Chronic Conditions and ACC claims

CBG Health Research Limited

25 September 2009

Contents

Tables

Figures

Executive Summary

This research was commissioned by ACC to examine the relationship between co-morbidity and injury treatment provision in New Zealand. Of particular interest is whether the existence of a chronic disease is associated with additional injury treatment provision.

This relationship has been examined using data from the HealthStat random sample of general practices, covering over 500,000 patients. HealthStat practices code most common chronic conditions, in an agreement with HealthStat. In return they get access to personalised websites that provide business and clinical information about their practice population, and payment for participating in research projects. Data from 453,113 patients and 94 practices contributed to this analysis.

Read codes and prescribing patterns were examined for each patient to determine if they had certain common illnesses. Chronic diseases include asthma, heart disease, hypertension, diabetes, mental illness and cancer. Arthritis is not reliably coded .The number of ACC funded consultations in the year April 2008 - March 2009 has been used as a measure of the level of injury treatment services received by a patient. Patient registers provided demographic information.

The distribution of chronic illness by demographics (age, gender and ethnicity) followed expected patterns, as did consultation rates for all consultations and ACC funded consultations.

ACC consultation rates for patients who had a chronic disease were compared with the rates for those who did not have a chronic disease. These consultation rates are shown in the following table:

ACC Consultation by chronic disease

	No chronic disease			*Chronic Disease*		
		Lower	*Upper*		*Lower*	*Upper*
	Mean	*95% ci*	*95% ci*	*Mean*	*95% ci*	*95% ci*
Age						
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
Gender						
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						
Maori	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**

Patients with a recorded chronic disease have nearly twice as many ACC visits than patients that do not have a chronic condition, 0.49 visits per annum compared with 0.26 visits per annum. The difference is highly statistically significant. In all demographic breakdowns the confidence intervals around ACC consultation rates in the two groups are non-overlapping. These differences persist after controlling for age, gender and ethnicity in a multivariate analysis. In the study sample this rate difference corresponds to an additional 34,000 injury treatment consultations. As the HealthStat sample is a random sample of nearly exactly 10% of the population this represents an additional 340,000 consultations nationally.

These findings are consistent with a range of published literature on co-morbidity and levels of workers' compensation. It would be useful to examine the reasons for ACC claims made by people with and without chronic diseases. This could be done by linking practice data with national datasets, and examining Read codes in claims, even though these are not always 100% accurate. If such linkage were done it would also be possible to examine total treatment costs in different categories.

Introduction

There are a number of studies that demonstrate a positive correlation between chronic disease and workers' compensation. Both injury rates and amount of compensation have been shown to be associated with health status, for example obesity[1], cardiovascular risk[2], health risk behaviours, smoking and general life satisfaction scores[3]. ACC wishes to understand the effects of co-morbidity on injury treatment provision in New Zealand. Of particular interest is whether the existence of a chronic condition is associated with additional injury treatment.

This study uses the HealthStat data set to examine this question. The HealthStat dataset has unit record data for over 500,000 patients, from 103 randomly selected general practices across New Zealand. A wide range of data is collected every week, including dates of all consultations, any ACC claims (including invoicing for services covered by existing claims), all diagnostic coding and other classifications recorded by clinicians, all prescriptions, and demographic data including age, gender, ethnicity, and an index of socioeconomic deprivation.

An analysis data set has been constructed, using information from the HealthStat data warehouse, which contains one record for every patient registered with practices that agreed to take part in this research. Each record includes a count of the number of ACC funded consultations received by the patient in the year April 2008 - March 2009 and a series of flags which indicate if a patient has a chronic condition or not.

The amount of earnings related compensation a patient has received is not available within primary care computer systems in NZ. However future research could examine this association explicitly if primary care and ACC datasets were linked. The number of ACC funded consultations in the year April 2008 - March 2009 is used here as a measure of the level of ACC subsidy received by a patient for primary care GP consultations, but it is likely to also be a good indicator of the total ACC funding received by a patient.

Because ACC services are received at different rates by different patient groups, the research question has been addressed by looking at the association between chronic disease and ACC services in separate age, gender and ethnicity strata.

