



Results of Three Pilot Studies Quantifying the Effects of Selected Health Co-morbidities on ACC Injury Treatment Utilisation and Costs

Results of studies involving:

- 1. Brief review of the literature**
- 2. Service provision using GP Practice data**
- 3. ACC Claims Utilisation and Costs using linked ACC-MOH data**

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Peer Review

The report has been the beneficiary of verbal and written comments from a range of internal and external peer reviewers including:

- Senior ACC research staff
- University researchers
- ACC Clinical Advisors.

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Executive Summary

Purpose

Research has completed a suite of pilot studies aimed at identifying and describing the evidence for health co-morbidity effects upon ACC injury treatment claims utilisation and claims costs over a 12 month period.

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

This is the first report to produce quantified estimates indicating the size of the burden to ACC associated with health co-morbidities on injury treatment utilisation, claims costs and duration. The report presents the key results of the work undertaken by external and internal researchers. The paper has been subject to external and internal peer review including clinical advisors and university researchers.

Headline Results

Evidence for the existence of health co-morbidity effects on increased injury treatment utilisation and costs is well supported in the literature.

Extra ACC injury treatment and rehabilitation costs of approximately \$100 million in a 12 month period have been associated with the presence of diabetes and coronary heart disease.

There are marked differences between life-cycle age groups and gender in extra claim utilisation and cost where a co-morbidity is present.

Analysis of GP consultations clearly shows that the presence of one or more of a wide range of health co-morbidities is associated with extra GP ACC injury related consultations compared to those without a health co-morbidity. In the 12 month period April 2008 to March 2009, the extra cost to ACC of GP injury treatment consultations where a co-morbidity is present is estimated to have been \$12.6 million in that period.

Extra injury treatment claim costs to ACC associated with Diabetes and Coronary Heart Disease compared to those without the co-morbidities (linked ACC-MOH data)

The following two tables summarise the extra claims utilisation, duration and cost associated with coronary heart disease and diabetes respectively.

Excess costs are calculated by summing the mean extra cost of a claim where the identified co-morbidity is present compared to the mean cost of the claim where the co-morbidity is not present, multiplied by the number of co-morbidity claims.

For All Claims in the 2008/09 financial year:

- Extra costs of at least \$60 million have been associated with the presence of coronary heart disease at the 6 month time point following a claim
- Extra costs of at least \$36 million for the 2008/09 year have been associated with the presence of diabetes at the 6 month time point following a claim
- Extra costs continue to increase to the 12 month time point. The substantive costs are incurred within the 6 month time period.

- Evidence for the existence of health co-morbidity effects on increased injury treatment utilisation and costs is well supported by the literature. There are marked differences between life-cycle age groups and gender.

Table 1: Summary - Extra Costs, Claims Utilisation and Duration Associated with Coronary Heart Disease

Excess associated with Coronary Heart Disease					
Claims made in July / June 2008/09 Year, for whom ACC has an NHI number					
	Extra Costs (Incl. PHAS)		Percent Extra Claims Utilisation associated with co-morbidity	Duration: Medical Payments	Duration: Paydays
	6 months	12 months			
All Claims	\$62,670,614	\$66,635,192	20%	Yes, particularly 25-44 age group	n/a
Entitlement Claims	\$27,859,014	\$27,567,687	23%	Yes, those working age - particularly Males approx. 20 - 30 payments	Yes, those working age - particularly Males approx. 30 - 40 payments
* % based upon: Utilisation Ratio Claims per 1000 people CHD / No CHD					

Table 2: Summary - Extra Costs, Claims Utilisation and Duration Associated with Diabetes

Excess associated with Diabetes					
Claims made in July / June 2008/09 Year, for whom ACC has an NHI number					
	Extra Costs (Incl. PHAS)		Percent Extra Claims Utilisation associated with co-morbidity	Duration: Medical Payments	Duration: Paydays
	6 months	12 months			
All Claims	\$36,396,050	\$ 40,964,302	16%	None	n/a
Entitlement Claims	\$13,168,872	\$14,189,812	14%	Yes, Males Working Age - approx. 6 - 16 payments increasing with age	Yes Males Working Age - approx. 10 - 18 payments, varies by age
* % based upon: Utilisation Ratio Claims per 1000 people Diabetes / No Diabetes					

Implications for ACC Scheme Liability

The report presents substantive evidence that there is an extra cost to ACC for treating injuries where diabetes and coronary heart disease (CHD) are present as health co-morbidities. The increased costs have been quantified at 6 and 12 month time points for claims occurring in the 2008/09 financial year.

In addition, there is sufficient published international literature, including some New Zealand, which clearly shows a wide range of other health co-morbidities are associated with increased injury claim utilisation and costs at the primary and hospital care levels.

It is expected that additional extra costs associated with other health co-morbidities would be identified should the pilot work be extended to include other co-morbidities.

Given the marked sex and age related effects seen with the two selected health co-morbidities, it is expected that as the New Zealand population gets older Scheme liability will increase over time particularly in the Non-Earners Account, and to lesser degree in the Work and Earners' Accounts.

To address this scheme liability, recommended actions that could be taken include developing:

- policy settings around the apportionment of the cost of a claim to the health system where a health co-morbidity is present, however this is likely to be highly contentious
- claims management processes to better identify and manage claims where a health co-morbidity is present, currently no data is collected by ACC about the presence of a health co-morbidity
- experience rating models that include a function for health co-morbidity effects for population groups differentiated by type of co-morbidity, life-cycle age group, and sex. This work would likely require further research to be undertaken focussing upon developing New Zealand specific risk ratios for the selected health co-morbidities
- workplace based health promotion programmes targeted at improving the general health of the workforce and thereby reducing co-morbidity related workers compensation costs and poor health status in general
- further research to develop a more complete estimate of the cost effects of the full range of health co-morbidities to ACC based upon the methods used in this report, and to develop more complete and better estimates of the relative risk associated with specific health co-morbidities on ACC claims utilisation and costs.

Key findings – ACC-MOH Linked Data: Injury Treatment Utilisation and Cost Impacts to ACC for Selected Co-morbidities

The prevalence of diabetes and coronary heart disease in the ACC population is similar to that reported in national estimates for all age groups up to 80 years of age.

There is clear evidence that the selected co-morbidities (diabetes and coronary heart disease) increases the risk of making an ACC claim (claim utilisation), increases the mean cost of All Claims and Entitlement claims respectively, and results in increased duration of some claims. The effects are statistically significant in some cases.

Irrespective of statistical significance, small levels of increased costs associated with the co-morbidity adds up to significant costs to the Scheme, in the 2008/09 time period examined.

- Excess All Claims costs of least \$60 million for the 2008/09 financial year have been attributed to the presence of coronary heart disease at the 6 month time point following a claim.
- Excess All Claims costs of least \$36 million for the 2008/09 year have been attributed to the presence of diabetes at the 6 month time point following a claim.
- Costs, for both co-morbidities continue to increase to the 12 month time point for All Claims and Entitlement Claims respectively, but not significantly.
- Increased costs of All Claims are likely to be related to increased complexity of treating claims due to the presence of the co-morbidity.
- Increased cost of Entitlement claims is likely to be associated with increased rehabilitation required due to the presence of the co-morbidity.
- The effects of the selected co-morbidities are significantly related to older population age-groups. This has implications for increased Scheme liability as the population gets older.

Key findings – Primary Care Service Utilisation and Cost Impacts to ACC

A study using GP practice data (CBG Health Research Ltd, 2009) has shown that in the 12 month period April 2008 to March 2009:

- The extra burden to ACC of consultations for patients with a recorded health co-morbidity is estimated to be 340,000 consultations nationally, which at an average cost of \$37.12 per consultation for the period, equates to a cost of \$12,620,800 (excl GST) in that period.
- Approximately 32% of the GP patient population has at least one health co-morbidity (Anxiety, Asthma, Bipolar Affective disorder, Chronic Obstructive Pulmonary Disease, Congestive Heart Failure, Depression, Diabetes Mellitus, Infectious gastroenteritis, Influenza-like Illness (ILI), Ischaemic Heart Disease, Schizophrenia, Substance Abuse) recorded on their patient file.
- Irrespective of age, sex, and ethnicity 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 level of extra service utilisation was also found in the GP client population who weren't ACC clients.
- ACC Consultations represented 8.1% of all GP consultations.

Key Findings: Literature

Health co-morbidity effects

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.

The presence of one or more health co-morbidities in a patient complicates treatment, prolongs hospitalisation and rehabilitation, and confounds analysis when examining the importance of other risk factors such as age, ethnicity and social deprivation.

Patients with mental health and behavioural disorders and those with previous injuries respectively, have higher treatment rates - at least double - compared to those without a co-morbidity, and compared to other co-morbidities.

A causal link appears to exist between the existence of mental health conditions, risk-taking behaviours, alcohol misuse and psychological characteristics such as impulsivity, sensation seeking and risk-perception and increased risk of injury and injury treatment utilisation.

Patients with higher numbers of co-morbidities utilise services more than patients with lower co-morbidities.

Two Ministry of Health pilot studies found that the probability of hospital admission for falls-related injuries significantly increased where substance abuse, anxiety and dementia, and vision impairment were present. The probabilities increased with age, and particularly so for those over 55 years.

Workers Compensation

Higher workers' weekly compensation costs are associated with high individual health risk status (typically includes a range of health risk and behaviour indicators), with higher health risk scores associated with higher costs and:

- 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 health 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.

Other findings

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.

Background: This Report

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.

The report is intended to address the following questions:

- 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?

The following work has been undertaken over the last 18 months to address the questions:

- a brief review of the academic literature on the link between health co-morbidities and risk of injury and extra injury treatment provision;
- a short descriptive epidemiological study using Ministry of Health National Minimum Dataset information to explore whether the existence of a health co-morbidity is associated with higher health system injury treatment costs;
- a large descriptive epidemiological study using HealthStat data, drawn from a large random sample of General Practices (GPs), to explore whether the existence of a health co-morbidity was associated with extra ACC Consultations and, if so to determine the size effect of this;
- a trial study linking ACC and MOH data to examine the effects of selected health co-morbidities upon ACC claims utilisation and costs.

This work demonstrates the utility and on-going necessity, of using linked ACC-MOH data to inform ACC research, policy development, service design and operational decision-making.

Section 1: Introduction and Report Structure

Background

Co-morbidities are diseases or disorders that co-exist with the disease or illness of interest (Hall, 2006; Sarfati, Hill, Purdie, Dennett, & Blakely, 2010). Clinicians have been long aware of the importance of co-morbidity in modifying patient treatment. The presence of health co-morbidity conditions can prolong and complicate treatment, affect the quality of life, and increase the risk of early mortality (Sarfati, Hill, Purdie et al., 2010). Higher rates of injury and costs of workers compensation treatment and rehabilitation for people with high general health risks and co-morbidities are now well described in the international literature. The importance of effects though, has only recently been recognised in health policy and research (Sarfati, Hill, Purdie et al., 2010). Measuring co-morbidity has potentially significant implications for ACC and Ministry of Health service planning, funding, and policy.

ACC is not able to look directly at the impact of health co-morbidity on injury treatment utilisation and costs in its own data because information about the presence of health co-morbidity conditions is not collected in the claims management system. However recent research has demonstrated how routinely-collected Ministry of Health (MOH) administrative data can be used to inform co-morbidity research for health policy and service design (Sarfati, Hill, Purdie et al., 2010; Wright, 2009; Wright & Davies, 2009). The implication of this new research is that by linking ACC and MOH administrative data, ACC may, for the first time, be able to begin to quantify the effect health co-morbidity has upon injury treatment utilisation and costs to the Scheme.

Research Questions

Over the last 18 months ACC Research has undertaken a suite of activities aimed at exploring the effect health co-morbidities may have upon ACC injury treatment utilisation and costs. Specifically:

- Does the publicly available academic literature support the hypothesis that the existence of a health co-morbidity is associated with increased workers compensation injury treatment service utilisation and costs?
- Is there New Zealand evidence of such a relationship, and
- if so, what is the size effect on ACC injury treatment utilisation and costs, claims duration and weekly compensation costs?

The following research activities have been undertaken to address the questions:

1. A brief international literature review of published literature;
2. A study commissioned exploring at primary care level, the relationship between health co-morbidity and ACC injury treatment provided in GP practices (CBG Health Research Ltd, 2009);
3. A study linking ACC and selected MOH administrative data to explore the health co-morbidity effects of diabetes and cardio-vascular heart disease upon ACC injury treatment utilisation and costs for the Scheme as a whole;
4. Two brief case-studies by the Ministry of Health, Health and Disability Intelligence Unit exploring whether:

- a. deteriorating health status affects falls injury severity and mortality (*Wright & Davies, 2009*)
- b. the existence of mental health disorder affects the cost of hospital injury treatment for motor vehicle traffic crashes in the 15-34 year age group, and falls injuries in females aged 75+ years (*Wright, 2009*).

Report Structure

The report is structured into the following sections:

1. Introduction
2. A brief descriptive review of the literature about the effects of a health co-morbidity upon risk of injury, treatment utilisation, and Weekly Compensation costs respectively.
3. Results of a study using GP practice data examining the effects of the existence of a health co-morbidity upon GP and ACC consultation rates respectively.
4. Results of a ACC / MOH data linkage project exploring the effects of selected co-morbidities upon ACC treatment utilisation rates and claim costs.
5. Summary and Conclusions

Section 2: Summary of Literature

Key Findings: Literature on Health Co-morbidity Effects on Injury Treatment Service Utilisation

Health co-morbidity is defined as the existence of a chronic disease or disorder that has a gradual onset, and which co-exists with the disease or illness of interest. Chronic diseases may result in poorer health status and reduction in health life expectancy for those affected by them.

- The literature reviewed, including 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.
- The presence of one or more health co-morbidities in a patient complicates treatment, prolongs hospitalisation and rehabilitation, and confounds analysis when examining the importance of other risk factors such as age, ethnicity and social deprivation.
- Patients with mental health and behavioural disorders and those with previous injuries respectively, particularly result in rates of utilisation which are at least double compared to those without co-morbidity, and compared to other co-morbidities.
 - A causal link appears to exist between the existence of mental health conditions, risk-taking behaviours, alcohol misuse and psychological characteristics such as impulsivity, sensation-seeking and risk-perception and increased risk of injury and injury treatment utilisation.
- Patients with higher numbers of co-morbidities utilise services more than patients with lower co-morbidities.
- Two MOH pilot studies found that the probability of hospital admission for falls-related injuries significantly increased where substance abuse, anxiety and dementia, and vision impairment were present respectively. The probabilities increased with age, particularly for those in the over 55 year age group.

Workers Compensation

- Higher Workers' Weekly Compensation costs are associated with high individual health risk status (typically includes a range of health risk and behaviour indicators), with higher health risk scores associated with higher costs and:
 - 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 health 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.

Other findings

- 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 over-estimate the burden of injury in the whole population, if they do not adjust for co-morbidity effects in the injured population.

Introduction and Method

A literature review has been undertaken to identify relevant research-based findings about the effects of health co-morbidities upon injury treatment utilisation and weekly compensation and health care costs.

The literature summarised in this section has been identified by electronic searching of leading injury prevention journals using the key words: co-morbidity, injury, effects and workers compensation, and the “snowball” technique, where reading one article lead to identifying other articles of interest through the reference lists. Using these two techniques 36 articles have been identified and selected as relevant to the topic, and reviewed.

The ‘snowball’ technique identified that the substantive body of literature on the subject resides in the occupational health and safety, and trauma treatment literature respectively, not the injury prevention literature. An unexpected finding was the identification of a substantive body of approximately 500 articles in the health promotion literature examining the cost-effectiveness of work-based health promotion programmes, which target health co-morbidities as a mechanism to reduce medical insurance and workers compensation costs in large companies. Two authoritative meta-analyses of this literature have been attached in Appendix 1 (*Chapman, 2003, 2005; Pelletier, 2001*).

