

# **Using Health Risk/Cost Analyses to Develop a Population Health Management Program in an Australian Health Insurance Environment**

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## ***Introduction***

In 1994, the Board of the Australian Health Management Group (AHMG) included in its mission statement for the first time a commitment to not only provide insurance coverage for the cost of health care but also assist members to achieve ongoing good health. In making the decision, the Board was aware that health status and claims costs are inextricably related. As 88% of the costs of the Fund are due to claims made as the result of illness and disease, an improvement in the health status of members generally was likely to reduce the need for health services and consequently contain costs.

Since then, the Fund has introduced a number of measures to assist members to enjoy the best health possible. In 1995, the Healthtrac Health Risk Appraisal (HRA) was offered to members. The HRA uses a questionnaire containing health, behavioural and lifestyle questions to generate a customised report for participants suggesting ways in which their health status may be improved. Over the years, AHMG and Healthtrac have enhanced this program to include the SF-12 and “Readiness for Change” questions.<sup>1,2</sup> In 1998, Diabetes and Cardiac disease management programs were introduced which involved nurses contacting participants and offering extra benefits and support in the management of their disease.\*

To deliver the programs, AHMG established an independent health management division in 1999 trading as *CareLink*.

Intuitively, it was believed that the program was improving the health status of members and consequently containing costs. There is a body of U.S. research which shows that individuals with more high-risk behaviours incur more health care costs than those with low-risk behaviours.<sup>3-5</sup> More importantly, those individuals who change lifestyle behaviours improving their health status have been found to reduce costs.<sup>6-9</sup>

It is these data which gives rise to the concept that excess health risks in a population result in excess costs. The lowest costs are associated with the healthiest (low-risk) individuals. Excess costs are defined as the difference between the costs of the lowest risk individuals and other higher risk groups.<sup>10</sup> In the United States, the percent of total medical costs attributable to excess health risks is relatively consistent, ranging from 21% to 31%.<sup>10,11</sup> However, these concepts had not been tested in the Australian private health insurance environment.

In early 2000, the Health Management Research Centre at the University of Michigan was retained to undertake an evaluation of the effectiveness of the *CareLink* program in terms of both health status and claims costs and to assist with future planning and development.

The evaluation had a number of objectives. This paper reports on an analysis of one sub-group which tests the following: 1) there was an improvement in the aggregated health status of the population over the period; 2) within the Australian private health insurance environment, high-risk individuals have higher costs than low-risk individuals; 3) changes in costs follow changes in risks when health status changes; and 4) a population health management strategy can be successfully implemented based on these trends.

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\* Program clinicians make no clinical assessments. The Fund considers the General Practitioner to be the manager of the members' care and disease management programs are designed to complement the treatment

## **Methods**

A group of 2,588 Australian Health Management Group (AHMG) members were selected according to the following criteria: 1) continuous membership during the years 1995 to 1999 and 2) completed at least one Health Risk Appraisal (HRA) questionnaire in each of the five years of the study period.

### *Health risk appraisals*

The HRA, offered every 6-months, was used as a measurement tool for individual health risks and to assign health risk status. Eight individual health risks were selected to establish health status: current smoker, little or no physical activity, overweight, high blood pressure, high cholesterol, excessive alcohol use, three or more illness days during the past 6 months, and chronic disease (diabetes, cardiac etc.).

Health risk status was determined by counting the number of individual health risks for each person. In the first analysis, health risk status was defined as follows: low-risk status (0 to 1 health risks), medium-risk (2 health risks) and high-risk status (3 or more health risks).

In the second analysis which investigated changes in costs relative to changes in health status, high-risk status was re-defined by grouping all individuals with 2 or more health risks, i.e., combining medium- and high-risk into one high-risk category. Two HRAs were selected from two different years of the study period, 1996 and 1998, to investigate the relationship.

### *Costs*

Total annual costs, (all hospital and ancillary claims excluding dental), were calculated for each HRA participant. Costs were paid amounts adjusted to year 2000 dollars using published medical inflation rates. To study cost trends over time, two time periods were considered to correspond to the years that the HRAs were completed: 1996 to 1997 and 1998 to 1999. Average annual costs were then calculated for each time period, 1996-97 and 1998-99.

#### *Excess costs*

Average annual costs for 1998-99 were assessed for those 1998 HRA participants at low-risk (0-1 risks), medium-risk (2 risks) and high-risk (3 or more risks). Excess costs were defined as the difference in costs between the low-risk group and the other respective risk groups times the respective number of people in each group.

