

# ST. JOHN'S COLLOQUIUM

JUNE 27-29, 2016



Understanding the Impact of Health Assessments on  
Customer Behaviour and Private Medical Insurance  
claims for a UK Healthcare Provider

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# Key Premise / Hypothesis

Bupa's purpose is helping people live "Longer, Healthier, Happier Lives."

"We do this by providing a broad range of healthcare services, support and advice to people throughout their lives."

Amongst Bupa's services in the UK are Private Medical Insurance (PMI) and Health Assessments (HA) via Bupa Clinics. The HA is frequently included by companies as an employee benefit to their staff.

We sought to understand the claiming behaviour of PMI customers both before and after a Bupa Health Assessment. We also sought some evidence that the HA was contributing to them leading healthier and eventually longer lives.

Customers enrol for each proposition separately although there are many common customers. Separate databases are maintained and data protection ensures anonymity of each database. The study focused on UK Corporate customers who offered both Bupa PMI and Bupa HA as employee benefits. We are unable to identify customers where PMI and/or HA is offered through other providers.

The study linked anonymised PMI claims information pre and post HA to anonymised data gathered at the HA. PMI information was based on incurred claims; HA data was gathered via questionnaire and empirical medical measurement. A control group of PMI customers who did not have HA was used to inform conclusions albeit that some of these customers may have undergone HA via other providers.

# CONTENTS

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1) Claims behaviour for members with HA vs members without HA

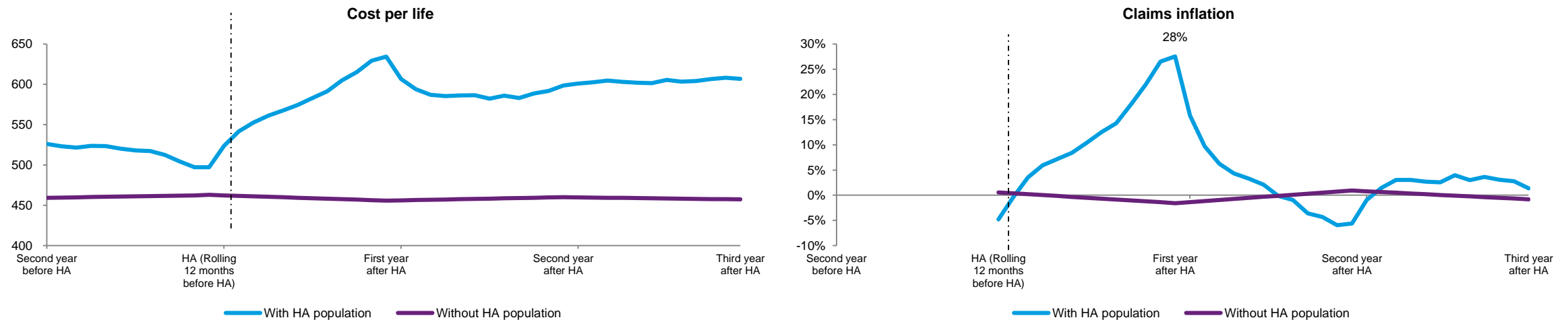
2) Can the HA Results Analyse Help Predict Future Claims?

3) Does Health Change between 1<sup>st</sup> and 2<sup>nd</sup> HA?

4) Claims spend for members with Health Change between 1<sup>st</sup> and 2<sup>nd</sup> HA.

Appendix:  
Data Summary,  
Methodology &  
Limitations

# Claims for Members WITH HA vs Members WITHOUT HA



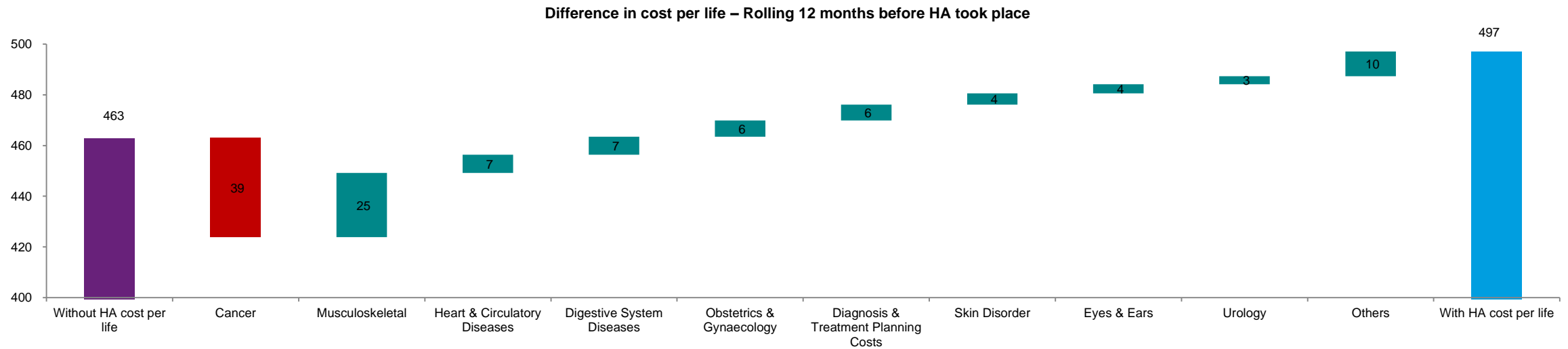
*The diagrams show the cost per life and claims inflation for the members who completed one or more health assessments (HA), using elapsed duration since the HA as x-axis.*

## Observations:

- 1) The population with HA had a higher cost per life than the population without HA before the HA took place.*
- 2) The cost per life increases in the 12 months following the HA (28% claims inflation).*
- 3) Costs remain relatively stable beyond 12 months albeit at a higher absolute level than for the without HA group.*



# Cost per Life : Population WITH HA vs Population WITHOUT HA (PRIOR TO the HA)

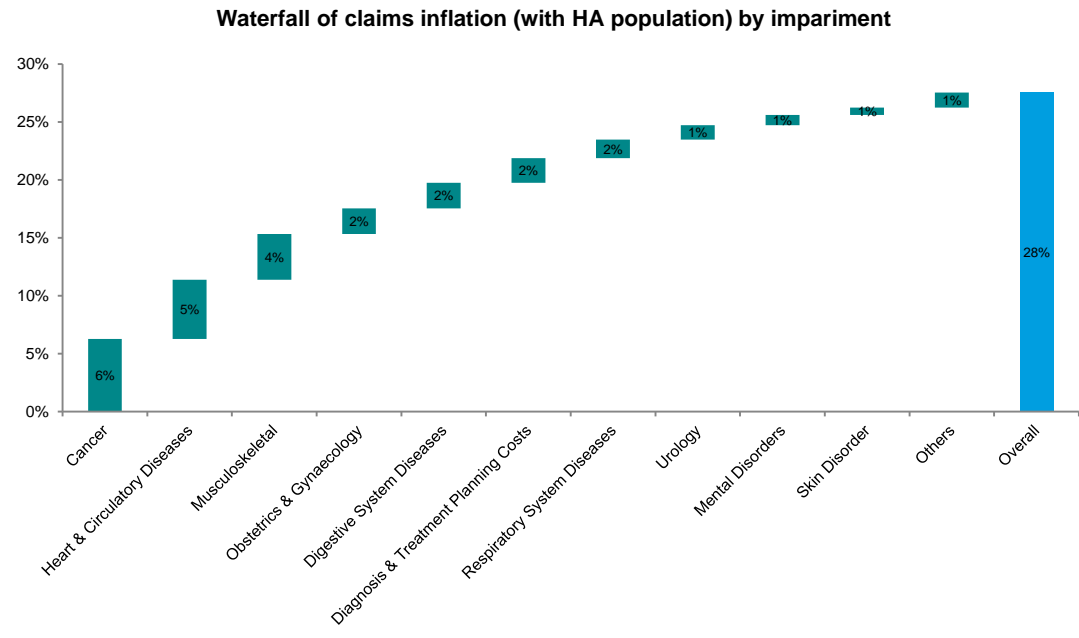
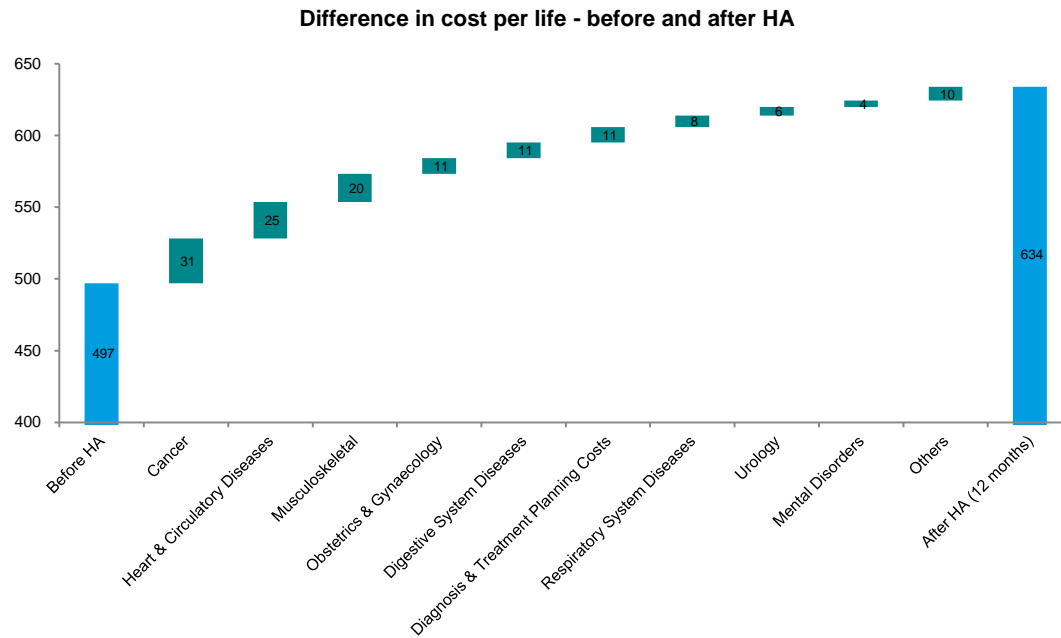


The diagram shows differences in cost per life for the respective groups without HA and with HA prior to the HA occurring.

## Observations:

- 1) The cost per life for the population without HA is £34 (about 8%) lower than that for the HA population PRIOR to HA.
- 2) This suggests that people who subsequently took the HA were inherently in poorer health.
- 3) The CANCER cost per life for population with HA is £39 lower than the cancer cost per life for population without HA. This suggests that people already with cancer conditions are less likely to undergo HA.
- 4) The cost per life for ALL OTHER impairments (Musculoskeletal (MSK), heart & circulatory disease, digestive system diseases, etc) are higher for the population with HA.

# Drivers of the Increase in Cost per Life in 12 months POST the HA

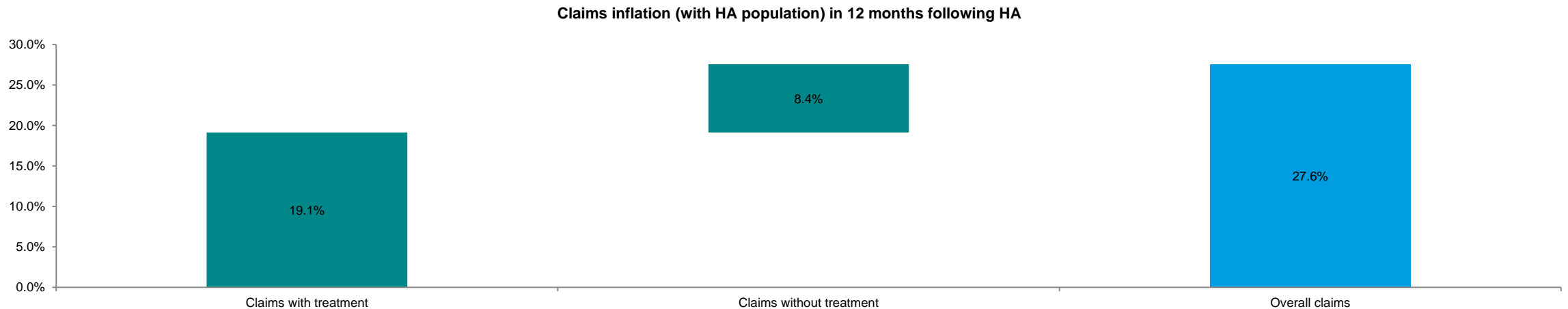


*The diagrams show the differences in cost per life on a rolling 12 months basis before HA took place and rolling 12 months basis after the HA (for the population that underwent HA.)*

## Observations:

- 1) The cost per life is £137 (28%) higher. This suggests that more claims are incurred following HA.*
- 2) The biggest change is the cancer cost per life, it has increased by £31 following HA. There are also significant increases in the heart & circulatory diseases (£25 higher) and MSK (£20 higher).*
- 3) These impairments combined drive over half (£76 of £137) of the increase.*

# Does the HA Drive Treatment or Simply Further Diagnostics?



***The claims inflation is 28% in the 12 months following HA of which 19% relates to actual treatment.***

## Methodology:

For each claims event, we have data on the procedures. We have classified the claims event into “claims with treatment” or “claims without treatment” depending on whether there were any treatment procedures within the claims pathway. A claim event with consultations and scans only is classified as “claims without treatment”.