Since the 1980s, staff of the Health Management Research Center at the University of Michigan have been the source of much of the literature describing the links between health co-morbidities in the working population, medical treatment and workers compensations costs (*Burton, Chen, Conti, Schultz, & Edington, 2003; Burton, Chen, Schultz, & Edington, 1998; Edington, 2001; Lynch, Edington, & Johnson, 1996; Musich, Hook, Baaner, & Edington, 2006; Musich, Hook, Barnett, & Edington, 2003; Musich, Napier, & Edington, 2001; Schultz, Chen, & Edington, 2009; Schultz & Edington, 2007; Wright, Adams, Beard, Burton, Hirschland, McDonald et al., 2004; Wright, Beard, & Edington, 2002; Yen, Edington, & Witting, 1994; Yen, Schultz, Schnueringer, & Edington, 2006*). A significant reason for the success of the unit has been access to a large longitudinal dataset, which has been established through the support of a range of large US corporate companies and the Australian Health Management Group (*Edington, 2001*). Sarfati et al (2010) have authored, and identified a few other New Zealand research papers on co-morbidity effects in this country.

Findings

Health Co-morbidity Effects on General Primary Care and Hospital Treatment Utilisation

The effect of a pre-existing health co-morbidity on increased health service utilisation has been well-documented in recent World Health Organisation (WHO) reports (*Cameron, Purdie, Kliwer, McClure, & Wajda, 2007; Cameron, Kliwer, Purdie, & McClure, 2006; Cameron, Prudie, Kliwer, & McClure, 2005*). The findings of these reports were based upon analysis of a population-based matched cohort of injured and non-injured people between 18 and 65 years of age who had been treated for injury between 1988-1991 in Manitoba, Canada.

The authors of these reports have concluded that:

- injured people are different from the non-injured population in terms of pre-existing morbidity;
- the existence of a wide range of health co-morbidities results in significant additional risk of injury-related primary care and hospital treatment utilisation that includes increased use of services including length of stay in hospital;

- patients with mental health and behavioural disorders and those with previous injuries respectively, result in rates of utilisation which are at least double compared to those without a co-morbidity, and compared to other co-morbidities;
- patients with higher numbers of co-morbidities utilise injury services more than patients with lower co-morbidities;
- existing population attributable estimates of injury that extrapolate from samples of the injured population may over-estimate the size of the injury problem (*Cameron, Prudie, Kliewer et al., 2005*).

The following table highlights the increased primary health care and hospital service utilisation rates associated with the existence of a health co-morbidity compared to those without, which have been reported by Cameron et al (2005). The size of the rate ratio indicates the level of increased risk associated with the general type of health co-morbidity. All rate ratios reported below have 95% confidence intervals that do not cross 1, which means the ratios are statistically significantly different.

The following table shows that people with a prior history of mental health disorders or a previous injury event have been shown to have rates of hospital and GP service utilisation 9.31 and 3.5 times higher respectively compared to those without that type of co-morbidity (*Cameron, Prudie, Kliewer et al., 2005*).

Table 3: Injury Treatment Utilisation, Health Co-morbidity Rate Ratios Injured / Non-injured

Health co-morbidity (ICD-9-CM Chapter)	Rate Ratios* Injured/ Non-Injured	
	*Adjusted for age, sex and place of residence *	
	Hospital Admissions Claims per 1000 person years	Physician Claims per 100 person years
Mental Health disorders	9.31	3.50
Injury and poisonings	3.68	2.72
Blood diseases	3.36	1.53
Endocrine and metabolic	2.79	1.38
Musculoskeletal disorders	2.61	1.76
Nervous system diseases	2.35	1.42
Respiratory diseases	1.98	1.38
Circulatory diseases	1.70	1.21
Congenital anomalies		1.41
Skin diseases	1.54	1.33
Digestive diseases	1.52	1.62
Infectious diseases	1.50	1.31
Genitourinary diseases	1.46	1.37
Neoplasms		1.27
Source: Adapted from Cameron et al, 2005. Tables 4 and 5 respectively.		

Similarly those with a prior history of an injury or poisoning have hospital admission claim rates 3.68 times higher than those without that co-morbidity.

Other studies of a range of other health co-morbidities report excess health service utilisation and costs of approximately double, compared to the population with no health co-morbidity (*Edington, 2001; Musich, Hook, Barnett et al., 2003; Yen, Edington, & Witting, 1991; Yen, Schultz, Schnueringer et al., 2006*)

In a recent briefing report for the Australian Institute of Health and Welfare, Cripps & Harrison (2008) have concluded “there appears to an aetiological link between mental health conditions and injury, particularly in relation to risk-taking behaviours, alcohol misuse, and psychological traits such as impulsivity, sensation-seeking, and risk-perception.”

New Zealand Research

Published New Zealand research on the effects of co-morbidity in New Zealand is limited (*Davis, Lay-Yee, Fitzjohn, & al., 2002; Hill, Sarfati, Blakely, & al., 2010; Sarfati, Hill, Blakely, & al., 2009; Sarfati, Hill, Purdie et al., 2010*). Sarfati et al (2010) in their new study report that:

- Davis et al (2002) found in their study of three Auckland hospitals “that over a third of patients admitted had at least one co-morbid condition, and that co-morbidity was associated with length of stay, mortality and the occurrence of adverse events.
- Stevens et al (2008) found amongst a cohort of lung cancer patients that co-morbidity was “very common” and was “adversely associated with survival.”
- Ministry of Health administrative data “provides a reasonably useful source of accessible information on co-morbidity for risk adjustment particularly in multivariable models.”

In addition to this work, recent unpublished Ministry of Health pilot study research for ACC using administrative data has recently examined the effects of selected co-morbidities on injury hospital treatment (*Wright, 2009; Wright & Davies, 2009*). This work, available as a Microsoft PowerPoint, found that in the 2007/08 financial year:

- 15-34 year old patients admitted for a motor vehicle traffic crash injuries and who also had a pre-existing mental health disorder, cost, on average, an extra \$683 each compared to those without a mental health disorder (*Wright, 2009*);
- women aged over 75 years admitted for a falls injury event and who had a pre-existing mental health disorder, cost, on average, an extra \$796 each compared to those without a prior mental health disorder (*Wright, 2009*);
- analysis of falls-related mortality found that there was a significantly higher probability of death following admission for a falls injury where the following co-morbidities were present:
 - Septicaemia (p= 46%)
 - Acute myocardial infarction (p= 31%)
 - Stroke (p= 22%)

- Heart failure (p=20%)
- Increased falls-related mortality was not associated with coronary heart disease or diabetes (Wright & Davies, 2009).
- probability of hospital admission for a falls injury significantly increases where the following co-morbidities were present 12 months prior to the injury event:
 - substance abuse, at least 5% up to 55 years of age then rapidly increases to 25% up to 64 years, and as high 55% over 80 years;
 - dementia, at least 10% for those over 35 years, increasing to approximately 20% by age 60 years, and then rapidly to 30% by mid-70s, and up to 45% plus for older age groups;
 - anxiety and vision impairment respectively, approximately 4% up to age 65, then rapidly to 10% at 70 years, then higher after that particularly for anxiety disorder (Wright & Davies, 2009).

Un-related to injury, Hill et al (2010) found that after adjusting for co-morbidity effects differences in colon cancer survival rates between Māori with non-Māori were significantly reduced. The implication is, that the presence of health co-morbidity affected the probability of survival for colon cancer.

Workers Compensation

The epidemiologic work of the Health Management Research Centre has consistently documented a positive association between increased health service utilisation (including pharmaceutical services) and workers compensation costs among working people in a variety of settings and a variety of health co-morbidities (Edington, 2001; Forrester, Weaver, Brown, Phillips, & Hilyer, 1996; Goetzl, Anderson, Whitmer, & al., 1998; Mills, Kessler, Cooper, & Sullivan, 2007; Milzman, Boulanger, Rodriguez, Soderstrom, Mitchell, & Magnant, 1992; Morris, MacKenzie, Damiano, & Bass, 1990; Morris, MacKenzie, & Edelstein, 1990; Musich, Hook, Barnett et al., 2003; Musich, Napier, & Edington, 2001; Ostbye, Dement, & Krause, 2007; Pronk, Goodman, O'Conner, & Martinson, 1999; Rochon, Katz, Morrow, McGlinchey-Berroth, Ahlquist, Sarkarati et al., 1996; Schultz, Chen, & Edington, 2009; Truls, Dement, & Krause, 2007; Wardle, 1999; Wright, Adams, Beard et al., 2004; Wright, Beard, & Edington, 2002; Yen, Edington, & Witting, 1991, 1994; Yen, Schultz, Schnueringer et al., 2006).

In addition to increased injury risks, higher medical treatment costs, workers compensation costs, and poor work performance (presenteeism) have also consistently been associated with specific lifestyle risk factors such as tobacco use (current and previous), obesity, stress, and lack of regular physical activity (Cripps & Harrison, 2008; Mills, Kessler, Cooper et al., 2007).

Cost-benefit of work based health promotion interventions

A substantive body of over 500 published health promotion articles has been identified that focuses on the effectiveness of worksite-based programmes to deliver general lifestyle health promotion and injury prevention to employees (Chapman, 2003, 2005; Mills, Kessler, Cooper

et al., 2007; Pelletier, 2001). Meta evaluations have been undertaken by Chapman (2003, 2005) and Pelletier (2001) on the effectiveness of such programmes. In spite of methodological differences between evaluation studies, meta-analysis has shown a high degree of “congruence” with worksite-based programmes showing “average reductions in sick leave, health plan costs, and workers’ compensation and disability costs of slightly more than 25%” (Chapman, 2005). Chapman (2005) also found that more recent intervention studies have shown cost/benefit ratio returns of 1:6.3. Pelletier (2001:115) has concluded that:

“the most salient issue for insurers and corporations to address is not whether worksite health promotion and disease management programmes should be implemented...to reduce risks..., but rather how such programmes should be designed, implemented and evaluated in order to achieve optimal clinical effectiveness and cost-effectiveness.”

Studies since, have reported that the most effective interventions both clinically and cost wise:

- are typically targeted to high risk populations (those with a wide range of health co-morbidities or risky lifestyles, income and education) and multifaceted (*Mills, Kessler, Cooper et al.*, 2007);
- use methods such as:
 - mandatory annual health risk appraisal;
 - a Transtheoretical model of change and self-directed change;
 - telephone support to particularly high risk participants;
 - internet based health information delivery;
 - tailored health information to the circumstances of the participant;
 - financial incentives linked to benefits of participating in the programme (*Chapman, 2005*).

Section 3: Results of a study using GP practice data examining the effects of co-morbidities upon GP and ACC consultation rates respectively

Key findings – Primary Care Service Utilisation and Cost Impacts to ACC (CBG Health Research Ltd, 2009)

ACC

In the 12 month period April 2008 to March 2009, a study by CBG using New Zealand HealthStat data collected from GP Practices 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;
- irrespective of age, sex, and ethnicity 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. The same rate of extra service utilisation was found in GP clients with a health co-morbidity but who weren't ACC clients;
- ACC Consultations represented 8.1% of all GP consultations.

The extra burden to ACC of consultations for patients with a recorded health co-morbidity is estimated to be 340,000 consultations nationally, which at an average cost of \$37.12 per consultation for the period, equates to a cost of \$12,620,800 (excl GST) in the 12 month period.

Introduction and Methods

In the previous section a descriptive summary of the literature on the effects of health co-morbidities upon health treatment utilisation and workers' compensation costs was presented. In this section, research findings specific to ACC Consultation rates in General Practice settings is reported.

ACC Research commissioned CBG Health Research to examine the relationship between health co-morbidity and injury treatment utilisation at the primary care level in New Zealand using HealthStat data (CBG Health Research Ltd, 2009). The following is a summary of the full report. The report is available from ACC Research or ACC Library services.

A random sample of HealthStat data of 94 General Practices and 453,113 patients was drawn for the 12 month period April 2008 to March 2009. Read codes and prescribing patterns were statistically analysed to examine the relationship between patients treated for an injury resulting in an ACC Claim, and the existence of a health co-morbidity. Injury treatment was defined as an ACC invoiced service. ACC consultation rates for patients with an identifiable co-morbidity were compared to the consultation rates of those without a co-morbidity. Co-morbidity was defined as having one or more of the following coded flags:

1. Asthma – diagnosis or related prescription
2. Chronic obstructive pulmonary diseases (COPD)

3. Ischaemic heart disease diagnosis or related prescription
4. Hypertension – as measured through Blood Pressure
5. Heart Failure
6. Diabetes diagnosis or related prescription
7. Mental health diagnosis or related prescription
8. Any other Chronic disease or cancer diagnosis.

Findings

Examination of the HealthStat data set drawn showed that the observed pattern of health co-morbidity by age, sex and ethnicity in the sample was as expected when compared to national prevalence estimates reported by the MOH.

Effect of Health Co-morbidity on ACC Consultation Rates and All Consultations Respectively

Overall, there were 1,826,188 GP consultations (“visits” or “encounters”) made by the 453,113 patients in the sample. Of these 148,974 (8.1%) were identified as ACC consultations involving an invoice to ACC for payment.

The following table shows the mean number of ACC consultations compared to All GP Consultations by demographic group, existence of a health co-morbidity, and the ratio of consultations between those with and without a co-morbidity respectively.

ACC consultations increase with age, and men have more consultations than women, which would be expected from a range of injury risk profiles. In contrast, for all GP Consultations, there is a clear increase in consultation rate with older age groups. Those aged 65+ have the highest rates. Females have higher overall rates compared to men, and people of “Other” ethnicity have more consultations than Māori and Pacific ethnicities.

In the table, the ratio of consultations of those with a co-morbidity compared to those without provides a measure of the extra service utilisation associated with the existence of a health co-morbidity in the sample population.

The ratios indicate that for ACC consultation rates, overall (total sample population) there is an extra 88% primary care treatment service utilisation associated with those who have a health co-morbidity. The extra utilisation varies by demographic group, ranging from a low 43% for Pacific Peoples, to a high of 235% for females. Higher rates of service utilisation are seen in the “All Consultations” column.

Table 4: Mean Number Consultation Rates by Demographic Group and Existence of Co-morbidity

Patient Group	ACC Consults			All GP Consults		
Age group	No Chronic Condition	Chronic Condition	Ratio Chronic / No Chronic	No Chronic Condition	Chronic Condition	Ratio Chronic / No Chronic
0-5	0.15	0.23	1.53	5.12	7.49	1.46
6-17	0.21	0.31	1.48	1.95	4.19	2.15
18-24	0.25	0.36	1.44	2.53	5.60	2.21
25-44	0.27	0.44	1.63	2.82	6.93	2.46
45-64	0.36	0.56	1.56	3.73	9.55	2.56
65+	0.37	0.65	1.76	5.92	13.71	2.32
Sex						
Female	0.20	0.47	2.35	3.67	9.65	2.63
Male	0.32	0.53	1.66	2.71	7.96	2.94
Ethnicity						
Māori	0.25	0.41	1.64	2.90	8.06	2.78
Other	0.27	0.54	2.00	3.35	9.18	2.74
Pacific	0.21	0.30	1.43	2.84	8.30	2.92
Total	0.26	0.49	1.88	3.19	8.88	2.78

Source: Adapted from CBG Health Research Ltd (2009), Table 3, page 13

Table 5 (next page) focuses upon ACC Consultations, and compares the mean number of consultations between those with and those without the presence of a health co-morbidity. 95% confidence levels are presented, to show the statistically significant differences between the two groups. Multivariate analysis showed that the observed differences persist after controlling for age, sex and ethnicity (CBG Health Research Ltd, 2009).

For the study sample, the additional rate of service utilisation associated with co-morbidity equals an additional 34,000 injury treatment consultations. Extrapolating this result to the whole population, these findings suggest that the rate of additional injury treatment utilisation to ACC is in the order of 340,000 consultations per annum at an additional cost of approximately of \$12,620,800 (excl GST), assuming an average cost per consultation of \$37.12¹ for the time period.

