1.2. In this document the HMI publishes its response to the above issues. This document is based on the technical input provided to the HMI by WTW. The technical issues raised by stakeholders are dealt with via the WTW Technical Appendix of this document which is aimed at an expert audience.

1.3. In conclusion the HMI appreciates the engagement of stakeholders, and remains open to further constructive engagement to ensure reliability of data, all of us are interested in understanding the private healthcare market as accurately as possible given the time and data available to us.

ACCESS TO DATA ROOM

1.4. All applications for access to underlying data were considered by the HMI. In order to comply with the HMI access regime, in terms of Supplementary Guideline 2, the HMI held engagements with stakeholders who submitted the data to agree on the approach to access to confidential information. At this meeting stakeholders indicated they were willing to provide access to the data to certain categories of stakeholders, if the data were aggregated. Stakeholders also expressed that they were comfortable with access being granted to stakeholders' experts. Three stakeholders' appointed experts (Netcare, Mediclinic and Life Healthcare) were granted access to a data room to interrogate the data. Discovery Health (DH) was granted permission to have an observer in the data room.

DATA ROOM PROCESSES

1.5. The hospital groups' experts raised the following points:

1.5.1. Stakeholders were not allowed access to the original raw data collected by the HMI and hence some steps in the process could not be scrutinised within the data room; and

1.5.2. The SAS Viewer software available in the data room did not allow them to perform their own analyses on the data, nor did it allow them to run and test the SAS scripts which the HMI provided.

1.6. With regard to access: The HMI does not have the authority to grant another stakeholder access to data which has been claimed as confidential without the consent of the stakeholder who submitted the data. The access regime was decided by the stakeholders themselves, so while experts were looking forward to greater access to raw data, this was not the agreement of the stakeholders.

1.7. In respect of the software functionality within the data room: The purpose of the exercise was for stakeholders to assess the correctness of the analyses performed not to run their own analyses. The SAS Universal Viewer software allowed users to inspect and examine data provided to them; and

1.8. The logs produced by SAS when the scripts were run, as well as some of the outputs produced by SAS, were provided in the data room for stakeholders to examine.

1.9. Further access has subsequently been arranged as per *"Notice to stakeholders. Delay in publication of the Health Market Inquiry (HMI) Provisional Findings and Recommendations Report and Amendments to the Adminstrative Timetable 21 November 2017"* available at http://www.compcom.co.za/wp-content/uploads/2017/01/Final-Notice-to-Stakeholders-21-November-2017-Published.pdf

WORDING AND PHRASING

1.10. A number of relatively minor issues around the wording of certain sections of the reports have been raised by some stakeholders accessing the data room. Three particular wording issues have been flagged as concerning to stakeholders:

1.10.1. The Mediclinic experts noted that a category had been omitted from the written description of the 'Member Movement' indicator in Expenditure Analysis Report No. 2, but was included in the code supplied in the data room. This is an unintended omission in the report writing process and the relevant wording has been added to the report.

1.10.2. The Life Healthcare experts noted a phrase in Expenditure Analysis Report No. 2 which they claim made currently untested inferences about the relationship between tariff increases and CPI inflation. The report indicated *"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".* The HMI stands by this and underlines that we indicate that this is potentially the case. Further we indicate that this will be investigated further. A conclusion will only be drawn after that. The HMI also noted that *"Somewhat surprisingly, however, given that tariffs have not increased much above CPI, there was a significant increase in the average cost per admission (~2% unexplained increase per annum)".*

1.10.3. The Life Healthcare experts also noted a statement in Expenditure Analysis Report No. 2 which states that the HMI is seeking to identify the *"unavoidable drivers of cost escalation in the private sector, isolating a residual segment of increased costs that are amenable to intervention".* This wording has been conflated by the stakeholder expert with the 'Unexplained Factors' in the tables and taken to mean that the HMI has definitively stated that the unexplained factors are factors on which it intends to intervene. The HMI states that further analyses will inform any possible interventions.

OVERALL STRUCTURE

1.11. A number of submitters raised the issue of the HMI analyses potentially omitting relevant explanatory variables which could be used to understand the unexplained increase. This comment is included here under the heading structural factors because these two reports are part of a series of analyses. Issues such as these are dealt with in further reports. The additional reports are being published starting on the 8th of December with the rest following.

1.12. The variables used in reports one and two were chosen because they were commonly cited in submissions to the HMI as being related to costs. They are also possible to measure from the data available to us. Some were omitted (such as provider input costs, a factor

mentioned in the data room submissions) because they cannot be accurately or practically measured. Suggestions included using additional factors such as geographic market definition variables and factors related to supply-induced demand. These analyses are currently underway and will be produced.

QUERIES REQUIRING ADDITIONAL EXPLANATION

Times, Days and Quantities

1.13. The Mediclinic experts noted a number of issues with the fields relating to quantities, namely the various 'ward-day' fields and the 'theatre-minutes' fields. They suggest that some of the results appear unreasonable and therefore were not checked properly.

1.14. We note that to-date no published analyses are dependent on these fields and we recognise their variability. Level of care analyses in the practitioner and facility reports do make use of these data and in those analyses adjustments are made to take into account possible unreliability.

1.15. This issue results from the variable quantities many of the medical scheme administrators provided, as well as the inconsistency of how NAPPI codes in particular are coded by the administrators. Where we use these variables in the facility and practitioner reports we note the required adjustments.

Surgical and Medical Admission Classification

1.16. The Mediclinic experts noted that some medical admissions had theatre costs assigned to them, while some surgical admissions had no theatre costs assigned to them. This, in their view, is inconsistent with the stated definition of a surgical case as one where a theatre claim is recorded. We have tested this assertion and found that:

1.16.1. The issue of surgical admissions having no theatre time likely results from reversed claims i.e. multiple claims are recorded with a net zero cost, and affects only a very small number of admissions (around 76 000 out of over 11.5 million admissions, or 0.66% of total admissions) and is unlikely to have a material impact on the overall classification; and

1.16.2. The issue of medical admissions having theatre costs assigned to them relates to a grouping process whereby some equipment tariff codes applicable only in-theatre were included in the theatre fee calculation, whereas the facility fee for a

theatre was used to determine the split between surgical and medical admissions. This is a correct approach in terms of cost allocation but can lead to some confusion.

