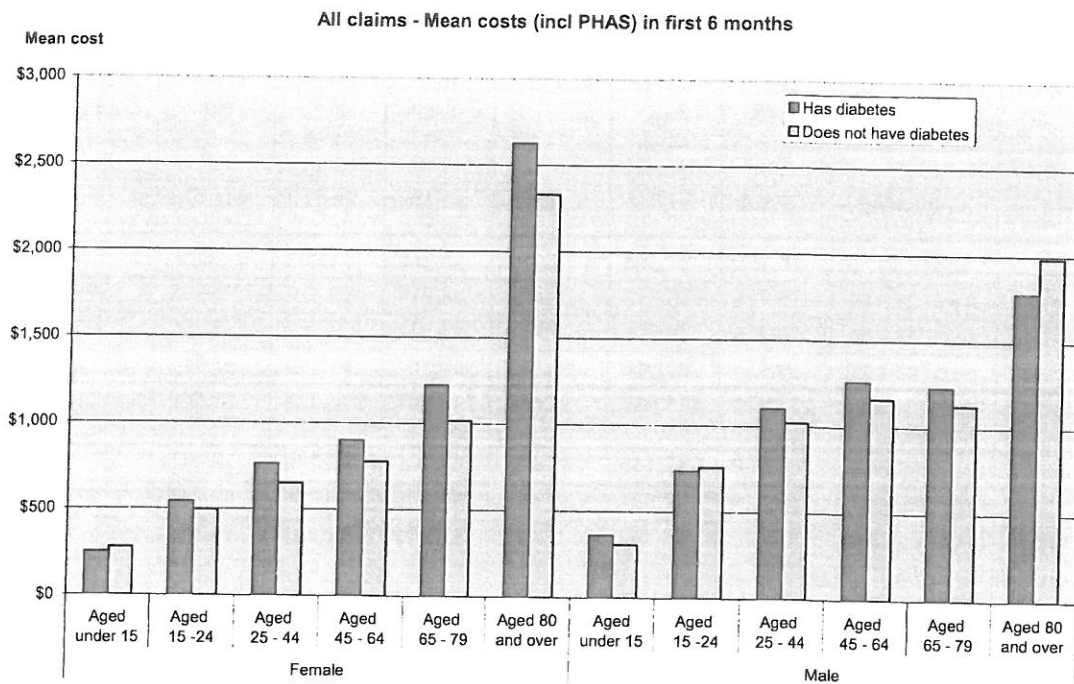


**Figure 6: Mean Cost (Incl. PHAS) of Diabetes related All Claims first 6 Months by Age and Sex, July/June 2008/09 Financial Year**



***Diabetes Entitlement claims –mean cost and duration at 6 and 12 months (incl. PHAS)***

Table 13 and the two figures that follow show the mean costs and duration of Entitlement claims at 6 and 12 month time points. Costs can continue to increase for many years but the 6 and 12 month time limits were used. Approximately 94% of all claims are “Med Fees” only claims and treatment and rehabilitation concludes within 3 months. Claims longer than 3 months typically involve Weekly Compensation entitlements, and may last for years. Consequently, the numbers presented in the following section most likely represent a conservative estimate, particularly given that not all the claims identified within the sample used in this study have been followed for the same time period.

The table shows that costs continue with time, however the differences between the mean costs of the age groups are not particularly large except for females over 65 years of age.

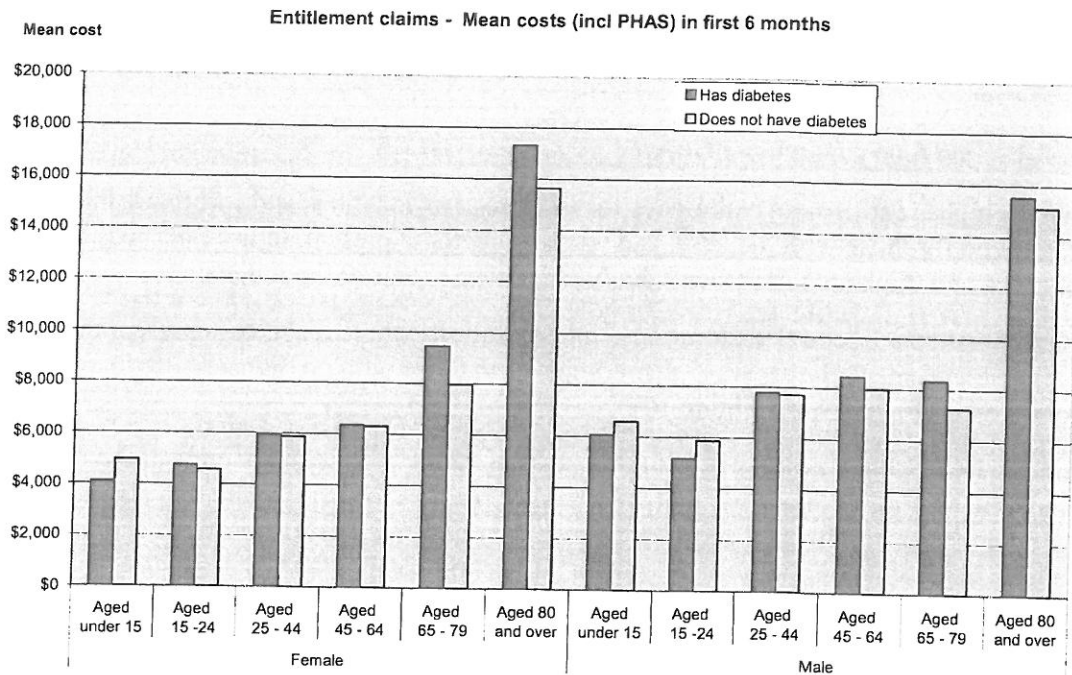
However, there is a difference between the mean costs of females and males, and in the duration of payments between those with and without diabetes. Males have higher mean costs compared to females, except for the oldest age groups (80+) where females have the higher costs. The mean duration of claims for those with diabetes is longer, and particularly for males in the working age group (45-64 years). This suggests the extra cost of Entitlement Claims for those with diabetes is associated with the extra time for rehabilitation.

The cumulative extra cost of Entitlement claims associated with diabetes in the 2008/09 financial year is estimated to be \$13 million and \$14 million at the 6 and 12 month time points respectively.

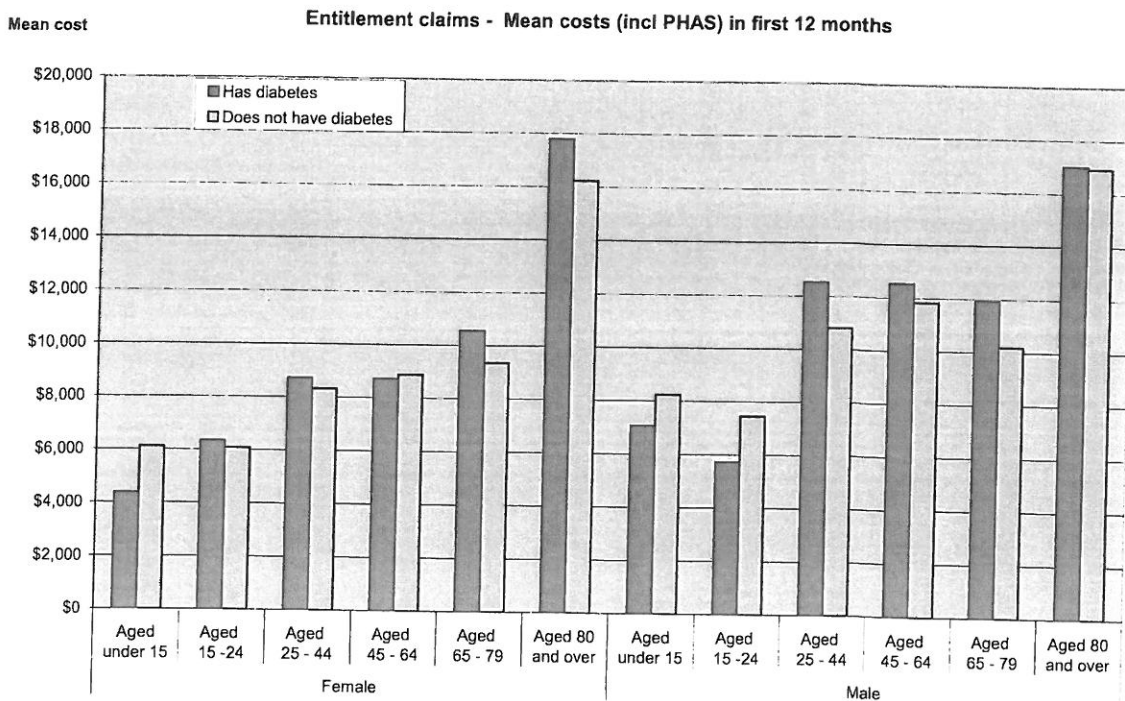
**Table 13: Mean Cost (incl PHAS) and Duration of Diabetes related Entitlement Claims, @ 6 and 12months, July/June 2008/09 Financial year**