All analyses were performed using SAS 9.1.3. This report and the statistical analysis has been undertaken by Dr Barry Gribben of CBG Health Research Ltd.

---

[1] Truls O, Dement JM, Krause KM. Obesity and Workers' Compensation. Arch Int Med. 2007;167:766-773

[2] Battie MC, Bigos SJ, Fisher LD et al. A prospective study of the role of cardiovascular risk factors and fitness in industrial backpain complaints. Spine. 1989;14:141-147

[3] Musich S, Napier D, Edington DW. The Association of Health Risks with Workers' Compensation Costs. J Occup Environ Med. 2001;43:534-541

Methods

Description of data source

HealthStat[4] collects data every week from a random sample of 103 NZ general practices using the MedTech32 (MT32) practice management system. Over 86% of the NZ population is enrolled at a general practice that uses MT32. The HealthStat sample of practices was randomly selected from a list of all MT32 practices active in NZ, and was stratified by District Health Board to be geographically representative. Practices were personally recruited, usually involving a site visit. The original sample was comprised of 122 practices, of which 103 agreed to take part, a response rate of 84%. Over 10% of the population of NZ is covered in the HealthStat random sample.

Practice sample construction

When the HealthStat sample was selected there were 1364 active general practices on the CBG practice database of all practices in NZ. This database is updated monthly and at the time was the most complete database we were aware of. Accident and Medical services were included if they provided general medical services to a registered population. The sampling methodology was designed to deliver a geographically representative random sample of over 100 practices and associated 360+ doctors. To stratify by DHB, a quota was set for each DHB in proportion to the population of the DHB. A minimum of 3 practices per DHBs were selected, to provide practice anonymity in DHB level analyses. To choose the random sample in each DHB, the practices in a DHB were listed in suburb or town order. A random start point was chosen using the Excel random number generator, and every "nth" practice was chosen, with "n" chosen to produce the required number of practices for that DHB.

---

[4] A sample of HealthStat analyses is available at www.healthstat.co.nz, login=anypho, password=anypho

Demographic breakdown of the HealthStat sample

The following table shows the composition of the HealthStat patient sample. HealthStat collects up to three ethnicities and applies "level 0" prioritisation, i.e. if any of the three ethnicities are Maori, ethnicity is recorded as Maori, otherwise if any of the three ethnicities are Pacific ethnicity is recorded as Pacific, otherwise ethnicity is recorded as Other. Over 98% of records have recorded ethnicities. The prioritisation algorithm will assign "Other" ethnicity to patients with no recorded ethnicity.

Table 1 Description of HealthStat sample

Age group	**N**	**%**
0-5	55,391	9.67
6-17	113,347	19.79
18-24	58,365	10.19
25-44	157,299	27.46
45-64	129,012	22.53
65+	58,724	10.25
missing	607	0.11
Total	572,745	100
Ethnicity	**N**	**%**
Māori	123,239	21.52
Pacific	83,902	14.65
Other	365,604	63.83
Total	572,745	100
Gender	**N**	**%**
Male	278,114	48.56
Female	293,548	51.25
Missing or Unknown	1,083	0.19
Total	572,745	100

In general, HealthStat over-represents Māori and Pacific patients, and patients from "Access" practices. Prior to July 2007 "Access" practices received greater subsidies for patient consultations; there is now no distinction between Access and Interim practices. The response rate from socio-economically deprived, high Māori and Pacific practices that appeared in the random sample was 100%. The HealthStat sample is therefore slightly biased in favour of these populations. Some chronic conditions are more predominant in these groups, for example diabetes.

Data collection

Each HealthStat practice supplies a download of anonymous data from the practice computer system each week, using a completely automatic procedure built into MedTech32. Data are downloaded using the secure HealthLink messaging system. The practice downloads are spread over the working

week, so that data are received from 20% of practices each day. This reduces the daily traffic maximum volumes that HealthLink has to handle. Registers are downloaded from each practice every three months, to provide up-to-date denominators for rate calculations. Downloads are spread over the three months; the pooled register data thus estimates the HealthStat denominator at the midpoint of a quarterly reporting period. This data has been accumulating since October 2005. The analysis was based on data for the year ending March 2009.