PMB Definitions and Zero Claims

1.17. The Mediclinic experts noted that some lines in the analysis files had zero claimed amounts but positive amounts for the PMB and PMBD claimed amounts. This should not be possible given the definition of the files. We have investigated this and found that:

1.17.1. A very small number of lines in each set of files are affected (less than 0.5% of total lines); and

1.17.2. These inconsistencies result from the way in which some medical scheme administrators deal with reversed claims. In some cases, when administrators reverse claims they don't always include all of the information which was on the original entry. This can lead to the original claim being a PMB and the reversal a non-PMB (because of missing ICD10 codes on the reversal line). This means a positive amount could be attributed to PMBs while the corresponding negative amount is not flagged as a PMB.

1.17.3. This is a feature of the data and it would not be practically possible to correct this. In addition, the number of affected lines is so small the impact on the overall results will not be material.

Assignment of Episodes

1.18. The issue of how a hospital episode was created and potential errors and issues associated with this was raised in a number of the responses. Specifically, a number of the experts pointed out that it is standard practice for medical scheme administrators to create an authorisation for each hospital event and pay all claims associated with the hospitalisation under that authorisation number. They contend that those authorisation numbers could and should have been used to define the episodes.

1.19. Although there are similarities across administrators, there are also differences which can make it difficult when comparing trends across multiple administrators. For example, not all administrators deal with follow-up treatments consistently (some include it as part of the authorisation, while others don't). Additional inconsistencies can arise from the inclusion and

exclusion of certain provider types as valid in-hospital claiming practices. These are only two of the possible inconsistencies found. For this reason we defined a standard approach which would be consistent across administrators. We are comfortable that our approach is sufficiently accurate to allow for comparisons given the data processing inconsistencies across administration systems. It would appear that the criticisms mostly related to the non-standard nature of the method rather than its accuracy.

1.20. Netcare's experts raised some additional queries around the exclusion of dental practitioners as treating specialists, as well as the potential inclusion of some non-admission hospital services in the admissions file. They raised a concern around the high number of admissions where no treating doctor is defined and the potential overstating of the admission rate.

1.21. This is better understood by referring to the explanation of how the HMI defined 'day admissions'. This definition is provided in the descriptive statistics section of the facility report; but to be clear we were aiming for consistency and understandability. All hospital services need to be grouped together consistently, and further confusion would be created if services defined as 'out-of-hospital' could be provided by hospitals.

Tariff Code Grouping Issues

1.22. Mediclinic's experts raised the issue that some of the groupings used to define maternity and theatre claims are incomplete, and they provided some examples of tariff codes they believed were missing from the specifications. These were codes 017 and 018 for maternity admissions and code 212 for theatre cases. We have reviewed these codes and the specifications questioned by Mediclinic and determined that:

1.23. In the case of the maternity codes Mediclinic is correct, but the codes they outline can only be charged after the first day and hence the identification of maternity cases is unaffected (since the first day codes are included in the specification); and

1.24. In the case of theatre, we cannot find code 212 in the published erstwhile NHRPL structure, and therefore must assume it is a code specifically used by one or more hospital groups and/or administrators. Since we do not have a confirmed definition of it, the code cannot be used in the grouping methods.

Script and Log Issues

1.25. Mediclinic's experts noted a number of alleged errors and inconsistencies in the data processing and analysis scripts, which we assume they have inferred from viewing the log files which were provided to them. These relate to issues such as missing variables, division by zero and various other warnings SAS prints to the log. We have checked these:

1.25.1. It is alleged that the process produces duplicate entries and that data are therefore 'excessively duplicated' in the admission file. This has been checked and is dealt with under a separate item later in the report.

1.25.2. It is alleged that clinical profile groupings could be erroneous because statements refer to so-called 'uninitialised variables'. This occurs when no beneficiary in a scheme claims for a particular medicine or diagnosis category, and would default to a string of blank values. Since SAS treats blanks and zeroes in the same way, this cannot have a material effect on the classifications and we argue it is unavoidable given the potential for missing diagnoses which cannot be known prior to data processing.

1.25.3. Mediclinic allege that by converting the tariff codes and practice types to numeric values, information is lost in the grouping process. We checked prior to the data room exercise and again subsequently and, while SAS generates a log indicating a potential error, the error SAS refers to is related to alpha-numeric codes only. None of our groupings contain alpha-numeric codes (since these are mostly in-house dummy codes). We note that where our groupings contain alpha-numeric codes no conversion procedure is used.

1.25.4. Mediclinic's experts raised an issue with the combining of all of the clinical profile categories into a single 'chronic' status group for the model which assigns utilisation, as well as for the descriptive statistics in Expenditure Analysis Report No. 1. They say the approach is overly simplistic and unhelpful in assessing burden of disease. We would note here that this combining was done for two specific analyses only, and that where it is relevant and applicable all groups are modelled individually. The reason in those instances was for ease of summarising in the descriptive stats (noting that elsewhere in the report all 17 disease groups are shown along with the unassigned –'no-disease'- lives). Further the structure of

the utilisation model, most notably that fact that a life has to claim in order to be grouped, means that the actual group is not therefore relevant to utilisation.

1.25.5. Mediclinic's experts also noted that the SAS logs occasionally show 'divided by zero' errors. This occurs when the denominator of a formula is unexpectedly zero. Since the correct result here would be zero and SAS creates blanks when a 'divide by zero' error occurs, we are comfortable this has no impact on the analysis results as they are stated (since SAS treats zeroes and blanks in a similar way).

1.25.6. Mediclinic's experts requested a diagrammatic representation of what was done with the data and how the scripts fitted together. Providing a pictorial summary necessitates simplification of what was done and would then lead to questions about why what actually was done was not provided. The scripts record much accurately and precisely what was done with the data. We refer them to the provided scripts as this provides full details.

1.26. In terms of the alleged errors in the scripts, we are comfortable that none of the warnings produced by SAS in processing the scripts have a material impact on the data processing or analysis results. In most cases they simply result from unexpected data points and have been treated correctly in spite of the warnings.

1.27. However, Netcare's experts noted where a space was placed in the wrong position in the attribution analysis scripts, meaning some of the age band and gender indicators were duplicated and one interaction term between age and gender was excluded. The duplicate entries do not affect the modelling since SAS removes them automatically, but the missing interaction term does affect the model. We have reviewed this and re-run the appropriate analyses and scripts. The corrected results are shown in the updated reports; the omission has been found to not impact materially the reported results.