Diabetes: Entitlement Claims		Mean cost in first 6 months incl PHAS		Extra Mean Cost Diabetes @ 6 mth	Mean cost in first 12 months incl PHAS		Extra Mean Cost Diabetes @ 12 mth	Average duration of medical payments 12 mth	
Sex	Age Group	Has diabetes	Does not have diabetes		Has diabetes	Does not have diabetes		Has diabetes	Does not have diabetes
Female	Aged under 15	\$4,106	\$4,945	-\$839	\$4,382	\$6,118	-\$1,736	62	52
	Aged 15 -24	\$4,755	\$4,564	\$191	\$6,340	\$6,083	\$257	95	73
	Aged 25 - 44	\$5,934	\$5,874	\$60	\$8,718	\$8,320	\$398	126	105
	Aged 45 - 64	\$6,355	\$6,295	\$60	\$8,724	\$8,882	-\$158	113	108
	Aged 65 - 79	\$9,456	\$7,960	\$1,496	\$10,561	\$9,350	\$1,211	91	93
	Aged 80 and over	\$17,328	\$15,637	\$1,691	\$17,797	\$16,225	\$1,572	63	73
	Other	0	\$2,146	-\$2,146	0	\$2,146	-\$2,146	0	56
	Sub-Total	\$9,919	\$7,073	\$2,846	\$11,490	\$9,074	\$2,416	95	95
Male	Aged under 15	\$6,077	\$6,590	-\$513	\$7,078	\$8,241	-\$1,163	77	51
	Aged 15 -24	\$5,173	\$5,861	-\$688	\$5,732	\$7,450	-\$1,718	72	71
	Aged 25 - 44	\$7,794	\$7,707	\$87	\$12,518	\$10,802	\$1,716	109	103
	Aged 45 - 64	\$8,462	\$7,994	\$468	\$12,540	\$11,837	\$703	142	126
	Aged 65 - 79	\$8,348	\$7,260	\$1,088	\$11,932	\$10,185	\$1,747	167	152
	Aged 80 and over	\$15,567	\$15,143	\$424	\$17,032	\$16,932	\$100	92	100
	Other	0	\$6,105	-\$6,105	0	\$17,605	-\$17,605	0	336
	Sub-Total	\$8,973	\$7,454	\$1,519	\$12,600	\$10,326	\$2,274	138	104
<b>Total Cost @ 6 mths</b>		Has Diabetes		No Diabetes					
		\$ 57,146,839		\$707,627,558					
<b>Excess* Entitlement Claim Costs Attributable to Diabetes, @ 6 months</b>							\$ 13,168,872		
							<b>12 months</b>		
							\$ 14,189,812		
* Excess is Sum of: Mean Extra Cost x Sub-total of Claims in each Group									

**Figure 7: Mean Cost Diabetes related Entitlement Claims (incl. PHAS) in first 6 months by Age and Sex, July/June 2008/09 Financial Year**



**Figure 8: Mean Cost Diabetes related Entitlement Claims (incl. PHAS) in first 12 months by Age and Sex, July/June 2008/09 Financial Year**



**Additional analysis: Diabetes**

Additional detailed work using ACC injury diagnosis and event codes has been undertaken exploring whether the overall differences reported above hold true in situations where differences would be expected to be seen in injury diagnosis and injury event given the nature of diabetes. The results of this work summarised below are informative, but not statistically significant.

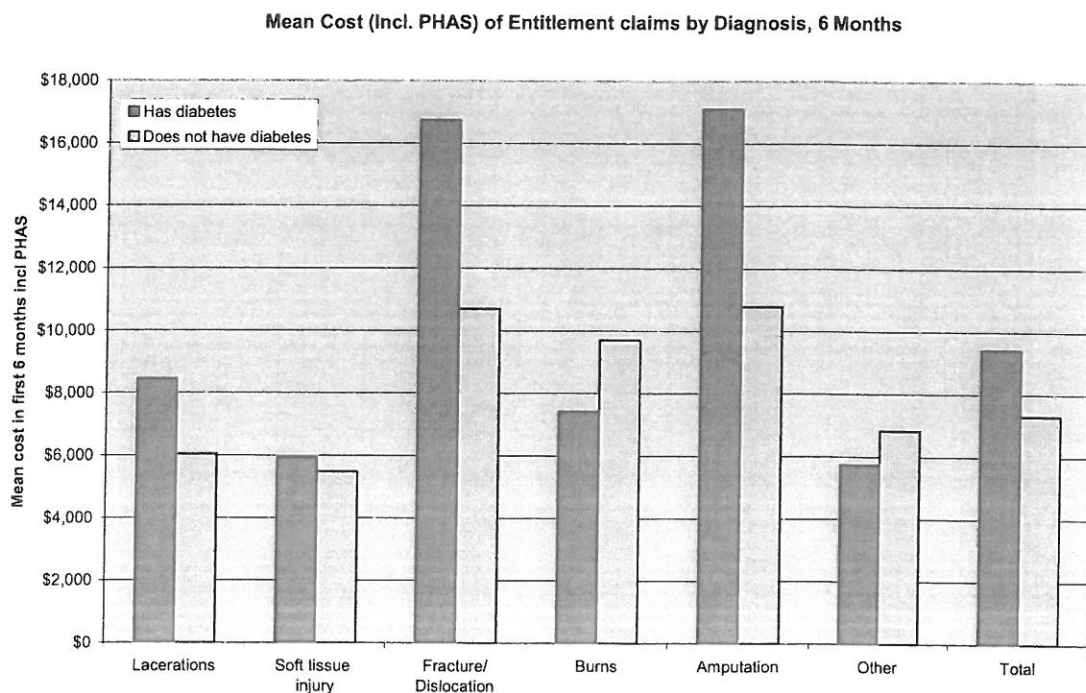
*Diabetes and Injury Diagnosis Group*

Slightly higher entitlement claim rates for fractures / dislocations and soft tissue injuries have been found for those with diabetes, and where diabetes is present, injury rates to the hip, upper leg and thigh area are at least double for those clients without diabetes.

For amputations, fractures/dislocations, and lacerations where diabetes is present the mean costs of Entitlement claims are higher compared to those with no diabetes after 6 and 12 months (see - Figure 9 and Figure 10).

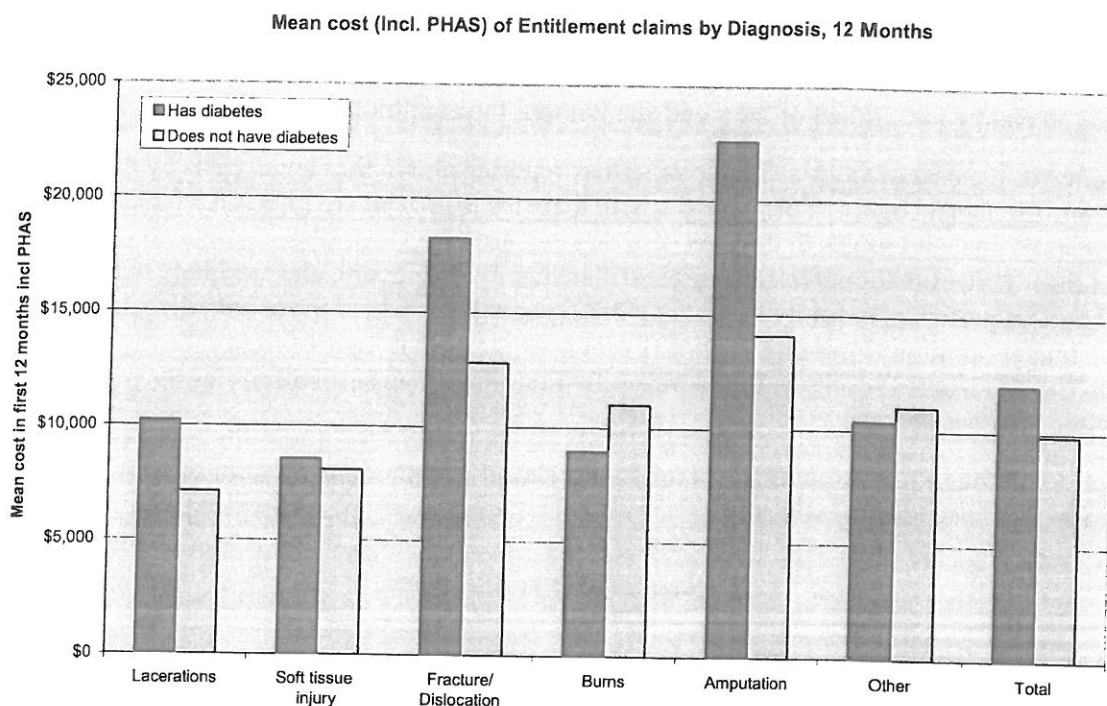
Another interesting feature is that if these costs are compared with the costs at the 6 month time point (Figure 9), it is clear that most of the costs are incurred in the first six months for most diagnoses, but the mean cost for amputations and fractures/dislocations claims where diabetes is present continues to increase in the second six months. This suggests that injuries involving people with diabetes involve longer treatment or rehabilitation times than similar injuries for people without the disease. Figure 11 shows that there is some evidence for this, although the differences are not significant. It may just be that the people with the condition tend to be older, on average, than those without, but this pattern is not observed in those with coronary heart disease in the next Part. Another possibility is that uncontrolled diabetes affects the periphery blood circulation earlier than uncontrolled CHD.