Discussion

The findings in the CBG report are consistent with the published literature reviewed earlier. Patients with a health co-morbidity have nearly twice as many ACC visits than patients who do not have a co-morbidity. The higher number of ACC visits is consistent with the medical

¹ Average cost provided by Jenny Mason, Senior Analyst, ACC Business Intelligence Injury Prevention, 14/7/10.

treatment complications arising from health co-morbidities. For example, patients with diabetes can suffer from neuropathies that reduce heat and pain sensation so burn injuries are more likely. In addition, treatment for such injuries is prolonged because poor tissue perfusion associated with diabetes results in a delay in wound healing. The same situation applies to those with circulatory disease problems. Obese patients will have reduced opportunities for physical activity-based rehabilitation. Age, sex and ethnicity are all complicating factors.

Another factor to consider is the nature of health service delivery in New Zealand and the existence of ACC, which may result in more claims in New Zealand compared to overseas. For example, patients with a chronic condition who visit their GP, provides opportunities for extra treatments to be provided for relatively minor injuries, the costs for which are passed onto ACC. The ability to make such an ACC claim, may consequently be acting as means to reduce what otherwise could be a cost barrier for patients with chronic co-morbidities in seeking treatment. While this is arguably important for improving the health of the population, arguably it should not be at the cost to the ACC levy payer.

Table 5: Mean Number (and 95% Confidence Intervals) of GP ACC Consultations by Patients With No Co-Morbidity Compared to Patients With Co-morbidity,

Patient	No Health Co-morbidity		With Health Co-morbidity	
	Mean Consults	95% Confidence Interval	Mean consults	95% Confidence Interval
Age group				
0-5	0.15	0.14 – 0.15	0.23	0.21 – 0.25
6-17	0.21	0.20 – 0.21	0.31	0.29 – 0.32
18-24	0.25	0.24 – 0.26	0.36	0.34 – 0.38
25-44	0.27	0.27 – 0.28	0.44	0.42 – 0.45
45-64	0.36	0.35 – 0.37	0.56	0.54 – 0.57
65+	0.37	0.34 – 0.39	0.65	0.63 – 0.67
Sex				
Female	0.20	0.19 – 0.20	0.47	0.46 – 0.48
Male	0.32	0.32 – 0.33	0.53	0.51 – 0.54
Ethnicity				
Māori	0.25	0.25 – 0.26	0.41	0.40 – 0.43
Other	0.27	0.27 – 0.27	0.54	0.53 – 0.55
Pacific	0.21	0.20 – 0.21	0.30	0.27 – 0.32
Total	0.26	0.26 – 0.26	0.49	0.49 – 0.50

Source: Adapted from CBG Health Research Ltd (2009), Table 4, page 14

Section 4: Selected Health Co-morbidities and ACC Injury Treatment Utilisation and Compensation Costs: Results of a trial of linked ACC-MOH Data

Key findings –Injury Treatment Utilisation and Cost Impacts to ACC for Selected Co-morbidities

- The prevalence of diabetes and coronary heart disease in the ACC population is similar to that reported in national estimates for all age groups up to 80 years of age.
- Clear evidence that the selected co-morbidities (diabetes and coronary heart disease) increases the risk of making an ACC claim (claim utilisation), increases the mean cost of All Claims² and Entitlement claims respectively, and results in increased duration of some claims. The effects are statistically significant for Entitlement Claims.
- Irrespective of statistical significance, small levels of increased costs associated with the co-morbidity adds up to significant costs to the Scheme.
- Extra All Claims costs of at least \$60 million for the 2008/09 financial year have been attributed to the presence of coronary heart disease at the 6 month time point following a claim.
- Extra All Claims costs of at least \$36 million for the 2008/09 year have been attributed to the presence of diabetes at the 6 month time point following a claim.
- Costs, for both co-morbidities continue to increase to the 12 month time point for All Claims and Entitlement Claims respectively, but not significantly.
- Increased costs of All Claims are likely to be related to increased complexity of treating claims due to the presence of the co-morbidity.
- Increased cost of Entitlement claims is likely to be associated with increased rehabilitation required due to the presence of the co-morbidity.
- The effects of the selected co-morbidities are significantly related to older population age-groups. This has implications for increased Scheme liability, particularly in the Non-Earners' Account and to some degree the Work and Earners' Accounts as the population gets older.
- Linked ACC and MOH data was used to examine the effects of diabetes and coronary heart disease on ACC claim rates and costs. The findings reported are the first to quantify ACC related co-morbidity size effects using linked data.
- Linked MOH and ACC data is required to quantify co-morbidity effects on ACC injury treatment utilisation and costs. Using the approach by Sarfati (2010), a more disaggregated analysis could be undertaken in a future study using more detailed data from MOH data on the health treatment history of ACC clients. Such a request though may raise significant ethical and confidentiality issues.

² All Claims includes Med Fees only claims, Weekly Compensation claims and Other Entitlement claims.

Introduction

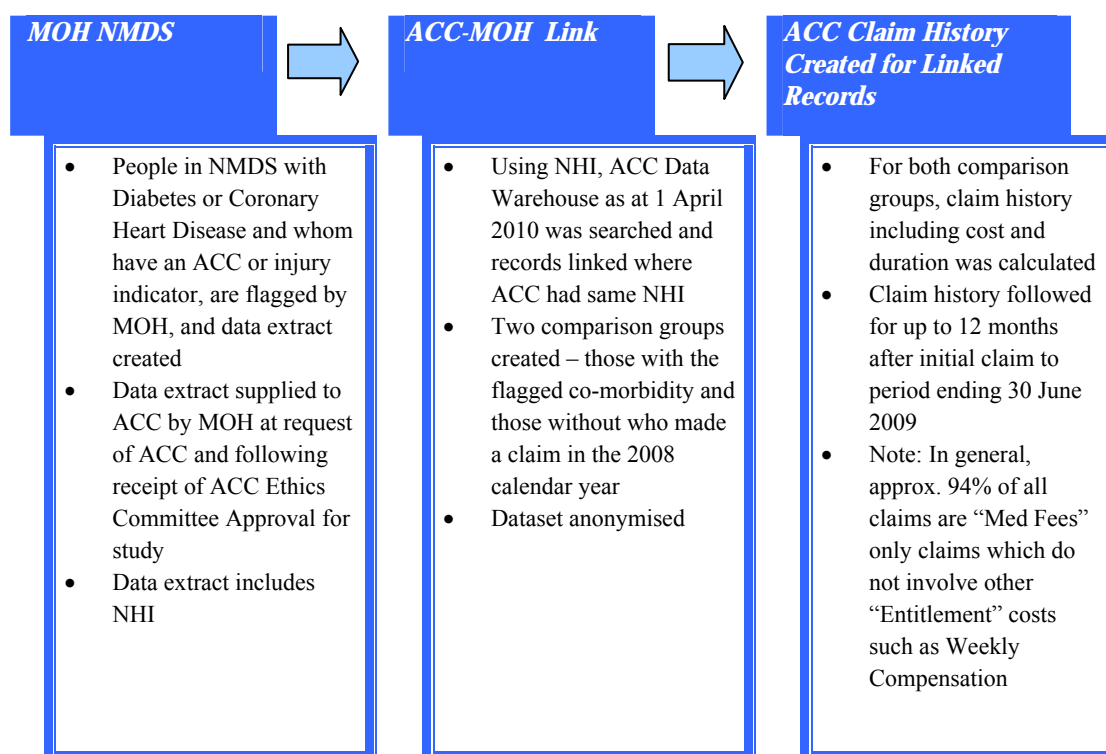
In the previous section, research findings that explored the effects of a wide range of existing health co-morbidities upon ACC Consultation rates in General Practice settings was presented (CBG Health Research Ltd). The research clearly showed that having a health co-morbidity was significantly associated with increased primary care injury treatment utilisation and associated costs to ACC compared to those with no record of a pre-existing health co-morbidity.

In this section the results of an ACC research project, in collaboration with ACC Business Intelligence (Injury Prevention), using linked ACC and MOH data is presented.

Methods

ACC Business Intelligence (Injury Prevention) using National Health Index (NHI) numbers linked Ministry of Health (MOH) National Minimum Data Set (NMDS) data to ACC data to identify all people flagged by MOH as having diabetes and coronary heart disease and an ACC injury claim. By linking the data, the claim histories, including cost and duration, of people with and without these conditions were able to be followed and compared for up to a 12 month period ending 30 June 2009 (Mason, 2010). The process of linkage and claim history preparation is outlined in the following diagram.

Figure 1: MOH - ACC data linkage process and claim history preparation



The data linkage process involved identifying all ACC clients born before 1 July 2008 and for whom ACC held a NHI number that could be linked to the MOH data. This amounted to just over 3,037,435 million people out of 7 million records (or 44% of records) in the ACC Data Warehouse in April 2010. The details of all claims made by these people in the year from 1 January 2008 to 31 December 2008 were then extracted along with all information about the treatment and entitlements received in the first year of these claims through to 30 June 2009.

Although less than half the personal records contain an NHI number, there have been recent attempts to improve the proportion of claims on which the NHI number is provided and currently it is known for about 80% of new claims. The NHI number is provided by the initial treatment provider when a new claim is lodged and some treatment providers are able to provide this and others are not. Some primary care treatment providers are not able to provide an NHI because of the nature of the electronic claims filing system. Once an NHI has been provided on one claim, it can be attached to all subsequent claims for that person. Therefore it is likely to be held for most people who have made a claim at any time in recent years and there is no reason for any bias to result from including only these people in this analysis. However to check for population level biases, the prevalence of Diabetes (irrespective of type) and CHD in the ACC data set has been compared to those reported by the MOH for the general population by sex and life cycle age group. The comparisons are presented in Tables Table 6 and Table 7 on the following pages.

The results indicate that the prevalence of Diabetes and CHD in the ACC dataset is close to the national prevalence estimates reported by the MOH – except for females aged over 80 years.

Other points to note: The ACC Data Warehouse includes a record for every person who has ever made a claim to ACC, so:

- it will include people who have since died – ACC is usually only informed of a client's death if that person is currently receiving some sort of payment from ACC (at the time of death). All records where the person is known to have died have been omitted;
- it will include people currently living overseas and visitors who made a claim while they were in New Zealand, for whom co-morbidity information does not exist. It is not known how many these may be, however the number is likely to be very small;
- it will include duplicate records for some people. Typically these occur when a claim was lodged with differences in the personal details such as change of name or address and a new record was created instead of the person being recognised as an updated form of the original record. However, any new claims for this person within approximately the last two years will be assigned to only one of these records. This issue applies to both the comparison groups.³

In all these cases, the personal record will have had no new claims related to it but it does not mean that that person was alive and well and living in New Zealand and made no claims. This will be a problem if there are a large number of these records of this type in either group as it will reduce the incidence claim rate for that group.

Why Diabetes and CHD?

Diabetes and CHD were selected for analysis because of their relevance to injury treatment and rehabilitation, and specific validated flags were available from the Ministry of Health for this study (*Craig Wright, Health and Disability Intelligence*).

³ ACC Business Intelligence – Data Integrity have commenced a project to improve the integrity of ACC data, including the reconciliation of duplicates records.

Injury patients with diabetes can suffer from neuropathies that reduce heat and pain sensation so burn injuries are more likely. Furthermore, treatment for such injuries is prolonged because poor tissue perfusion associated with diabetes results in a delay in wound healing. The same situation as diabetes applies to those with circulatory disease problems. Obese patients will have reduced opportunities for physical activity-based rehabilitation. Age, sex and ethnicity are all complicating factors. The presence of both diseases complicates primary treatment.

Since this project was commenced, Sarfati et al (2010) have examined the quality of routinely collected MOH data to provide co-morbidity data using the standard MOH National Minimum Data Set (NMDS) coding frames. The researchers concluded that routine MOH administrative data “provides a reasonably useful source of accessible information on co-morbidity for risk adjustment particularly in multivariable models” (Sarfati, Hill, Purdie et al., 2010).

Recommendation:

Future co-morbidities studies using linked ACC-MOH data should follow the methods published by Sarfati et al (2010). Such an approach would have the advantage of allowing for the effects of a much larger range of health co-morbidities to be quantified, than those reported below. However, such a project may have to address privacy and confidentiality issues as it would require linking data concerning other health issues.

Findings

Introduction

In the analysis presented in the following two parts, the key findings for diabetes and CHD are presented separately. The findings presented focus upon quantifying and comparing differences in:

- extra claims utilisation for “All Claims” and “Entitlement Claims” respectively
- extra costs in terms of “All Claims” and “Entitlement Claims” respectively at 6 and 12 months for each type of claim
- claims duration as measured by number of payments made over time

The findings are briefly discussed in the context of additional analyses that have been undertaken, but which are not reported in detail in this paper. The additional analysis looked at injury situations where the selected co-morbidity could be expected to result in a differential pattern given the medical condition should an effect be true. For example, for diabetes and CHD due to the medical nature of the two conditions it could be expected to find increased service utilisation and costs are associated with:

- older age groups
- specific injury types such as falls, burns and extremities and amputation, fractures soft-tissue damage.

Prevalence of Diabetes and CHD in the ACC Population Compared to National Estimates

Diabetes

Of the 3,037,435 people in the ACC claims dataset with an NHI number 140,117 people (4.6%) were identified as having diabetes.

The population distribution of ACC clients with diabetes is very similar to the national estimates from the MOH, apart from those aged over 80 years. In this age group the ACC proportion is 4% lower than would be expected from MOH population data.

Analysis of the ACC data by age group, ethnicity and social deprivation⁴ also shows that the:

- greatest number of ACC clients with diabetes are those aged 45 – 64 years;
- rate among Pacific Peoples is slightly higher than for other ethnic groups despite the fact that this group tends to have a younger average age than other groups;
- rate of diabetes rises steadily from 3.6% for ACC clients living in the least deprived (or decile 1) areas, to 5.7% for clients living in the most deprived or decile 10 areas.

Table 6: Percentage of the population with diabetes, comparison of MOH estimates with ACC data set

Age group / Sex	MOH national figures			ACC clients in study		
	Female	Male	Total	Female	Male	Total
Aged under 15	0.3	0.3	0.3	0.4	0.4	0.4
Aged 15 -24	0.9	0.5	0.7	1.1	0.6	0.8
Aged 25 - 44	2.5	1.8	2.1	3.0	1.8	2.3
Aged 45 - 64	6.1	7.6	6.8	7.0	7.9	7.4
Aged 65 - 79	14.0	17.1	15.5	14.3	16.9	15.6
Aged 80 and over	15.0	17.7	16.0	11.5	13.6	12.3
Total	4.3	4.6	4.4	4.9	4.3	4.6

Coronary Heart Disease

Of the 3,037,435 people in the ACC claims dataset with an NHI 127,000 (4.1%) were identified with having CHD in the dataset.

The population distribution of CHD among ACC claimants is very similar to the national totals for all ages except those aged over 80 years, which is the situation similar to that for diabetes. The largest numbers of ACC clients with this condition are males aged 65 - 79 years (38,000) followed by females aged 65 -79 years (29,000) and men aged 45-64 (27,000).

When examined by ethnicity, Māori, Pacific Peoples and Asians, ACC clients have observed rates of CHD at approximately half of that compared to Other / European, 2% compared to

⁴ Details are available on request from ACC Research.

5%. This is likely to reflect the different demographic profile of the groups, with Māori and Pacific Peoples having a much higher proportion of young people than the Other/European. However, other ACC research (*Kake et al, 2010*) indicates that this may also represent some under-claiming by these groups.

In terms of socio-economic status (as measured by deprivation), the distribution of CHD is not as clear as that for diabetes. The lowest rate at 3.5% is in the least deprived group (i.e. Decile 1). The highest rates of close to 4.5% are found in each of the deciles 5-9, however the most deprived group (i.e. decile 10) have a lower rate at less than 4%. No statistical tests of significance were done on these analyses.