Result Differences from Council for Medical Schemes (CMS) Data

1.28. Experts compared the HMI analysis results to the annual financial reports published by the CMS, and consequently labelled the results as inconsistent and potentially incorrect. The specific points by Mediclinic raised are:

1.28.1. That the results are allegedly inconsistent and show abnormal trends. The analysis (graphs) provided by the Mediclinic expert report show some volatility in the total number of lives. The HMI report specifically alerts readers to this since

many schemes made only partial submissions. The other data provided by Mediclinic appear to indicate high levels of consistency between the HMI and CMS reports in the cost per life and admissions per 1 000 lives (shown on pages 33 to 35 of the Mediclinic expert report) with the exception of one apparent step shift from day to overnight admissions in 2011;

1.28.2. A number of other inconsistencies are stated, but it appears these relate to incomplete data submissions, the use of member counts as opposed to exposure and the use of claimed as opposed to paid amounts in calculating claims. These items are dealt with separately in a later section.

1.29. We note that when Mediclinic compares like with like the results match almost exactly to the CMS reports. This in our view indicates that the HMI data is accurate and the differences result from specific analysis decisions made by the HMI and WTW as opposed to any flaws or errors in the data. Where deviations from CMS data occur we have noted this in our methods and reports indicating that we have chosen a different approach to the CMS reports and alerted stakeholders to expect the differences.

Mid-Year Option Changes

1.30. Netcare's experts raised the issue of members changing options midway through analysis years and requested further details on how this was dealt with in the data.

1.31. Some schemes allow members to change options during the year if they fulfil certain criteria. We undertook to confirm the data warehouse criteria for the assignation of members to individual options, since in each analysis year they must be uniquely assigned.

1.32. We have subsequently confirmed that the option assigned to each member is the option they belonged to at the end of each year of analysis i.e. members who change during the year will be assigned to the option they have moved to. A consequence of this is that members who change options during the year will be recorded as switchers for analysis purposes. This is consistent with the analysis process followed for the rest of the option changes.

1.33. A further issue has been raised around options and option switches – Life Healthcare's experts contend that, given their understanding of the market and its dynamics, there are more option switches than would be expected. Specifically, they cite the fact that over 15% of Discovery Health Medical Scheme beneficiaries have changed options in each of the analysis years, and contend that this percentage should be less than 5%.

1.34. This observation is correct at the superficial level. However, it is noted that the data structure means beneficiaries are only assigned to options once they join the scheme, and hence new joiners would be recorded in the data as having changed options. The analysis process, however, separates new joiners from the switcher group, and once this is done the proportion of switchers falls to around the 5% indicated by the experts.

Claimed Amount vs Paid Amount

1.35. All of the stakeholders who entered the data room raised the issue of using the amount claimed from the medical scheme as the base cost instead of what was paid by the medical scheme from its funds. This is the reason why the claims figures in the comparison to the CMS data performed by Mediclinic's experts do not match.

1.36. In terms of the merits of using claimed as opposed to paid amounts, the HMI is interested in broader expenditure by medical scheme members rather than only what is paid by the scheme. Out of pocket or potential out of pocket payments are an important analysis area for the HMI since the expense is borne by the member in a large number of cases. Later analyses, published with this set of reports, do differentiate claimed from paid where relevant.

1.37. Netcare's experts raised a concern about duplicate claims being included in the HMI figures as these would potentially be rejected and resubmitted with different coding, causing a double counting.

1.38. In the data warehouse process, no adjustments have been made for this and thus the analysis data should contain all the lines as they were submitted by the medical scheme administrators. However, when the data were requested from administrators, it was specifically requested that the duplicate lines which were rejected were excluded from the data supplied.

1.39. We have also noted that, as our analyses have proceeded, the 'Unpaid' components which would reflect these rejected and duplicate claims if they were in the data, are in line with what we expect. Stakeholders will see this from the newly published reports.

Alternative Reimbursement Models (ARM) Definitions and Issues

1.40. Mediclinic's experts noted a concern around the definition of ARM used, stating that the data they viewed was inconsistent with known arrangements in the market and that some arrangements were excluded from the definition.

1.41. We note this where this is the case (e.g. as stated in the Facility report where these data are used):

1.41.1. We identified ARMs using codes provided to us by the administrators who supplied the data and it is conceivable some ARMs have been missed;

1.41.2. The type of arrangements whereby claims are billed at fee for service tariffs and the account is then 'settled' to the ARM figures at the end of a given time period will have been excluded since they cannot be identified from the data; and

1.41.3. Formal capitation arrangements involving risk transfer are also excluded for the same reason (noting that in most cases, as stated in Expenditure Analysis Report No. 1, we did not receive the underlying capitation data).

1.42. We accept the points raised by Mediclinic and these have been appropriately noted in the applicable section of the reports.

TECHNICAL ISSUES

1.43. A number of experts requested additional technical detail around the modelling process and various specific technical issues. This detail is appropriate for a technical audience across the industry and is provided as a WTW technical annexure to this document. The contents of this annexure is informed by the queries and discussions set out during the data room process.

MODELLING ERRORS AND CONFIDENCE INTERVALS

1.44. The Life Healthcare experts commented that the contribution of the unexplained factors may be overstated because all statistical models have an inherent random error within them and thus the actual figure may differ from the estimates used to build the attribution.

1.45. This is a valid point, and to the extent the model is understating the impact of the explanatory factors the statement would be true.

1.46. However, these types of statistical models are usually structured on a so-called ‘best estimate’ or ‘maximum likelihood’ basis. This means that the actual result is the most likely point in the statistical distribution, and that it is roughly equally likely that the actual observed value will be higher than the estimate as it is that it will be lower.

1.47. Thus, although the principle is valid, we are comfortable that there is no bias in the modelling process and that any modelling errors are equally likely to occur in either direction. This is a necessary implication of this type of statistical modelling, since random error is inherent is the assumptions and the modelling process.

Duplicate Lines in Admissions File

1.48. Mediclinic’s experts noted that some lines appear to be duplicated in the admissions files. They correctly inferred that this was because the methodology whereby diagnoses, procedures and treating doctors are assigned to episodes can sometimes not definitively identify an admission if two or more groups have the same total cost. Mediclinic’s experts estimated these duplicates could make up around 1.5% of the dataset.

1.49. We understand this reasoning and note that this problem is inherent in the dataset building process. We have however considered this and decided to retain the detail and the duplicate lines rather than arbitrarily decide between the categories in contradiction with the stated methodology. We also tested the dataset for duplicate lines and found only around 65 000 duplicates across the entire dataset, or 0.5% of the total lines.

1.50. We are therefore comfortable that the duplication of lines is not materially impacting the results as they have been presented.