**Figure 9: Mean Cost (incl. PHAS) of Diabetes related Entitlement Claims in first 6 Months of claim by Diagnosis, 2008/09 July/June Financial Year**

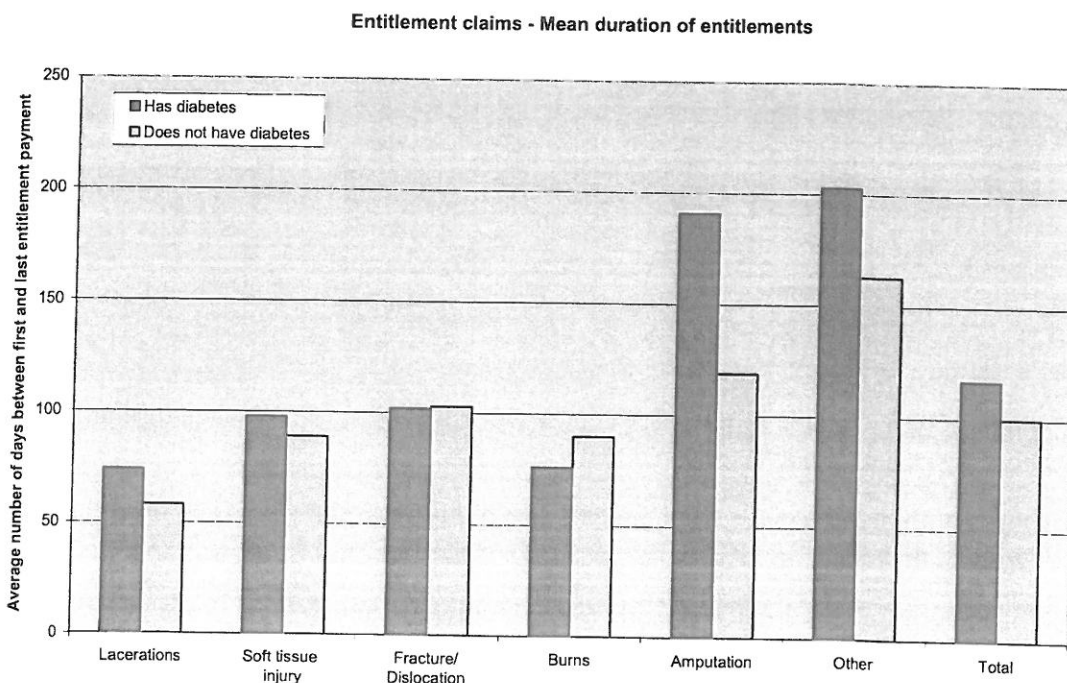




**Figure 10: Mean Cost (incl. PHAS) of Diabetes related Entitlement Claims by Diagnosis in first 12 Months of claim, 2008/09 July/June Financial Year**



**Figure 11: Mean duration of Entitlement Payments, first 12 months 2008/09 Financial Year, Diabetes / No Diabetes, Diagnosis**



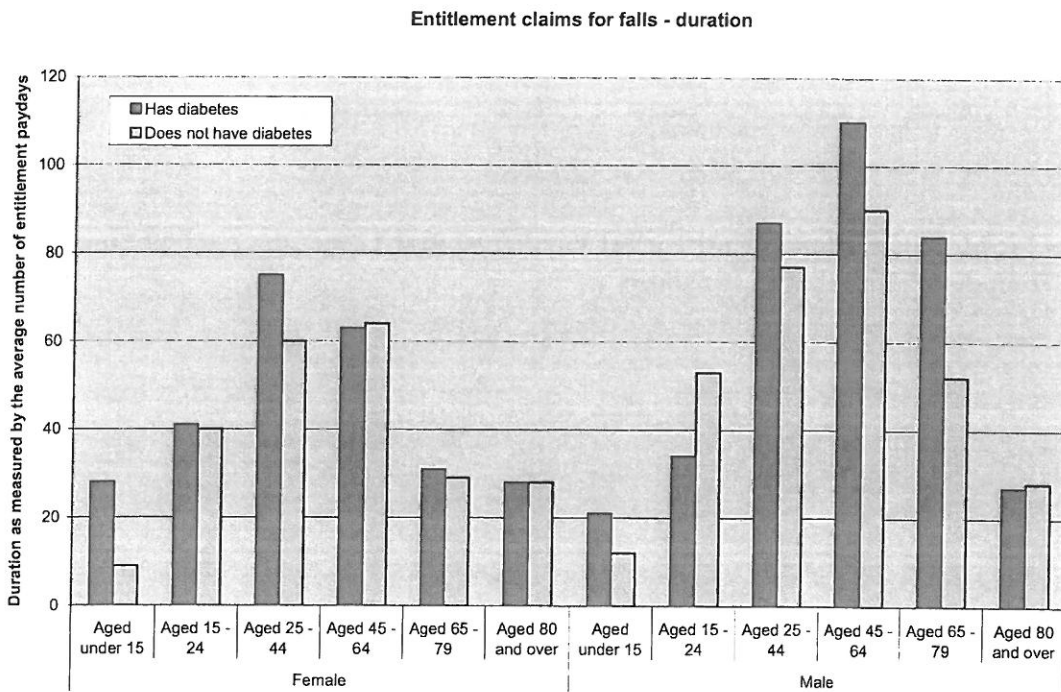
*Diabetes and Type Injury Event: Falls, Burns, Extremities*

*Falls*

It could be expected that diabetics may be more likely to have more falls, which would result in a higher rate of claiming. This appears to be slightly evident in the analysis undertaken, particularly amongst older women. The rate of falls for females over the age of 80 years is particularly high for those with diabetes, at over 50 claims per 1000 people, compared with about 30 claims for women of the same age without the condition.

In terms of the cost of falls, a similar pattern as reported above for claims costs by diagnosis is seen. The mean costs of falls claims where diabetes is present are higher for females over 80 years of age, and males in the over 45 years age groups. Costs also continue to increase with time. However the differences are not statistically significant, and are likely to be related to duration, particularly for males in the working age group where those with diabetes tend to have longer duration times (see Figure 12). This suggests that injuries from falls involving people with diabetes results in longer rehabilitation times than similar injuries for people without the disease.

**Figure 12: Mean duration of Diabetes Falls related Entitlement Payments, first 12 months 2008/09 Financial Year**



*Burns*

The number of burns related injuries associated with diabetes are small when disaggregating by sex and age group. Analysis showed that:

- those with diabetes have much higher rates of burns-related claims compared to those without diabetes;
- most burns claims are of relatively short duration, although there is a suggestion that where diabetes is present, claims duration is longer particularly for males;

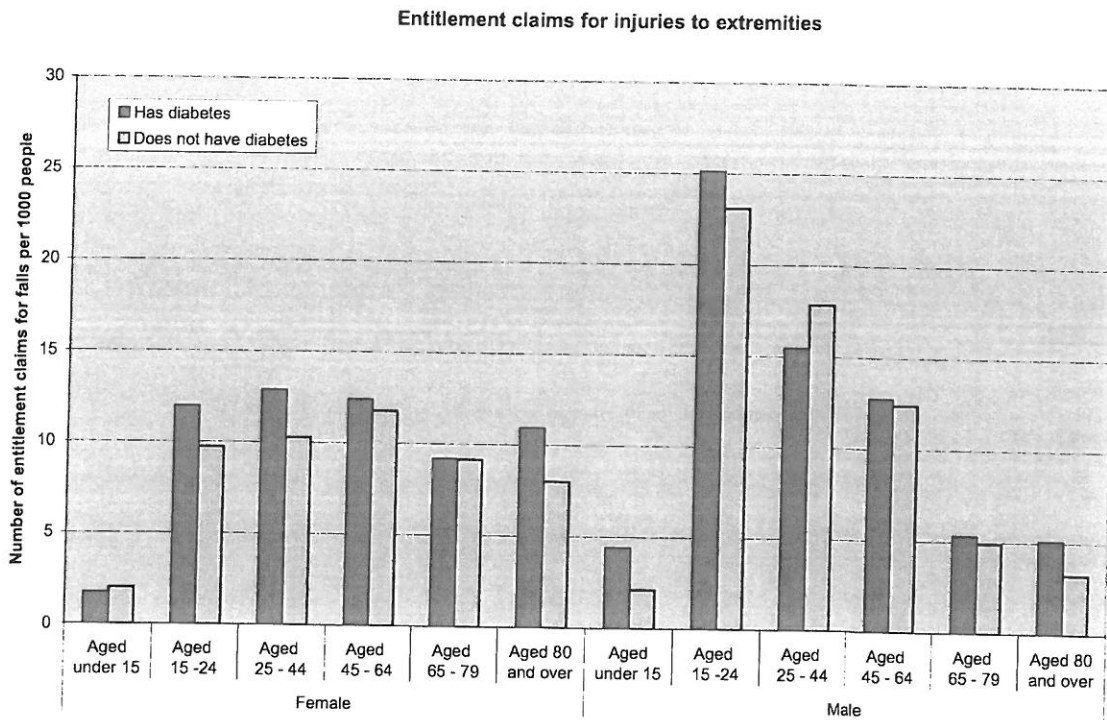
- the mean cost of treatment for both female and male diabetics in the 25 to 44 age group is significantly higher compared to their counterparts, however this is likely to be a function of the relatively higher number of claims and the increased duration of claims in this age group.