Table 7: Percentage of population with CHD, Comparison of National Estimates with ACC Data set

Age group / Sex	MOH national figures			ACC clients in study		
	Female	Male	Total	Female	Male	Total
Aged under 15	0.1	0.1	0.1	0.2	0.2	0.2
Aged 15 -24	0.1	0.1	0.1	0.2	0.2	0.2
Aged 25 - 44	0.4	0.6	0.5	0.5	0.6	0.6
Aged 45 - 64	2.9	5.3	4.1	3.6	5.8	4.7
Aged 65 - 79	14.1	20.3	17.1	15.7	21.1	18.3
Aged 80 and over	27.2	31.6	28.8	22.1	24.8	23.0
Total	3.4	4.3	3.8	4.2	4.2	4.2

Does the presence of Diabetes or CHD result in Extra Claims Utilisation?

All Claims

Diabetes

In the July / June 2008/09 financial year, there were in total 1,416,349 claims invoiced to ACC in the dataset. Of these, 71,857 (1.97%) were from people who had diabetes.

Looking at Table 8 and Figure 2 a higher rate of claiming can be observed for those with diabetes, particularly for those over 80 years of age. Statistically, the All Claims differences were not significant at the 95% confidence level; however this changes when examining Entitlement Claims.

Coronary Heart Disease

In the period under analysis there were 127,000 (4.1%) ACC clients with CHD in the data set.

The ratios in

Table 9 show the levels of extra claiming associated with clients having CHD. There is a marked age gradient, with the risk of extra claiming significantly increasing with age. In contrast, only males with CHD over 65 years have an All Claims rate higher than their counterparts without CHD. Overall, when looking at the ratio of claims between the two groups the only age group that is substantially higher is the over 80 age group, where the rate of claiming is 79% and 206% higher for females and males respectively. For all age-groups, the ratios are small, and the differences are not statistically significant. This changes when looking at Entitlement Claims.

Table 8: Claims Rate – All Claims ‘Has Diabetes’ Compared to ‘No Diabetes’ July / June 2008-09 Financial Year

Diabetes: <u>All Claims</u>		No. of Claims With Diabetes	Claim Rate: Number of claims per 1000 people, in July / June 2008/09 Year & for whom ACC has an NHI number			Claim Rate Ratio Diabetes / No Diabetes
Sex	Age Group		Has diabetes	Does not have diabetes	Total	
Female	Aged under 15	520	451	432	432	1.05
	Aged 15 -24	1,118	514	444	445	1.16
	Aged 25 - 44	5,140	463	425	426	1.09
	Aged 45 - 64	11,786	489	461	463	1.06
	Aged 65 - 79	10,933	518	470	476	1.10
	Aged 80 and over	7,814	673	436	463	1.54
	Sub-Total Number of Claims	37,313	611,280			
Male	Aged under 15	677	499	500	500	1.00
	Aged 15 -24	1,013	688	636	637	1.08
	Aged 25 - 44	3,740	503	520	519	0.97
	Aged 45 - 64	13,410	476	479	478	0.99
	Aged 65 - 79	11,059	486	420	432	1.16
	Aged 80 and over	4,640	606	364	397	1.67
	Sub-Total (N=)	34,544	778,242	(without Diabetes)		
Grand Total (N=)		71,857	1,389,522 (without Diabetes)			

Table 9: Claims Rate - All Claims ‘Has Coronary Heart Disease’ Compared to ‘No CHD’, July/ June 2008/09 Financial Year

Coronary Heart Disease: <u>All Claims</u>			Claim Rate: Number of claims per 1000 people, in July / June 2008/09 Year & for whom ACC has an NHI number			Claim Rate Ratio CHD / No CHD
Sex	Age Group	No. of Claims With CHD	Has CHD	Does not have CHD	Total	
Female	Aged under 15	172	385	432	432	0.89
	Aged 15 -24	128	394	445	445	0.88
	Aged 25 - 44	967	509	425	426	1.20
	Aged 45 - 64	6,573	529	461	463	1.15
	Aged 65 - 79	13,401	577	458	476	1.26
	Aged 80 and over	15,692	706	395	463	1.79
	Other	1				
	Sub-Total	36,934	611,659			
Male	Aged under 15	294	475	500	500	0.95
	Aged 15 -24	228	564	637	637	0.89
	Aged 25 - 44	1,386	523	519	519	1.01
	Aged 45 - 64	10,393	504	477	478	1.06
	Aged 65 - 79	14,305	506	412	432	1.23
	Aged 80 and over	9,024	647	314	397	2.06
	Other	5				
	Sub-Total (N=)	35,635	777,151	(without CHD		
Grand Total (N=)	72,569	1,388,810	(without CHD			

Figure 2: Comparison All Claim Rates, per 1000 people by Age and Sex with Record of Diabetes to those Without Diabetes, July / June 2008/09 Financial Year

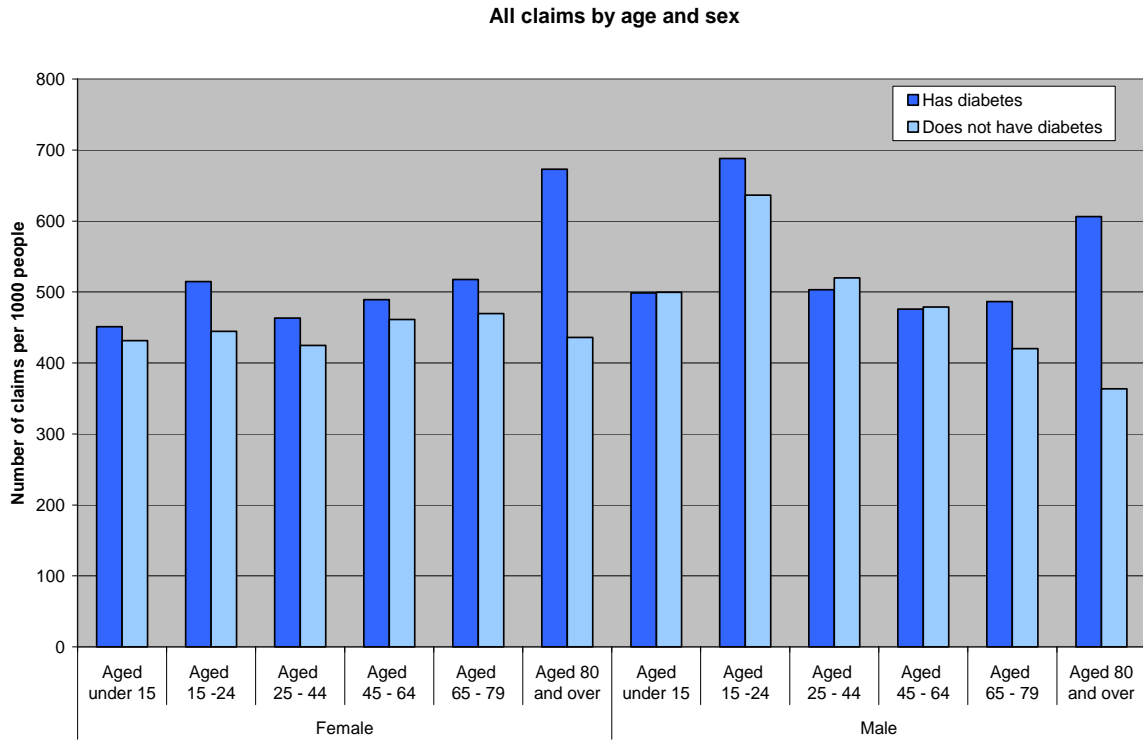
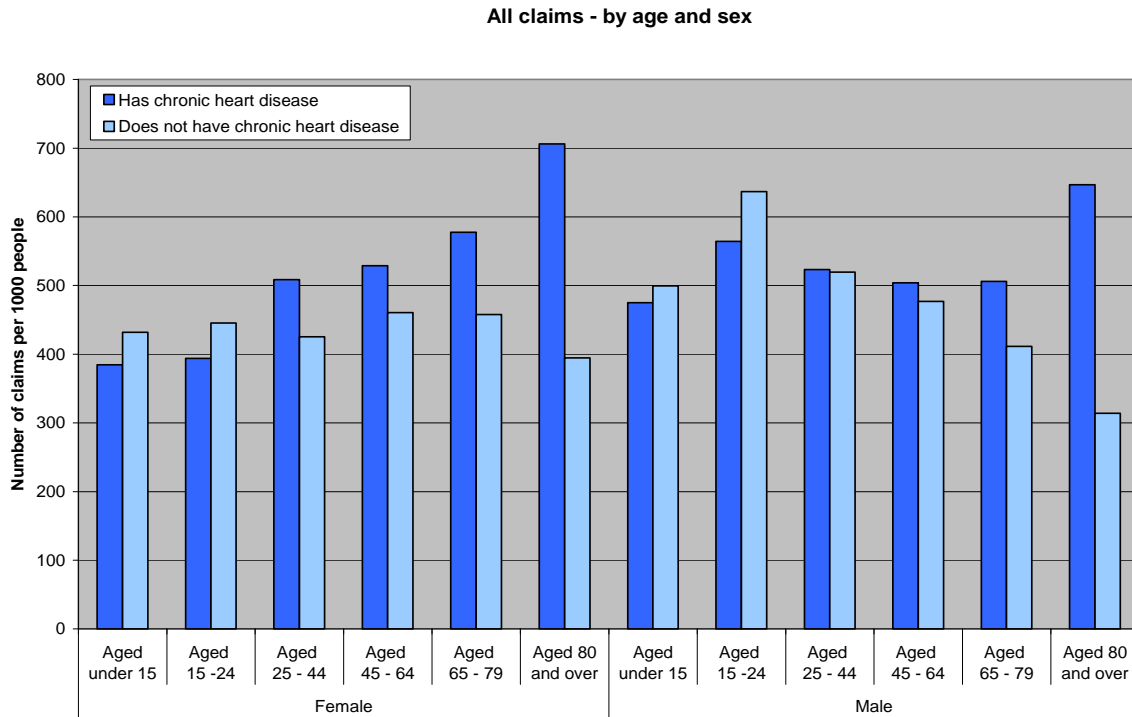


Figure 3: No CHD related All Claims per 1000 People by Age and Sex, July/June 2008/09 Financial Year



Entitlement Claims

It is often more helpful to limit the analysis to Entitlement Claims. This is sometimes used as a proxy for more serious claims, and they are the claims that often result in significant long-term liability to the Scheme. Entitlement claims include payments for some sort of entitlement, for example compensation for loss of earnings or payment for attendant care, rather than just payments for medical treatment. This is not perfect as sometimes it merely reflects that the client was working at the time of the injury, however it does indicate that at least 5 days off work were required.

Diabetes

Figure 4 shows the rate of Entitlement claims for those with and without diabetes together with confidence intervals to show whether the rates are significantly different for the two groups.

It can be seen that the pattern of claims utilisation for males and females is different with the claim rate for females aged over 45 years with diabetes significantly higher than for the corresponding groups without the disease. It is particularly marked for those aged 80 years or more, as was also seen for All Claims. For males the only significant difference is in the oldest age group, with the claim rates for the younger age groups being very similar or slightly higher for those without diabetes.

The number of extra Entitlement Claim utilisation is described in Table 10 on the next page. Note the numbers are relatively small, with extra utilisation particularly associated with those over 80 years of age where the rate of claiming is at least 50% higher where diabetes is present.

Figure 4: No Diabetes related Entitlement Claims Per 1000 People, By Age and Sex, 95% Confidence Intervals, 2008/09 Financial Year

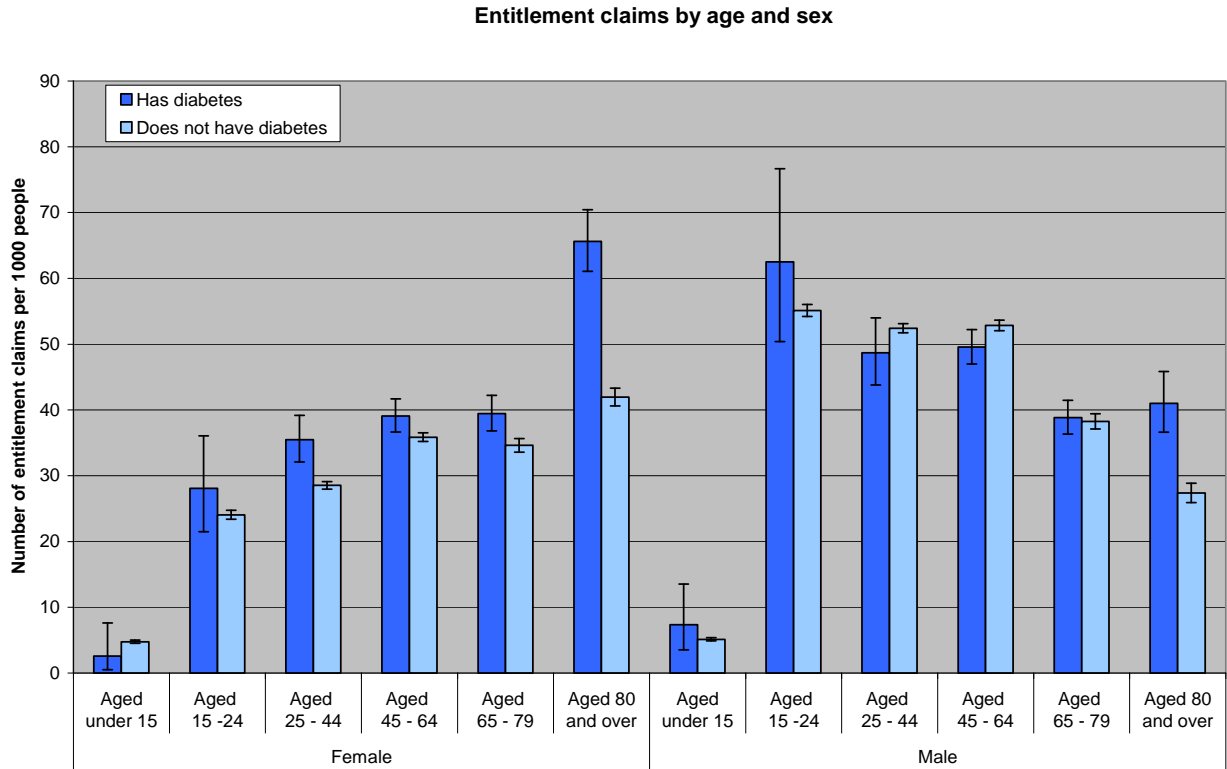


Table 10: Number of Entitlement Claims, Per 1000 People with record (with ACC NHI) With and Without Diabetes, by Sex and Age Group, 2008/09 Financial Year

Diabetes: Entitlement Claims		Number of claims made in July / June 2008/09 Year, for whom ACC has an NHI number		Number of claims per 1000 people, for whom ACC has an NHI number		Claim Rate Ratio Diabetes / No Diabetes
Sex	Age Group	Has diabetes	Does not have diabetes	Has diabetes	Does not have diabetes	
Female	Aged under 15	3	1395	3	5	0.6
	Aged 15 -24	61	4628	28	24	1.17
	Aged 25 - 44	394	10269	36	29	1.24
	Aged 45 - 64	942	11528	39	36	1.09
	Aged 65 - 79	833	4373	39	35	1.14
	Aged 80 and over	762	3734	66	42	1.56
	Other	0	1			
	Sub-Total	2995	35928	Ratio Sub total		1.03
Male	Aged under 15	10	1803	7	5	1.43
	Aged 15 -24	92	14274	63	55	1.13
	Aged 25 - 44	362	21813	49	52	0.93
	Aged 45 - 64	1397	17354	50	53	0.94
	Aged 65 - 79	883	4263	39	38	1.02
	Aged 80 and over	314	1332	41	27	1.50
	Other	0	2	Ratio Sub total		1.16
	Sub-Total	3058	60841	Ratio Total		1.14
	Grand Total	6,053	96,769			

Coronary Heart Disease

Figure 5 and

Table 11 show that women 25 years of age and over with CHD have significantly higher Entitlement claim rates compared to women without CHD. In contrast only men over 45 years have significantly higher claim rates than their counterparts.