Coding chronic diseases

HealthStat practices undertake to code the following diagnoses, signing a memorandum of understanding with HealthStat. In return for coding patients in the following groups practices receive quarterly analyses of their practice data on their own password protected website.

- 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

However, the HealthStat system also collects every diagnostic code associated with a patient in the last five years. The conditions in the above list were originally chosen to support tracking common chronic conditions in performance management programmes and the data analysis requirements of the first users of the HealthStat system, for example the Public Health Intelligence unit in the Ministry of Health.

For diabetes, asthma, ischaemic heart disease and depression, diagnoses are also inferred from prescribing history, and feedback is provided to clinicians, on personalised websites, to encourage more complete coding.

The way HealthStat data collection has evolved means that some common chronic conditions are not on the agreed list. Notable examples would be hypertension and arthritis (osteoarthritis, rheumatoid arthritis and gout). However, since HealthStat started, over the last 4 years there has been a marked increase in the number of disease codes recorded for patients. Many PHOs have required practices to

record chronic disease diagnoses using diagnostic codes, the DHBNZ performance management programme has probably improved coding rates, and audit programmes for professional development have also had an impact.

The case of hypertension has provided a good "test case", as BP recordings are also picked up by HealthStat. Although hypertension is not on the agreed list, over 90% of all people with three elevated BP recordings are coded as having hypertension.

For completeness it should be noted that there is anecdotal evidence that there is some reticence to record mental health diagnoses. This may be changing due to the "Like Minds Like Mine" campaign and the Ministry of Health National Depression Initiative, with high profile TV advertising and funding for practices to provide an expanded range of service to people with common mental health conditions.

Completeness of other data elements

Because data collection is automatic and comes directly from practice databases other data elements are basically 100% complete, with missing data rates for demographic data as noted earlier. The definition of a non-ACC "consultation" is problematic. In other work based on the HealthStat data warehouse the definition of a consultation used by HealthPAC and DHBNZ has been adopted. A non-ACC consultation is defined as a recorded patient contact with an associated invoice – the invoice can be a zero-invoice. The use of zero-invoices for patients who do not have to pay a co-payment has increased steadily since 2005.

Constructing the analysis dataset

An analysis dataset has been built for this project from the HealthStat data warehouse. The analysis dataset contains a single record for every patient continuously registered with a HealthStat practice in the previous year. Less than 1% of patients had missing data – these have been excluded from the analysis dataset. The fields in the dataset include these variables:

1. A practice identifier
2. A patient identifier
3. Age
4. Gender
5. Ethnicity (prioritised to Maori / Pacific / Other)
6. Number of consultations in year (n)
7. Number of ACC invoiced services (n)
8. Asthma - Asthma diagnosis or prescription? (1/0)
9. COPD – Chronic Obstructive Pulmonary Disease (1/0)
10. IHD – Ischaemic heart disease diagnosis or prescription? (1/0)
11. BP – Hypertension
12. HF – Heart Failure
13. DM - Diabetes diagnosis or prescription? (1/0)

14. MH - Mental Health diagnosis or prescription? (1/0)
15. Any Chronic Disease - Any of variable 8 - 14 or a cancer diagnosis.

For the purposes of answering the research question, an injury treatment event has been defined as an ACC-invoiced service.

Results

This section presents chronic disease profile by demographic group, a description of consultation rates, an analysis of ACC consultation rates by chronic disease status and a regression model that predicts ACC consultation rates by chronic disease status, after controlling for demographic variables. Data from 453,113 patients and 94 practices contributed to this analysis.