Exposed Lives vs Count of Lives

1.51. All the experts representing the three stakeholders granted access to the data room, as well as DH, raised concerns about the use of a count of total membership as opposed to the exposed monthly membership which is commonly used in the industry when performing cost analyses. Most cited actuarial principles, specifically the principle of correspondence, as the reason why they felt the HMI should use exposed monthly lives as the base analysis unit. Netcare’s experts went as far as to say that all the analyses were invalid because of this methodology.

1.52. Logically, this makes sense for the descriptive statistics and unadjusted cost trends (since the exposure corresponds to the periods in which the claims were made). However, for certain of the attribution analyses where statistical models are used, using exposed months as a base unit creates a number of practical and interpretation challenges. This is because the dataset is necessarily structured at a per-member-per-year level whereas if monthly exposure was the base unit then the input data would need to be member-months.

1.53. This can be managed by using weighted regression models where exposed months is used as the weighting factor, but this would add significantly to the complexity of the models as well as the processing time required to run them. It also introduces further potential sources of model error since weightings need to be added to the modelling process. It was thus decided that the attribution models continue to be run on the current (per-year) basis. In addition, we note that all members with partial exposure (less than 12 months) will be captured through the member movement indicator (as either joiners or leavers) and adjustments are made in this way. Thus, the impact is taken into account in the model.

1.54. In respect of the descriptive statistics, we agree that the optimal method is to run these on an exposure-adjusted basis. Some of the analyses therefore were repeated using exposed months as a base. The tables are shown below, for membership as well as total claims trends.

TABLE 1: MEMBERSHIP TRENDS USING EXPOSED MEMBERS: ALL SCHEMES

Year	Beneficiaries	Average Age	% Male
2010	6 838 105	31.26	47.37%
2011	7 167 248	31.38	47.37%
2012	7 886 869	32.01	47.16%
2013	8 232 115	32.29	47.18%
2014	8 269 191	32.49	47.06%
Change	20.93%	1.23	-0.31%

1.55. Table 1 shows the membership trends using exposed membership, and should be compared to the table in Expenditure Analysis Report No. 1 (also available in the technical annexure for ease of reference). When this comparison is performed, it shows that, as expected, counting members produces higher membership than exposed members (8.27 million in 2014 versus 9.21 million using counts), and it also produces a higher membership increase (20.93% over the five years versus 18.35% using counts). This suggests that exposure is becoming more complete over time i.e. more members are staying for the full 12 months. This is consistent with the higher proportion of long-term members shown in the funder report being issued with this set of documents.

1.56. Table 2 shows the results using exposed, as opposed to counts of, lives to perform the summary cost analysis table. It again should be compared to Table 7 in the previous iteration of that report.

TABLE 2: TOTAL COST BREAKDOWN USING EXPOSED LIVES, ALL SCHEMES

Cost Contribution – All schemes	2011	2012	2013	2014
Total Cost Increase	13.03%	19.00%	13.75%	10.19%
Membership Growth	4.81%	10.04%	4.38%	0.45%
Cost Increase pbpm	7.84%	8.14%	8.98%	9.69%
Utilisation				
- Frequency	0.20%	-0.28%	0.96%	0.68%
- Intensity	2.50%	2.70%	2.13%	2.68%
Price (CPI)	5.00%	5.60%	5.70%	6.10%

1.57. The figures show an average per beneficiary per month (pbpm) increase of between 7.84% and 9.69%, slightly lower than the comparable figures in the descriptive statistics. This gap is

approximately 0.55%, similar to the impact of the member movement variable in the overall attribution analysis which was quantified at an average of 0.57%.

1.58. Although it is not a recommended approach, a weighted set of GL models using the HMI data was run. The results suggest that the unexplained factors contribution remained similar at 2.20% (compared to 2.14% in the initial attribution analysis), with the total claims and the contributions of the explanatory factors reducing proportionally as outlined above. The results are shown in Table 3, and indicate that all the other factors (barring member movement as outlined above) show very similar contributions to the unweighted attribution results.

TABLE 3: ALL SCHEMES COST INCREASES EXPOSURE-WEIGHTED ATTRIBUTION, 2010-14

All Schemes, All Claims	2011	2012	2013	2014	Average
Total Increase	7.81%	8.13%	8.95%	9.69%	8.64%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
All Explanatory Factors	0.30%	-0.10%	2.07%	1.11%	0.85%
Age	0.79%	2.16%	1.50%	0.93%	1.35%
Gender	0.01%	-0.04%	0.02%	0.02%	0.00%
Disease Profile	0.60%	-0.52%	0.69%	0.16%	0.23%
Member Profile	0.13%	-0.01%	-0.10%	0.30%	0.08%
Plan Mix	-1.23%	-1.69%	-0.04%	-0.30%	-0.82%
Unexplained Factors	2.51%	2.63%	1.18%	2.48%	2.20%

1.59. Given that, aside from one variable, the results are not materially different, it would arguably be an unnecessary duplication of work to rerun all of the analyses on an exposure-adjusted

basis. We have thus retained the analysis results as they are as the overall interpretation would not change. The issue of exposure is dealt with in the technical annexure, where these types of results can be demonstrated and a further explanation around the member movement variable is provided.

Model Fit and Robustness Checks

1.60. All of the stakeholders raised the need for the model provided to them to be accompanied by some of the fit statistics and checks on the robustness of the model. The SAS logs and standard output, contrary to statements in some of the expert reports, were provided to the experts in the data room. However, because of the generalised linear modelling process, these outputs are not as easily understood as the output from a multiple linear regression model. The experts therefore identified a need for additional information around the fit statistics for the model.

1.61. This will be addressed in the technical annexure. We note however that GL modelling is less frequently used and generally less immediately understood. Some of the diagnostic statistics requested relate to multiple regression analyses and are not directly applicable to GL models.

Variable Ordering in the GL Model

1.62. A number of the stakeholders raised the issue of the ordering in the model structure used, and suggested that different orderings be tested. The HMI approach to building the model is informed by the reasoning that was described in the Revised Statement of Issues. The HMI notes that the rigorous and appropriate approach to any analysis is to choose hypothesis driven predictors a priori and test them rather than to vary ordering until a model is produced that best suits a preferred outcome. Nonetheless we assessed how ordering impacted the outcome. The Mediclinic expert report quotes the WTW analysts as saying the ordering was not significant in the model. This is incorrect, and the statement made was that regardless of the ordering of variables, the split between CPI, explanatory factors and unexplained factors would remain the same. What would differ is how the cost increase assigned to the explanatory factors was split amongst the different factors.