The Claims Rate ratio shows a clear age gradient particularly after 45 years of age, as one would expect. (It should be noted that the numbers under 15 years are small and should be discarded for analytical purposes.) Overall the presence of CHD results in an extra Entitlement claims utilisation of 23%, however this hides the substantive differences between population groups by age and sex.

It is interesting to note that male Entitlement claim rates in the working age group (15-64 years) both for those with and without CHD are substantially higher than women in the same age group. However, in the over 80 years age group, female rates are substantially higher than males. The differences are not unique. Women's risk of CHD tends to increase after menopause. Given the life-cycle age groups used in this analysis, it is expected that there would be increased claims utilisation in the 65+ age groups.

Figure 5: No CHD related Entitlement Claims per 1000 People by Sex and Age, 95% Confidence Intervals, July/June 2008/09 financial year

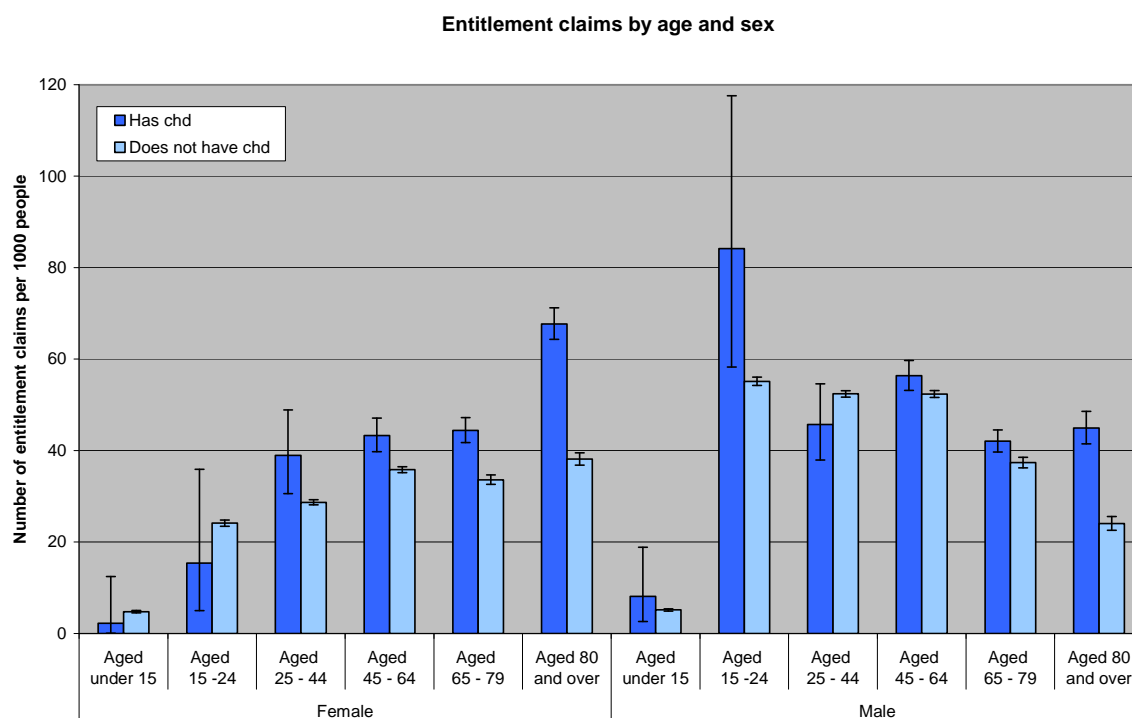


Table 11: Number of Entitlement Claims, Per 1000 People With and Without CHD, by Sex and Age Group, 2008/09 Financial Year

Coronary Heart Disease: Entitlement Claims		Number of Entitlement Claims July / June 2008/09 Year, where ACC has an NHI number		Number of claims per 1000 people, for whom ACC has an NHI number			Claim Rate Ratio CHD / No CHD	
Sex	Age Group	Has CHD	Does not have CHD	Has CHD	Does not have CHD	Total		
Female	Aged under 15	1	1,397	2	5	5	0.47	
	Aged 15 -24	5	4,684	15	24	24	0.64	
	Aged 25 - 44	74	10,589	39	29	29	1.36	
	Aged 45 - 64	538	11,932	43	36	36	1.21	
	Aged 65 - 79	1,030	4,176	44	34	35	1.32	
	Aged 80 and over	1,505	2,991	68	38	45	1.78	
	Other	-	1					
	Sub-Total		3,153	35,770		Ratio Sub total		1.05
Male	Aged under 15	5	1,808	8	5	5	1.57	
	Aged 15 -24	34	14,332	84	55	55	1.53	
	Aged 25 - 44	121	22,054	46	52	52	0.87	
	Aged 45 - 64	1,162	17,589	56	52	53	1.08	
	Aged 65 - 79	1,188	3,958	42	37	38	1.12	
	Aged 80 and over	627	1,019	45	24	29	1.87	
	Other	1	1					
	Sub-Total		3,138	60,761		Ratio Sub total		1.34
Grand Total		6,291	96,531		Ratio Total		1.23	

Claims costs and duration first 6 & 12 months (incl. Public Health Acute Services PHAS))

Diabetes All Claim Costs

Table 12 and Figure 6 shows, by sex and age the mean cost of All Claims in the first 6 months where the claimant has diabetes compared to those with no diabetes for the July/June 2008/09 financial Year. The mean cost is the sum of all costs divided by the number of all claims in the period.

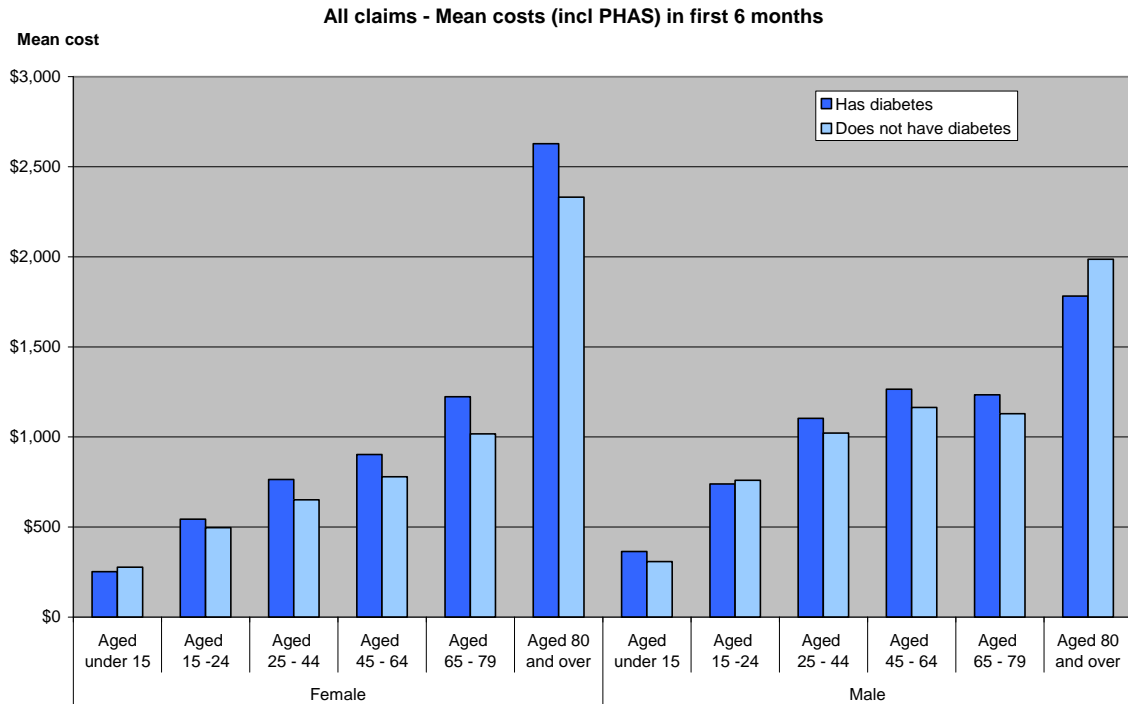
While the mean cost of All claims is generally higher for those with diabetes, the mean difference between those with and without diabetes is not significantly different when comparing age groups. However, it can be observed that there is a sizable difference between females and males in both comparison groups. In the under 65 age groups, males have higher mean costs (but not duration) compared to females. However, this changes after the working age, where females over 65 years have higher mean costs compared to males in the same age groups. This suggests the higher costs are associated with complications of treatment rather than rehabilitation, and whether the claimant is participating in the workforce.

While statistically there is little difference in terms of mean costs, the combination of higher claims utilisation and extra cost, adds up to a sizable additional cost to the Scheme overall that can be attributed to diabetes. The table shows that the extra cost of All Claims associated with treating and rehabilitating clients with diabetes at the 6 month point is estimated to be approximately \$36 million in the 2008/09 financial year. At the 12 month point the costs continue to increase, and are estimated to reach approximately \$41 million at that time point.

Table 12: Mean Cost (incl PHAS) and mean duration of All Claims Diabetes related, First 6 months, July/June 2008/09 Financial year

Diabetes: <u>All Claims</u>		Mean cost in first 6 months incl PHAS		Extra Mean Cost Diabetes First 6 mth	Average duration of medical payments 6 mth	
Sex	Age Group	Has diabetes	Does not have diabetes		Has diabetes	Does not have diabetes
Female	Aged under 15	\$252	\$277	-\$25	34	29
	Aged 15 -24	\$544	\$497	\$47	56	49
	Aged 25 – 44	\$764	\$651	\$113	72	70
	Aged 45 – 64	\$902	\$779	\$123	80	84
	Aged 65 – 79	\$1,224	\$1,017	\$207	71	76
	Aged 80 and over	\$2,628	\$2,331	\$297	55	53
	Other	\$2,215	\$394	\$1,821	109	105
	Sub-Total	\$1,319	\$725	\$594	70	62
Male	Aged under 15	\$364	\$308	\$56	33	27
	Aged 15 -24	\$739	\$759	-\$20	47	45
	Aged 25 – 44	\$1,103	\$1,022	\$81	63	63
	Aged 45 – 64	\$1,265	\$1,163	\$102	79	78
	Aged 65 – 79	\$1,234	\$1,129	\$105	71	77
	Aged 80 and over	\$1,782	\$1,986	-\$204	49	53
	Other	\$809	\$1,960	-\$1,151	42	181
	Sub-Total	\$1,274	\$862	\$412	69	55
Total Cost		\$ 93,224,903	\$1,114,022,604			
Excess <u>All Claim</u> Costs Attributable to Diabetes, First 6 months*				\$ 36,396,050		
				@ 12 months		
				\$ 40,964,302		
* Excess is Sum of: Mean Extra Cost x Sub-total of Claims in each Group						

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: <u>Entitlement Claims</u>		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
Total Cost @ 6 mths		Has Diabetes		No Diabetes					
		\$ \$57,146,839		\$707,627,558					
Excess* <u>Entitlement Claim</u> Costs Attributable to Diabetes, @ 6 months							\$ 13,168,872		
12 months							\$ 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

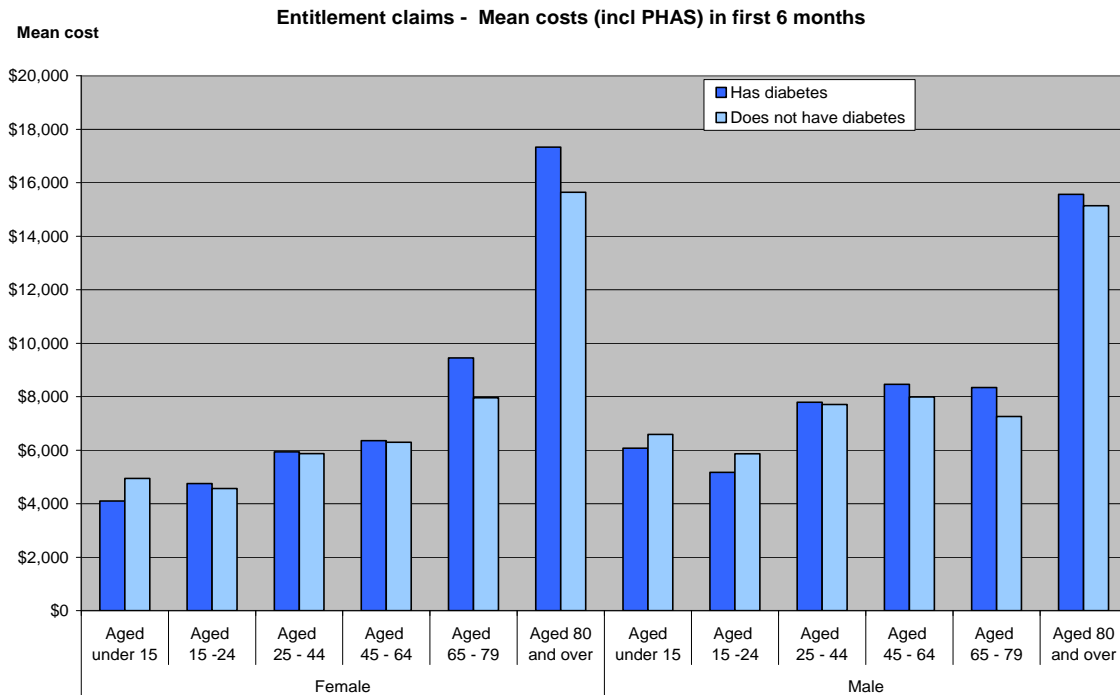
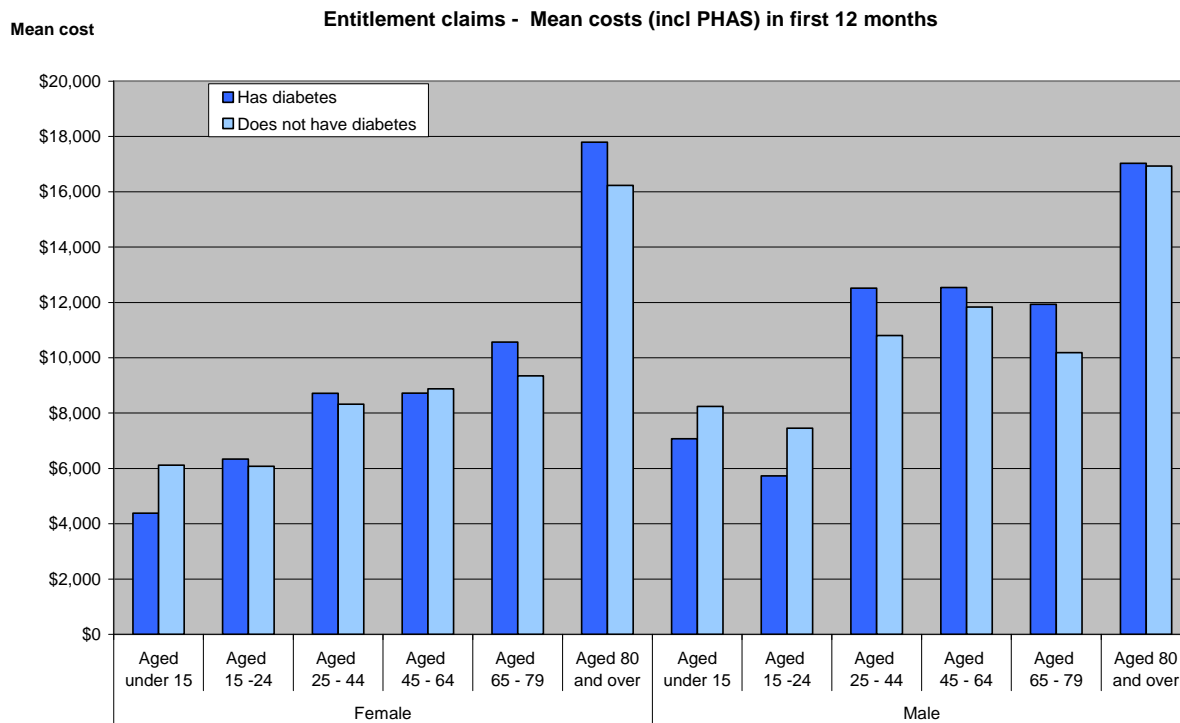