The following procedures are classed as treatment procedures:

1) Accommodation (2) Consumables and prosthetics (3) Drugs (4) Non-surgical therapies (5) Pregnancy and delivery\* (6) Radiotherapy (7) Surgery

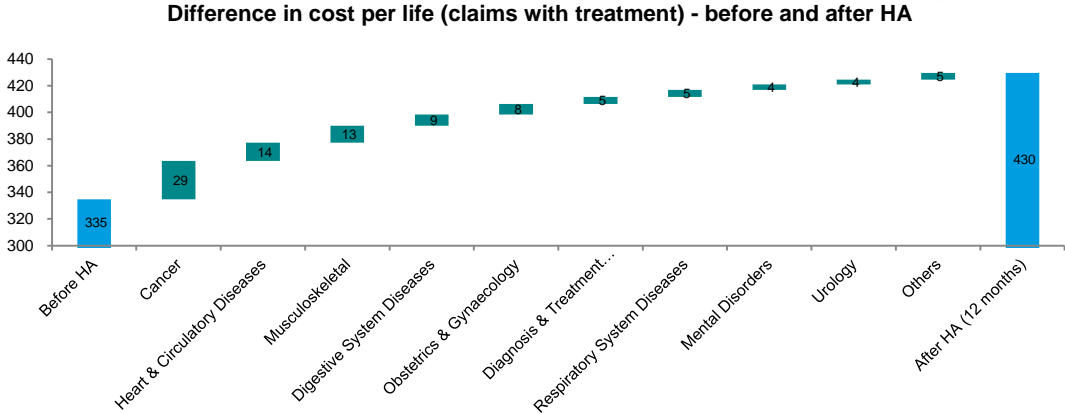
## Observations:

- 1) Most of the claims inflation arises from “claims with treatment”. This suggests that the HA has identified a need for further medical intervention. Further data and investigation would be required to identify any downstream savings.***
- 2) There is also an increase in “claims without treatment”. This suggests that further medical investigation was required following the HA. Future research could be done to establish whether any of this was duplication of HA investigations.***

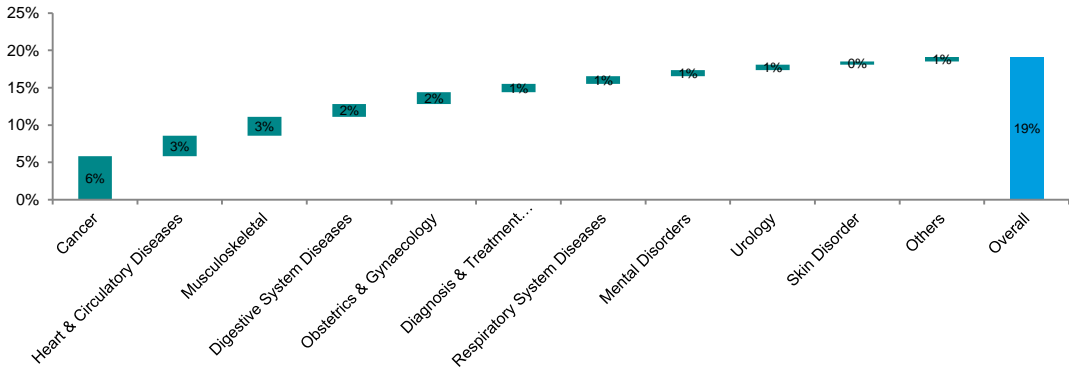
*\* Although theoretically pregnancy could be excluded from the analysis as an event independent of the HA, this was not done.*

# Claims Inflation by Impairment – With vs Without Treatment

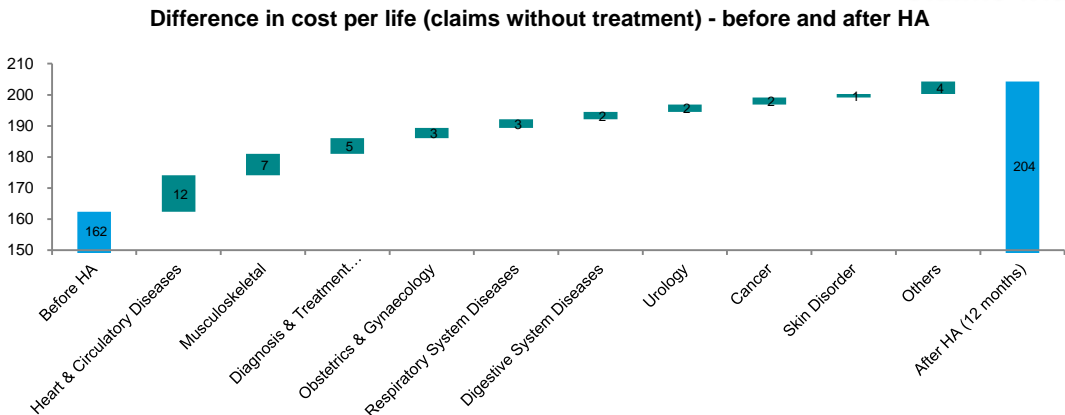
Claims with treatment



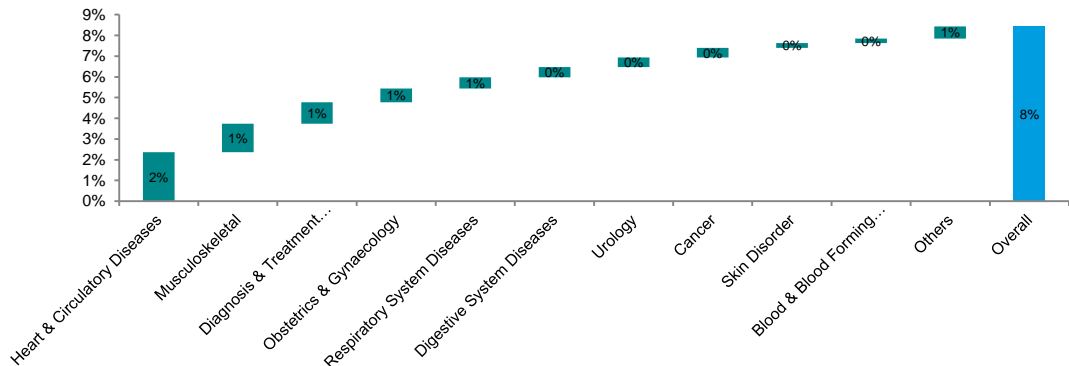
Waterfall of claims with treatment inflation (with HA population) by impairment



Claims without treatment



Waterfall of claims without treatment inflation (with HA population) by impairment

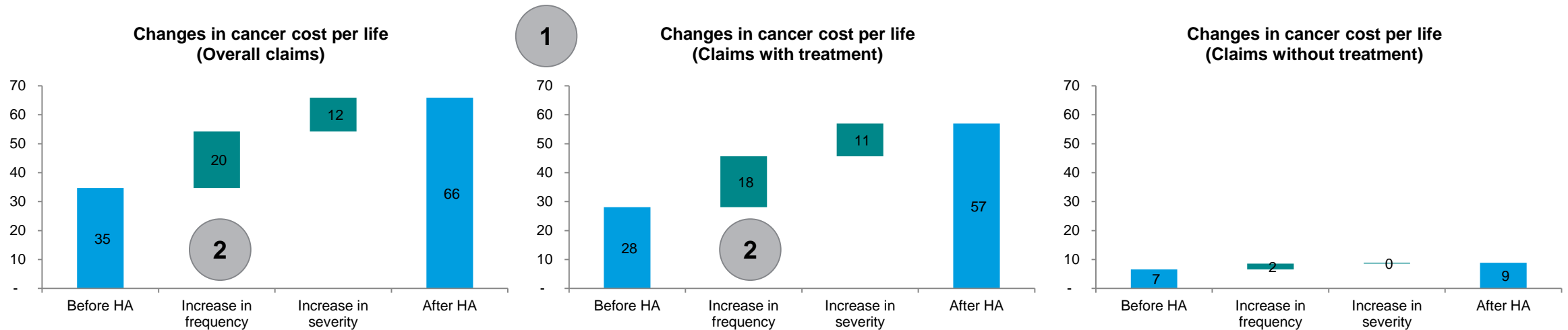


The diagrams illustrate differences in cost per life / drivers of inflation by impairment post HA, for “claims with/without treatment”

The top three impairments for “claims with treatment” are: 1) Cancer 2) Heart & circulatory diseases 3) MSK  
 The top three impairments for “claims without treatment” are: 1) Heart & circulatory diseases 2) MSK 3) Diagnosis



# Increase in Cost per Life – CANCER



**The biggest driver of the increase in cost per life following HA is Cancer (increase by £31 following HA).**

The diagrams analyse this increase by frequency and severity overall and for claims with/ without treatment.

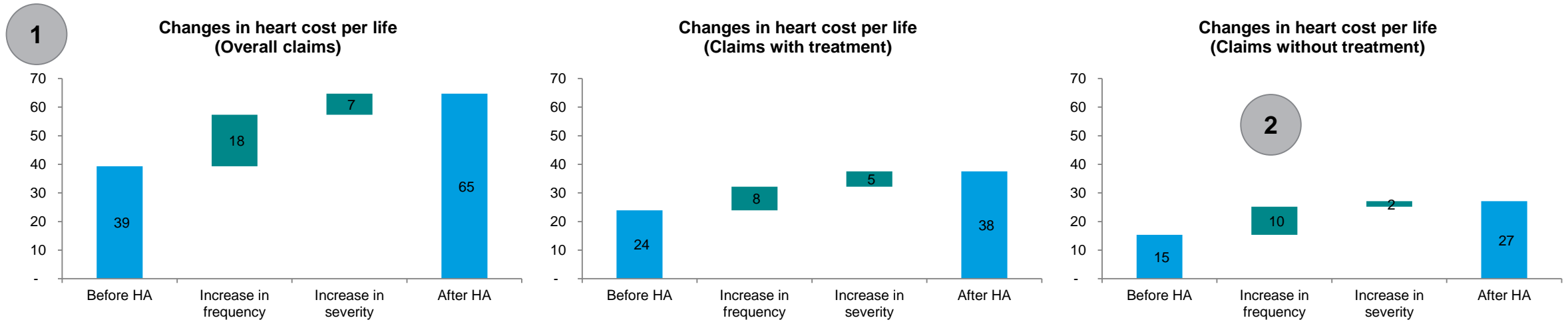
## Observations:

**Of the £31 increase in cancer cost per life:**

**1) £29 is driven by “claims with treatment”.**

**2) £20 is driven by increase in frequency for overall claims and £18 is driven by increase in frequency for “claims with treatment”.**

# Increase in cost per life – HEART & CIRCULATORY



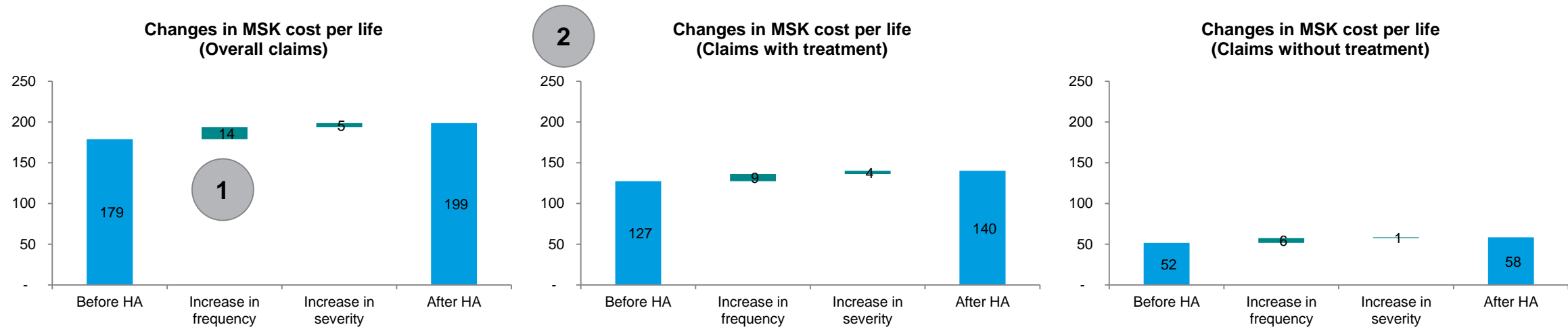
*The 2<sup>nd</sup> biggest driver of the increase in cost per life following HA is heart & circulatory disease (increase by £25 following HA).*

## Observations:

*Of the £25 increase in heart & circulatory cost per life:*

- 1) £18 is driven by increase in frequency for overall claims.*
- 2) £10 is driven by increase in frequency for “claims without treatment”. Note that before HA, the cost per life for claims without treatment before HA was £15.*

# Increase in cost per life – MSK SPECIFIC



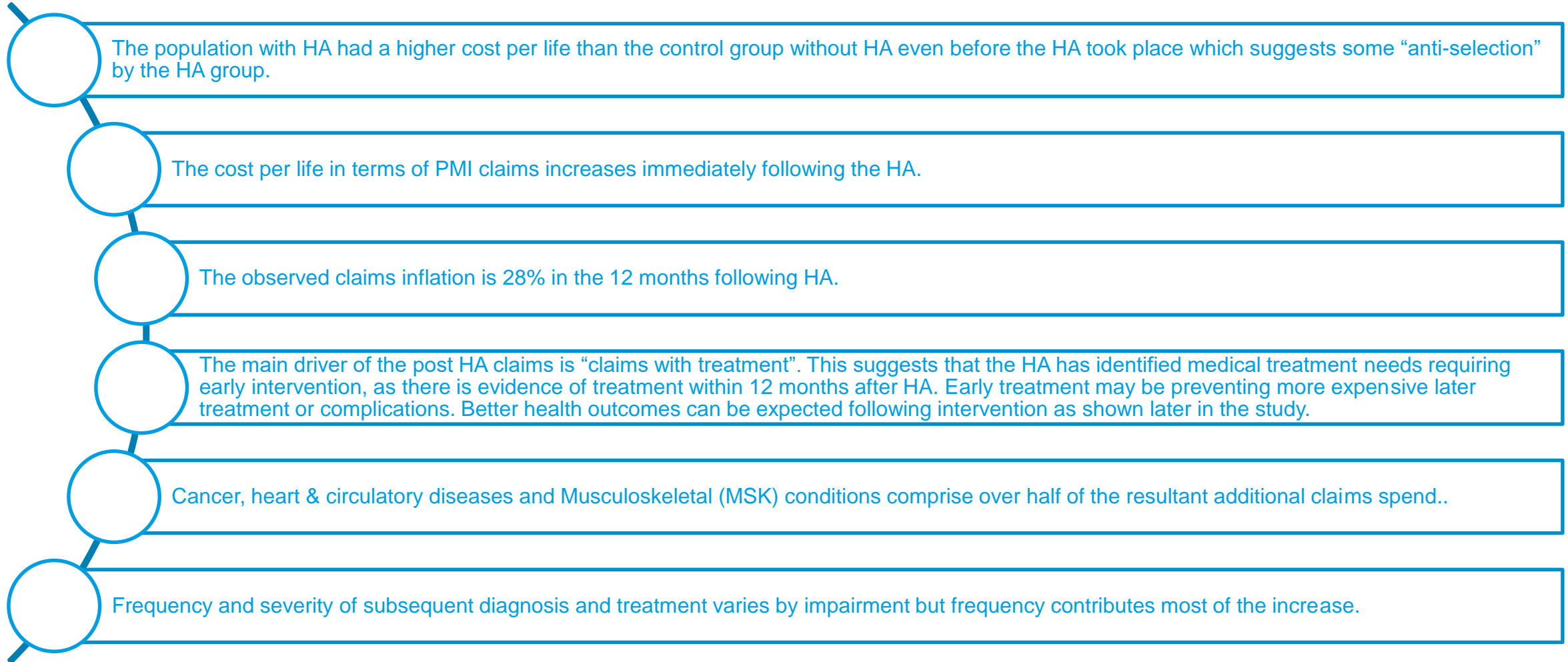
The 3<sup>rd</sup> largest driver of the increase in cost per life following HA is MSK (increase by £20 following HA).

Observations:

Of the £20 increase in MSK cost per life:

- 1) £14 is driven by increase in frequency for overall claims.
- 2) £13 is driven by “claims with treatment”.

# Key Observations – CLAIMS BEHAVIOUR



# CONTENTS

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2) Can the HA Results Analyse Help Predict Future Claims?