#### *Changes in costs follow changes in risks*

To track changes in risks and costs over time, health status (high-risk, re-defined as 2 or more risks, or low-risk) was determined in the first time period (1996-97) and then was re-assessed in the second time period (1998-99) for each risk group. Four health status change groups were defined according to individual health trends from the first time period to the second time period: high-risk to high-risk (H-H); high-risk to low-risk (H-L); low-risk to high-risk (L-H); and low-risk to low-risk (L-L).

Three measures of cost trends for high-risk and low-risk individuals were used for each time period: average costs, median costs and percent of high-cost (being in the top 10<sup>th</sup> percentile of costs). Differences were statistically tested using ANOVA for average costs, non-parametric median test for median costs and chi-square test for percentages.

## **Results**

The 2,588 HRA participants were 59% male and 41% female with an average age of 52.3 years (in 2000). Table 1 shows the percentage of the population at risk for individual health behaviors during each year 1995 to 1999. Although the population had aged by five years, the calculated health status of the group remained relatively consistent with a range for the five-year period between 1.0 and 0.9 average health risks per member. (See Table 1) The percentage at risk for smoking and physical activity reduced. Those with risks related to blood pressure, weight or medical problems increased slightly but this is to be expected in an aging population.

#### *Excess costs*

The lowest costs were associated with the individuals in the low-risk category (See Figure 1). Excess costs were associated with excess risks, i.e., with those individuals at medium- or high-risk. Those with 2 risks (medium-risk) had costs \$126 higher than those with 0-1 risk. Those with 3 or more risks (high-risk) cost \$456 more than those at low risk. Overall, the percent of total costs attributable to excess risks was 17.6%. This is the theoretical maximum savings in costs that could be achieved if all participants changed to low-risk and costs followed this change in risk. In the U.S. health environment, this figure is between 21% and 31% with a mean close to 25%. This difference is largely due to the inclusion of primary care and pharmacy costs.

#### *Changes in costs follow changes in risks*

Focusing on years 1996-97 and 1998-99, as a group, the overall health status changed from 75% low-risk/25% high-risk to 74% low-risk/26% high-risk. In 1996-97, high-risk individuals were associated with significantly higher costs compared with low-risk individuals. (See Figure 2) In the second time period (1998-99), those individuals who

changed to low-risk had significantly lower costs than those who remained at high-risk. Those who changed to high-risk had higher costs than those who remained at low-risk. Those who remained at high-risk for both time periods had the highest costs; those who remained at low-risk for both time periods had the lowest costs.

## **Discussion**

As demonstrated in the U.S., the health status of Australians correlates with costs, i.e., those at high-risk are more likely to be high-cost; those at low-risk are more likely to be low-cost. Furthermore, for those who changed health status over time, costs followed risks.

Based upon these findings, the strategic challenge was to not only continue to facilitate the positive transitions in the population (i.e., those who were either maintaining or reducing health risks), but also to more aggressively manage the negative transitions (i.e., those whose health risks were escalating). Accurate identification of the health risks of individuals, with a view to offering customised health management plans to them, is the critical first step in the process.

The HRA was able to identify those individuals who are likely to be in the top 10% of costs. It used an algorithm based upon U.S. cost data which included primary care and pharmacy costs, for which Australian private health insurance does not have financial liability. Furthermore, the system used costs rather than health risks to identify people for intervention.

Since the evaluation demonstrated that costs followed risks, it is the identification of the health risks that provides the information needed to implement a successful program in Australia. In response, a new triage model was developed which uses the raw data from the

HRA to stream participants into 3 groups: standard risks, elevated risks and diseased. (See Figure 3) Participants within each category are then offered a customised health risk management plan. The intensity of the intervention depends upon the disease stage or risk factor and the program content is agreed between the participant and a clinically qualified program coordinator. The participants' readiness for change is also a major determinant of the intervention.

This "second generation" health management program is currently being rolled out to all adult members of AHMG. Evaluation criteria for each program is in place. A clinical management system tracks the total costs of the intervention for each participant, including telephonic counselling, along with the key criteria essential for measuring clinical outcomes.

The University of Michigan will continue to independently evaluate the program and validated results will be published annually. Continuous monitoring of the program outcomes allows data-driven decision support for program changes and adjustments as the program is implemented.