Figure 8: Mean Cost Diabetes related Entitlement Claims (incl. PHAS) in first 12 months by Age and Sex, July/June 2008/09 Financial Year



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

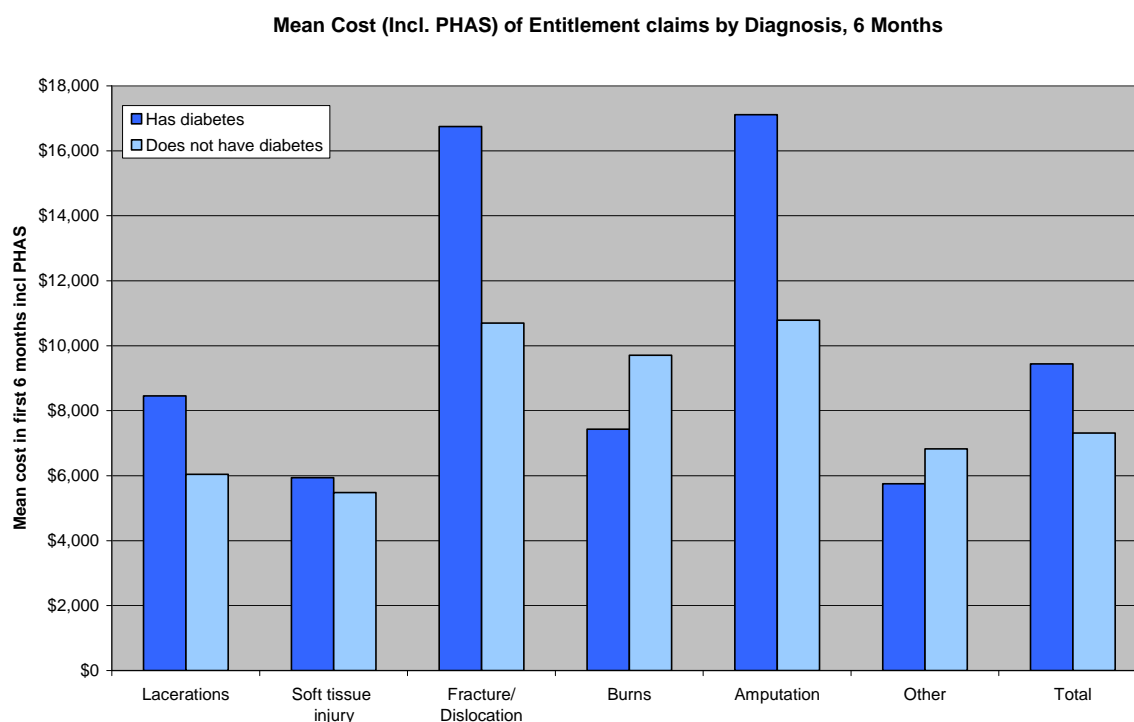


Figure 10: Mean Cost (incl. PHAS) of Diabetes related Entitlement Claims by Diagnosis in first 12 Months of claim, 2008/09 July/June Financial Year

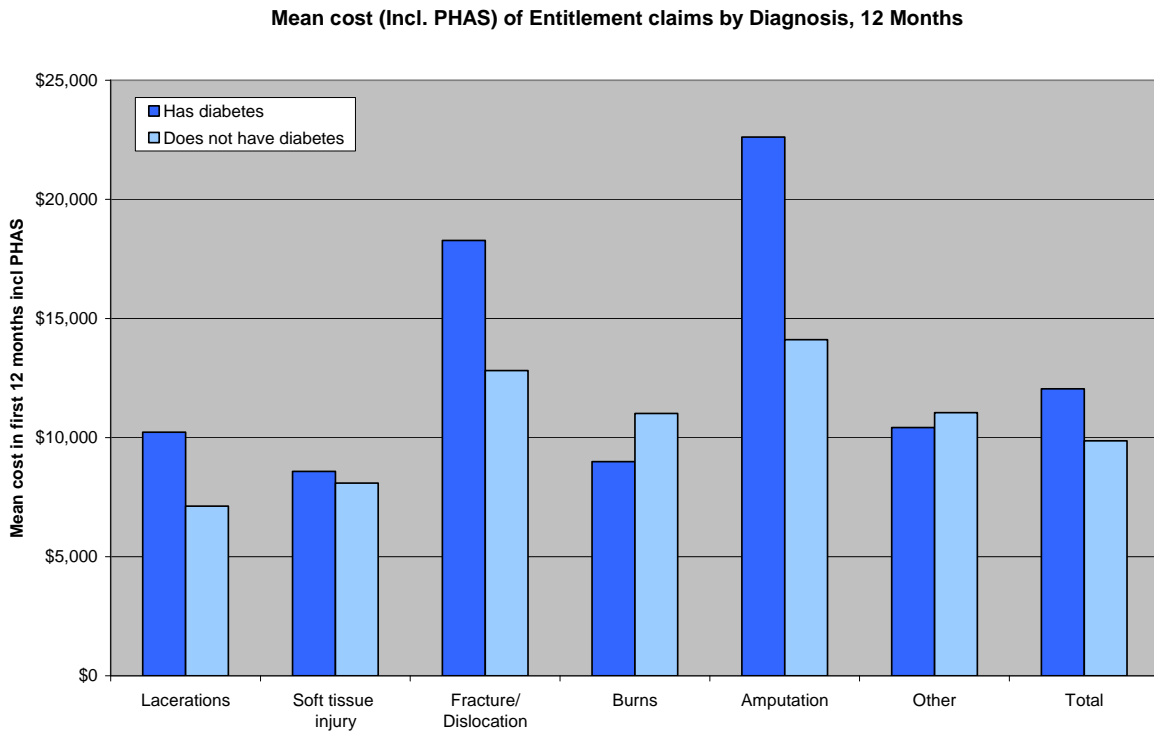
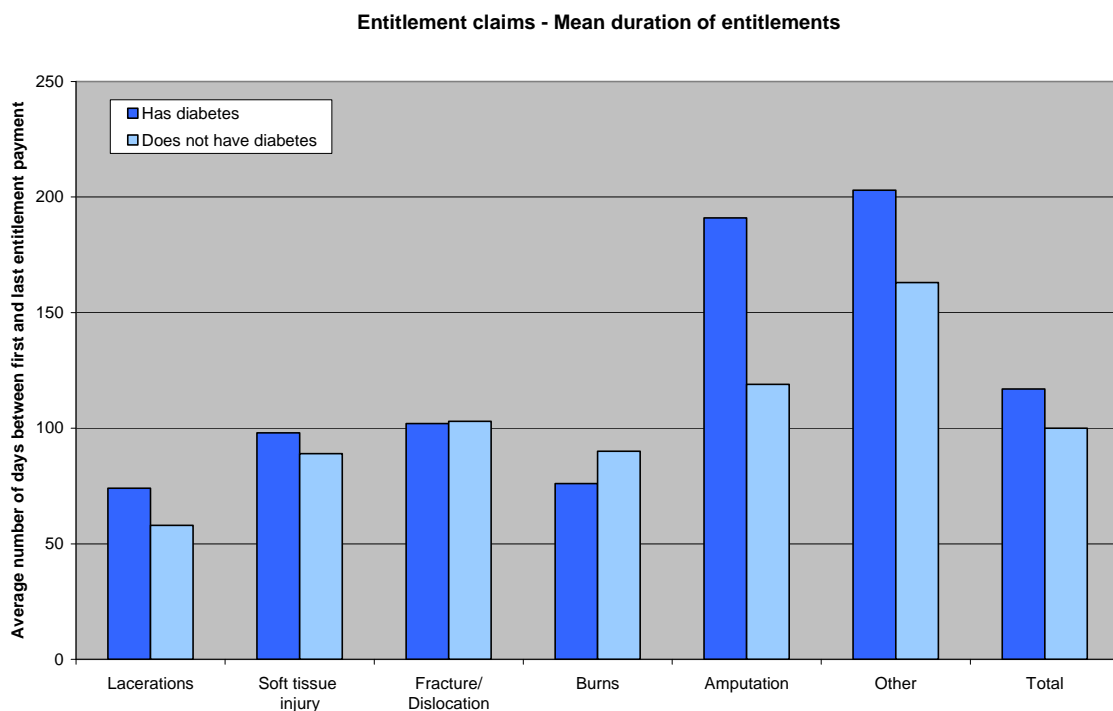


Figure 11: Mean duration of Entitlement Payments, first 12 months 2008/09 Financial Year, Diabetes / No Diabetes, Diagnosis



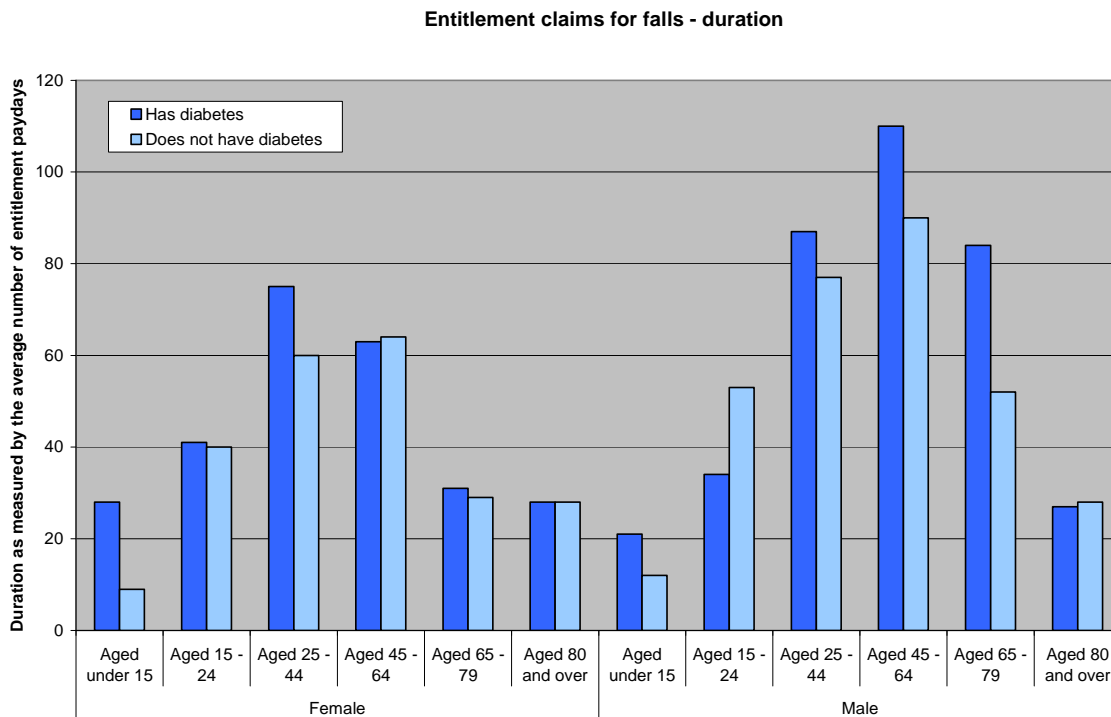
Diabetes and Type Injury Event: Falls, Burns, Extremities

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

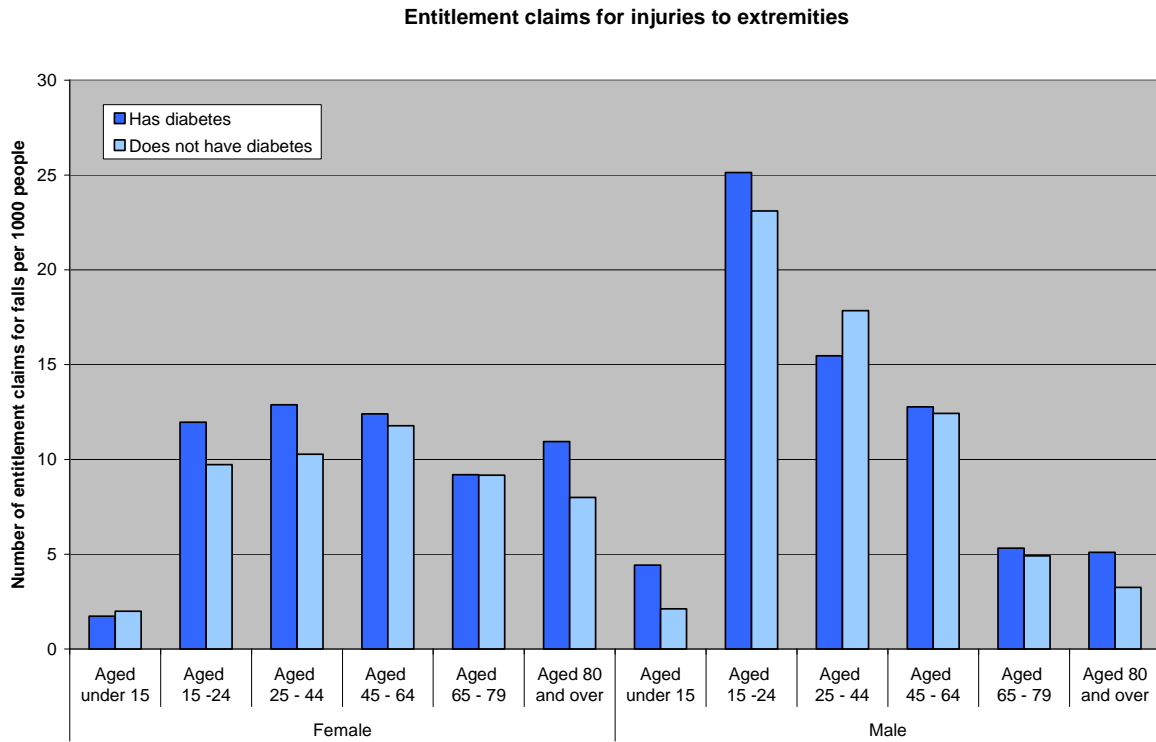


Figure 14: Mean Cost (Incl. PHAS) Diabetes Extremity Entitlement Claim first 6 Months, 2008/09 Financial Year

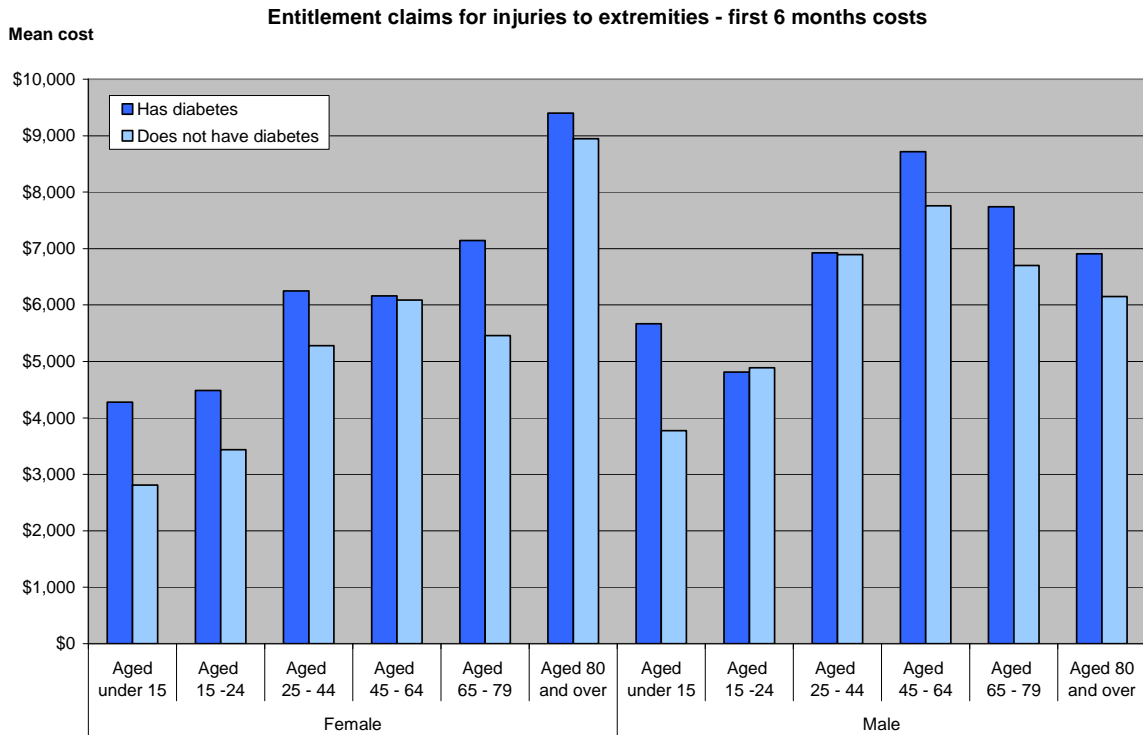


Figure 15: Mean Cost (Incl. PHAS) Diabetes Extremity Entitlement Claims first 12 Months