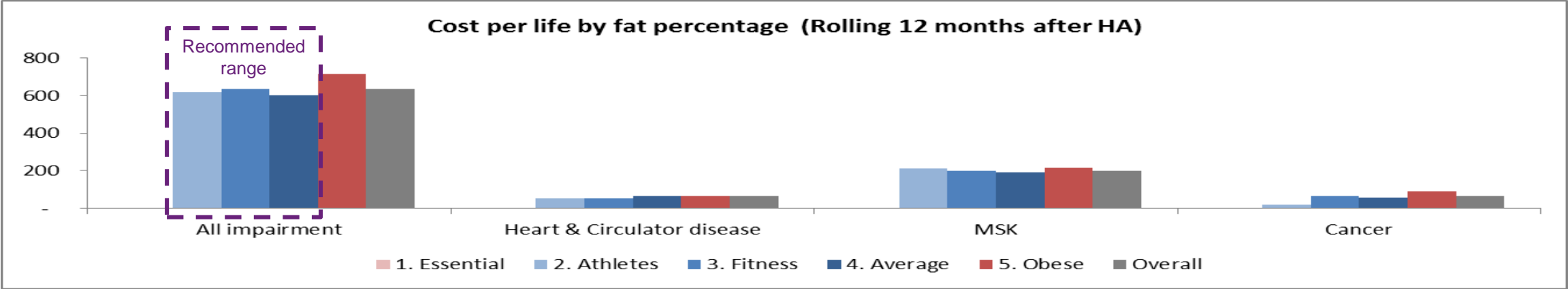
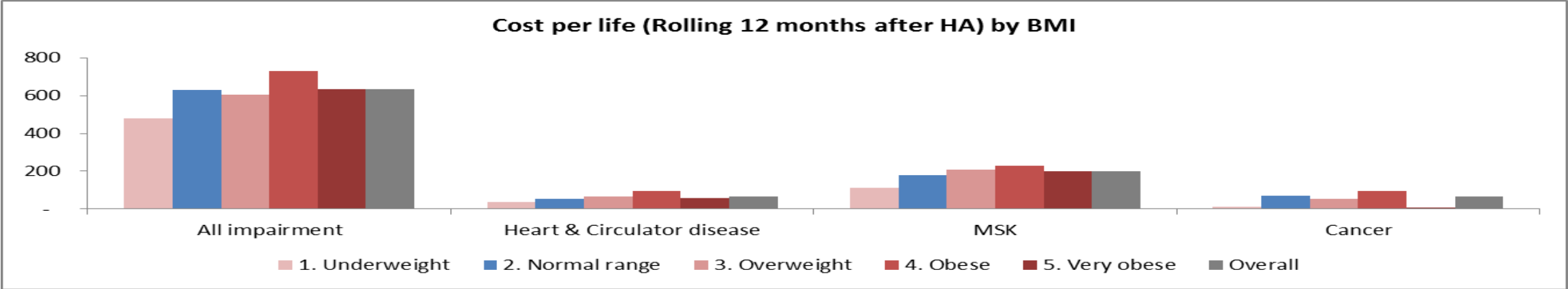
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Limitations



# BMI and Fat % Measured at HA vs Claims by Impairment POST HA

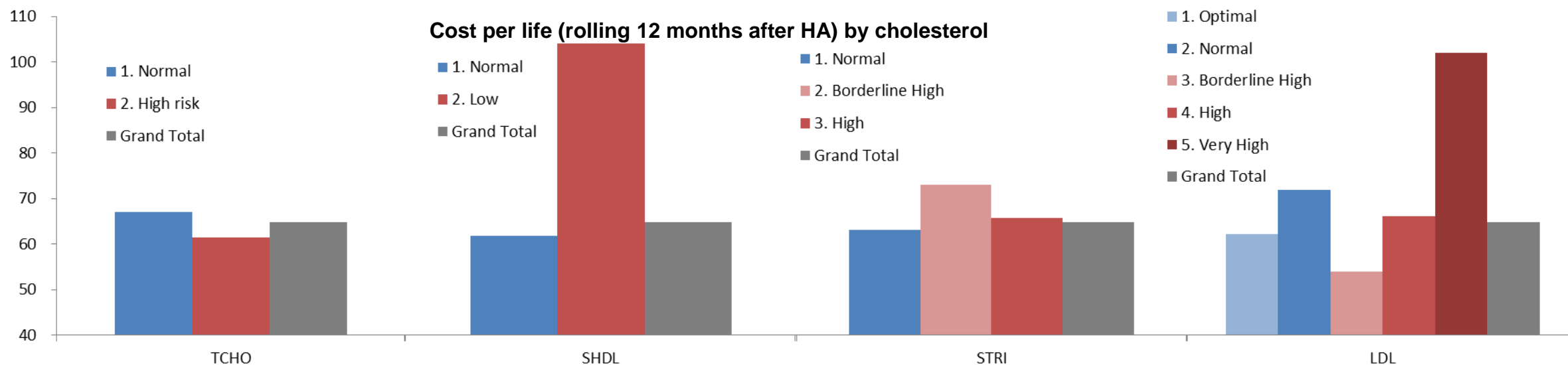


The classification of BMI is based on the definitions established by the World Health Organization (WHO).

The classification of body fat percentage by gender is derived from the American Council on Exercise. The recommended ranges for body fat percentage are: “2. Athletes”, “3. Fitness” and “4. Average”.

**The cost per life increases as BMI increases for heart and MSK related claims.**

# Cholesterol Measured at HA vs Heart & Circulatory Claims POST HA



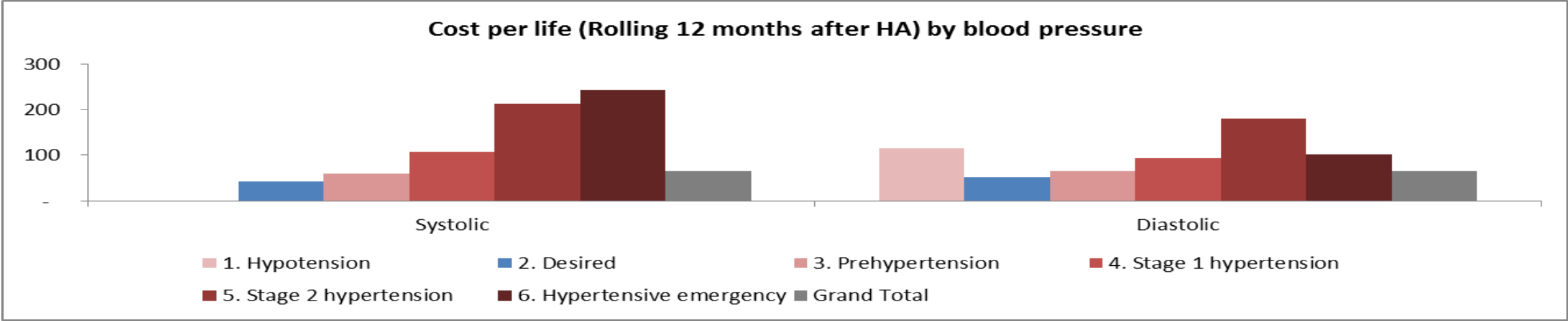
**The diagram shows the cost per life for heart related claims by cholesterol.**

- TCHO: A simplistic view of looking at cholesterol at a whole. (Test now outdated but useful historically)
- High-density lipoprotein (SHDL) is also referred to as “good cholesterol”. (Remove lipid molecules from the wall of arteries)
- Triglyceride (STRI) is an ester derived from glycerol and three fatty acids, the main constituents of body fat.
- Low-density lipoprotein (LDL) is also referred to as “bad cholesterol”. (Transport the content of lipid molecules into artery walls).

For cost reasons, usually only the total (TCHO), HDL and triglycerides are measured. We have estimated VLDL as one fifth of the triglycerides and estimated LDL using Friedewald formula. (However, based on recent study, the formula may have underestimated the LDL. )

**The heart and circulatory cost per life is significantly higher for the members with very high LDL and with low SHDL.**

# Blood Pressure Measured at HA vs Heart & Circulatory Claims POST HA



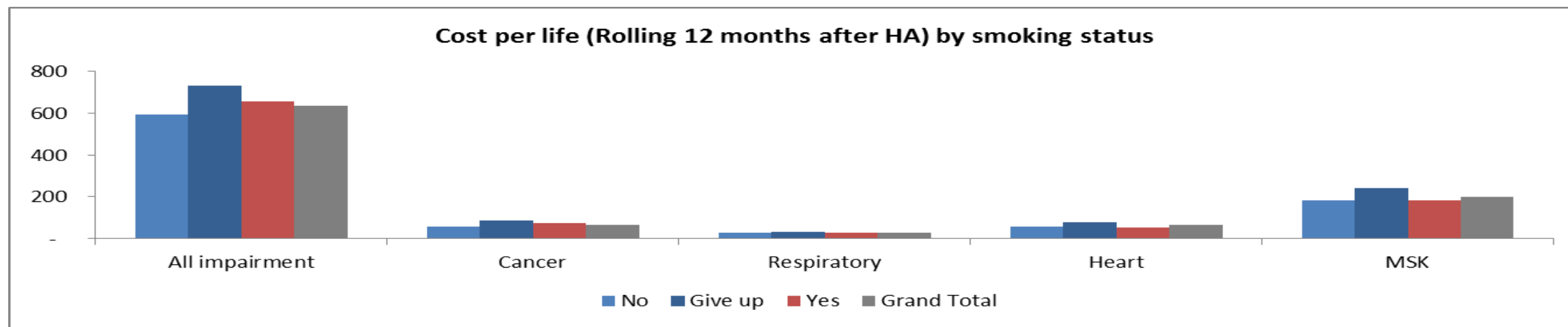
*The diagram shows the cost per life for heart related claims by blood pressure. Blood pressure is expressed in terms of the systolic (maximum pressure) over diastolic (minimum).*

The classification of blood pressure is based on the American Heart Association guidelines for adults who are 18 years and older.

Various factors, such as age and gender, influence a person’s blood pressure and variations. As adults age, systolic pressure tends to rise and diastolic tends to fall. In the elderly, systolic blood pressure tends to be above the normal adult range, thought to be largely because of reduced flexibility of the arteries. Also, an individual’s blood pressure varies with exercise, emotional reactions, sleep, digestion and time of day.

*The heart and circulatory cost per life increases as blood pressure (both systolic and diastolic) increases.*

## Smoking Status Declared at HA vs Claims by Impairment POST HA



*The diagram shows the cost per life for various impairments by declared smoking status.*

There are three types of status: 1) Non-smoker 2) No longer smoke (have given up) 3) Smoker

This question is part of the health assessment questionnaire, answered by the member before their health assessment.

*The members who appeared to be “Non-smoker” have the lowest cost per life amongst the three status, for all impairments, cancer claims and respiratory claims.*

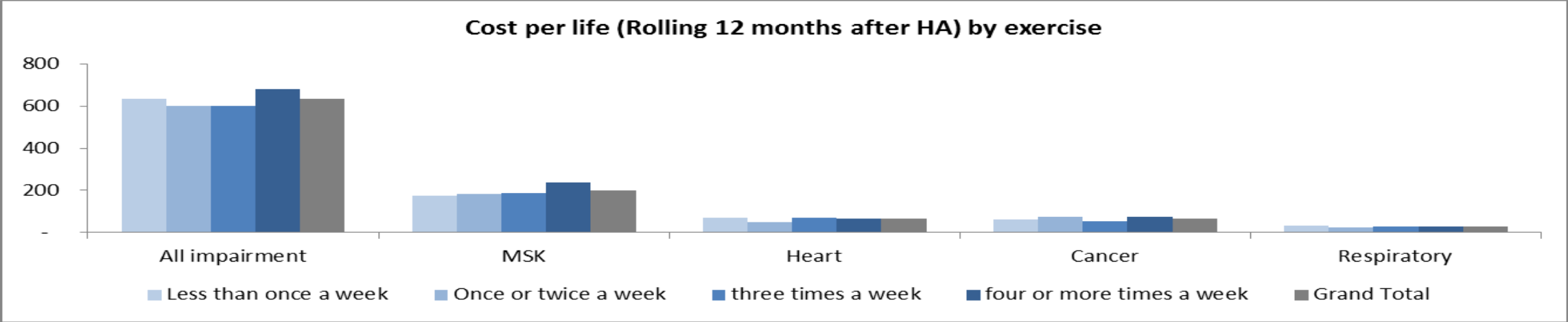
*Interestingly, there appears to be very little difference in the costs of Smokers vs Non-Smokers for Heart, Respiratory and MSK*

*The members who declared “No longer smoke (have given up)” have the highest cost per life for all impairments, cancer claims, respiratory claims and heart and circulatory claims.*

The HA does not gather information about the reasons for giving up smoking and one could speculate that this was due to impaired health.

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# Amount of Exercise Declared at HA vs Claims by Impairment POST HA



*The diagram shows the cost per life for various impairment by the amount of exercise per week.*

There are four options: 1) Less than once a week 2) Once or twice a week 3) Three times a week 4) Four or more times a week

This question is part of the health assessment questionnaire, answered by the member before their health assessment.

*The members who appeared to exercise the most have the highest cost per life in aggregate, primarily as a result of MSK claims.*

*The members who appeared to exercise the least have high cost per life in aggregate, but the lowest cost per life that are related to MSK.*

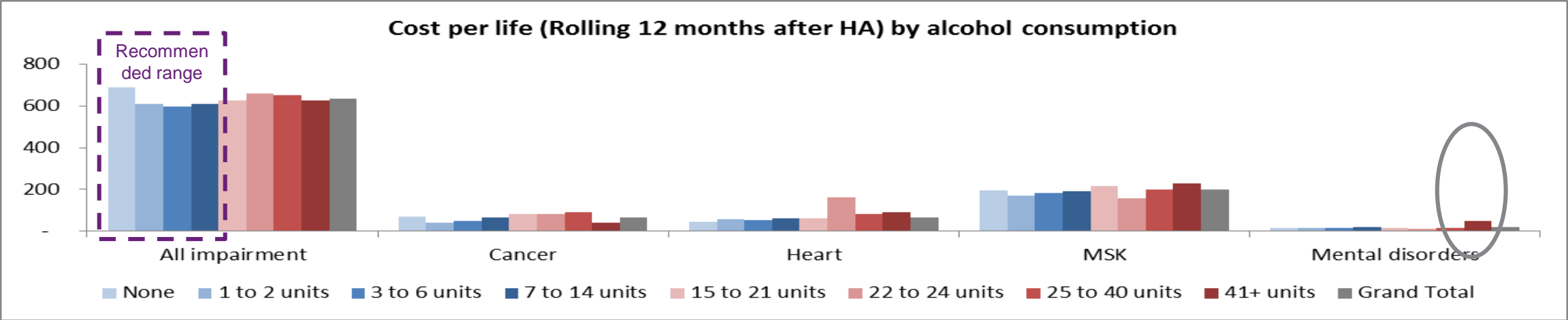
*The MSK cost per life increases when the amount of exercise increases.*

*Surprisingly, heart & circulatory claims levels seem relatively independent of exercise levels.*

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# Alcohol Consumption Declared at HA vs Claims by Impairment POST HA



*The diagram shows the cost per life for various impairment by weekly declared alcohol consumption.*

There are nine options: 1) None 2) Less than 1 unit (not used due to insufficient data) 3) 1 to 2 units 4) 3 to 6 units 5) 7 to 14 units 6) 15 to 21 units 7) 22 to 24 units 8) 25 to 40 units 9) 41+ units.

This question is part of the health assessment questionnaire, answered by the member before their health assessment.