*Extremities*

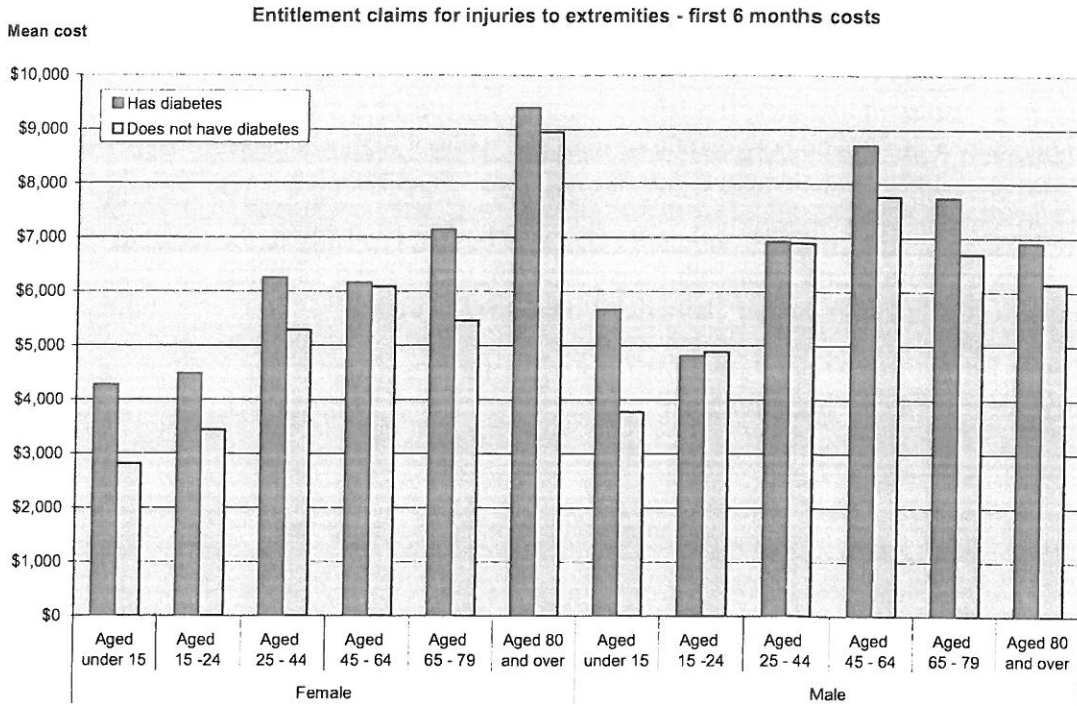
Given the nature of diabetes, it might be expected that analysis of extremity-related injuries might show a difference between those with and without diabetes respectively. There is some evidence of higher Entitlement claim rates (Figure 13), although not significantly so.

However the mean cost of Entitlement claims is higher, typically in the range of \$1,000 to \$1,500 at both the 6 and 12 month time points (Figures 13 and 14). The increased cost is likely to be related the longer claim duration time (Figure 16).

**Figure 13: No Diabetes related Extremity Entitlement Claims Per 1000 people, July/June 2008/09 Financial Year**



**Figure 14: Mean Cost (Incl. PHAS) Diabetes Extremity Entitlement Claim first 6 Months, 2008/09 Financial Year**



**Figure 15: Mean Cost (Incl. PHAS) Diabetes Extremity Entitlement Claims first 12 Months**

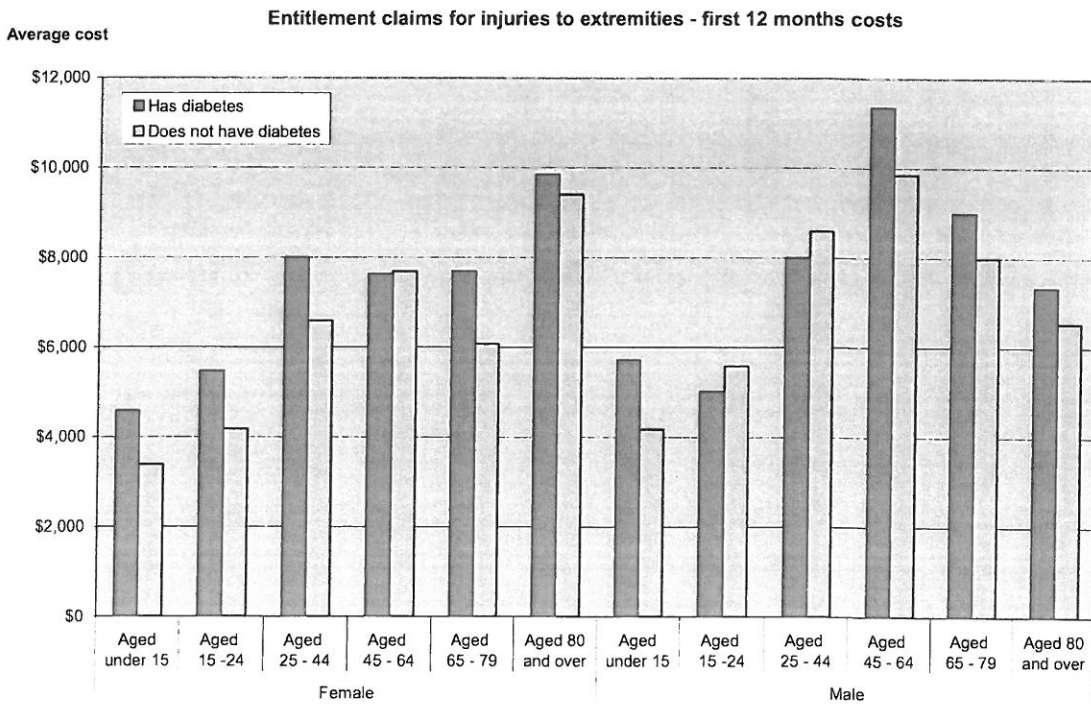
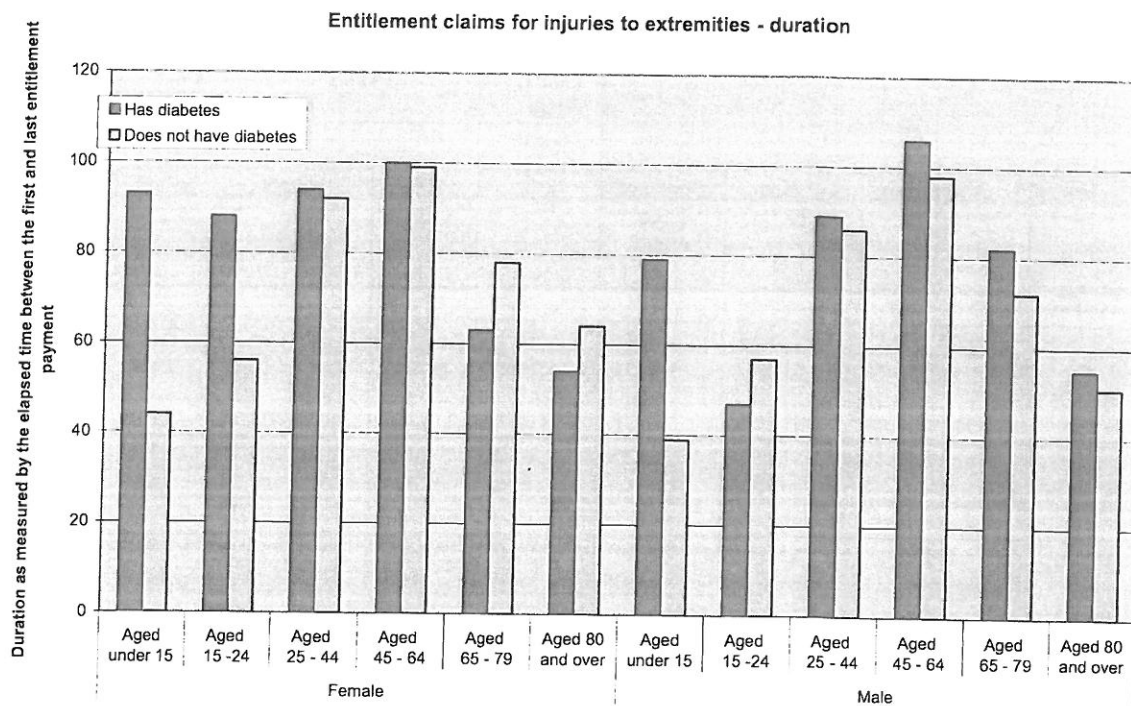


Figure 16: Mean Duration Diabetes Extremity Entitlement Claims



**CHD All Claim Costs**

Table 14 shows the mean extra cost associated with all CHD related claims at 6 and 12 month time points, and the mean duration of payments.

The table indicates a consistent pattern of extra costs associated with CHD of typically between \$300-\$400 per claim, irrespective of age and sex. There is no difference in duration, suggesting the extra cost is associated with complications of treatment rather than the time taken to rehabilitate.

Overall, the extra costs attributable to CHD are at least \$62 million in the 2008/09 financial period.