Chronic disease profile

The demographic and chronic disease profile is described in the following table:

Table 2 Chronic disease profile

		Asthma	*COPD*	*IHD*	*Hypertension*	*HF*	*Diabetes*	*Mental Health*	*Any of these Conditions + Ca*
	Patients	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*
Age Group									
0-5	43050	10.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	11.1%
6-17	87929	17.5%	0.0%	0.0%	0.1%	0.0%	0.2%	3.5%	20.9%
18-24	45658	13.8%	0.0%	0.1%	0.3%	0.0%	0.6%	9.5%	22.9%
25-44	123773	11.5%	0.1%	0.5%	2.9%	0.1%	2.2%	13.3%	27.9%
45-64	104760	8.9%	1.8%	5.4%	18.1%	0.7%	8.2%	14.1%	44.0%
65+	47943	8.6%	6.5%	21.5%	41.7%	5.9%	15.9%	12.1%	70.5%
Gender									
Female	234513	12.6%	1.1%	3.2%	10.2%	0.8%	4.2%	10.9%	34.2%
Male	218600	11.1%	1.2%	4.2%	8.6%	0.8%	4.5%	8.9%	31.1%
Ethnicity									
Maori	105484	15.3%	1.2%	2.4%	7.1%	0.9%	4.6%	8.4%	30.2%
Other	310267	10.8%	1.2%	4.3%	10.4%	0.8%	3.9%	11.0%	34.3%
Pacific	37362	11.0%	0.7%	1.9%	8.0%	0.8%	**7.4%**	4.9%	26.0%
Total	453113	11.9%	1.1%	3.7%	9.4%	0.8%	4.3%	9.9%	32.7%

COPD = Chronic Obstructive Pulmonary Disease
IHD = Ischaemic Heart Disease or a prescription for vasodilator medication (e.g. a nitrolingual pump spray)
HF = Heart Failure
MH = Mental Health condition (mostly depression)

Any of these conditions + Ca = any of the listed conditions PLUS any cancer diagnosis

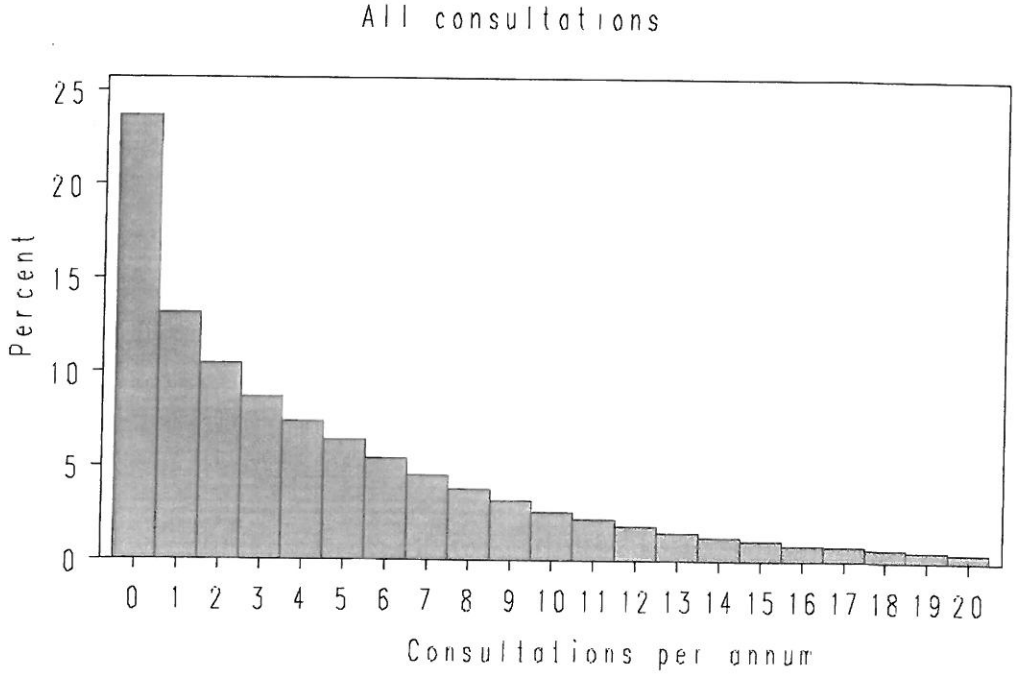
Overall, a third (32.7%) of the population has a chronic condition (as defined here). The table shows the percentage of the population subgroup that have the indicated chronic condition. For example 7.4% (in bold) of all Pacific people have a diagnosis of diabetes.