According to NHS, men and women are advised not to regularly drink more than 14 units a week. 14 units is equivalent to six pints of average strength beer or 10 small glasses of low strength wine.

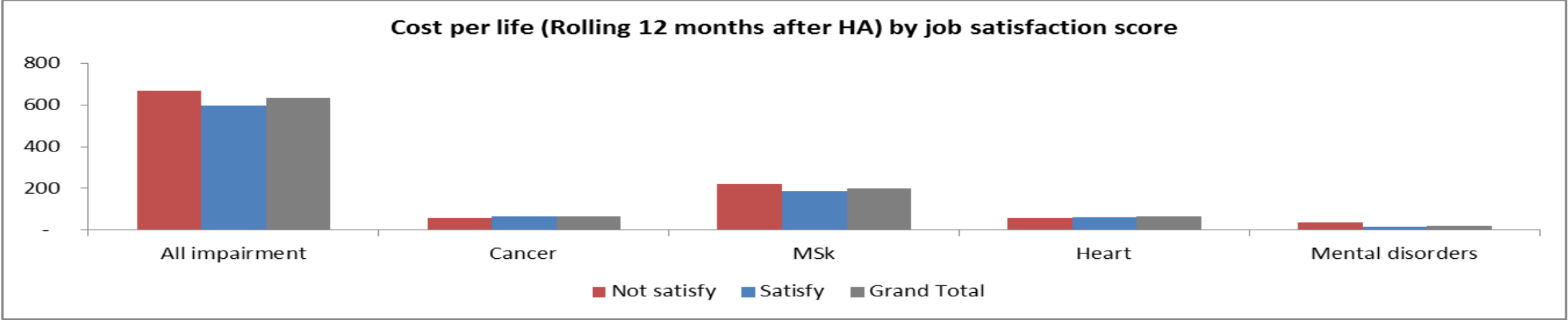
According to Institute of Alcohol Studies, the individual is a “hazardous drinker” if drinking 21 to 50 units a week for men and 14 to 35 units a week for women. The individual is a “harmful drinker” if drink more than 50 units a week for men and 35 units a week for woman.

*The members who claimed zero alcohol have the highest cost per life in aggregate, driven mainly by cancer claims.*

*The members who appeared to consume a lot have high cost per life in aggregate, but lowest cost per life related to MSK.*

*The mental disorder cost per life is much higher for the members who consume more than 41+ units a week.*

# Job Satisfaction Declared at HA vs Claims by Impairment POST HA



*The diagram shows the cost per life for various impairment by job satisfaction.*

There are two options: 1) Not satisfied 2) Satisfied

This question is part of the health assessment questionnaire, answered by the member before their health assessment

*The members who indicated job dissatisfaction have the higher cost per life in aggregate, for MSK and mental disorders.*

# Key Observations – HA RESULTS vs POST HA CLAIMS

HA results are likely to be more predictive of claims than “normal” underwriting as data is either empirically measured or based on Questionnaire where there is no perceived financial incentive to mis-report information.

BMI (and fat percentage although not shown in slides), High Cholesterol and Blood pressure are all predictive of future claims for Heart & Circulatory and BMI is also predictive of future MSK claims.

Former smokers are higher claimers than Smokers or Non-smokers for most impairments; current smokers are not obviously incurring higher future claims for respiratory, heart or MSK conditions although higher for cancer.

Those who exercise most (4x per week) are highest claimers in aggregate, especially for MSK; but moderate exercise means less claims in aggregate than non exercise; heart & circulatory claims appear independent of level of exercise.

Surprisingly, non-drinkers claim the most followed by those drinking 22-24 units per week; UK NHS guidance is a maximum of 14 units per week which is lowest claiming; very heavy alcohol consumption is correlated with higher mental health claims

There is positive correlation between Job satisfaction and lower PMI claims

# CONTENTS

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2) Can the HA Results Analyse Help Predict Future Claims?

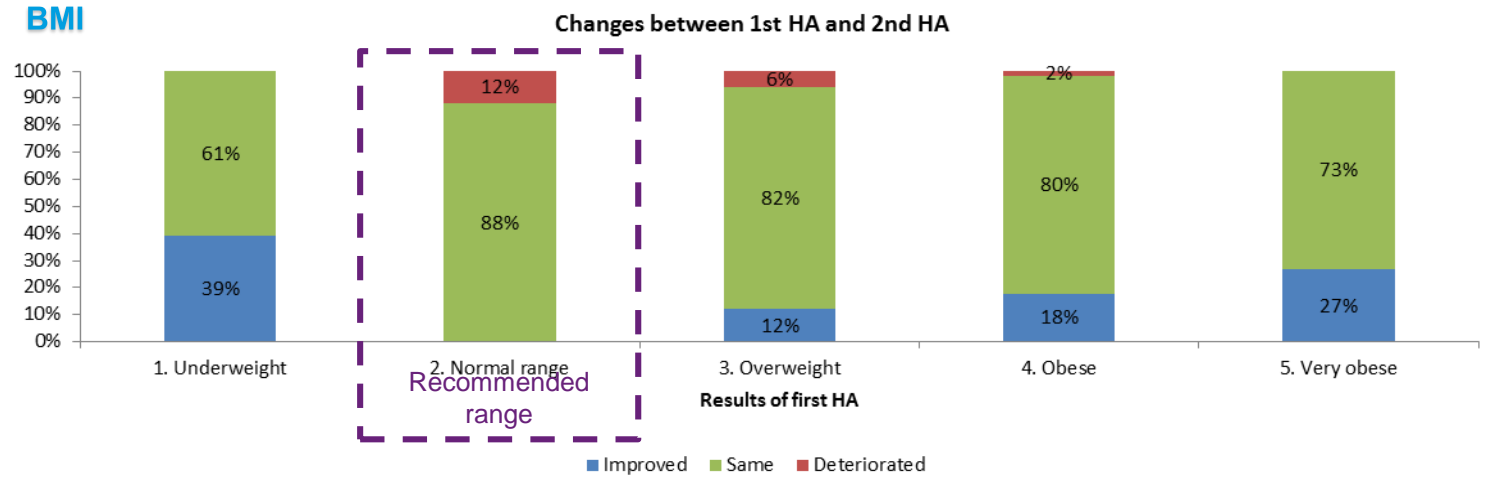
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Appendix:  
Data Summary,  
Methodology &  
Limitations

# Comparing the First and Second HA results – BMI and Fat percentage

## BMI

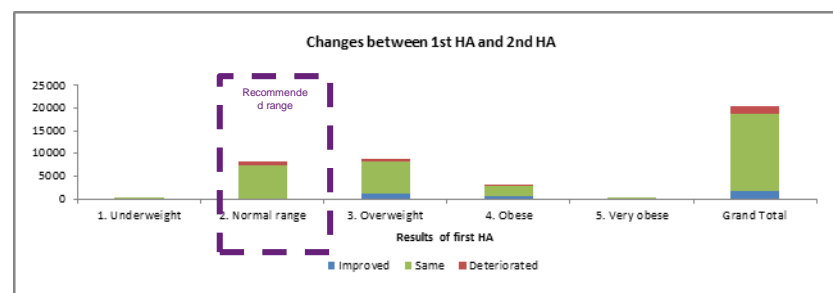


## BMI:

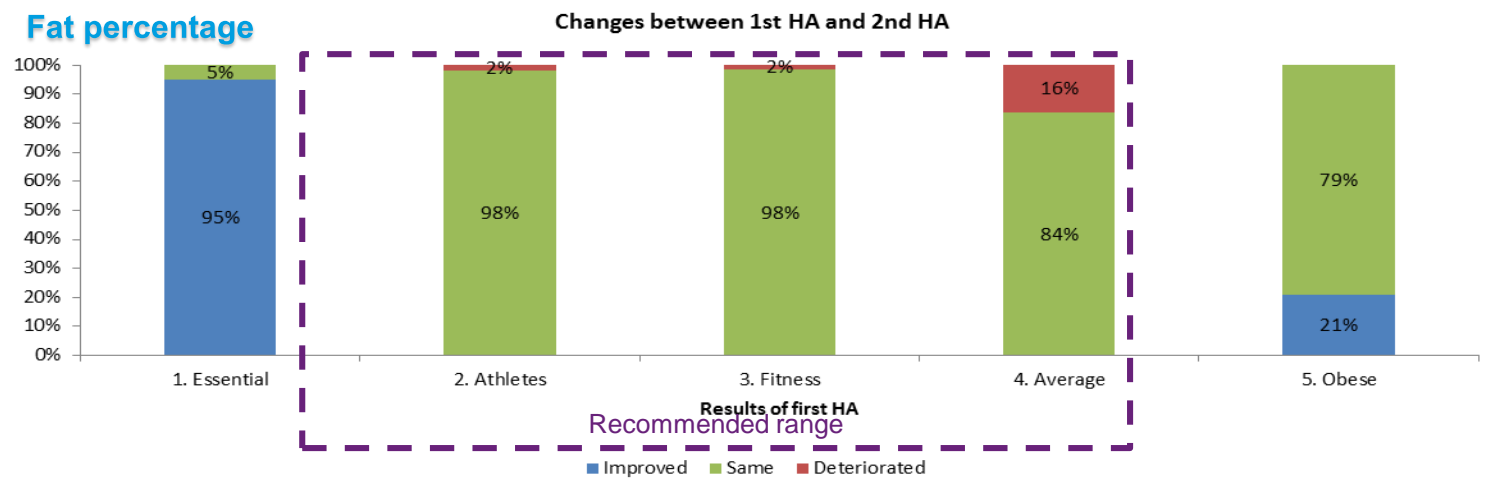
The recommended range is “2. Normal range”.

*Of the members that were outside the recommended range, 14% have improved and 5% have deteriorated.*

There is high volume of members under the recommended range in their 1<sup>st</sup> HA.



## Fat percentage

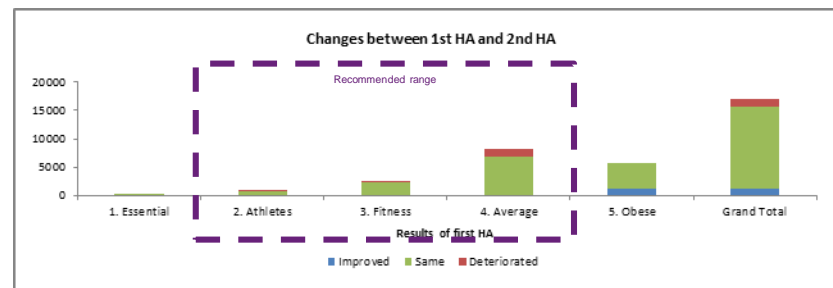


## Body fat percentage:

The recommended ranges are “Athletes”, “Fitness” and “Average”.

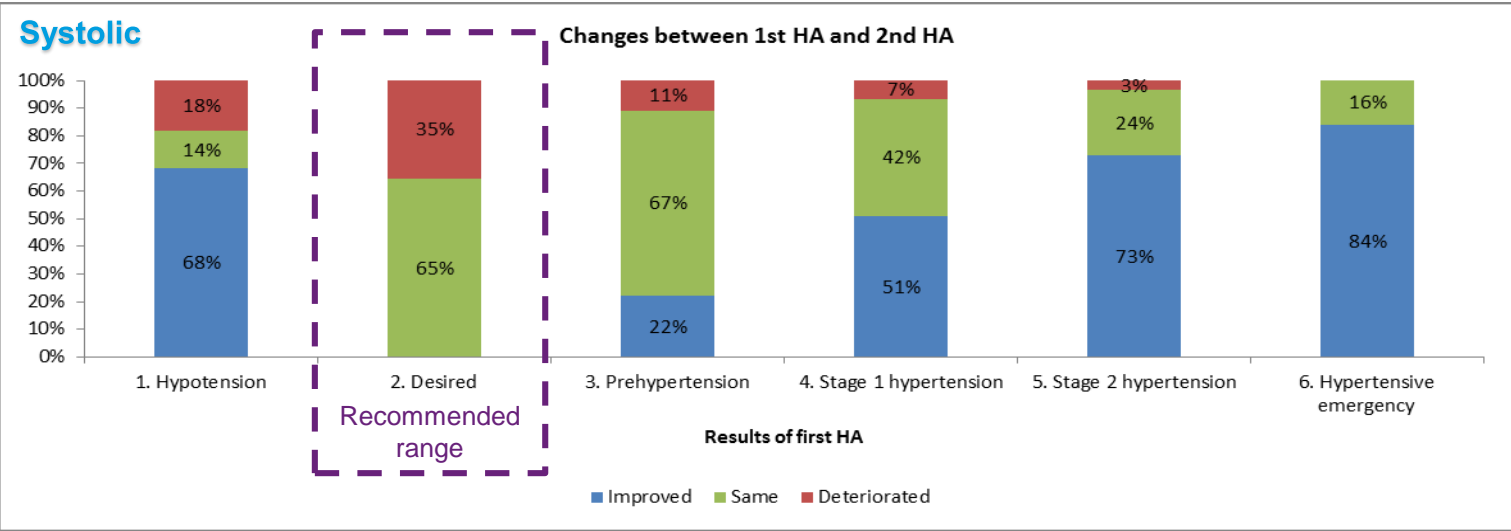
*Of the members that were outside the recommended range, 21% have improved.*

There is high volume of members under the recommended ranges in their 1<sup>st</sup> HA.