**Table 14: Mean Cost (incl PHAS) and Mean Duration of All Claims CHD related, @ 6 and 12 months, July/June 2008/09 Financial year**

Coronary Heart Disease: <u>All Claims</u>		Mean cost in first 6 months incl PHAS		Extra Mean Cost CHD @ 6 mth	Mean cost in first 12 months incl PHAS		Extra Mean Cost CHD @ 12 mth	Mean duration of medical payments	
Sex	Age Group	Has CHD	Does not have CHD		Has CHD	Does not have CHD		Has CHD	Does not have CHD
Female	Aged under 15	\$254	\$277	-\$23	\$258	\$297	-\$39	30	29
	Aged 15 -24	\$872	\$497	\$375	\$946	\$597	\$349	50	50
	Aged 25 - 44	\$1,147	\$651	\$496	\$1,508	\$843	\$665	78	70
	Aged 45 - 64	\$1,056	\$776	\$280	\$1,330	\$1,008	\$322	83	84
	Aged 65 - 79	\$1,316	\$986	\$330	\$1,455	\$1,119	\$336	72	76
	Aged 80 and over	\$2,618	\$2,260	\$358	\$2,713	\$2,341	\$372	52	55
	Other	\$4,197	\$380	\$3,817	\$4,197	\$445	\$3,752	0	114
	Sub-Total	\$1,812	\$696	\$1,116	\$1,961	\$838	\$1,123	65	62
Male	Aged under 15	\$449	\$308	\$141	\$503	\$331	\$172	30	27
	Aged 15 -24	\$1,991	\$758	\$1,233	\$2,441	\$906	\$1,535	78	45
	Aged 25 - 44	\$1,177	\$1,023	\$154	\$2,036	\$1,353	\$683	69	63
	Aged 45 - 64	\$1,381	\$1,157	\$224	\$1,945	\$1,599	\$346	82	78
	Aged 65 - 79	\$1,251	\$1,116	\$135	\$1,534	\$1,433	\$101	71	77
	Aged 80 and over	\$1,926	\$1,955	-\$29	\$2,046	\$2,150	-\$104	50	54
	Other	\$2,536	\$1,240	\$1,296	\$7,148	\$1,264	\$5,884	188	101
	Sub-Total	\$1,455	\$853	\$602	\$1,801	\$1,095	\$706	69	55
<b>Total Cost</b>		Has CHD: \$118,773,333		No CHD: \$1,088,624,467					
<b>Excess <u>All Claim</u> Costs</b>									
<b>Attributable to CHD first 6 months*</b>		\$ 62,670,614.00		<b>Excess @ 12 mths</b>		\$ 66,635,192.00			

\* Excess is Sum of: Mean Extra Cost x Sub-total of Claims in each Group

***CHD Entitlement claims –Mean Cost and Duration at 6 and 12 months (incl. PHAS)***

Table 15 and the three figures on the following pages clearly show that the presence of CHD is associated with sizable extra Entitlement costs, particularly in the working age population aged between 15 and 64 years (Figure 17 and Figure 18). Excess mean Entitlement costs are typically in the region of \$2,000, depending upon sex and age group.

The mean CHD Entitlement claim duration, as measured by number of paydays, is shown in Figure 19. It can be seen that there is very little difference between the pairs of groups for those over 65 years, which contain most people with coronary heart disease. The durations for people younger than 45 years were longer on average for those with the disease than for those without, however the number of clients with coronary heart disease in each of these age groups is very small. Where the mean duration is longer, the Entitlement costs are correspondingly significantly higher.

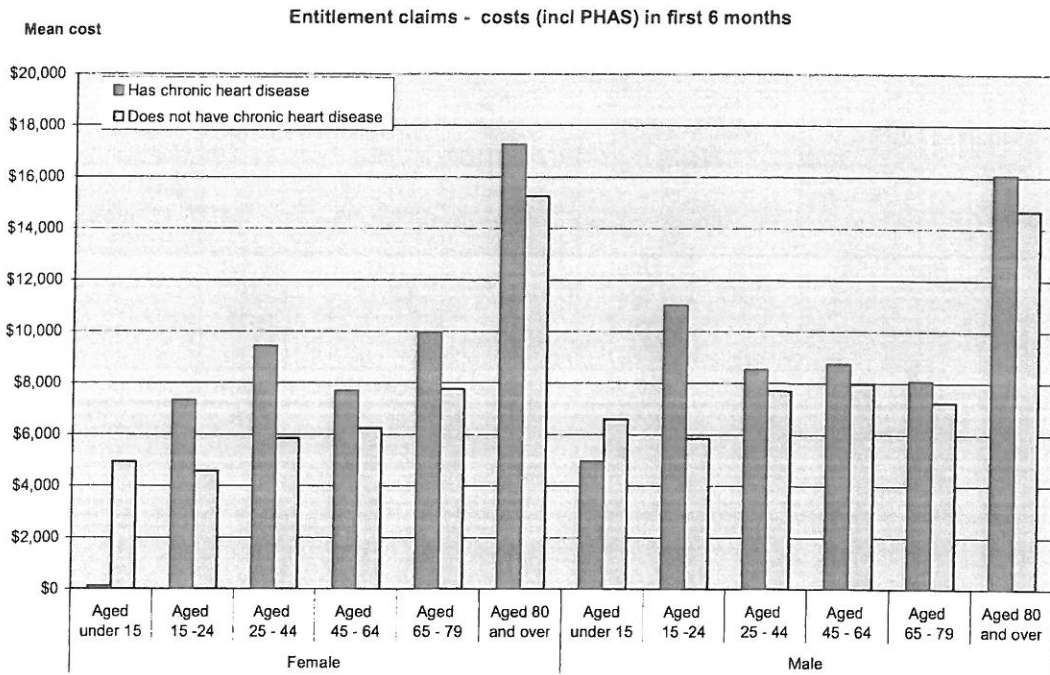
Overall, the extra Entitlement claims costs associated with CHD in the 2008/09 financial year are estimated to be approximately \$27 million.

**Table 15: Mean Cost (incl PHAS) and Mean Duration of CHD related Entitlement**

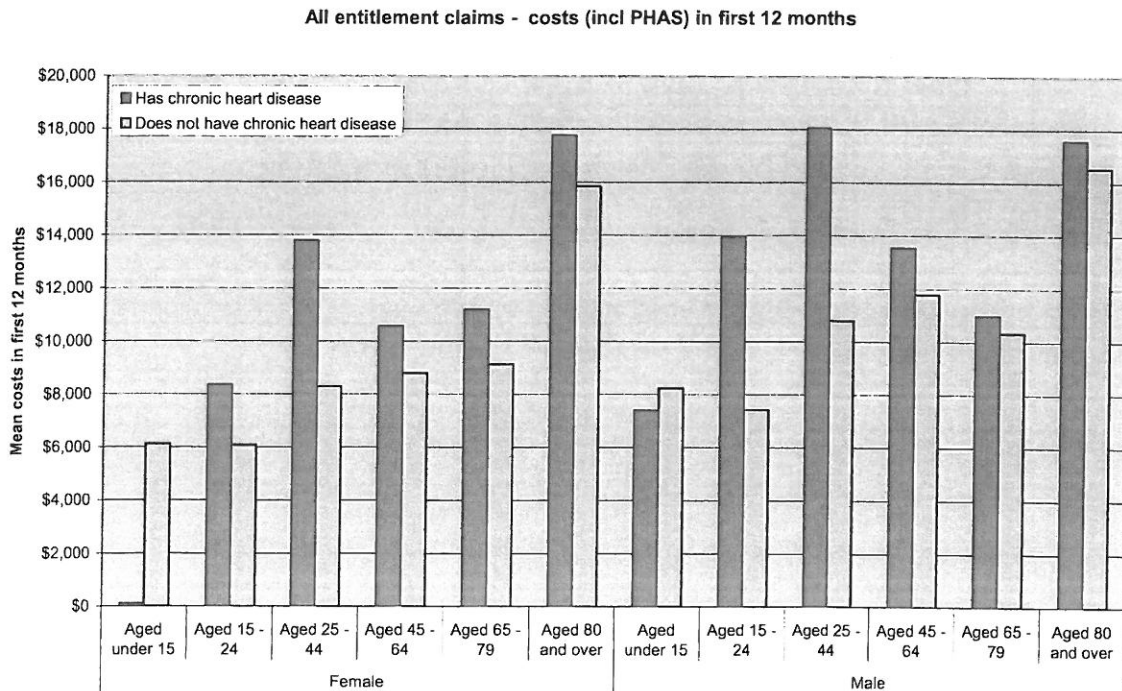
Coronary Heart Disease: Entitlement Claims		Mean cost in first 6 months incl PHAS		Extra Mean Cost CHD @ 6 mth	Mean cost in first 12 months incl PHAS		Extra Mean Cost CHD @ 12 mth	Mean duration of medical payments		
Sex	Age Group	Has CHD	Does not have CHD		Has CHD	Does not have CHD		Has CHD	Does not have CHD	
Female	Aged under 15	\$109	\$4,946	-\$4,837	\$109	\$6,118	-\$6,009	0	52	
	Aged 15 -24	\$7,343	\$4,564	\$2,779	\$8,356	\$6,084	\$2,272	64	73	
	Aged 25 - 44	\$9,450	\$5,851	\$3,599	\$13,802	\$8,297	\$5,505	126	105	
	Aged 45 - 64	\$7,708	\$6,236	\$1,472	\$10,574	\$8,794	\$1,780	123	108	
	Aged 65 - 79	\$9,970	\$7,762	\$2,208	\$11,198	\$9,135	\$2,063	92	93	
	Aged 80 and over	\$17,272	\$15,245	\$2,027	\$17,768	\$15,850	\$1,918	66	74	
	Other	0	\$2,146	-\$2,146	0	\$2,146	-\$2,146	0	56	
	Sub-Total	\$13,050	\$6,784	\$6,266	\$14,280	\$8,817	\$5,463	85	96	
Male	Aged under 15	\$4,969	\$6,592	-\$1,623	\$7,404	\$8,237	-\$833	117	51	
	Aged 15 -24	\$11,021	\$5,844	\$5,177	\$13,958	\$7,423	\$6,535	103	71	
	Aged 25 - 44	\$8,534	\$7,704	\$830	\$18,043	\$10,791	\$7,252	109	103	
	Aged 45 - 64	\$8,762	\$7,980	\$782	\$13,558	\$11,779	\$1,779	149	126	
	Aged 65 - 79	\$8,086	\$7,255	\$831	\$10,999	\$10,330	\$669	161	153	
	Aged 80 and over	\$16,096	\$14,688	\$1,408	\$17,589	\$16,559	\$1,030	92	103	
	Other	\$11,812	\$399	\$11,413	\$34,798	\$412	\$34,386	672	0	
	Sub-Total	\$9,982	\$7,400	\$2,582	\$13,569	\$10,273	\$3,296	140	104	
<b>Total Cost</b>		Has CHD: \$72,470,166		No CHD: \$692,295,080						
<b>Excess All Claim Costs</b>										
<b>Attributable to CHD first 6 months*</b>		\$27,859,014				<b>Excess @ 12 mths</b>				\$ \$27,567,687
* Excess is Sum of: Mean Extra Cost x Sub-total of Claims in each Group										