Because these rates depend on recording completeness they are not good estimates of population rates (for most conditions) however the pattern of chronic condition prevalence matches that known from other data sources. Age is the strongest determinant of having a chronic condition. Asthma rates fall with age (after middle age) but the prevalence of all other chronic conditions increases with age. Nearly half of people over 65 have hypertension (41.7%). Women have slightly more mental health conditions than men, but this includes substance abuse. Other more restricted mental health definitions show a more pronounced female / difference. Ethnicity profiles for chronic conditions show the expected pattern, with high rates of diabetes in Pacific people (and low rates of mental illness).

Consultation rates

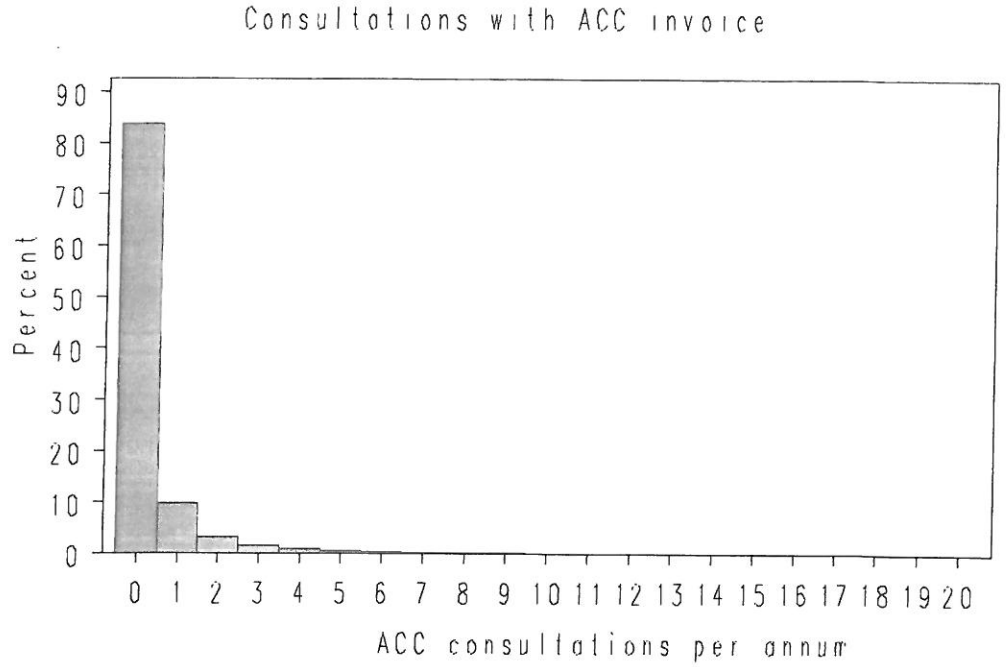
There were 1,826,188 GP consultations ("visits" or "encounters") made by the patients in the sample in the previous 12 months. The distribution of these visits is given below.

Figure 1 Consultation rate distribution – all consultations



Some of these are "ACC consultations". This is a consultation where computer records show that an invoice was generated for ACC. There were 148,974 ACC consultations (8.1% of all consultations). The distribution is shown below:

Figure 2 Consultation rate distribution – ACC consultations



These distributions show the normal distribution of practice visits. They are "zero-inflated" count (Poisson) distributions. The number of people not seeing the practice in a year is greater than reported in data from other sources (e.g. NZ Health Survey). This is because these sources do not ask questions specifically about usual source of care, so include contacts with all sources of care.

Impact of chronic condition on consultation rate

The number of total consultations and ACC consultations in the previous 12 months can be broken down by chronic condition status, as shown in Table 3 below.