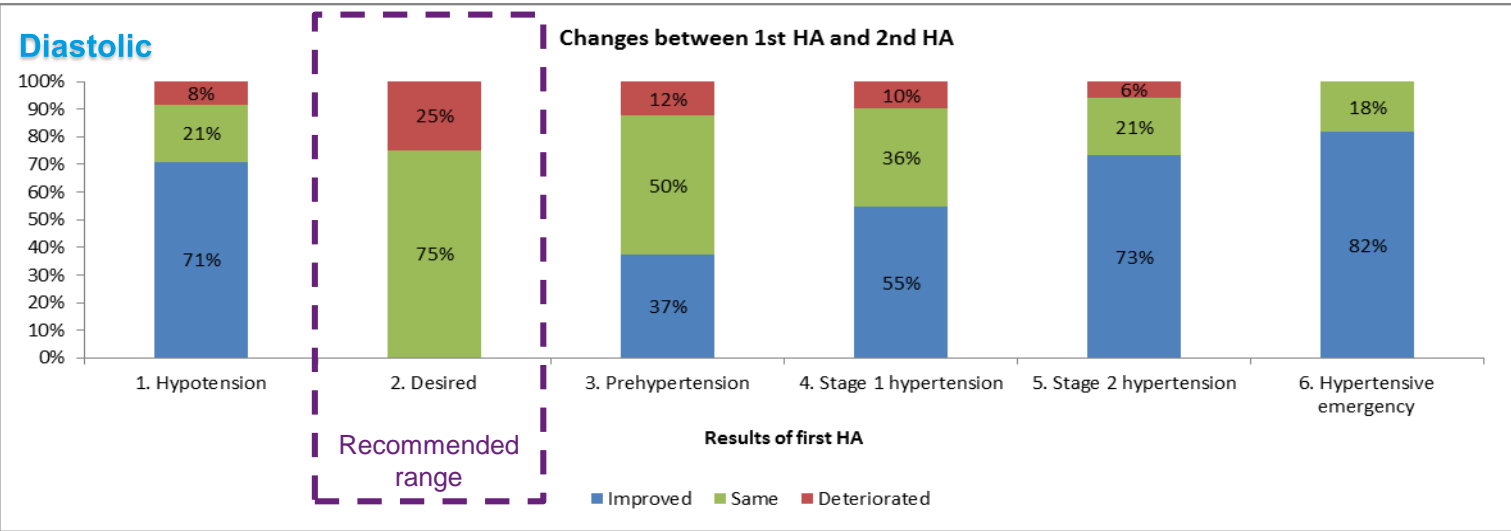
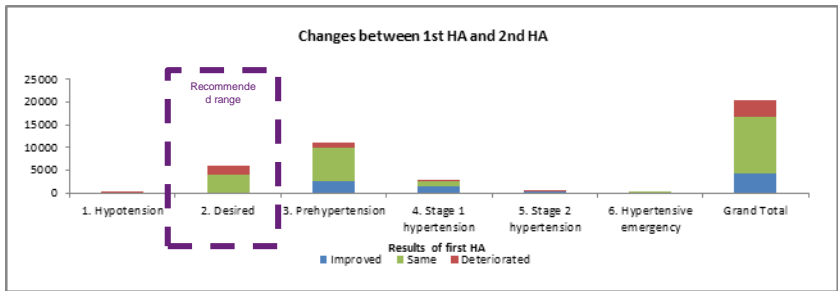


# Comparing the First and Second HA results – Blood pressure (Systolic and Diastolic)



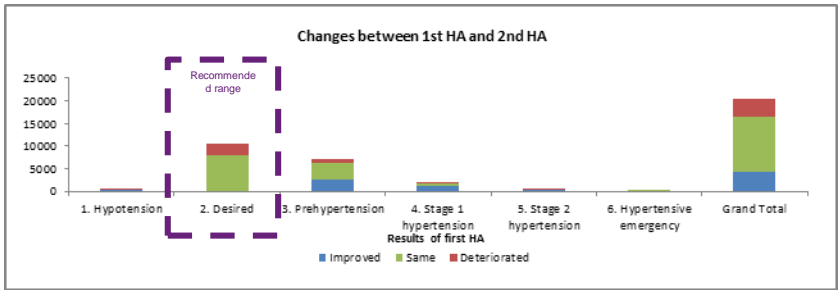
## Systolic:

The recommended range is “2. Desired”.  
Of the members that were outside the recommended range, 29% have improved and 10% have deteriorated.

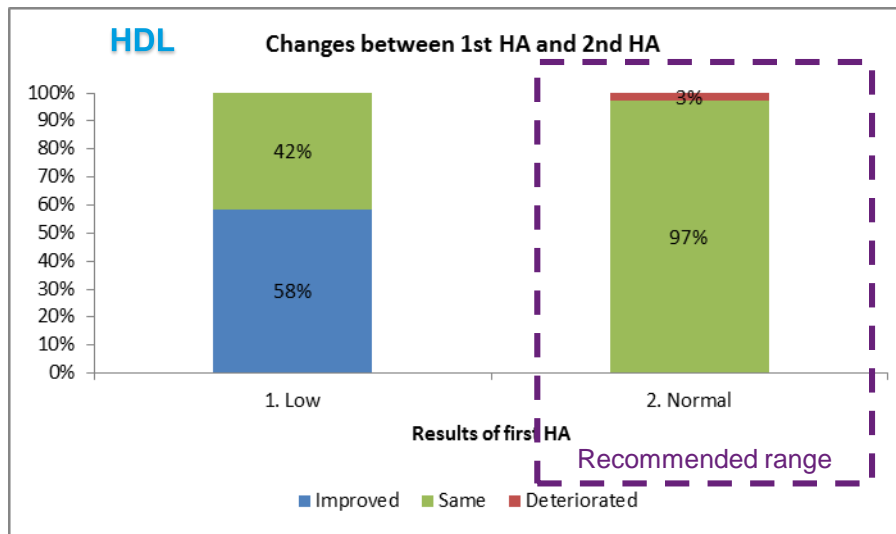
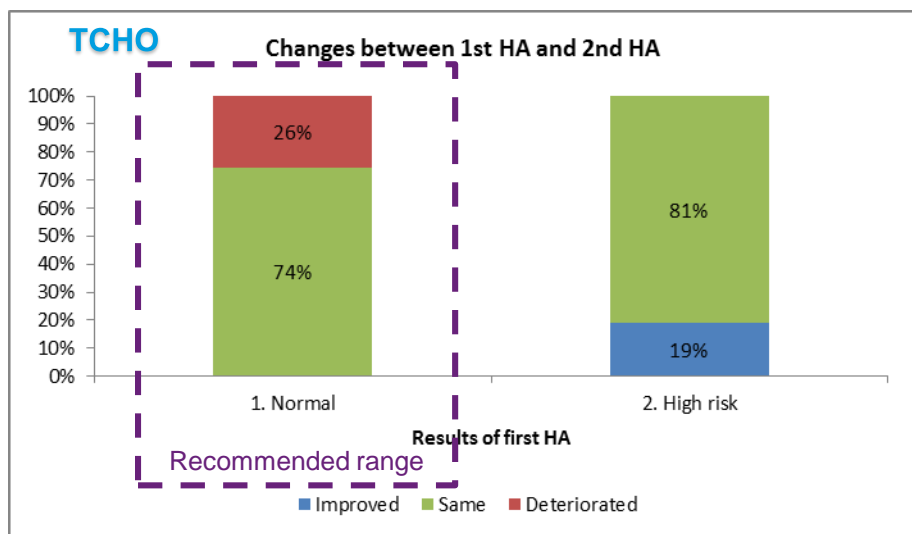


## Diastolic:

The recommended range is “2. Desired”.  
Of the members that were outside the recommended range, 43% have improved and 11% have deteriorated.



# Comparing the First and Second HA results – Cholesterol (TCHO, HDL, TRI, LDL)

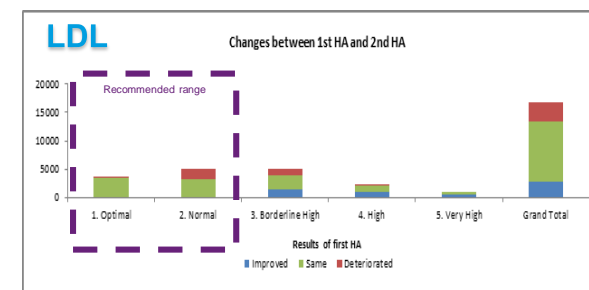
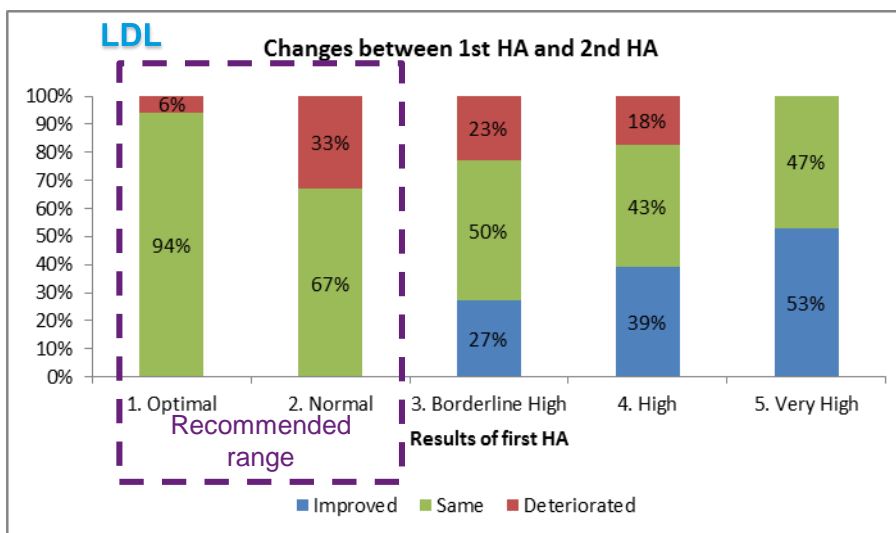
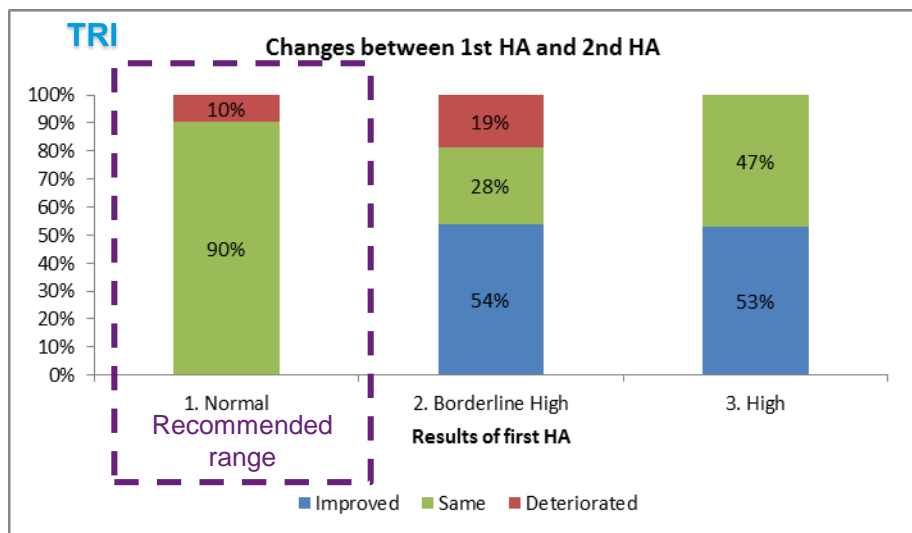


## Cholesterol

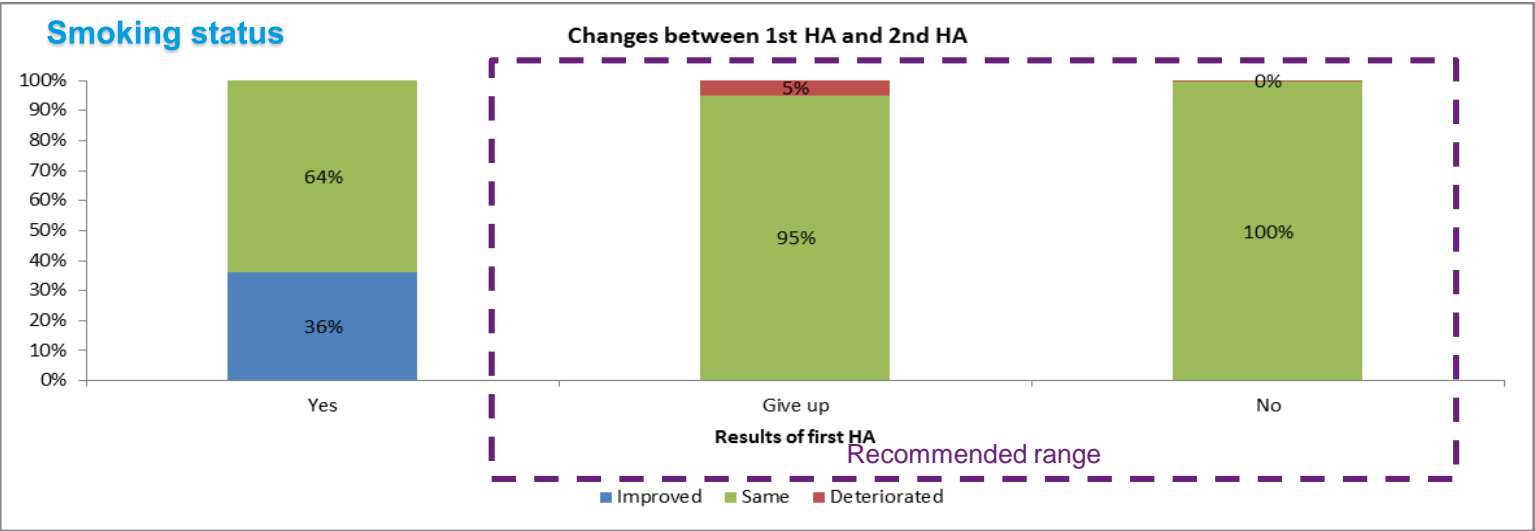
The recommended ranges for each type of cholesterol are as follow:

- Total cholesterol (TCHO) – “1. Normal”;
- High-density lipoprotein (HDL) – “2. Normal”;
- Triglyceride (TRI) – “1. Normal”;
- Low-density lipoprotein (LDL) – “1. Optimal” and “2. Normal”.

There is high volume of members under the recommended range for all types of cholesterol in their 1<sup>st</sup> HA, for instance LDL (see below).



# Comparing the First and Second HA results – Smoking status and Alcohol Consumption

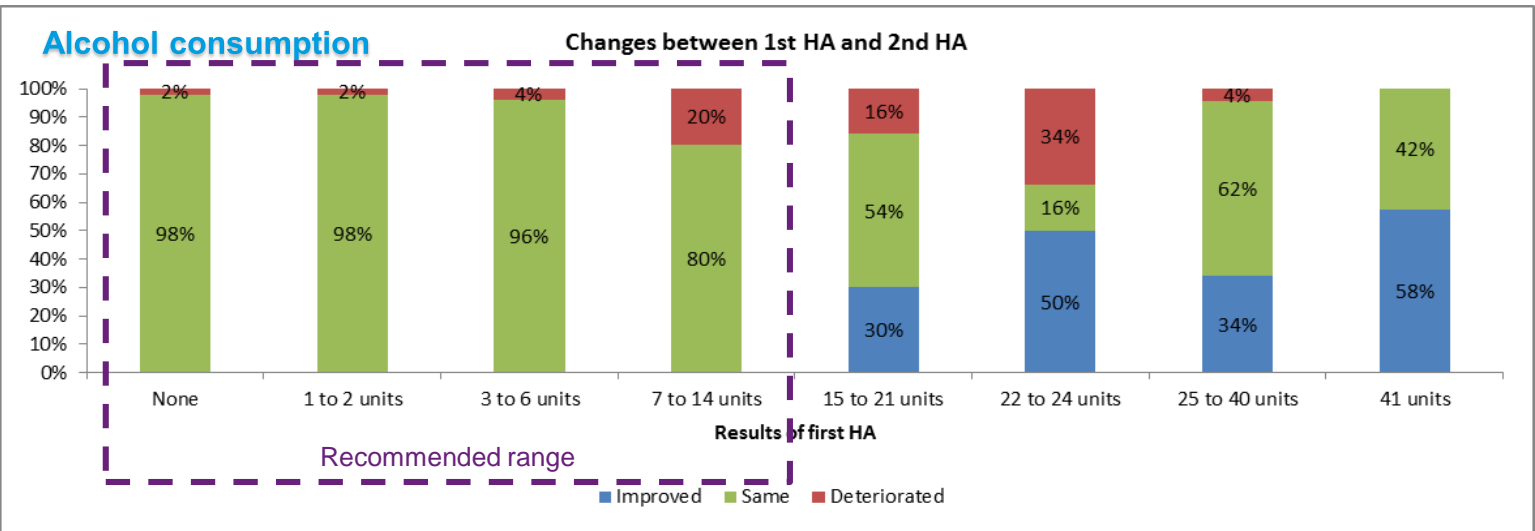


## Smoking status:

The recommended ranges are “No” and “Give up”..