The study provided the basis for the development of an informed strategy for *CareLink* to manage the health risks of the AHMG population. The focus is upon managing risks. Given the findings of the study with regard to the correlation between risks and costs, it can be expected that the strategy will improve the health status of the population as well as contain costs.

## References

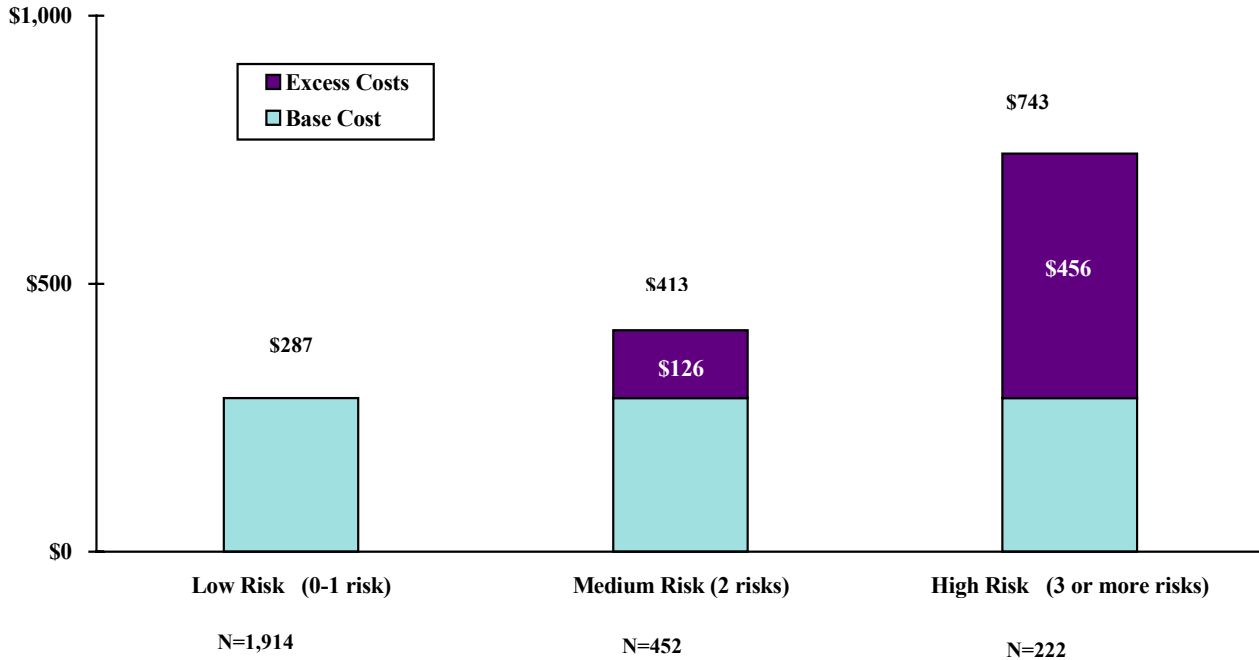
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**Table 1**  
**Differences in Health Risk Levels 1995-1999**  
(N=2,588)

Health Related Measures	Members at Risk				
	1995	1996	1997	1998	1999
<b>Lifestyle</b>					
Smoking	4.9%	4.0%	4.0%	3.6%	3.5%
Physical activity	26.7%	23.3%	20.1%	20.8%	14.0%
Alcohol use	9.0%	8.4%	8.5%	8.4%	9.1%
<b>Medical/Illness</b>					
Absence	13.4%	13.6%	12.3%	12.6%	10.7%
Medical problems	6.4%	7.2%	7.8%	8.9%	8.2%
<b>Biological</b>					
Blood pressure	17.3%	16.6%	18.9%	18.4%	19.9%
Cholesterol	4.3%	4.3%	3.8%	3.4%	3.6%
Body weight (BMI)	19.2%	19.1%	18.9%	20.6%	21.3%
<b>Overall Risk Status</b>					
Low Risk (0-1 risks)	73.4%	75.0%	75.4%	74.0%	76.2%
Medium Risk (2 risks)	17.9%	16.5%	17.1%	17.5%	16.0%
High Risk (3+ risks)	8.7%	8.5%	7.5%	8.6%	7.8%
<b>Ave Number of Risks</b>	1.0	1.0	0.9	1.0	0.9

Figure 1.