**Claims, @ 6 and 12 months, July/June 2008/09 Financial year**

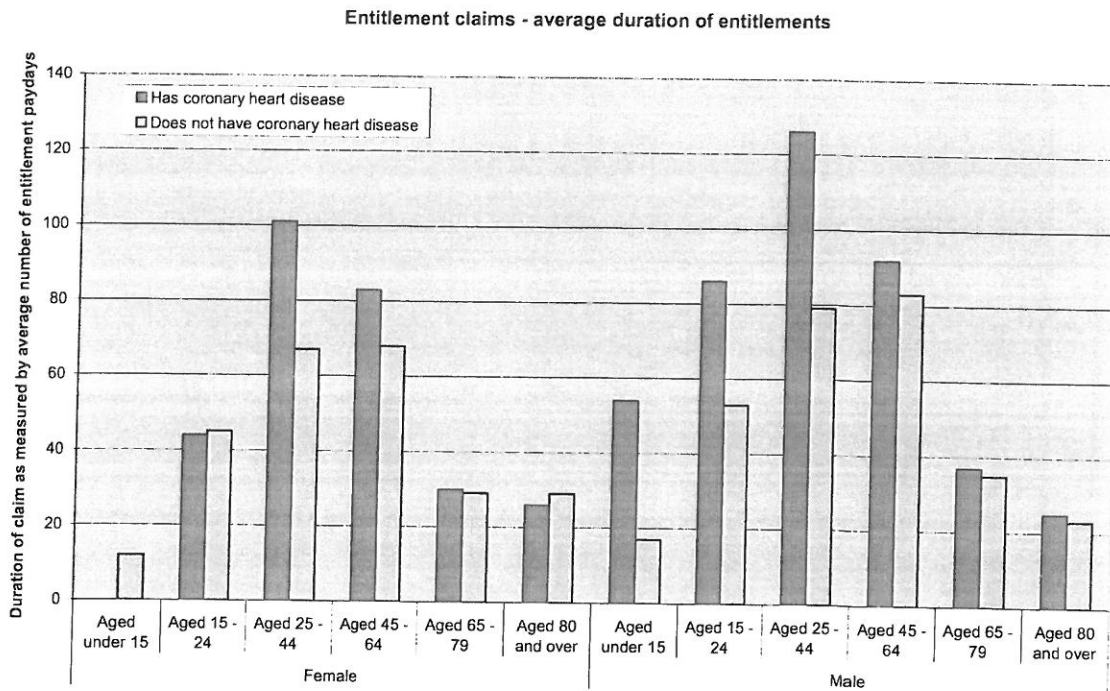
**Figure 17: Mean Cost (Incl. PHAS) CHD related Entitlement Claims, first 6 Months, July/June 2008/09 Financial Year**



**Figure 18: Mean Cost (Incl. PHAS) CHD related Entitlement Claims, first 12 Months, July/June 2008/09 Financial Year**



**Figure 19: Duration CHD Entitlement Claims, Mean Paydays, July/June 2008/09 Financial year**



**Additional analysis: CHD**

Additional detailed work has been undertaken exploring whether the overall differences reported above hold true in situations where differences would be expected to be seen when analysed by ACC injury diagnosis and injury event codes given the nature of CHD. The results of this work is summarised below. The findings support the overall results.

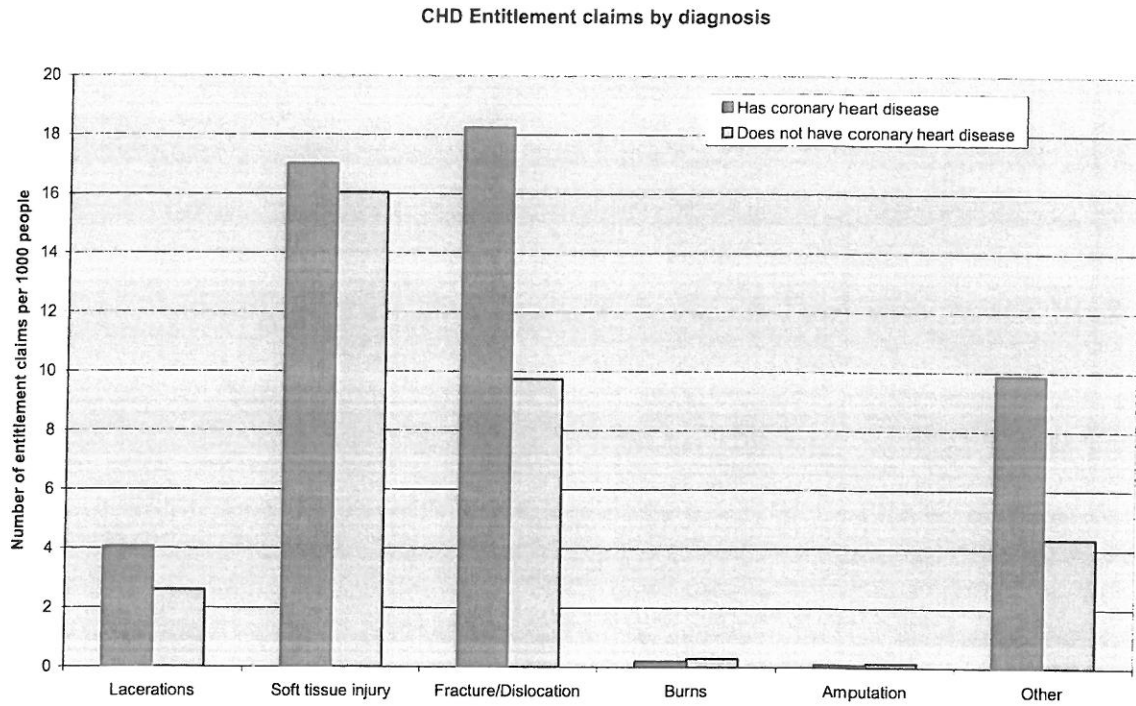
*CHD and Injury Diagnosis Group and Injury Site*

The following two figures show the rates of CHD Entitlement claims by major diagnosis group, and mean cost in the first 12 months. It can be seen that the highest claim rates for those with CHD are fractures / dislocations closely followed by soft tissue injury, and then lacerations. The rates of claiming are significantly higher for fractures/dislocations are approximately double those without CHD (Figure 20).

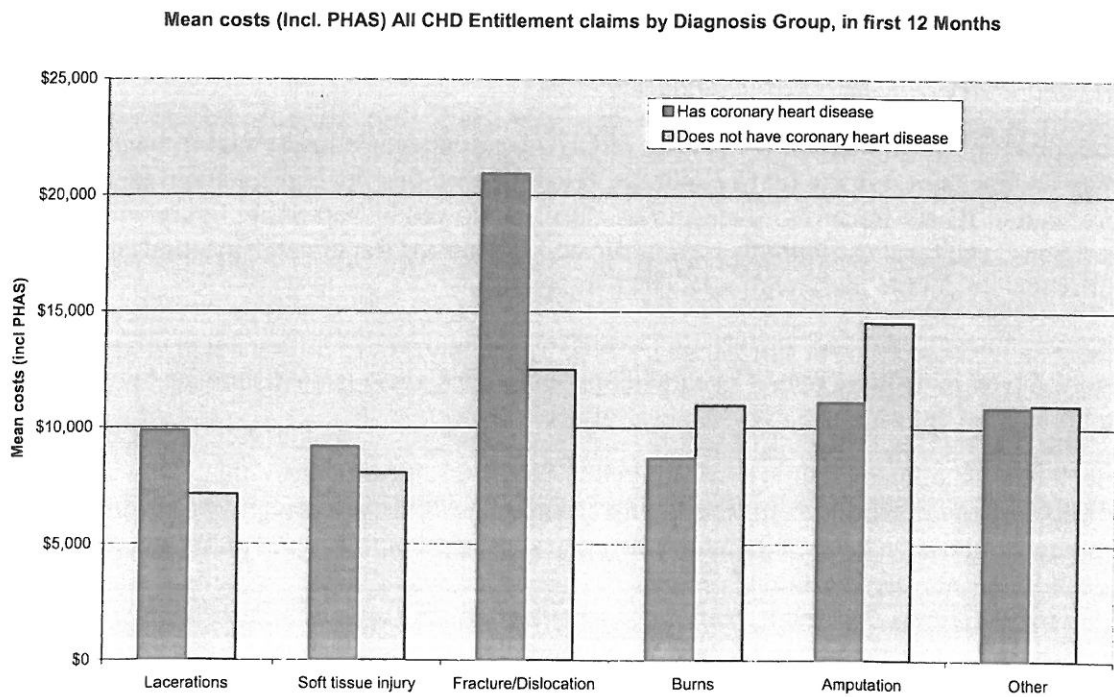
When examined by sex and age group, the differences in overall Entitlement claim rate is largely driven by females over 45 years of age. For males, there is no difference between the age groups, except for those over 80 years of age.