Table 3 Consultations per annum by demographic group

Consultations per annum	*ACC Consultations*		*All Consultations*	
	Chronic condition		*Chronic condition*	
	No	*Yes*	*No*	*Yes*
Current Age				
0-5	0.15	0.23	5.12	7.49
6-17	0.21	0.31	1.95	4.19
18-24	0.25	0.36	2.53	5.60
25-44	0.27	0.44	2.82	6.93
45-64	0.36	0.56	3.73	9.55
65+	0.37	0.65	5.92	13.71
Gender				
Female	0.20	0.47	3.67	9.65
Male	0.32	0.53	2.71	7.96
ethnicity				
Maori	0.25	0.41	2.90	8.06
Other	0.27	0.54	3.35	9.18
Pacific	0.21	0.30	2.84	8.30
Total	0.26	0.49	3.19	8.88

The table shows the expected pattern of "All Consultations" by age gender and ethnic group. The pattern by age is well known with children under 5 having consultation rates close to those of people aged 45-64, and people age 65+ having the highest rates. Women have higher overall consultation rates than men. People of "Other" ethnicity have more consultations than people of Maori and Pacific ethnicity. The pattern of ACC consultations shows ACC consultation rates increasing smoothly with age, and men have more ACC consultations than women. Pacific people have fewer ACC consultations than other ethnic groups.

The next table looks more closely at ACC consultation rates, giving the 95% confidence intervals around the estimates of the number of ACC consultations in the previous year for people with and without a chronic condition:

Table 4 ACC consultations per annum by demographics and chronic disease

ACC Consultations per annum with 95% ci	*Any chronic condition*					
	No			*Yes*		
	Mean	*Lower 95% ci*	*Upper 95% ci*	*Mean*	*Lower 95% ci*	*Upper 95% ci*
Current Age						
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
Gender						
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						
Maori	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

For example, for people aged 65 and over (shaded), the average number of ACC visits each year for people without a chronic condition is 0.37 with a 95% confidence interval of 0.34 – 0.39 visits per year. But if someone in the same age group has a chronic condition the average number of visits per year is 0.65, with a 95% confidence interval of 0.63 – 0.67 visits per year.

The "95% confidence interval" means that if the real value of the number of visits per year was 0.37 then we would expect to get a value outside the range 0.34 – 0.39 5 times in every 100 samples of the size of the HealthStat sample. The fact that the two 95% confidence intervals do not overlap

means we can be very confident that the ACC visit rates for people aged 65 and over with a chronic condition are really different from those without a chronic condition, i.e. the rates differ in the population of NZ.

If fact, none of the confidence intervals in the rows of the above table overlap. In all demographic groups people with a chronic condition have more ACC consultations than people that do not have a chronic condition.

These data can be used to estimate the total "excess injury treatment consultations" that can be attributed to chronic illness in the sample. From Table 2, there are 453,113 patients in the sample, of which 32.7% have a chronic illness, 148,168 patients. From Table 3, there are 0.23 (0.49-0.26) excess injury treatment consultations per annum for patients with a chronic illness. This represents an additional 34,079 consultations for these 148,168 patients. As the HealthStat sample is a random sample of nearly exactly 10% of the population, this represents approximately 340,000 consultations nationally.

Multivariate analyses

This previous table is the most useful table in the analysis. However a multivariate analysis can take account of any interactions between age, gender and ethnicity to estimate the effect of having a chronic condition after controlling for these demographic variables. This has been undertaken in two different ways below – these analyses just confirm these earlier results.

Because we have such a large amount of data and the effects we have already illustrated are also large, all effects in these models are significant. When an analysis is conducted on a large dataset statistically significant results are sometimes practically (or "clinically") insignificant. The effects here are large and not just merely statistically significant.

The procedure employed in the first analysis (SAS proc surveyreg) takes account of the clustering of patients within practices. This is desirable because patients within practices are not independent – they are likely to be more similar than two patients picked at random. This analysis is estimating the effect of each "parameter" in the statistical model, after allowing for the fact that patients attending the same practice may be similar in ways we have not accounted for with the variables in our dataset. The procedure is usually employed for analysing survey data where the response variable (number of ACC visits in this case) is approximately normally distributed.

Age enters these models as a numerical variable (rather than including it as a categorical variable, with six levels – the age groups) as the relationship between age and ACC consultation rate is very nearly linear, as shown in the previous analysis given in Table 4.