**Excess Medical Costs due to Excess Risks  
by Risk Status  
Risks (1998) x Average Costs (1998-1999)**



This chart shows that participants with more health risks have higher costs. Those with 2 risks have costs \$126 higher than those with 0-1 risk. High risk individuals' costs are \$456 higher than those at low risk.

The total annual medical cost of HRA participants was:  
 $(\$287 \times 1914) + (\$413 \times 452) + (\$743 \times 222) = \$900,940$

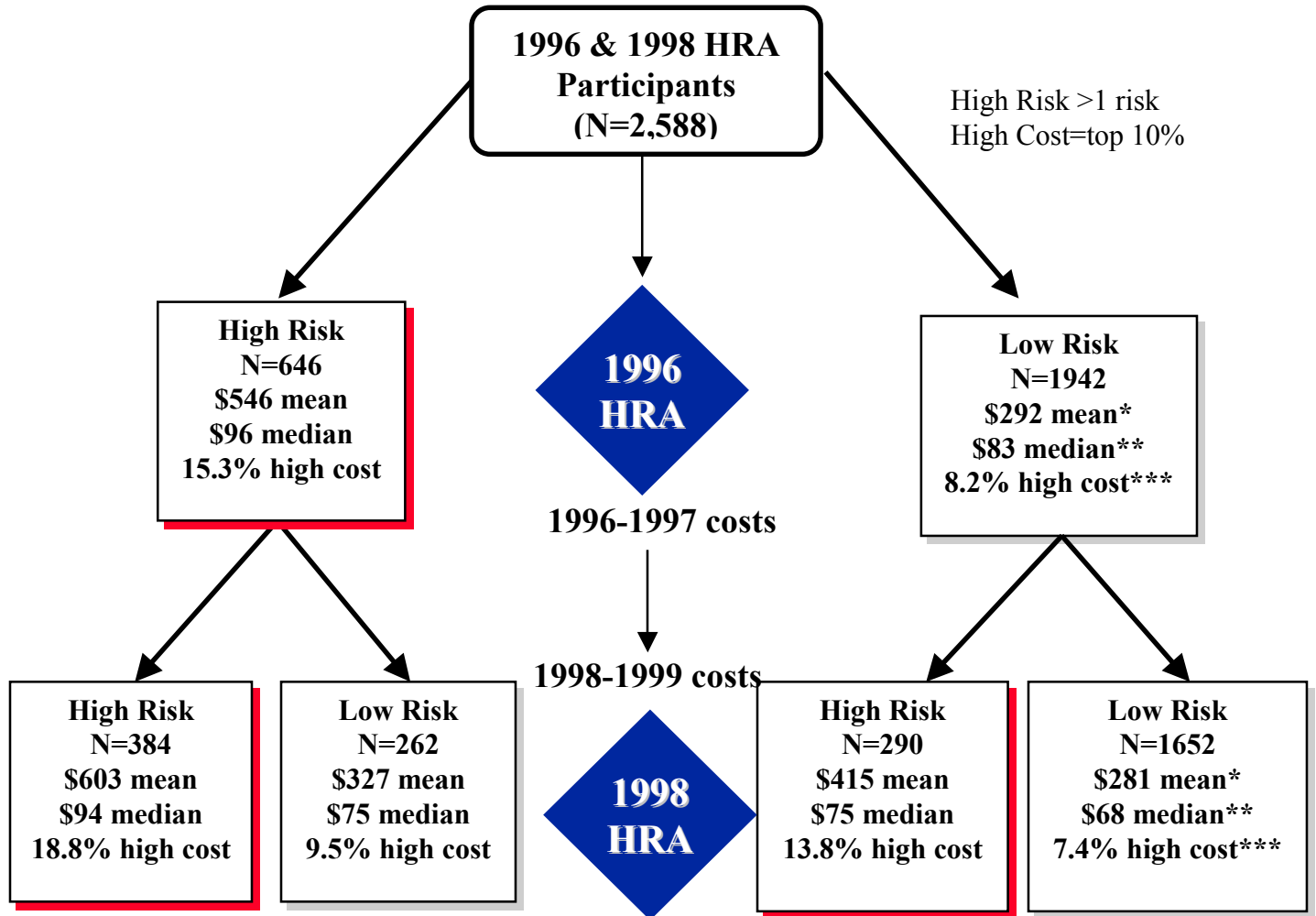
The total annual excess medical cost for medium and high risk participants was:  
 $(\$126 \times 452) + (\$456 \times 222) = \$158,184$

The percent of total costs attributable to excess risks is:  
 $\$158,184 / \$900,940 = 17.6\%$

This is the theoretical maximum savings in costs that could be achieved if all participants changed to low risk and costs followed this change in risk.