When the costs of these claims is considered in Figure 21, it can be seen that the mean cost for fractures and dislocations for those with coronary heart disease is significantly higher compared to those without CHD, with a mean cost of approximately \$21,000 compared with under \$10,000 for those without CHD.

**Figure 20: No CHD Entitlement Claims per 1000 People by Injury Diagnosis, 2008/09 Financial Year**



**Figure 21: Mean Cost of CHD Entitlement Claims by Injury Diagnosis Group, 2008/09 Financial Year**





*CHD and Type Injury Event: Falls*

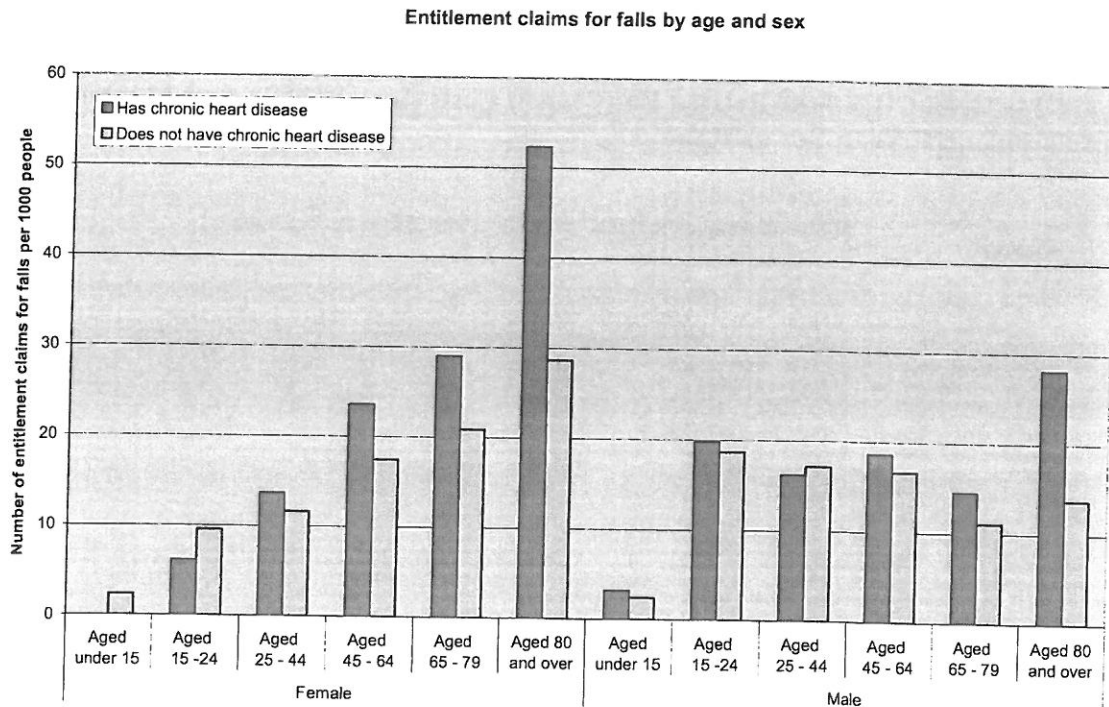
The Entitlement claim rate for falls is shown in Figure 22 below. The figure shows a marked age gradient and differences between the sexes. Females aged 80 years and over with coronary heart disease have significantly higher claim rates at over 50 entitlement claims per 1000 people compared to all other population groups. The next highest claiming groups are females aged 65-79 and males aged 80 years and over with coronary heart disease, and then women aged 80 years and over without the condition.

In addition to the extra claims utilisations associated with CHD, there are higher costs at both the 6 and 12 month time points for all age groups and both sexes (Figure 23 and Figure 24). Depending on sex and age group, the extra costs are typically in the range of \$2,000 to \$5,000 per claim, and increase with time.

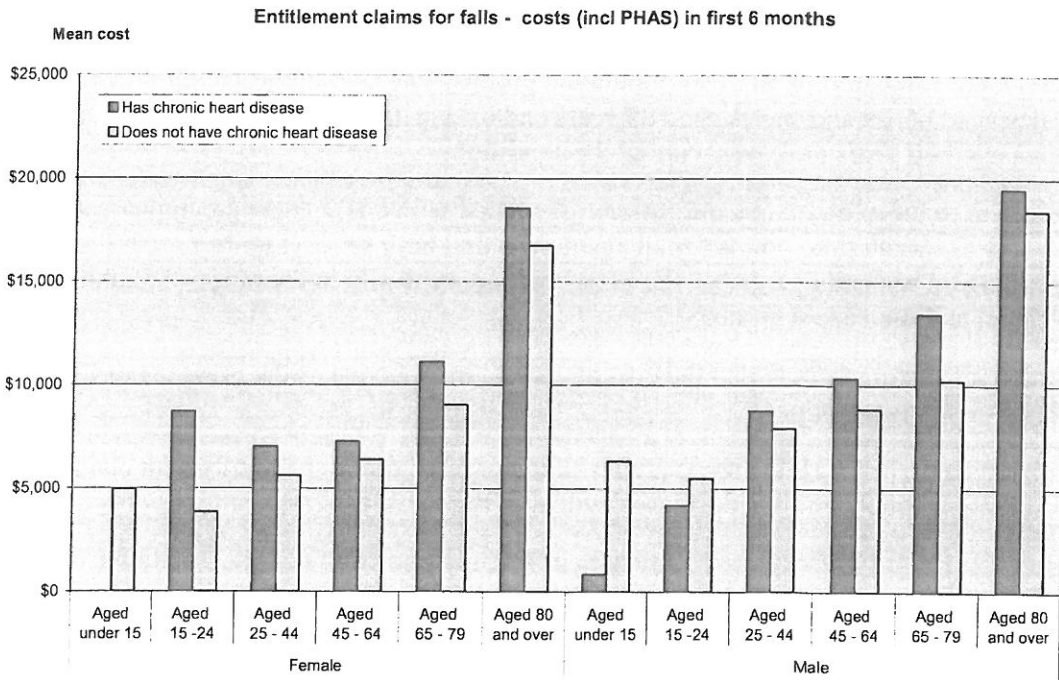
It is also interesting to note that the cost of claims, irrespective of the presence of CHD, increases with age-group.

As observed earlier, CHD is associated with increased duration of Entitlement claims in the working age groups, but this decreases with age (Figure 25).

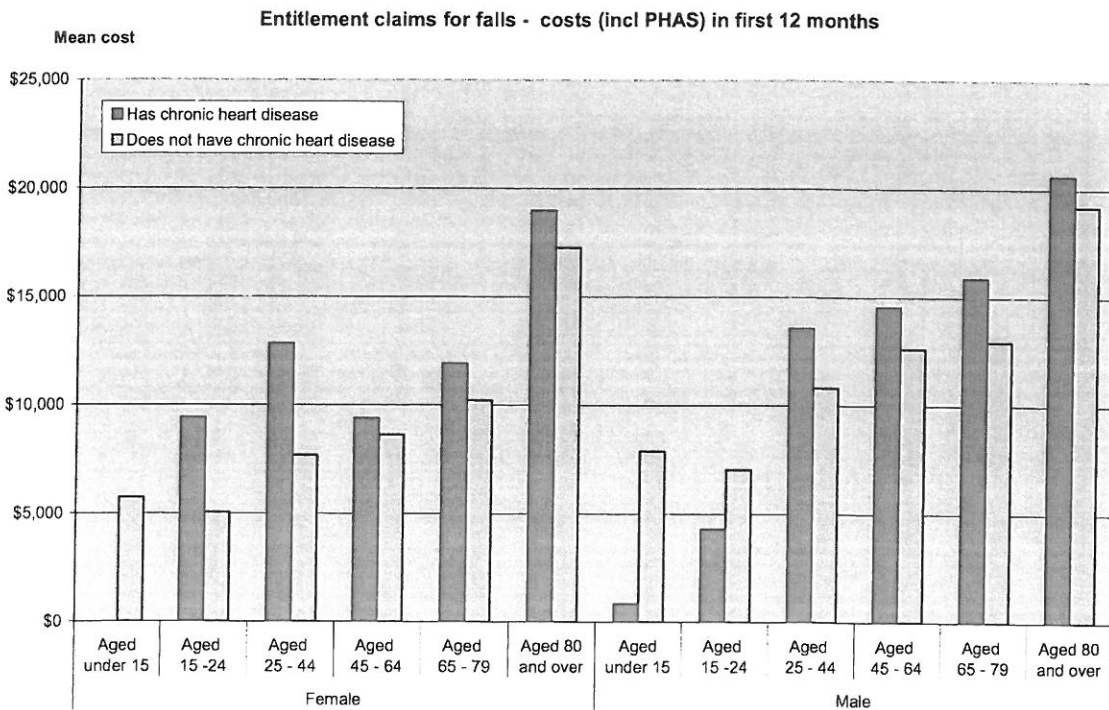
**Figure 22: CHD Falls-Related Entitlement Claims per 1000 people, 2008/09 Financial Year**