The analysis presented below shows that after allowing for clustering the presence of a chronic condition is significantly associated with an increased number of ACC visits in a multivariate analysis

Table 5 Regression analysis allowing for clustering

Proc surveyreg output				
Parameter	*Estimate*	*Standard Error*	*t Value*	*Pr > |t|*
Intercept	0.1178361	0.02547229	4.63	<.0001
Age	0.0044621	0.00038088	11.72	<.0001
gender Female	-0.1065204	0.00918579	-11.60	<.0001
gender Male	0.0000000	0.00000000	.	.
ethnicity Maori	0.0706576	0.02468966	2.86	0.0052
ethnicity Other	0.0748714	0.02634875	2.84	0.0055
ethnicity Pacific	0.0000000	0.00000000	.	.
Any Chronic Disease	**0.1630336**	**0.01969933**	**8.28**	**<.0001**

The coefficient of "Any Chronic Disease" is highly significantly not equal to zero. Unfortunately the count data for ACC visits is obviously not approximately normal, and an analysis of residuals shows expected departure from model assumptions. Count data can be modelled using Poisson or negative binomial distributions. This has been done in SAS proc genmod and with the following output:

Table 6 Poisson regression

Proc genmod output								
Parameter		*DF*	*Estimate*	*Standard Error*	*95% Confidence Limits*		*Chi-Square*	*Pr > ChiSq*
Intercept		1	-1.3832	0.0206	-1.4236	-1.3427	4493.12	<.0001
Age		1	0.0134	0.0002	0.0130	0.0138	3579.27	<.0001
gender	Female	1	-0.3813	0.0091	-0.3992	-0.3635	1749.42	<.0001
gender	Male	0	0.0000	0.0000	0.0000	0.0000	.	.
ethnicity	Maori	1	0.2422	0.0194	0.2042	0.2803	155.68	<.0001
ethnicity	Other	1	0.2484	0.0179	0.2132	0.2836	191.75	<.0001
ethnicity	Pacific	0	0.0000	0.0000	0.0000	0.0000	.	.
Any Chronic Disease	1	1	**0.4451**	**0.0100**	**0.4647**	**0.4255**	**1981.12**	**<.0001**

This analysis confirms the previous one - however it does not account for clustering which would slightly increase the confidence intervals around estimates, and the distribution of counts shows a large number of "zeroes" (in Figure 2), which means the data are not truly Poisson distributed.

Neither analytical approach is ideal. An analysis could be performed by programming modifications to some SAS procedures to allow for the specific error structure (distribution) of the data. This was attempted by did not run to completion ("converge"). A new procedure specifically for analysing zero-inflated count data such as these, while allowing for clustered sampling, is available in the next version of SAS (9.2) and this is being released in NZ currently.

The size of the effects observed is however very large, and the magnitude of the findings reported here is unlikely to change in a new statistical model.

Discussion

Finding consistent with literature

The analysis of the previous section shows that patients with a chronic disease recorded in their clinical record have significantly more ACC funded consultations than age, gender and ethnicity matched patients who do not have a chronic disease. This is consistent with other published research.

The studies cited in the introduction report the association between certain conditions (smoking, obesity, physical inactivity and psychosocial dysfunction) and workers' compensation levels. Obesity is a predictor of diabetes, and smoking is a predictor cardiovascular disease (ischaemic heart disease and hypertension) both of which were captured in this investigation.

A briefing paper from the Australian Institute of Health and Welfare National Injury Surveillance Unit, published in September 2008[5], reports research that demonstrates strong associations between a history of mental health illness and subsequent injury, particularly in relation to risk taking behaviours, alcohol misuse, and psychological traits such as impulsivity, sensation seeking, and risk perception.

A report by Cameron et al[6], also reported in this briefing paper, demonstrated that compared to non-injured people, injured people were five times more likely to have one or more comorbidities, were admitted to hospital almost twice as often and had higher rates of physician claims.

Musich et al[7] cite a range of studies that together suggests that non-injury medical costs might be associated with a different health profile, being more strongly associated with absence due to illness, drug/medication use, medical problems, high blood pressure and poor physical health.[8] [9] The present analysis does not explore this distinction, but does show that in New Zealand common medical conditions are associated with increased ACC consultation rates. The commonest conditions contributing to the "Any chronic disease" indicator were asthma and hypertension.