Figure 2.

## Changes in Costs Follow Changes in Risks



The figure outlines the changes in risk status for the 2,588 individuals who completed the 1996 HRA and the 1998 HRA. 1996-1997 average annual costs by 1996 risk status are compared to 1998-1999 average annual costs by 1998 risk status. Those individuals who changed to low risk had significantly lower costs than those who remained at high risk. Those who remained at low risk for both time periods had the lowest costs.

Average paid amounts are adjusted to 2000 dollars.

\* ANOVA (log costs)<.001 (Time 1); p<.05 (Time 2: H-H>L-L, H-L)

\*\* Non-parametric median test<.05 (Time 1); p=.06 (Time 2)

\*\*\* Chi-square<.001

Figure 3.  
*CareLink* HRA Triage System

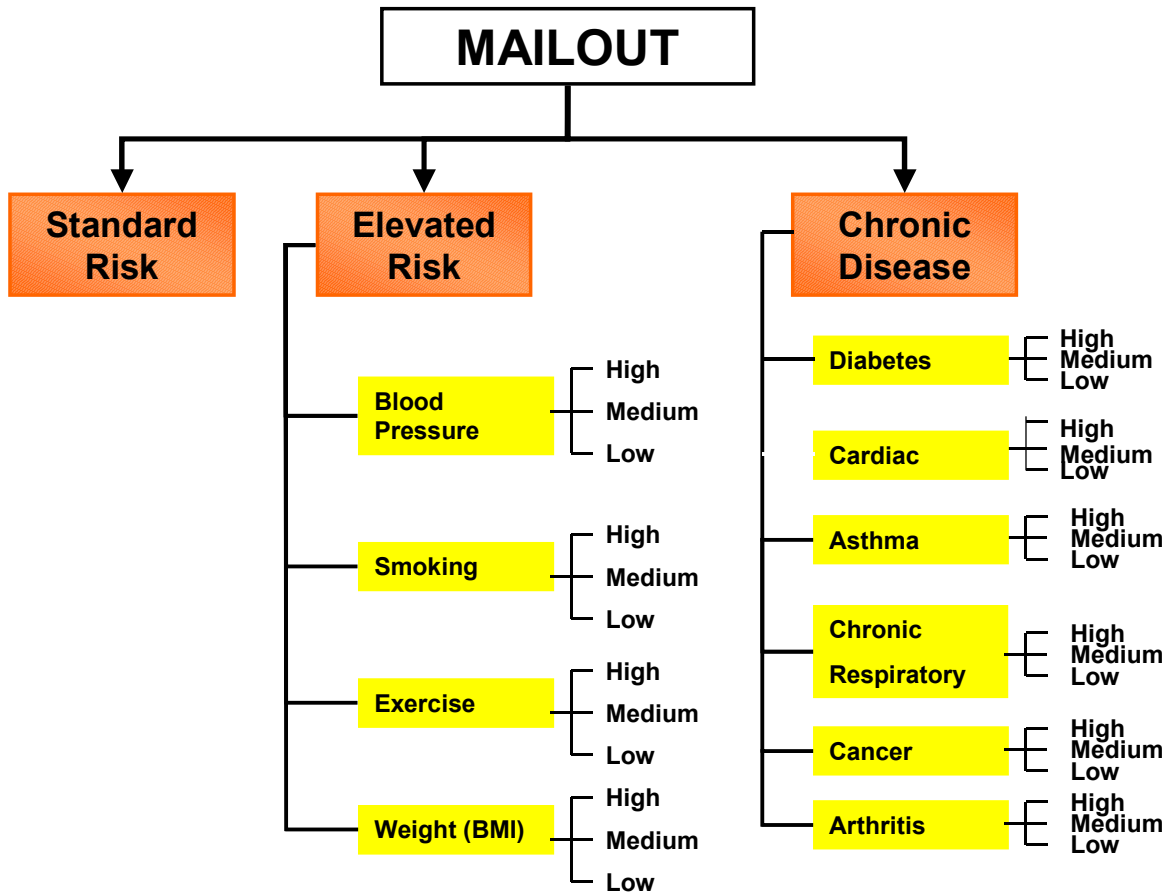


Figure 4.