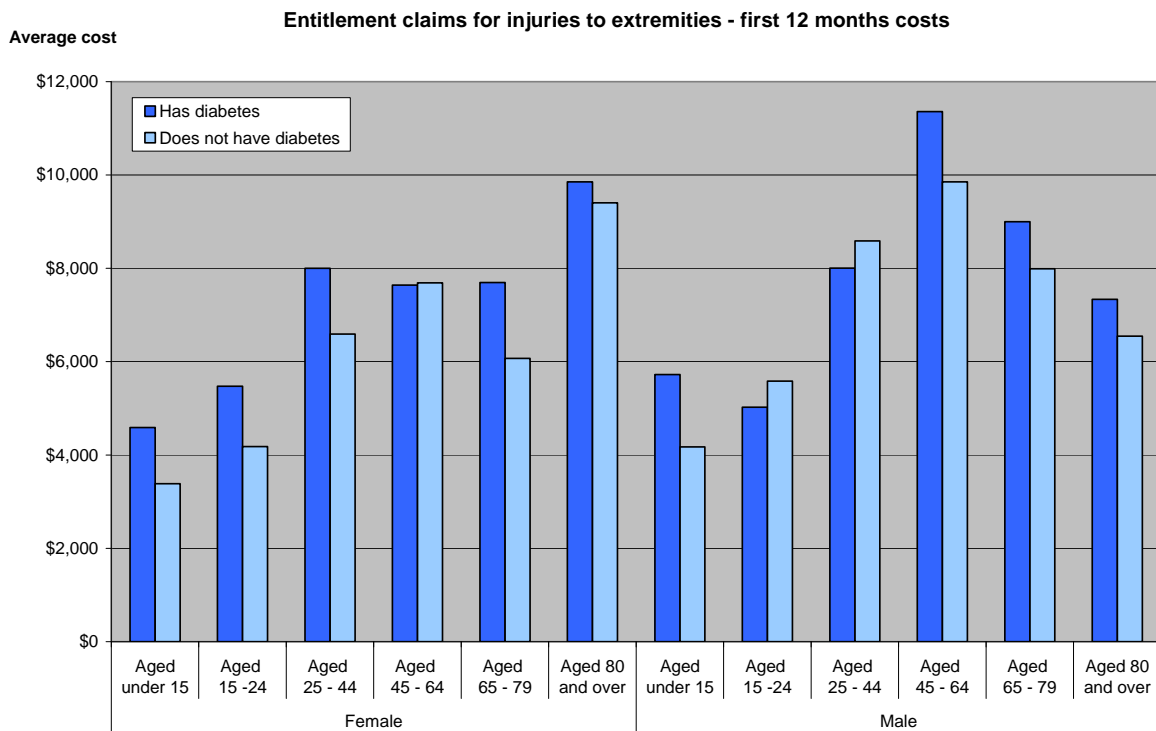
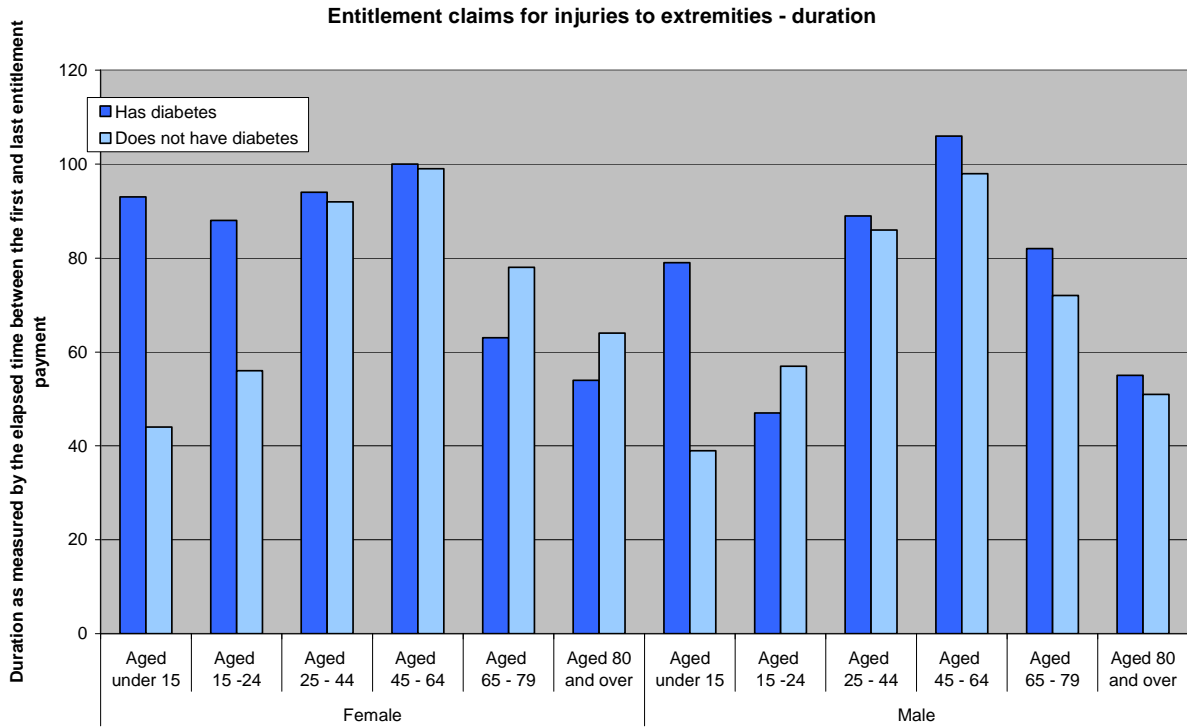


Figure 16: Mean Duration Diabetes Extremity Entitlement Claims



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
Total Cost		Has CHD: \$118,773,333			No CHD: \$1,088,624,467				
Excess <u>All Claim</u> Costs									
Attributable to CHD first 6 months*		\$ 62,670,614.00			Excess @ 12 mths		\$ 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: <u>Entitlement 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	\$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
Total Cost		Has CHD: \$72,470,166			No CHD: \$692,295,080				
Excess All Claim Costs		Attributable to CHD first 6 months*		\$27,859,014	Excess @ 12 mths		\$ 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

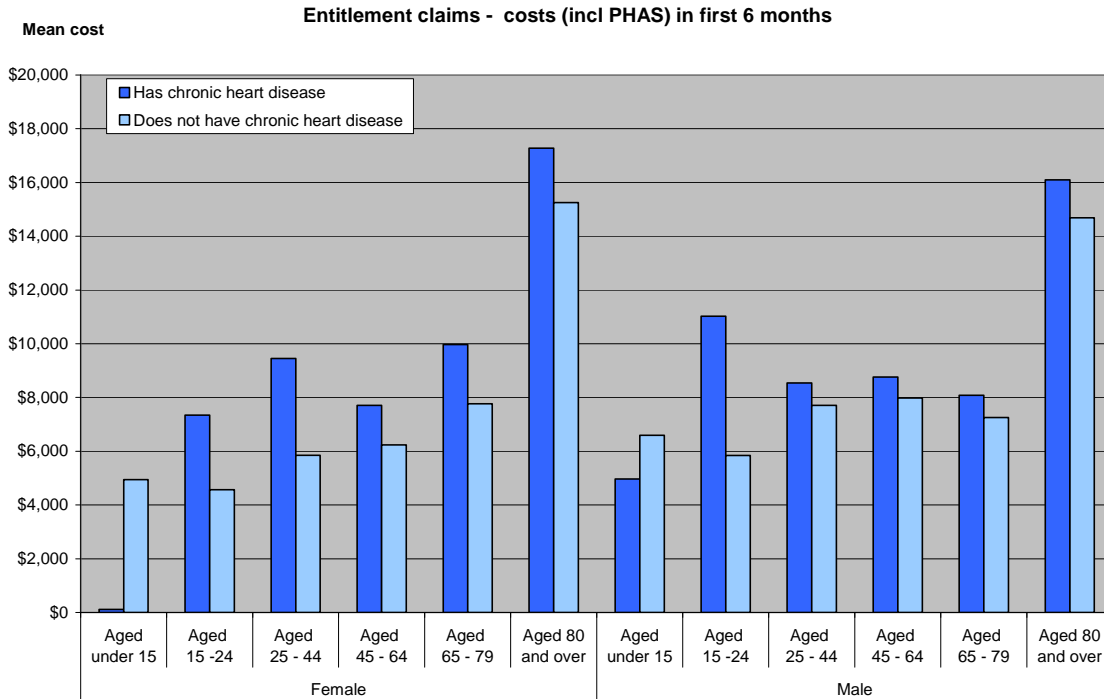


Figure 18: Mean Cost (Incl. PHAS) CHD related Entitlement Claims, first 12 Months, July/June 2008/09 Financial Year

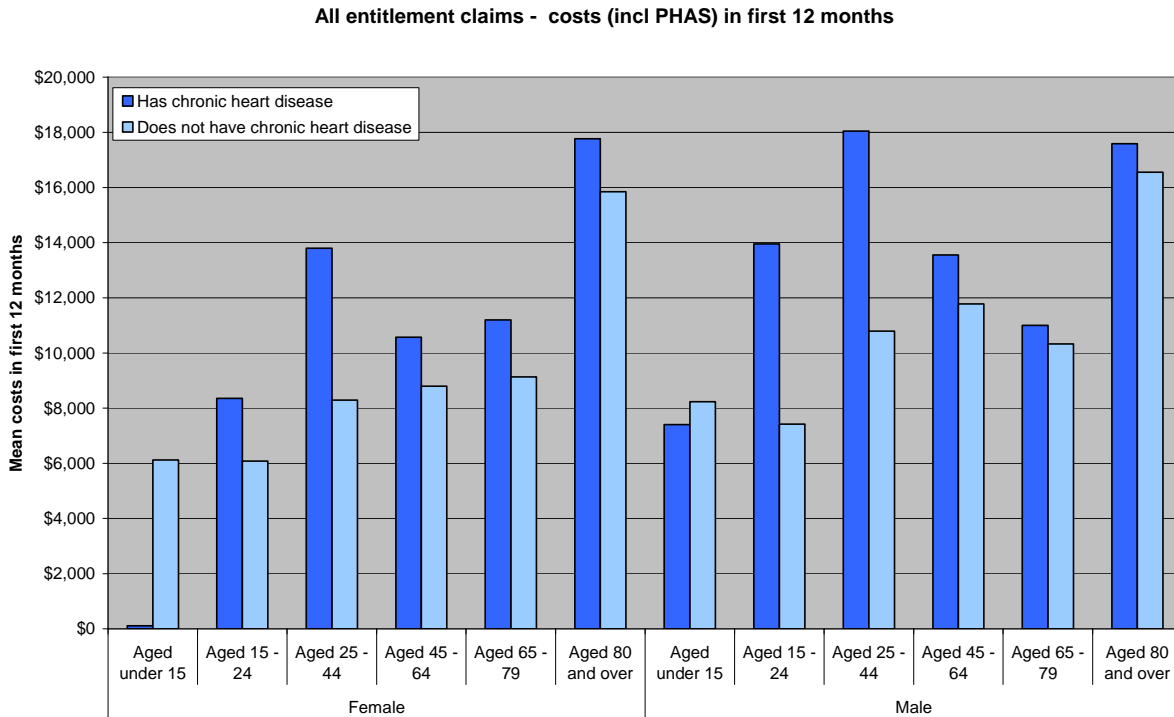
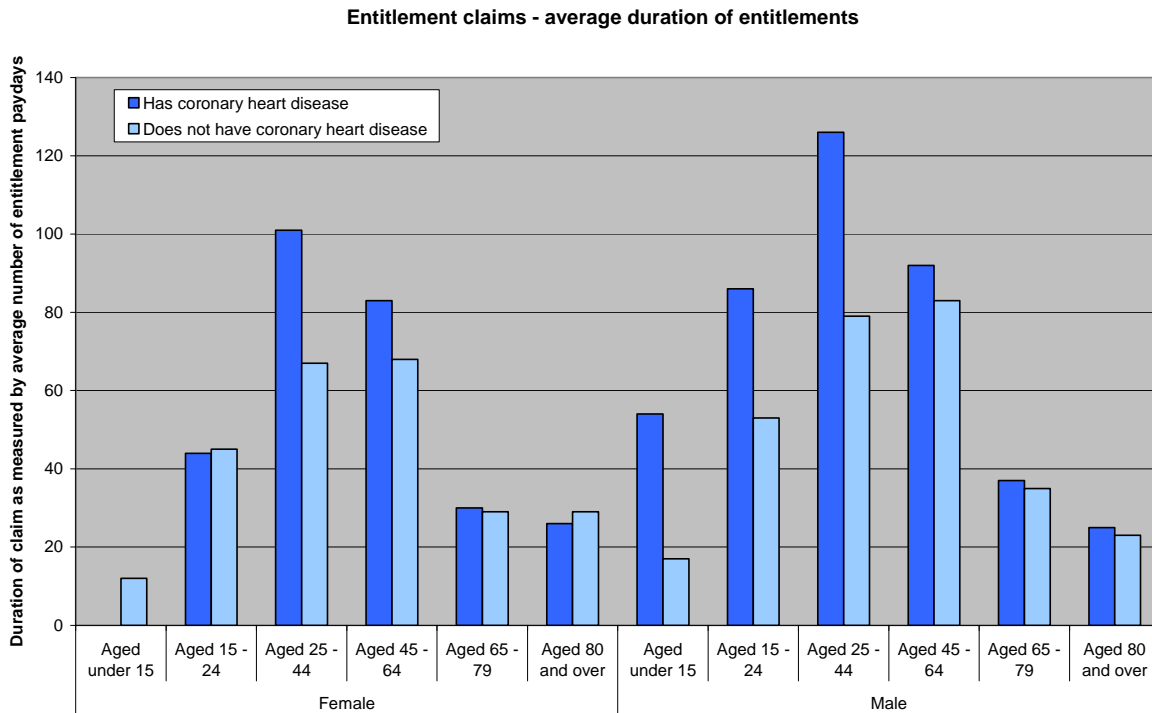


Figure 19: Duration CHD Entitlement Claims, Mean Paydays, July/June 2008/09 Financial year