1.63. The HMI focus is on the unexplained factors, thus the issue of ordering has no material impact on the % attributed to ‘unexplained’ factors. However, to the extent stakeholders view the individual contributions to increase as an important variable, the ordering becomes

material. In addition to the exploration of this presented below, different orderings for a sample set of outcomes (overall cost per beneficiary and cost per admission) are tested as part of the technical annexure, and the results interpreted to allow a level of comfort amongst stakeholders.

1.64. As an initial test, the overall cost per beneficiary attribution has been rerun with the variable ordering reversed. The correct interpretation of this table is that the impact shown for a given variable is the additional impact of that variable beyond the impact already catered for by the variables above it. The comparisons between the two attributions are shown in the tables below.

TABLE 4: ALL CLAIMS COST TRENDS ATTRIBUTION: ALL SCHEMES 2010-14

All Schemes, All Claims	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%
All 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 Profile	1.87%	0.02%	0.07%	0.31%	0.57%
Plan Mix	-1.28%	-1.63%	-0.12%	-0.19%	-0.80%
Unexplained Factors	1.88%	2.30%	1.70%	2.68%	2.14%

TABLE 5: ALL CLAIMS COST TRENDS ATTRIBUTION: ALL SCHEMES 2010-14 (VARIABLES REORDERED)

All Schemes, All Claims	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%
All Explanatory Factors	2.14%	0.68%	1.79%	1.38%	1.50%
Plan Mix	-1.39%	-2.06%	-0.29%	-0.47%	-1.05%
Member Profile	1.58%	0.26%	-0.02%	0.45%	0.57%
Disease Profile	0.04%	0.65%	1.23%	0.37%	0.57%
Gender	-0.06%	0.04%	-0.01%	0.01%	0.00%
Age	1.98%	1.78%	0.88%	1.02%	1.42%
Unexplained Factors	1.88%	2.30%	1.70%	2.68%	2.14%

1.65. Comparison of the two tables shows that, as outlined above, the overall split between explanatory and unexplained factors does not change. In addition to this, the increases attributed to each of the explanatory variables do not differ markedly across the two attributions. Plan mix has a marginally larger negative effect in the second table, while age and disease burden (as they are likely related to plan choice) have higher positive effects to offset this.

1.66. We are therefore comfortable that the variable ordering does not have a material impact on the trends seen, and that the results are reasonable given the methodology used.

DH Case Mix Issues

1.67. DH raised several specific issues relating to the case mix (admission type) variable. These related to whether or not costs were truncated (capped at a certain level) within admission type groups, whether neonatal admissions are captured accurately given the registration issues around new-born babies on medical schemes, and a more general discussion around the impact of individual high-cost cases.

1.68. These are valid but specific issues, and have been tested at a high level. They are explored in more detail in the technical annexure, but some initial feedback is provided here.

1.69. The HMI analysis did not truncate cases within our model, because the high cost cases often contain important information on issues such as hospital acquired infections, surgical complications and the like. They can additionally, especially if the truncation point is set at a relatively low level, constitute a significant proportion of the total cost by their very nature. Our preferred approach is to not truncate cases unless and until it is shown that individual cases distort the findings in the model. We found no evidence of such distortions during the modelling process, but have run some additional testing. The table below shows the proportion of admissions in each claim year which have incurred total claims exceeding various financial thresholds.

TABLE 6:PERCENT (%) ADMISSIONS ABOVE FINANCIAL THRESHOLDS, 2010-14

Year	> R100 000	> R500 000	> R1 000 000	> R5 000 000
2010	2.95%	0.16%	0.03%	0.0004%
2011	3.31%	0.20%	0.04%	0.0002%
2012	3.79%	0.24%	0.06%	0.0004%
2013	4.30%	0.28%	0.07%	0.0003%
2014	4.84%	0.32%	0.08%	0.0005%

1.70. Table 6 shows that less than 5% of admissions incur total claims of over R100 000, while almost no admissions incur claims of over R5 million. These are the types of claims which DH has argued could be truncated or excluded from the modelling process. However, the

proportions appear to be growing over time (part of this will simply be a result of inflation since the thresholds are fixed in nominal terms), and truncating or excluding admissions could mean valuable information is lost unless some specific analysis of these cases is undertaken. In addition, the extent of the dataset collected by the HMI means that one case is unlikely to distort the population trends. We are therefore comfortable that there is no need to truncate cases in the GLM process.

1.71. A specific review of neonatal claims was undertaken as DH pointed out the potential for very high cost neonatal claims and were further concerned that claims incurred by neonates being recorded under the mother's dependent code and thus affecting the risk adjustment. In the table below isolated the admissions where a paediatrician was labelled as the treating doctor and the data has been split the by patient age band.

TABLE 7: PAEDIATRICIAN ADMISSIONS BY PATIENT AGE BAND: ALL YEARS

Age Band	% of Admissions
Neonates	22.68%
Under 18	75.00%
18-35	1.89%
Over 35	0.43%

1.72. Table 7 shows that of the total admissions by paediatricians, over 20% are for neonates (born in the same year as they were admitted), 75% are for children under the age of 18, and only 2% for adults. This confirms that in the vast majority of cases the neonatal claims have been assigned correctly. Only a very small number of potentially mis-assigned admissions are evident here, and these most likely relate to paediatrician claims incurred while the mother remained in hospital.

Partial Data Submissions

1.73. A number of the stakeholders have argued that, where medical schemes or administrators made data submissions which did not include some of the years requested, those data should have either been re-requested or excluded. Re-requesting data to include the

excluded years is not a viable option in most cases as in our interaction with stakeholders it appears that the schemes/administrators have provided as many years of data as they were able to.

1.74. The only remaining decision is then whether or not those partial submissions are included or excluded from the analysis dataset. In order to test the impact, the HMI noted that for three large administrators, data for all of the years requested was provided (as long as the scheme was operational during that year), and combined these constitute close to 80% of the industry. The summary demographics as well as the overall cost attribution result from analysing those data is compared to the final results including all the data submissions in the tables below.