**Of the members that were outside the recommended range, 36% have improved.**

There is high volume of members under the recommended ranges in their 1<sup>st</sup> HA.

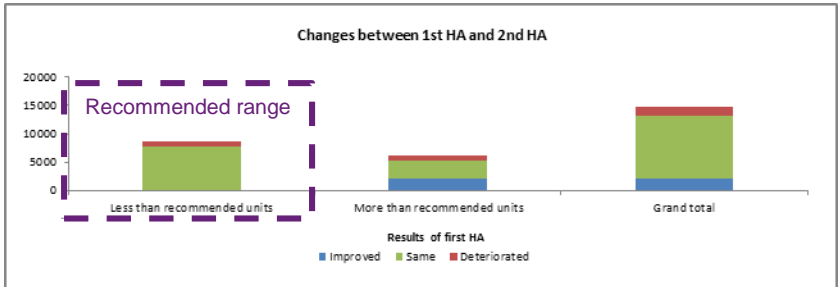


## Alcohol consumption

The recommended ranges are less than 14 units a week.

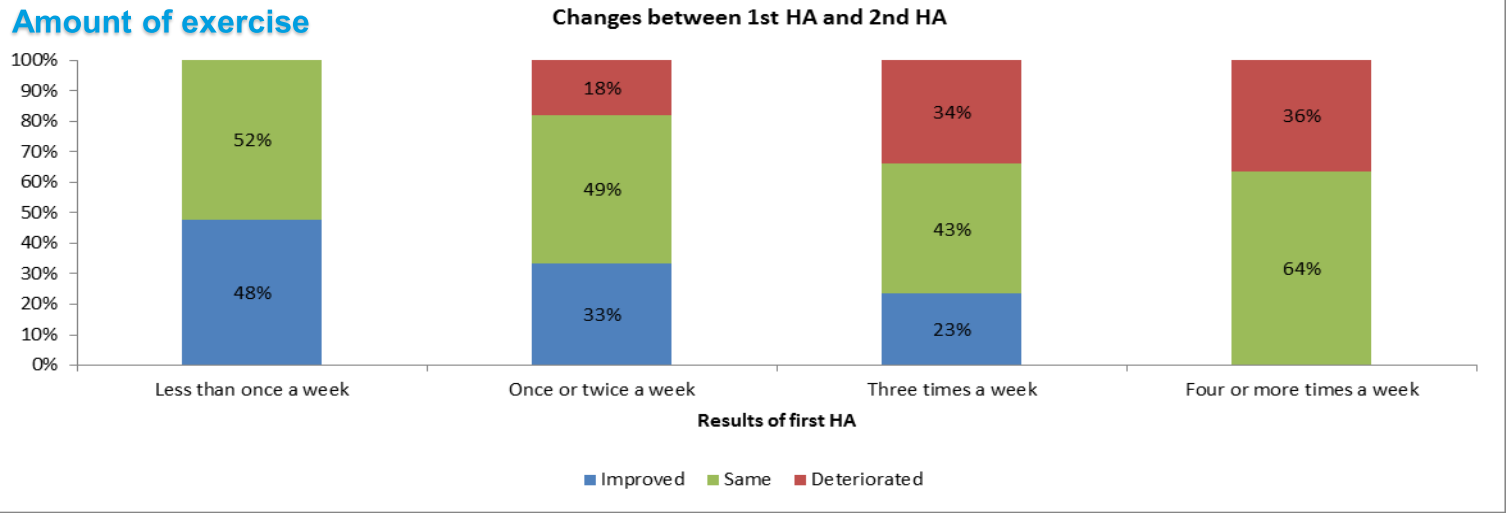
**Of the members that were outside the recommended range, 34% have improved and 12% have deteriorated.**

There is high volume of members under the recommended ranges in their 1<sup>st</sup> HA.



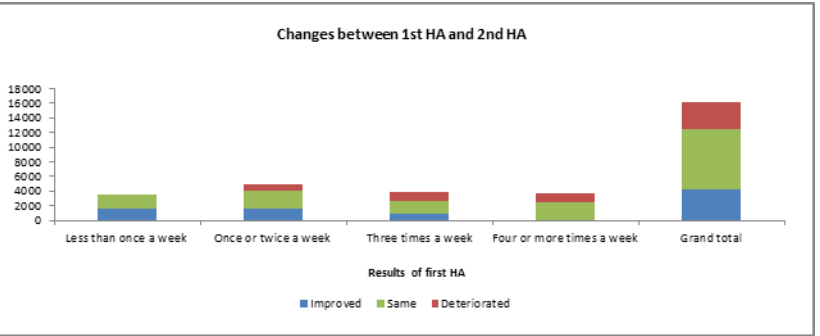
# Comparing the First and Second HA results – Amount of exercise and Job satisfaction

## Amount of exercise

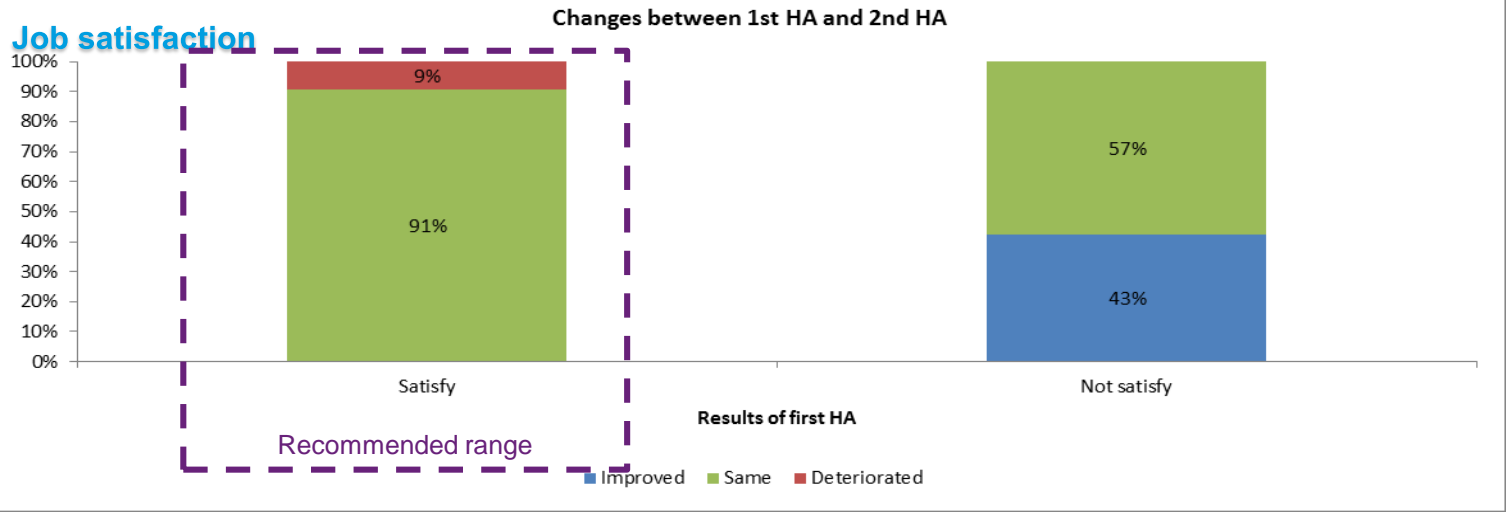


## Amount of exercise:

In total, 26% of members have increased amount of exercise and 22% of members have reduced.

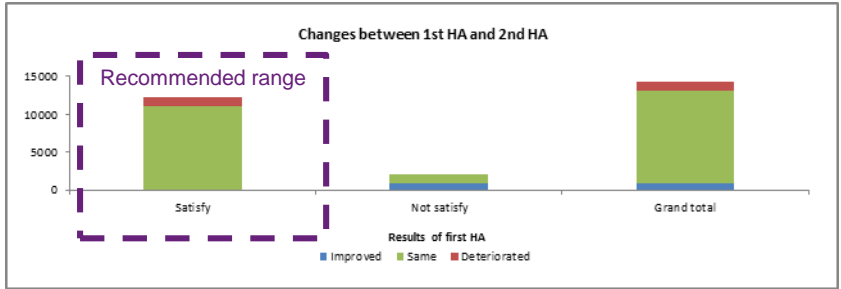


## Job satisfaction

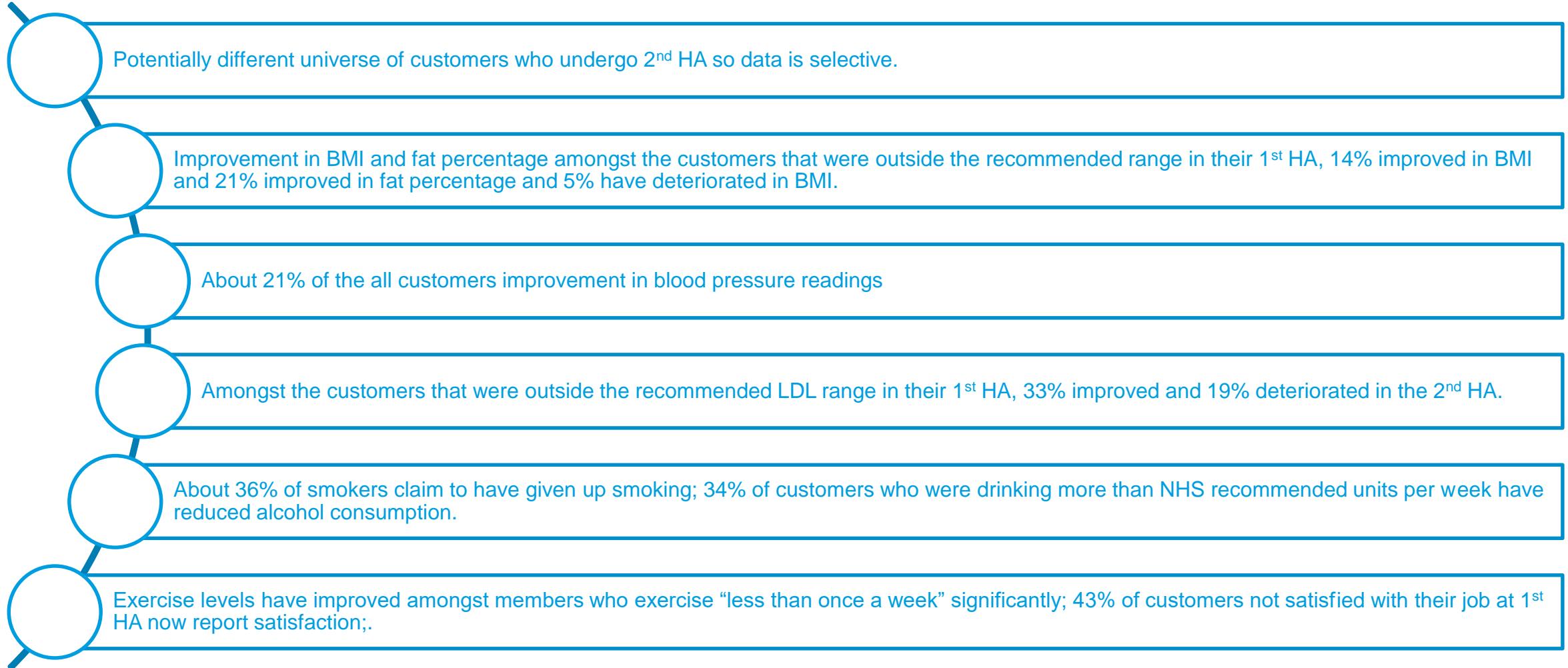


## Job satisfaction

The recommended range is “Satisfy”..  
Of the members that were not satisfied with their job, 43% have improved.  
There is high volume of members under the recommended ranges in their 1<sup>st</sup> HA.



# Key Observations – 1<sup>st</sup> vs 2<sup>nd</sup> HA CHANGES





# CONTENTS

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1) Claims behaviour for members with HA vs members without HA

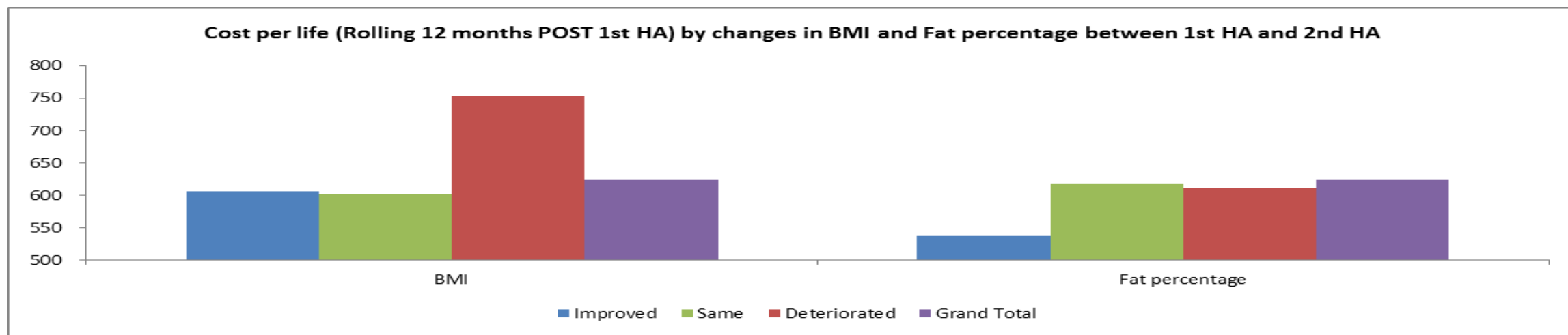
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Appendix:  
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Methodology &  
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## Changes in BMI and Fat percentage between 1<sup>st</sup> HA and 2<sup>nd</sup> HA vs Claims POST 1<sup>st</sup> HA



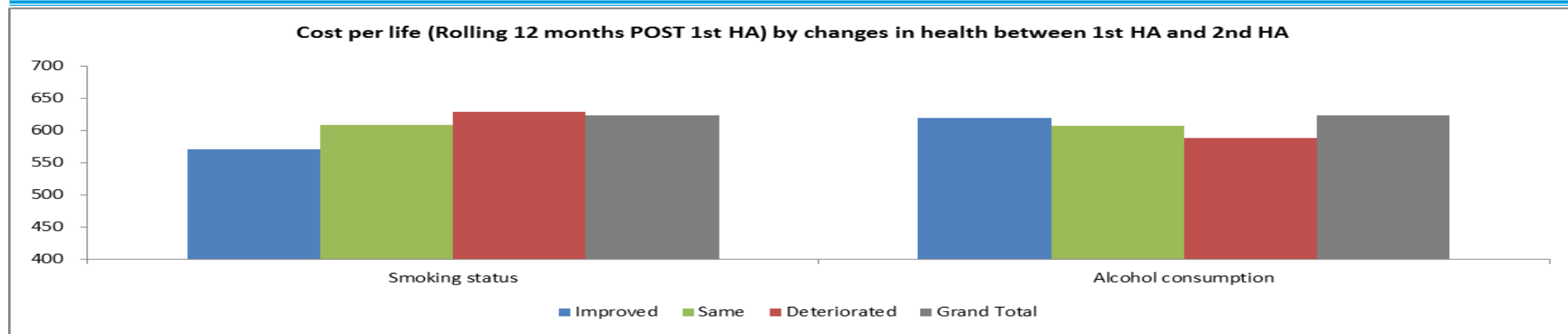
*The diagram shows the cost per life for claims for all impairment Post 1<sup>st</sup> HA by change in BMI and Fat percentage between 1<sup>st</sup> HA and 2<sup>nd</sup> HA.*

There are three options: Improved, Same and Deteriorated

- **Improved:**
  - If the results have changed from outside the recommended range (1<sup>st</sup> HA) to within the recommended range (2<sup>nd</sup> HA).
  - If the results have remained outside the recommended range but have improved, for example: changed from "Very obese" to "Obese".
- **Same:**
  - If the results have remained within the recommended range.
  - If the results have remained outside the recommended range and the results stay the same.
- **Deteriorated:**
  - If the results have changed from **within recommended range (1<sup>st</sup> HA)** to **outside recommended range (2<sup>nd</sup> HA)**.
  - If the results have remained outside the recommended range but have deteriorated, for example: change from "Obese" to "Very obese".