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

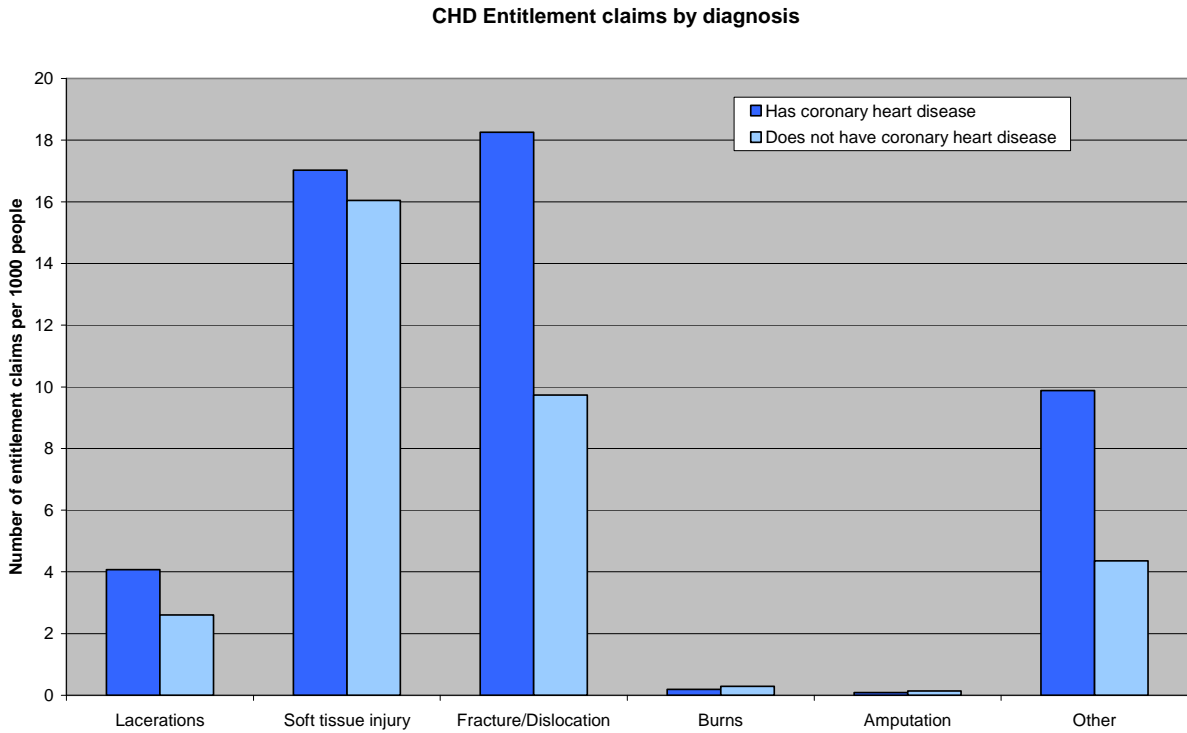
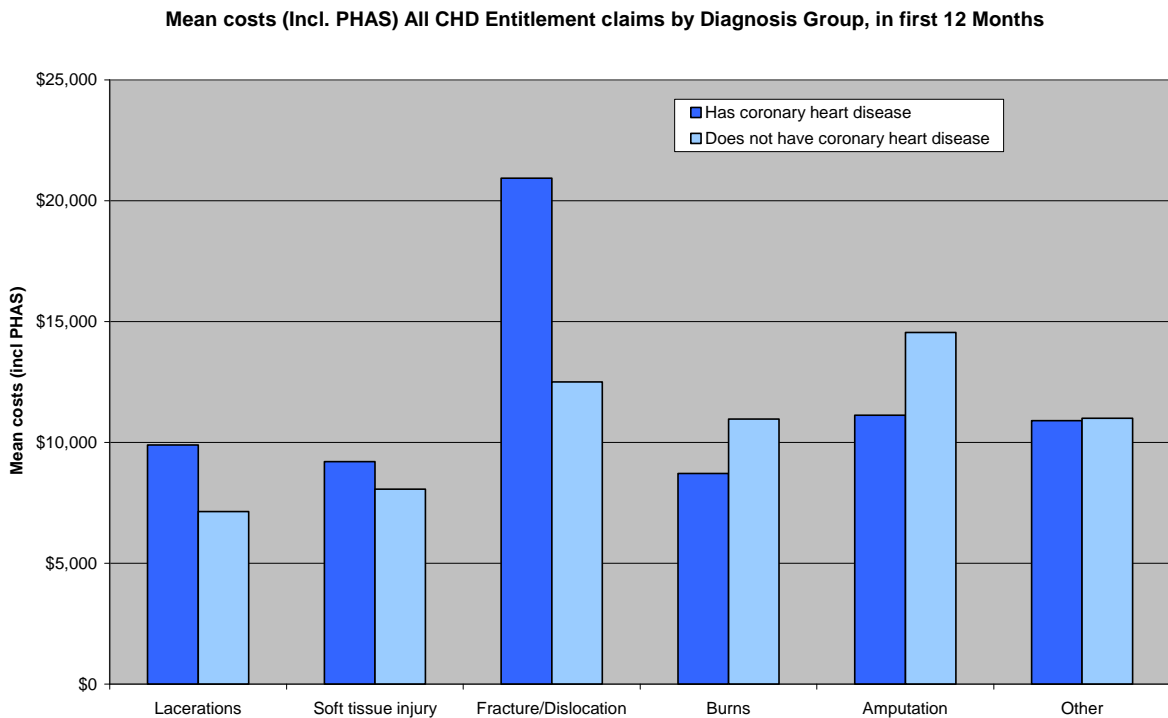


Figure 21: Mean Cost of CHD Entitlement Claims by Injury Diagnosis Group, 2008/09 Financial Year



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

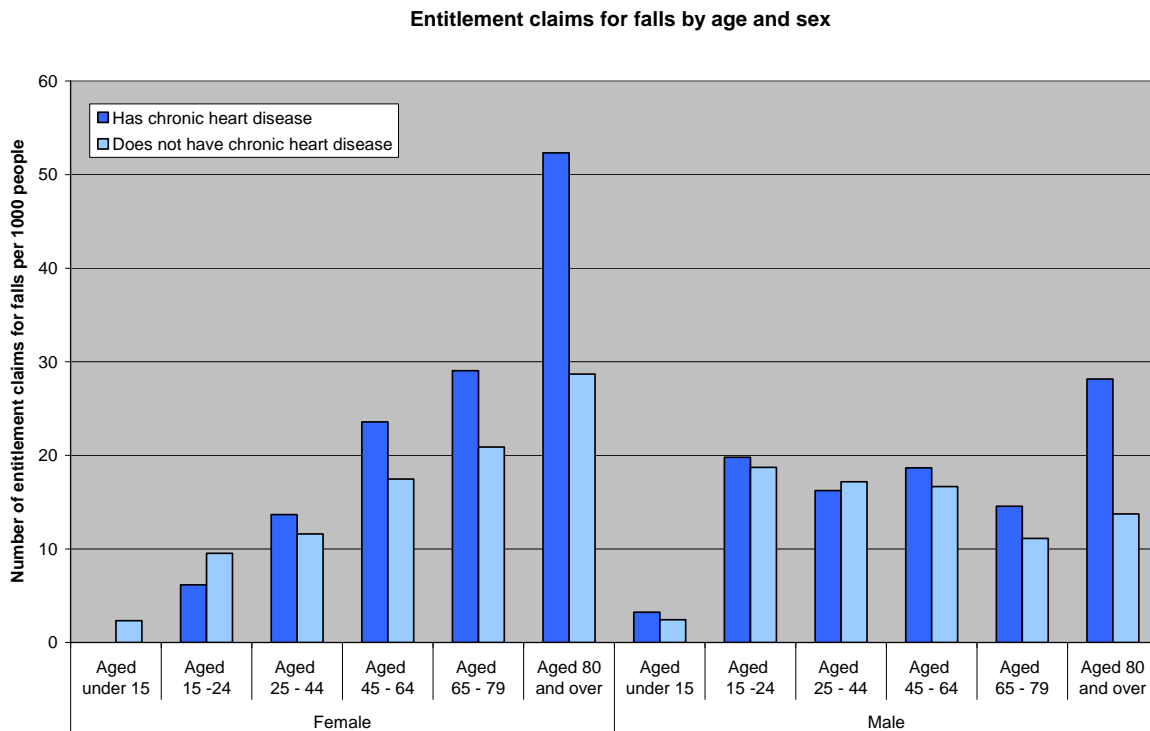


Figure 23: Mean CHD Falls-Related Entitlement Costs (Incl. PHAS), first 6 months, 2008/09 Financial Year

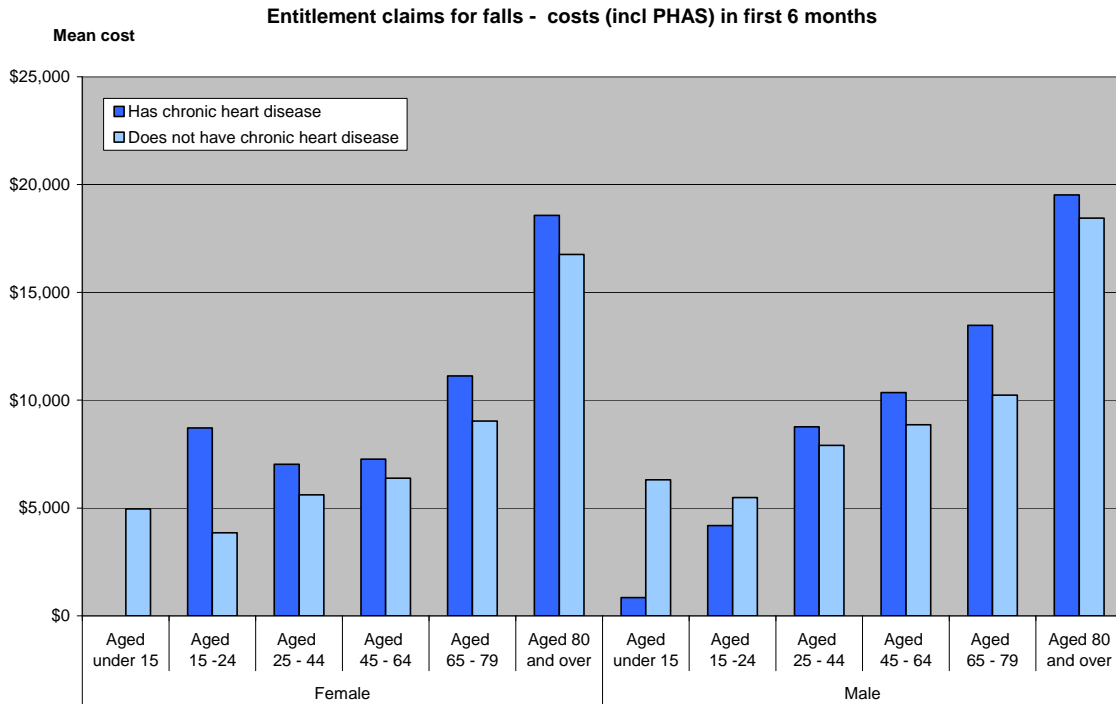


Figure 24: Mean CHD Falls-Related Entitlement Costs (Incl. PHAS), first 12 months, 2008/09 Financial Year, Sex and Age

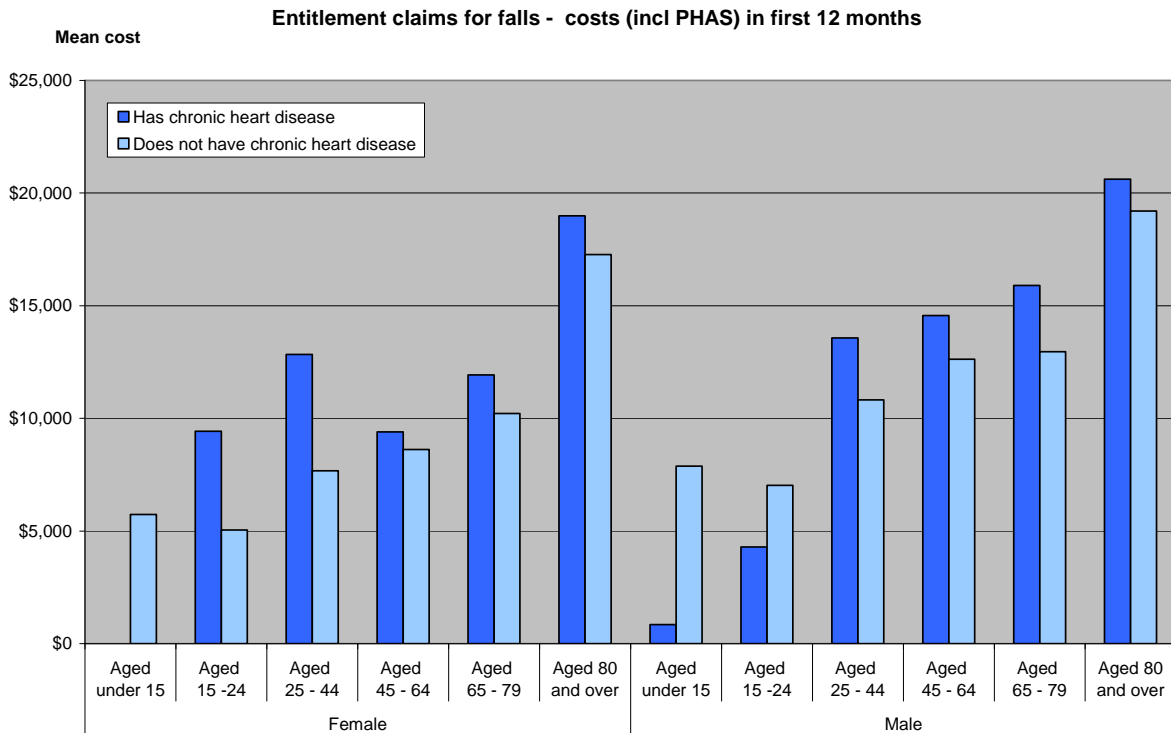
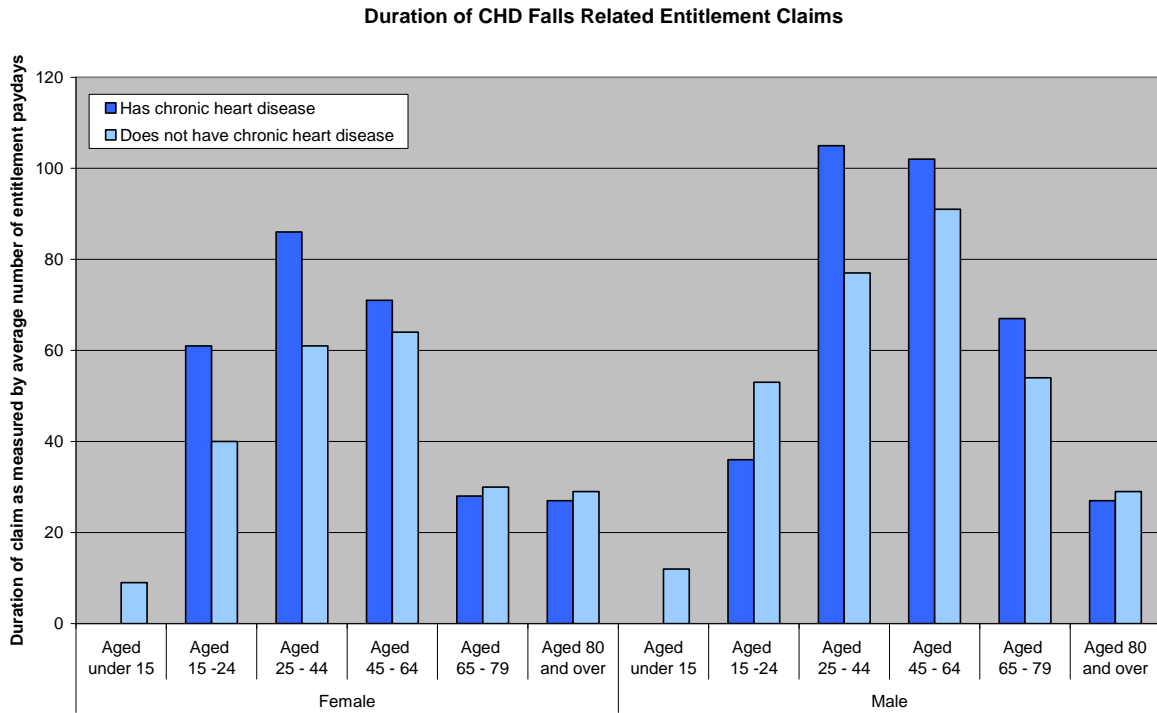


Figure 25: Mean Duration of CHD Falls-Related Entitlement Claims, 2008/09 Financial Year, Sex and Age



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

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