1.75. The first pair of tables (8 and 9) compare the demographics of the two sample populations:

TABLE 8: ALL SCHEMES DEMOGRAPHIC TRENDS: 2010-14

All Schemes			
Year	**Beneficiaries**	**Average Age**	**% Male**
2010	7 783 718	31.26	47.37%
2011	8 068 616	31.38	47.37%
2012	8 842 029	32.01	47.16%
2013	9 209 614	32.29	47.18%
2014	9 211 943	32.49	47.06%
Change	18.35%	1.23	-0.31%

TABLE 9: THREE LARGE ADMINISTRATORS' ONLY DEMOGRAPHIC TRENDS: 2010-14

Three Largest Administrators			
Year	**Beneficiaries**	**Average Age**	**% Male**
2010	6 713 838	31.10	47.38%
2011	6 979 319	31.19	47.34%
2012	7 229 205	31.47	47.16%
2013	7 450 241	31.73	47.06%
2014	7 542 231	31.98	46.95%
Change	12.34%	0.88	-0.43%

1.76. The tables show that the partial submissions, other than obviously meaning faster membership growth, appear to cause a step increase in average age in 2012, while having no material impact on the gender profile. The attribution results (for all claims) are shown in the next set of tables (10 and 11).

TABLE 10: ALL SCHEMES CLAIM COST TRENDS: 2010-14

All Schemes, All Claims	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%
All 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 Profile	1.87%	0.02%	0.07%	0.31%	0.57%
Plan Mix	-1.28%	-1.63%	-0.12%	-0.19%	-0.80%
Unexplained Factors	1.88%	2.30%	1.70%	2.68%	2.14%

TABLE 11: THREE LARGEST ADMINISTRATORS CLAIM COST TRENDS: 2010-14

3 Largest administrators, all claims	2011	2012	2013	2014	Average
Total Increase	9.24%	8.83%	8.55%	10.08%	9.17%
CPI	5.00%	5.60%	5.70%	6.10%	5.60%
All Explanatory Factors	1.16%	0.92%	0.60%	0.82%	0.88%
Age	0.49%	1.41%	1.02%	1.00%	0.98%
Gender	-0.02%	-0.01%	0.02%	0.03%	0.00%
Disease Profile	-0.03%	0.08%	-0.05%	-0.11%	-0.03%
Member Profile	1.81%	0.20%	0.18%	0.38%	0.64%
Plan Mix	-1.08%	-0.76%	-0.57%	-0.48%	-0.72%
Unexplained Factors	3.08%	2.31%	2.24%	3.15%	2.70%

1.77. The two sets of attribution results differ mainly in the analysis of the explanatory factors, with higher increases attributable to the explanatory factors experienced in all years except 2012. The first table (including partial submissions) shows a higher age effect (driven by the step change in 2012 as noted above), and higher disease profile effects (again possibly driven by different profiles). The net effect of including the partial submissions appears to be to explain a higher proportion of the annual cost increase through the explanatory factors, while the overall increase stays similar.

1.78. Although some of the figures may change if the partial submissions are excluded, it is unlikely to have a material impact on the conclusions based on these analyses. We can therefore see no reason to exclude this data as suggested by the experts.

Different Model Base Years

1.79. A number of the stakeholders questioned the appropriateness of using only a single year as the base year for modelling purposes. The HMI chose this approach because of the issues around accurately measuring tariff increases across years for non-hospital providers and thus the potential distorting effects of inflation. Experts were presented with this logic during the data room process and were mostly sympathetic to this reasoning. They nonetheless suggested that different base years be tested to confirm that the parameter values are consistent over time.

1.80. The approach to the analysis and related tables and results are described in the technical annexure. Overall the effects analysed have remained reasonably similar irrespective of choice of base-year and this choice is not materially impacting the results or conclusions of the analysis.

Modelling Choices and Grouping Issues

1.81. The issues raised in this section relate to choices of methodologies, whether modelling or grouping. Unless there is an obvious oversight or error identified, these issues cannot practically be resolved without rerunning the HMI analyses using every grouping and modelling process available in the market and/or proposed by stakeholders. This is eminently not practical, and could not be reasonably expected of the HMI.

1.82. As indicated previously, and based on the fact that the DH data covers a large proportion of the covered population, the HMI agreed that DH attempt to replicate the HMI results using its own methodologies.

Clinical Profile Variable

1.83. Stakeholders' experts raised a number of concerns about the clinical profile variable used as a proxy for disease burden in the models specified by WTW for the HMI. Issues include:

1.83.1. the accuracy of the grouping, with Life Healthcare's experts in particular citing inconsistencies across medical schemes, particularly a noticeably low prevalence of the identified conditions for Momentum Health;

1.83.2. the priority ordering of how beneficiaries are assigned into the 18 groups, mostly relating to issues of inconsistency of the ordering with the output parameter value ordering;

1.83.3. only grouping beneficiaries into one category and the potential for missing co-morbidities; and

1.83.4. not using in-hospital data to classify beneficiaries into the groups leading to a potential undercount of the classified beneficiaries.

1.84. The clinical profile indicator was created to allay the need for the HMI to collect and combine medicine authorisation data from the administrators which would have been a nearly impossible task given the inconsistencies in data format and data structure as well as inconsistent registration criteria across schemes.

1.85. The clinical profile indicator must capture as best it can the real disease profile of the population studied. To the extent that a population is sicker it is rational that more health care (and associated costs) is required. Most diseases or need for care correlate with age and gender (with the exclusion of HIV which has a different age distribution and is prevalent, but not evenly distributed, in South Africa). Some argue that these three indicators are sufficient to capture disease profile. Others argue that it is insufficient. Certain conditions operate in the South African health care environment (full payment for prescribed minimum benefits (PMBs), the mandatory cover for conditions listed on the chronic disease list (CDL), hospital only cover and concurrent hospital plans) which create incentives that make it rational to believe that, in addition to the expected overuse of care demonstrated in any health care market, a degree of induced demand (provider and or patient driven) may be prevalent in South Africa. To the degree that up-coding and overtreatment occurs, using chronic disease

registration or coding of admissions may produce a very liberal definition of chronic diseases and may overestimate the disease burden.

1.86. In reports 1 and 2 a parsimonious model was used; it included more than age and gender but did not include all possible data sources to define the level of illness of the population. In particular, if a patients first claim was at the point of hospitalisation, it was assumed that they had no prior chronic disease as they had claimed for no consultation or treatment for such. This was a deliberate choice to attempt to exclude supply induced demand. Nonetheless, experts who entered the data room raised the issue of the absence of so called co-morbidities in the indicator, since beneficiaries are uniquely assigned to one disease category.