*The cost per life is lower for the members that have improved in BMI and Fat percentage.*

# Changes in Smoking status Declared and Alcohol consumption Declared between 1<sup>st</sup> HA and 2<sup>nd</sup> HA vs Claims POST 1<sup>st</sup> HA



*The diagram shows the cost per life for claims for all impairment Post 1<sup>st</sup> HA by change in Smoking status and Alcohol consumption between 1<sup>st</sup> HA and 2<sup>nd</sup> HA.*

There are three options: Improved, Same and Deteriorated

## Smoking status:

- **Improved:** If the member has declared "Smoking" in the 1<sup>st</sup> HA and has declared "Given up" in the 2<sup>nd</sup> HA.
- **Same:** If the member remained the smoking status.
- **Deteriorated:** If the member has declared "Given up" or "Non-smoker" in the 1<sup>st</sup> HA and has declared "Smoking" in the 2<sup>nd</sup> HA.

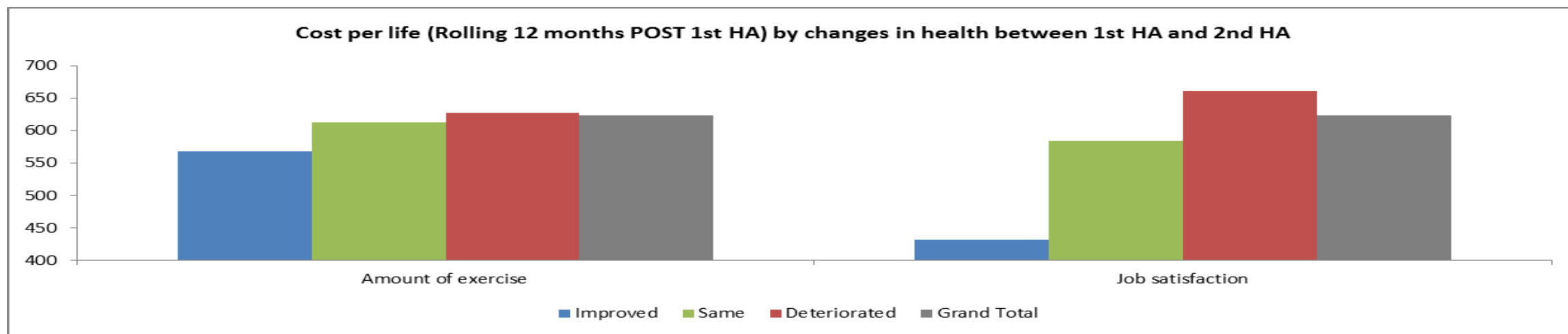
## Alcohol consumption:

- **Improved:** If the member was drinking more than NHS recommendation range in the 1<sup>st</sup> HA and has declared to reduce alcohol consumption in the 2<sup>nd</sup> HA.
- **Same:** If the member remained within the NHS recommendation range or remained the alcohol consumption.
- **Deteriorated:** If the member was drinking within the NHS recommendation range in the 1<sup>st</sup> HA and has declared to drink more than NHS recommended range.  
If the member was drinking more than NHS recommendation range in the 1<sup>st</sup> HA and has declared to increase alcohol consumption in the 2<sup>nd</sup> HA.

*The cost per life is lower for the members that have improved in Smoking status declared.*

*The cost per life is higher for the members that have improved in Alcohol consumption declared.*

# Changes in Amount of Exercise Declared and Job Satisfaction Declared between 1<sup>st</sup> HA and 2<sup>nd</sup> HA vs Claims POST 1<sup>st</sup> HA



*The diagram shows the cost per life for claims for all impairment Post 1<sup>st</sup> HA by change in Amount of Exercise and Job Satisfaction between 1<sup>st</sup> HA and 2<sup>nd</sup> HA.*

There are three options: Improved, Same and Deteriorated

## Amount of exercise:

- **Improved:** If the member has increased amount of exercise declared.
- **Same:** If the member has the same amount of exercised declared.
- **Deteriorated:** If the member has reduced amount of exercise declared.

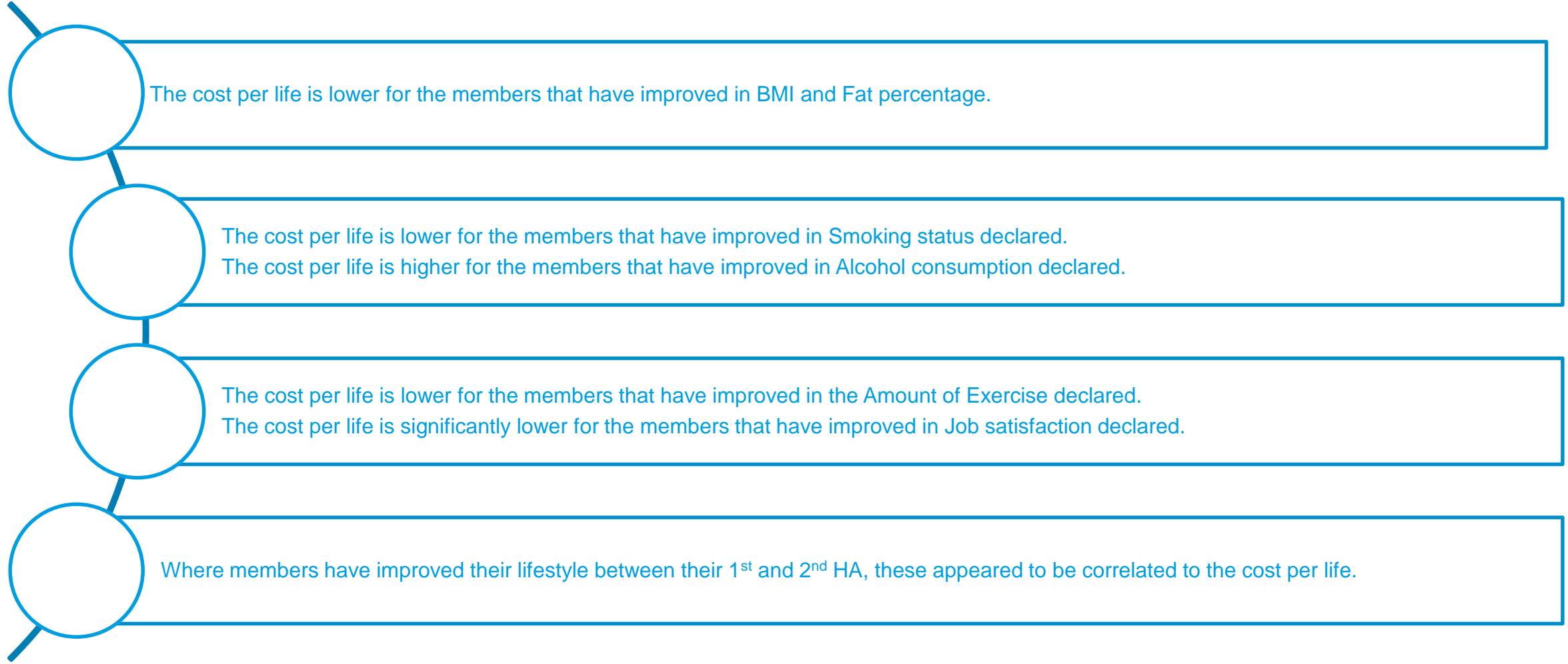
## Job satisfaction:

- **Improved:** If the member was unsatisfied with their job in the 1<sup>st</sup> HA and has declared to satisfy with their job in the 2<sup>nd</sup> HA.
- **Same:** If the member have the same answer.
- **Deteriorated:** If the member was satisfied with their job in the 1<sup>st</sup> HA and has declared to unsatisfied with their job in the 2<sup>nd</sup> HA.

*The cost per life is lower for the members that have improved in the Amount of Exercise declared.*

*The cost per life is significantly lower for the members that have improved in Job satisfaction declared.*

# Key Observations – CLAIMS SPEND BETWEEN 1<sup>st</sup> vs 2<sup>nd</sup> HA CHANGES



# Key Premise / Hypothesis - CONCLUDING REMARKS

- We sought to look for evidence that PMI customers using Bupa Health Assessments were, consequently leading healthier and eventually longer lives
- It is clear that customers undergoing HA's are on average claiming more from PMI both before *and* after their HA, with a significant increase in post HA claiming behaviour
- It is possible that customers substitute a specific GP consultation with a HA in order to avoid NHS waiting times or merely to address a plethora of health concerns via a single intervention
- Nevertheless, most resultant claims include specific treatment for an impairment suggesting that the HA adds value to the customer in terms of addressing latent health conditions
- The subsequent claims are predominantly correlated with conventional views of health risk indicators and HA results are either empirical or have less self-reporting bias making this more reliable than conventional insurance underwriting
- There is demonstrable evidence of (some) improvement in most health indicators and behaviours between 1<sup>st</sup> and 2<sup>nd</sup> HA suggesting that the HA does have a positive influence on (some) customers who are leading healthier lives post their 1<sup>st</sup> HA
- The study will need to be extended by gathering data over a longer duration to reach any conclusions around this ultimately results in longer lives



# ST. JOHN'S COLLOQUIUM

JUNE 27-29, 2016



Questions / Discussion

... Appendix



Canadian  
Institute of  
Actuaries



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canadien  
des actuaires



# CONTENTS

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1) Claims behaviour for members with HA vs members without HA

2) Can the HA Results Analyse Help Predict Future Claims?

3) Does Health Change between 1<sup>st</sup> and 2<sup>nd</sup> HA?

4) Claims behaviour for members with Health Change between 1<sup>st</sup> and 2<sup>nd</sup> HA.

Appendix:  
Data Summary,  
Methodology &  
Limitations



# Health Assessment and Private Medical Insurance cover (UK)

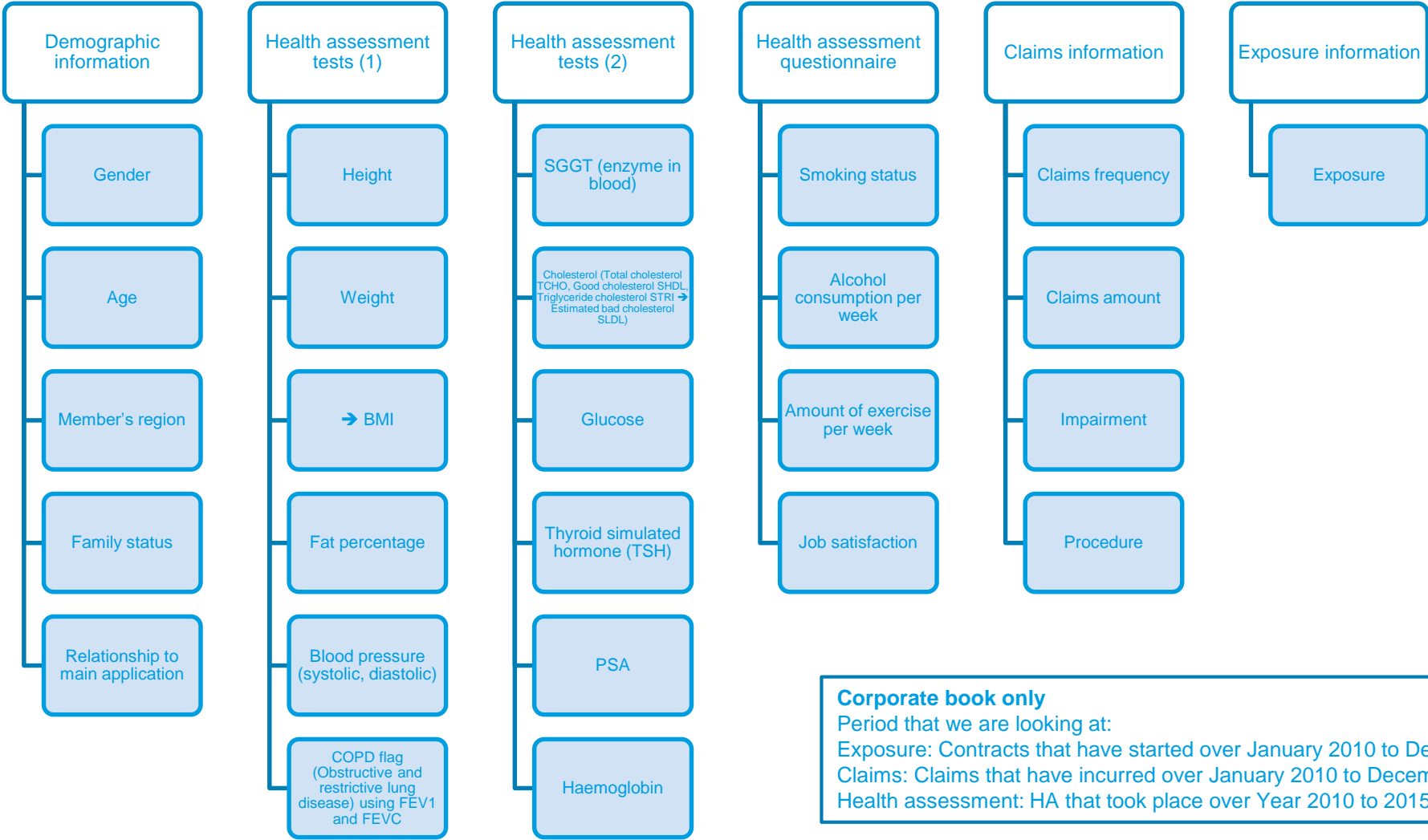
## Health assessment Typical measurements/tests

- Height
- Weight
- Fat percentage measurement
- Blood pressure (systolic and diastolic)
- COPD flag (Indicator for obstructive and restrictive lung disease)
- Lifestyle (smoking status, alcohol consumption, exercises, job satisfaction)
- SGGT
- Cholesterol (TCHO, SHDL, STRI, SLDL)
- Optional upgrades: Male or female health checks, Advanced fitness test, Mammography, Coronary CT scan, Colon CT scan, etc.