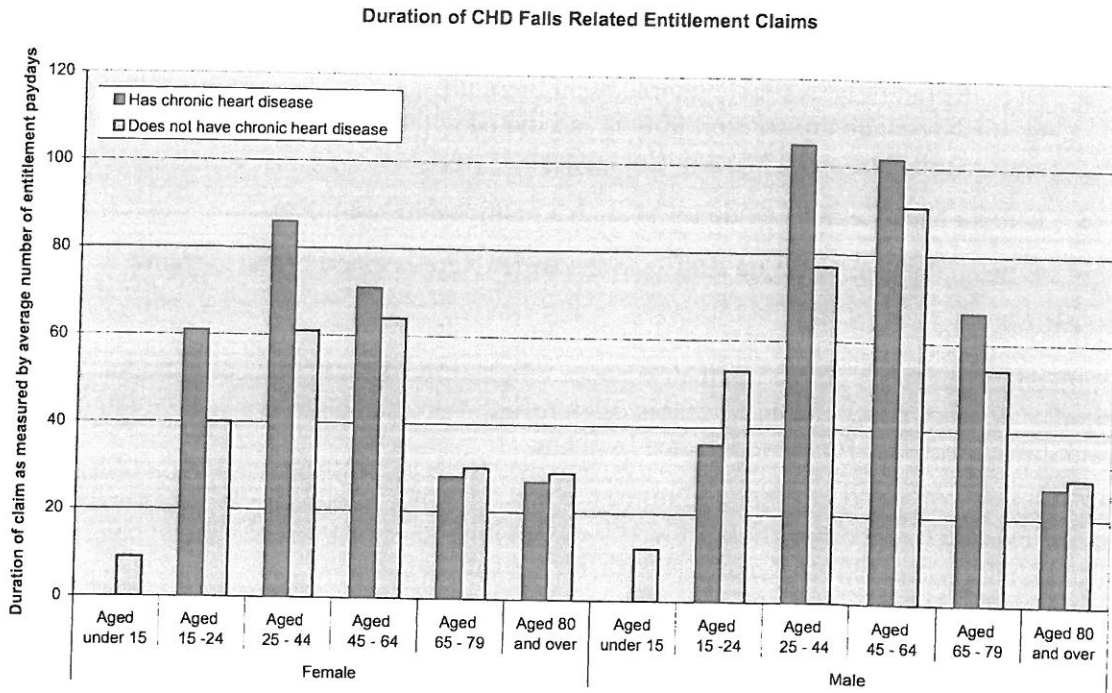
**Figure 23: Mean CHD Falls-Related Entitlement Costs (Incl. PHAS), first 6 months, 2008/09 Financial Year**



**Figure 24: Mean CHD Falls-Related Entitlement Costs (Incl. PHAS), first 12 months, 2008/09 Financial Year, Sex and Age**



**Figure 25: Mean Duration of CHD Falls-Related Entitlement Claims, 2008/09 Financial Year, Sex and Age**



## Summary & Conclusions

This report consolidates information from a suite of research initiatives that have been undertaken examining the degree to which health co-morbidities affect ACC injury claims utilisation, and treatment and rehabilitation costs.

Questions addressed are:

- Does the publicly available international literature support the hypothesis that the existence of a health co-morbidity is associated with an increased injury treatment service utilisation and Weekly Compensation costs?
- Is there New Zealand evidence of such a relationship? and if so
- What is the size effect on ACC and the wider New Zealand health system?

## Literature

Health co-morbidity is defined as the existence of a chronic disease that has a gradual onset or period of development. Chronic diseases often result in poorer health status and reduction in health life expectancy for those affected by them.

The international literature, and the limited amount of New Zealand research, is unequivocal that the existence of a broad range of health co-morbidities is associated with increased injury risk, health service utilisation and higher medical treatment costs.

Furthermore, severe acute injury events can lead to chronic health conditions, which in turn can result in increased risk of injury.

Estimates of the attributable burden of injury based upon samples of the injured population may overestimate the burden of injury in the whole population if they do not adjust for co-morbidity effects in the injured population.

In addition, higher workers' weekly compensation costs are associated with:

- high individual health risk status (typically includes a range of health risk and behaviour indicators), and higher health risk scores are associated with higher costs;
- there is considerable confidence that the excess risk from health co-morbidities accounts for at least 25% to 30% of medical costs per year across a wide variety of companies, regardless of industry or demographics.

The biggest cost factors are the cost of extra treatment utilisation, and medical costs associated with the complications of a co-morbidity.

There is a substantive body of literature indicating that comprehensive workplace based health promotion programmes promoting healthy life styles are cost-effective (typical cost-benefit ratio 1:6.3) in reducing economic losses including Workers' Compensation costs associated with workers with a risky life style, health co-morbidity or injury experience.

## Primary Care Service Utilisation and Cost Impacts to ACC

A study of a national sample GP Practices in the HealthStat data set (CBG Health Care) has clearly shown that approximately 32% of the GP patient population has at least one health co-morbidity (Asthma, COPD, IHD, Hypertension, HF, Diabetes, Mental Health, Cancer) recorded on their patient file. This is similar to level reported by Davis et al (1992) in their study of three Auckland hospitals.

Irrespective of age, sex, and ethnicity GP ACC patients who have a recorded chronic disease have approximately twice as many ACC consultations for injury treatment than ACC patients

who don't have a chronic condition. This same level of increased utilisation was found in GP clients with a health co-morbidity but who weren't ACC clients.

Based upon the sample in the study, the extra cost to ACC for GP patients with a recorded health co-morbidity, compared to those without a record of a health co-morbidity, is estimated to be 340,000 consultations nationally, which at an average cost of \$37.12 per consultation for a 12 month period, equates to a cost of \$12,620,800 (excl GST) in that period.

### **ACC-MOH Linked Data**

The linked data clearly shows there is an extra cost to ACC for treating injuries where diabetes and CHD are present as health co-morbidities.

The overall patterns of extra claims utilisation cost and duration associated with diabetes and CHD in the population by age group and sex holds true when disaggregating the analysis by injury diagnosis and event. The additional cost to ACC of treating injuries where these two health co-morbidities are present, while relatively small on an individual basis overall, cumulatively amounts to tens of millions of dollars, even after relatively short periods of time. It should be noted, that the overall analysis hides significant cost differences between those with and without a co-morbidity when looking a specific injury event.

Where diabetes is present, the analysis suggests that the extra costs associated with treating injury claims is largely due to increased claims utilisation and claims duration, rather than necessarily significant treatment complications. There are marked differences between age groups, and the differences are particularly significant in the older population group, which is expected. There are also some sizable differences in the mean costs of claims costs between males and females, which may be due to the type of workforce participation – however this has not been tested in this study.

With CHD, the extra cost is substantially the result of higher mean costs related to the increased duration of a relatively small number of Entitlement claims in the working age population, and significantly higher claims utilisation amongst the female population over 45 years of age.

The research has shown the utility of linked data analysis. Further disaggregated analysis could be undertaken using the methods recently reported by Sarfati et al (2010). However, such a study may raise significant patient confidentiality and ethical issues as such a project would require accessing significantly more patient health data than previously.

### **Implications for ACC and the Health System**

There is sufficient published international literature, including some NZ research, which clearly shows a wide range of health co-morbidities are significantly associated with increased probability of injury treatment utilisation and costs – including workers compensation.

Given the marked age-related effects seen with the diabetes and coronary heart disease health co-morbidities, it is expected that as the New Zealand population gets older, Scheme liability will significantly increase over time in the Non-Earners' Account, and to a lesser degree in the Work and Earners' accounts due to the prevalence of these co-morbidities in the New Zealand population.

To address this high probability, action should be taken to address the prevalence and incidence of these health co-morbidities in the population, or other policy measures taken to address the additional cost burden to ACC attributable to the presence of identifiable health co-morbidities.



In terms of injury prevention, one unexpected finding of this body of research was the finding of a substantial body of literature showing the effectiveness of work-based health promotion programmes targeting general health risks in reducing workers compensation costs. The literature is summarised in Appendix 1.

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## **Appendix 1: Meta-Evaluation of Worksite Health Promotion Economic Return Studies**

Chapman, L. (2005). Meta-evaluation of worksite health promotion economic return studies: 2005 update. *Art of Health Promotion*.

Pelletier, K. (2001). A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: 1998-2000 update. *Am J Health Promot*, 16(2), 107-116.