1.87. With respect to the specific issues raised:

1.87.1. An investigation into the Momentum Health issue revealed that the methodology is working correctly, but consultation rates with medical practitioners appear to be low on that particular scheme, leading to low rates of grouping into the clinical profile categories;

1.87.2. The priority ordering was set using clinical as opposed to financial severity, and hence will not necessarily be consistent with the cost parameters;

1.87.3. It is necessary to manage the number of categories into which the variable is classified to avoid model overfitting (too many parameters) and since the variable was intended to support the case mix and other indicators, the single categorisation is in our view reasonable; and

1.88. After the data room feedback parallel testing was undertaken by DH using DHMS data and DH chronic disease definitions. DH used two methods: chronic disease registration and a DH grouper. DH indicated that both methods resulted in a similar impact of chronic disease on overall costs. This showed higher prevalence of most chronic diseases as well as a higher impact of the clinical profile indicator over time.

1.89. The HMI clinical profile is purposively narrowly defined as explained above. However, taking into account the feedback from the data room and the DH analyses the HMI ran four sets of analyses in respect of this indicator:

1.89.1. A repeat of the models using the current indicator, but run only on Discovery Health Medical Scheme (DHMS) data so as to be directly comparable with the DH figures;

1.89.2. A set of models using a clinical profile indicator which has the same disease categories as the current indicator, but also uses in-hospital and medicines claims data to assign beneficiaries to disease groups;

1.89.3. A set of models using a clinical profile indicator based on complete data and incorporating comorbidities, but reducing the number of primary conditions;

1.89.4. A set of models using the same logic in respect of co-morbidities, but excluding in-hospital data i.e. assigning beneficiary profiles based on consultation and medicines data.

1.90. The table below shows the impact of the clinical profile variable for DHMS in each of the four clinical profile scenarios outlined above (noting that the DH figure for comparison was quoted at 1.32%):

TABLE 12: OUTCOME OF FOUR METHODS OF DEFINING CHRONIC DISEASE PREVALENCE ON DHMS DATA

Impact of Clinical Profile on Cost Increase	2011	2012	2013	2014	Average
Narrow grouping	0.14%	0.00%	0.10%	0.31%	0.14%
Narrow grouping, incl. hospital and Meds	1.49%	1.28%	1.36%	1.15%	1.32%
Co-morbidities, all data	1.48%	1.41%	1.31%	1.43%	1.41%
Co-morbidities, excl. hospital data	1.11%	1.32%	1.58%	1.55%	1.39%

1.91. The table shows that the HMI narrow grouping shows a much lower impact compared to the various indicators based on broader data sources as outlined above. The impacts of the other definitions are not materially different from the impact quoted by DH using registration data, which suggests that, to the extent that the intent was to create a proxy for chronic disease registrations, the narrow HMI methodology is different (as expected) to a broader definition.

1.92. The next table shows the unexplained component of the claims increase for DHMS under each of the clinical profile scenarios outlined above. It shows that the increase in the clinical profile impact proportionally reduces the unexplained component, which is significantly lower

in all scenarios other than the current more narrow grouper. The unexplained components are, as expected given the clinical profile impacts, relatively similar for all of the last three scenarios.

TABLE 13: IMPACT OF REVISION OF CHRONIC DISEASE PROFILE INDICATOR ON UNEXPLAINED EXPENDITURE

Impact of grouping on unexplained factors	2011	2012	2013	2014	Average
Narrow grouping	1.60%	0.72%	2.70%	2.95%	1.99%
Narrow grouping, incl. hospital and Meds	0.42%	-0.69%	1.30%	2.08%	0.78%
Co-morbidities, all data	0.21%	-0.73%	1.48%	1.83%	0.70%
Co-morbidities, excl. hospital data	0.44%	-0.63%	1.19%	1.63%	0.65%

1.93. In light of this the analyses have been re-run to reflect both narrow and broad definitions of the chronic disease indicator. The differences between the two are instructive and can only be interpreted in the light of the context in which they occur and in combination with other data and analyses and not from these data alone.

Member Movement Variable Queries

1.94. A number of experts in their reports appeared confused as to what the member movement indicator was designed to measure, and many in fact suggested it should be excluded. Some also argued that the inclusion of option change indicators overlapped with the plan mix indicators and was therefore unnecessary. Life Healthcare's experts also noted that the option change variable became relevant only when option changes happened within a plan mix group.

1.95. The variable was designed to assess the impacts of selective joining, leaving and option movements by members, as well as the change in these over time. It also (given the discussion above around exposure calculations) became a proxy for incomplete exposure as an alternative to weighting the regression models.

1.96. Many stakeholders refer to "selection effects" on the industry and to the extent that is exists the HMI would like to capture this in its models and we prefer to retain this variable. This is especially relevant given the selection analysis which was undertaken in the funder report.

1.97. In respect of the overlap between member movements and the plan mix variable, while we agree this is possible, we would argue they measure two different things: the member movements variable measures systemic differences between new and existing members on an option or scheme, while the plan mix variable measures the level of cover enjoyed by the population as a whole and how this impacts on their costs. We would thus argue that retaining both is a reasonable decision.

Plan Mix Indicator Issues

1.98. The stakeholders also raised some queries and problems with the plan mix indicator and how it was used in the modelling process. The following specific issues were raised:

1.98.1. A concern around the subjectivity of the classification of options into the groups;

1.98.2. A number of stakeholders raised the issue that the majority of options on the list provided to them were classified as 'Unknown'.

1.99. Possible suggestions to explore this further included

1.99.1. DH provided a sample of its own plan mix adjustment methodology and suggests the HMI adopt it or something similar; and

1.99.2. Life Healthcare's experts argued that including both in-hospital and out-of- hospital option groups in models for IH and OH claims was unnecessary since the two are essentially not related and only one should be included in those models.

1.100. We note that the need for accuracy in this indicator must be balanced against the principle of parsimony for the statistical models i.e. too many parameters can become problematic in terms of potential model overfitting. For this reason, it was necessary to group options in some way. In respect of the specific issues raised:

1.101. The grouping subjectivity has been acknowledged in the report and managed as best as possible within the analysis process;

1.102. The large number of 'Unknown' option grouping results from a particular scheme (Sizwe), whose data was eventually excluded, providing a long list of option codes (which change each year) which were classified as Unknown because the data were excluded. The Funder report shows that only around 4% of beneficiaries belong to options grouped as Unknown in 2010, and this proportion reduces dramatically over the period of the data.