## BUPA Corporate PMI cover Typical cover

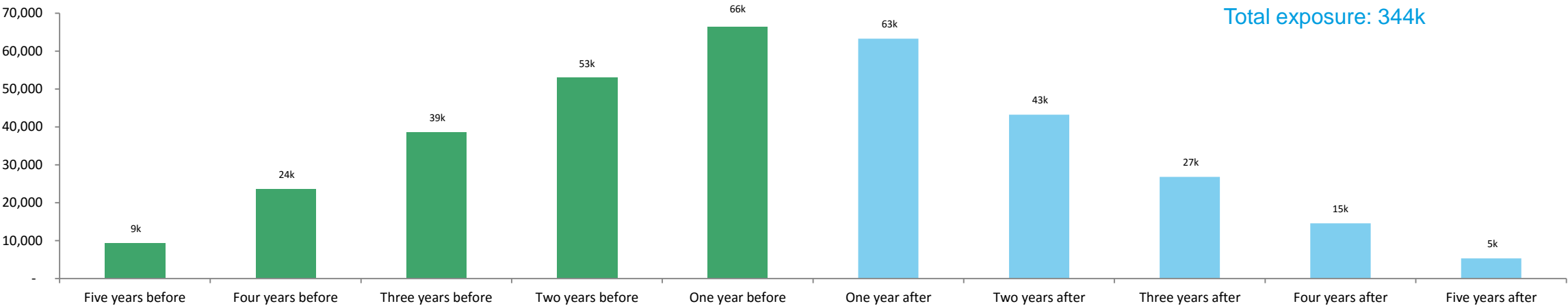
- Out-patient consultations
- Diagnostic tests
- Out-patient therapies
- Diagnostic MRI, CT and PET scans
- Cancer cover (options to downgrade)
- Parent accommodation
- Hospital treatment
- Mental health (options to downgrade)
- NHS cash benefit
- NHS cancer cover cash plan
- Optional upgrades or bespoke benefit: Private GP benefit, Virtual GP benefit, prescriptions cover, maternity cover, etc.

# Data

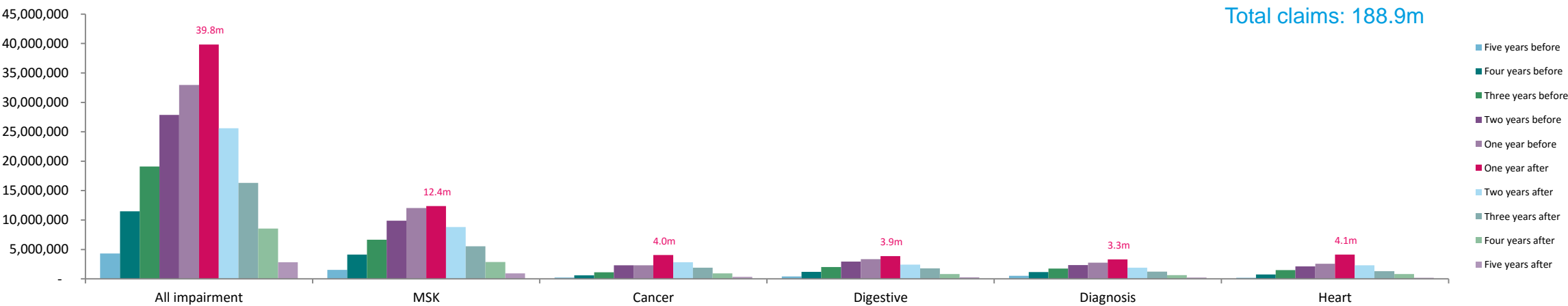


# Exposure and claims data for the population with HA

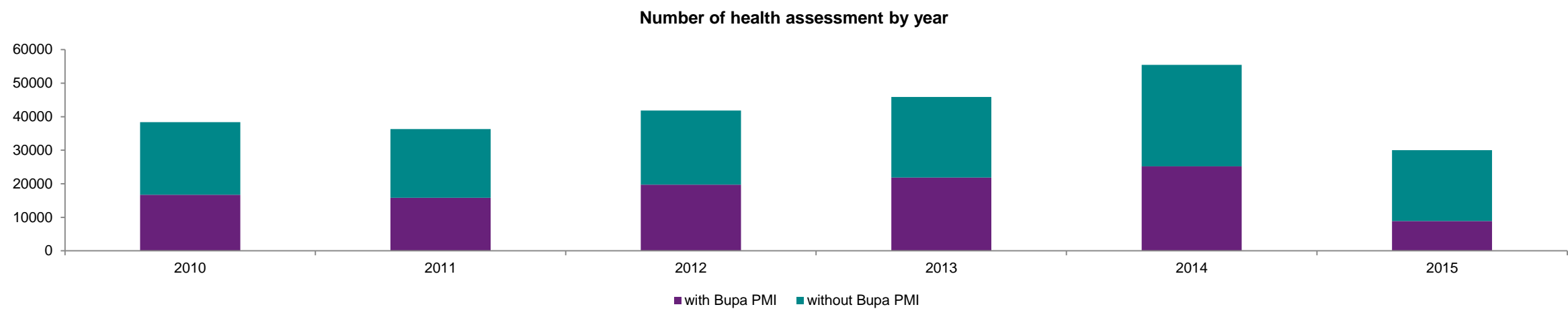
Exposure by year since HA (all HA)



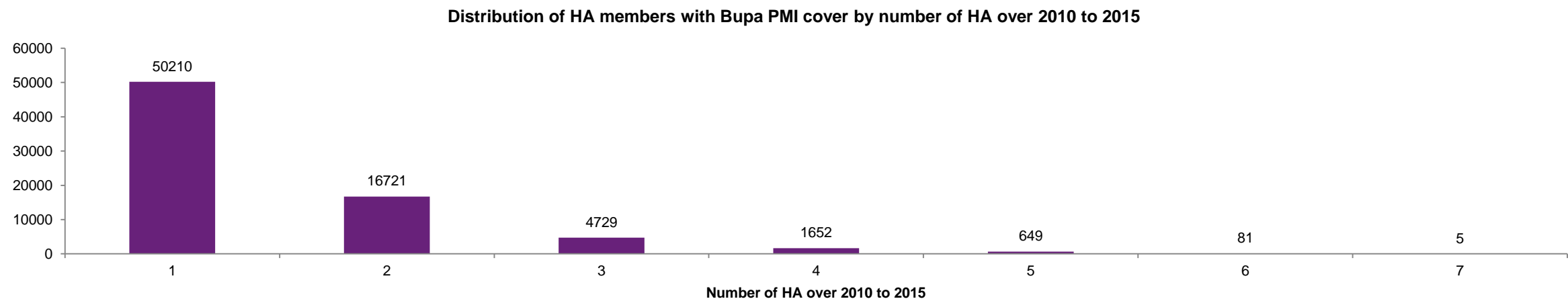
Claims by years since HA (all HA)



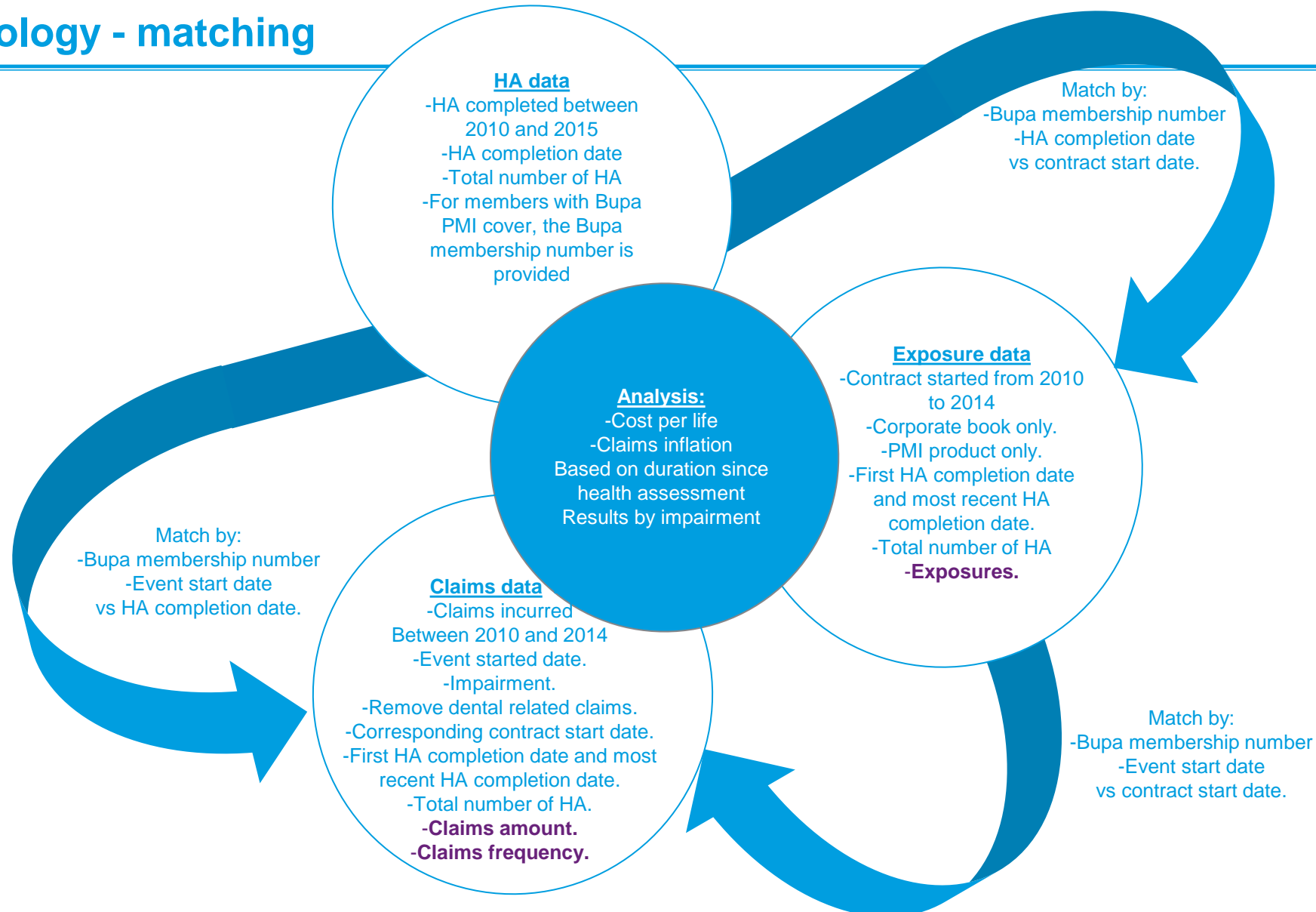
# Health assessment data



Out of 74k HA performed for members with PMI cover, 24k had multiple HA over 2010-2015.



# Methodology - matching



# Methodology

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The cost per life is calculated by dividing the total cost of claims by exposure over the rolling 12 months period.

The claims inflation is determined by comparing the cost per life against the cost per life a year ago.

All health assessments' observations are used in Section 1 and 2. If a member had two HA, there will be two observations. First observation used the first HA date as month 0 and the second observation used the second HA date as month 0.

The results are compared against the control group, which are the risk adjusted members without HA. The control group have the same mix (demographic and exposures) as the population with HA.

Frequency is based on the number of claim events. Member can have multiple claim events. The increase in frequency is based on number of claim events that have incurred over rolling 12 months after HA versus number of claim events that have incurred over rolling 12 months before HA.

Severity is based on the average claims for each claim event. The increase in severity is based on average claims for claim events that have incurred over rolling 12 months after HA versus average claims for claim events that have incurred over rolling 12 months before HA.

## Methodology – Control group (risk adjusted population without HA)

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The analysis is based on the members who completed one or more health assessments (HA), using duration since the health assessment as x-axis.

The results are compared against the control group, which are the risk adjusted members without HA (members that have not completed HA with BUPA).

The control group has the same mix of business:

- Same distribution of age bands
- Same distribution of gender
- Same distribution of members' region
- Same distribution of family status (Single, Couple, Family and Single parent family)
- Same distribution of relationship to main applicant (Main applicant, Partner and Children)
- Same distribution of period (therefore has the same underlying inflation).

### Methodology:

- 1) Determine the mix of business using the exposure data for the population with HA by the duration since HA.
- 2) Determine the mix of business using the exposure data for the population without HA (model points).
- 3) For each duration (rolling 12 months before HA, rolling 12 months after HA, etc.), rescale the model point for the population without HA such that the mix of business is identical to the population with HA.
- 4) For each duration, apply the scaling factor to the exposure data and claims data (both frequency and severity) for the population without HA.
- 5) As a result, the risk adjusted population without HA for rolling 12 months after HA will have the same mix of business as the population without HA for rolling 12 months after HA.

# Limitations

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1. The analysis and methods for calculating potential financial impacts is based on Bupa's best estimate and interpretation of trends. The calculations made contain some simplifications. However, we believe that the methods used are reasonable and support the conclusions drawn.
2. Categorisations used reflect Bupa Health Funding's own categorisations and may not be consistent with other categorisations.
3. In carrying out our work, we have relied on data provided. We have not audited or verified this data or other information. If the underlying data or information is inaccurate or incomplete, the results of our analysis may likewise be inaccurate or incomplete.
4. While due care and diligence has been exercised in carrying out this work, no assessment was done to measure the level of compliance against Technical Actuarial Standards.
5. We have only looked at health assessments that were completed over 2010 and 2015. Health assessments that were completed before 2010 have not been taken into account.
6. The members that were used in the analysis do not necessarily have full two years exposure (one year before HA and one year after HA) due to the availability of data.
7. The exposure data used in the analysis is based on contracts that started over Year 2010 to Year 2014 and the claims data is based on claims event that incurred over Year 2010 to Year 2014.
8. Different types of health assessments carry different checks/test. For example, male or female checks that aimed at the early detection of gender-specific cancers are only available to enhanced assessments. We have not reviewed the impact of different types of health assessments.
9. By risk-adjusting the population without health assessment, the two populations would have the same demographic mix. However, the health assessment population is closed, static and decaying with lapses after health assessment took place, whilst the population without health assessment will be more dynamic, churning with lapse and new business..
10. The benefit cover (such as out-patient limit) for the control group may be different from the population with HA.
11. The analysis is carried on the Corporate book only. The impact of health assessment may differ on the SME book and Consumer book.
12. The analysis is based on members that have Corporate PMI with BUPA and health assessments with BUPA and the control group (population without health assessment) is based on BUPA Corporate PMI members without health assessment. However, the members may have completed health assessments with another provider.
13. The analysis in Section 2 (Review the impact of health assessment results) have not allowed for difference in mix of business.
14. The analysis in Section 2, 3 and 4 ignored the observations without HA results.