1.103. The DH methodology essentially uses each individual option as its own cell and measures movement between those cells as the 'plan mix effect'. This is problematic from a parameterisation point of view as the number of variables will be very large, and additionally potentially overstates the plan mix effect if older and less healthy beneficiaries choose higher cost options (as is evidenced from the data).

1.104. The point raised by Life Healthcare's experts is a rational one since logically the separation they argue should be the case. However, benefit design out of hospital can arguably influence behaviour in respect of hospitalisation (since if cover is denied for out-of-hospital treatments an incentive exists for patients to be admitted for care to be funded). Similarly in-hospital benefit design can impact out-of-hospital claims if for example certain ongoing care is funded from the hospital benefit post hospitalisation. We would therefore argue this inclusion is justified initially, and parameters could be subsequently excluded if found to be insignificant.

Case Mix (Admission Type) Groupings

1.105. All stakeholders discussed the case mix (admission type) grouping in one way or another. Most advocated for the use of a so-called diagnosis related grouper (DRG) methodology to assess changes in case mix. In addition to this, two specific issues were identified with the classification:

1.105.1. Life Healthcare's experts noted that the script used to create the case mix groups wasn't operating as it was intended to; and

1.105.2. Netcare's experts raised some issues around the underlying coding as it was used for the creation of procedure groups, specifically around procedure code 1550.

1.106. The HMI made a decision not to use a commercially available DRG grouping system, and instead to use the World Health Organisation's Clinical Classifications Software (CCS) as an input to a more complete statistical modelling approach (as opposed to a DRG approach where the average cost within each DRG would be used as the 'predicted' value).

1.107. Mediclinic's experts stated that the relatively small number of admission type groups (when compared to a conventional DRG model) meant the model was likely to produce unreliable results due to a lack of detail, and additionally speculated that it was driven by a need to 'make the statistical model produce results'. The grouping has in this case been substantially

informed by what was found in the data and we are comfortable that it provides sufficient detail to capture material changes in case mix.

1.108. In response to the specific issues:

1.108.1. We agree with the Life Healthcare experts that the scripts dealing specifically with case mix need to be adjusted in order to produce the groupings they are intended to. This has been done, and the results in the updated reports reflect this correction.

1.108.2. We agree with Netcare's experts that code 1550 has been misclassified into CCS categories, but note that only 382 admissions over the five years fall into the 'incorrect' category. This cannot have a material impact on the case-mix calculation. When the admission type grouper was built, a series of reasonability checks were built into the process and it is unlikely that any material misclassifications exists (the reason this one appears to have been missed is that it had no material impact on the results or the admission type indicator).

Plan mix and modelling effect

1.109. Two issues are considered in this section – the issue of plan-mix adjusted claims increase figures as well as the issue of the alleged understatement of the plan-mix effect by the CCHMI analyses.

1.110. In respect of the request to present plan-mix adjusted figures, the starting point for the HMI analyses has always been the actual experience which can be replicated reasonably simply. This overall figure can then be broken down into various explanatory factors and a residual component identified.

1.111. The DH concern appears to be related to the fact that the results will be perceived to lack credibility if they do not correspond to the contribution increases experienced by members of medical schemes over the same period. This is an understandable concern, and one for which further explanation has been provided in the technical annexure to the analysis reports.

1.112. However, it is worth noting that many sources, including the Council for Medical Schemes (CMS), publish annual trends presented in a very similar way to the HMI results, and we

would suggest that credibility is unlikely to be a material issue here anyway. From the CMS reports, the average increases in gross relevant health expenditure per beneficiary per month for the Discovery Health Medical Scheme(DHMS) over the years 2010 to 2014 amounts to 7.99%, which is consistent with the WTW figure for DHMS average claims increase over the same period of 8.0%.

1.113. In respect of the DH recommendation that an 'outside the GLM' adjustment for plan mix be applied to the CCHMI claims increases because the CCHMI methodologies understate medical inflation, we would argue that the DH approach overstates medical inflation by providing a measure of the medical scheme contribution increases for only a portion of the membership, namely those members remaining on the same benefit option from one year to the next. Including the members who change options each year into the measure reduces the medical scheme contribution increase figure closer to that of the average claims increases calculated by the HMI. We would further add that:

1.113.1. Such an 'outside model' adjustment may harm the credibility of the results. We set out to model all of the effects in one model to allow for potential interactions between them, and to apply an outside model adjustment runs counter to that principle;

1.113.2. The DH approach is designed for the pricing process, which is prospective and relies on assumed patterns of member movement, whereas the HMI approach is retrospective and incorporates subsequent information about the exact member profile changes on options over time (whereas the DH approach assumes, reasonably when pricing, that the risk profile of options remains consistent over time);

1.113.3. The DH approach, although manageable within a single scheme, becomes complex and unwieldy when large numbers of options are analysed (especially if those options are small and claims patterns inconsistent); and

1.113.4. The HMI acknowledges and underlines that its purpose is that of assessing drivers of expenditure and not determining pricing for membership.

2010 Data

1.114. A number of inconsistencies in the 2010 data and the trends from 2010 to 2011 have been noted across the various analyses performed by WTW for the HMI, and these are noted in

the relevant reports. In addition to this, a specific issue was noted by the experts who entered the data room around option changes in the 2010 dataset, which cannot be defined (and have all been set to 'No') since 2009 data is not available to the HMI. DH, when testing the HMI against its own data and methodologies, noted that it found the largest discrepancies in the oldest data, specifically the 2010 to 2011 figures. This was specifically in respect of the cost per admission model, where the DH and HMI figures differed. This led to DH making a recommendation that the HMI consider excluding 2010 data and the consequent trends, from its overall analysis figures.

1.115. We note that:

1.115.1. The HMI requested five full years of data, which equates to four trend years, and removing one year of data implies a loss of 25% of the historical trend data;

1.115.2. The issues appear to be more concentrated in the Discovery data, with the notable step changes from 2010 to 2011 being concentrated in the Discovery data; and

1.115.3. The issue of option changes and member movements is a potentially material one, but as outlined above, the member movement variable has been more severely impacted by joiners and leavers (incomplete exposures) than option changes, and the 2010 step change noted by the experts appears to relate to this (as shown in the technical annexure, it is no longer present when the model is adjusted for exposure).

1.116. We therefore see no reason to exclude 2010 data, and have noted the step change in the appropriate section of the facilities report where it is most noticeable. Further investigations have not revealed what the likely cause of the step change in the Discovery data is. As we continue if we are able to assess this and redress it the HMI will do so but it did not deem it appropriate to delay publication of the report for this reason.