---

[5] Injury as a chronic health issue in Australia. Raymond A. Cripps and James E. Harrison. NSU Briefing number 13 September 2008. Australian Institute of Health and Welfare National Injury Surveillance Unit, Flinders University

[6] Cameron CM, Purdie DM, Kliewer EV & McClure RJ 2005. Differences in prevalence of pre-existing morbidity between injured and non-injured populations. Bulletin of the World Health Organization 83 (5):345–52.

[7] Musich S, Napier D, Edington DW. The Association of Health Risks with Workers' Compensation Costs. J Occup Environ Med. 2001;43:534-541

[8] Foote A, Erfut JC. The benefit to cost ratio of work-site blood pressure control programs. JAMA 1991;265:1283-1286

[9] Hashemi L, Webster BS, Clancy EA, Courtney TK. Length of disability and cost of work-related musculoskeletal disorders of the upper extremity. J Occup Environ Med. 1998;40:261-269

Why do people with chronic conditions have more ACC claims?

The higher number of ACC funded visits reported here could be a function of higher incidence rates and longer recovery times. Both possibilities would result in more ACC consultations per annum for patients with chronic disease. Both these explanations have some plausibility. Any chronic disease is likely to reduce normal function and thus make accidents more likely.

There are some well known features of specific chronic conditions that would make accidents of certain types more likely. Patients with diabetes can suffer from neuropathies that reduce heat and pain sensation so injury is more likely, for example burns. Patients with diabetes also have poor tissue perfusion so that wound healing is delayed. This could result in more visits for the same injury experienced by person without diabetes. Obesity (more likely in people with diabetes) will reduce the opportunities for rehabilitation based on physical activity. Chronic disease is an established risk factor for falls in the elderly and enters proposed risk assessment procedures.[10] Sleep apnoea has a well know association with traffic accidents.[11]

On the other hand, patients with chronic conditions would be less likely than other people to be involved in sport and other physical activities e.g. carrying / lifting heavy objects. These injuries comprise a large proportion of ACC funded primary care activity. It would be expected that people with lower levels of activity would have fewer ACC claims from sports related injury.

This suggests further research examining the nature of the ACC claims being made by people with chronic conditions in different age and disease groups could be useful.

The observed relationship between ACC claims and chronic conditions could also be a consequence of a causal relationship between some factor that is positively associated with injury and also associated with developing a chronic condition. This would be a factor other than age, gender or ethnicity, which have already been incorporated into the previous analysis.

One mechanism might be lack of education or general life skills, so that accidents were more likely (for example not wearing a seat belt) and behaviours that led to a chronic condition (smoking). Another related but more subtle mechanism might be a personality trait that resulted in a lack of self care, so that accidents were more likely, which also predisposed a person to the development of any chronic condition that was associated with lack of self care such as poor diet or lack of exercise. There is also some interesting research that suggests that people with a predisposition for risky

---

[10] Woo J, Leung J, Wong S, Kwok T, Lee J, Lynn H. Development of a simple scoring tool in the primary care setting for prediction of recurrent falls in men and women aged 65 years and over living in the community. J Clin Nurs. 2009;18:1038-48

[11] Heaton K, Browning S, Anderson D. Identifying variables that predict falling asleep at the wheel among long-haul truck drivers. J Am Assoc Occup Hlth Nurses 2008;56:379-85.

behaviour that may make them more likely get certain chronic diseases may be more likely to have jobs that have a higher injury rate.[12]

Does increased contact with care increase ACC claims?

This finding may be confounded by the way primary care is delivered in New Zealand. People with chronic conditions have more contact with primary care. This increased level of contact itself may result in more ACC claims. One mechanism might be that the chronic care visit provides an opportunity to make a claim for relatively minor injuries that might otherwise not be made. The inconvenience of attending primary care is in effect a barrier to making minor claims. For people with a chronic condition this barrier may be reduced.

This hypothesis could be tested by examining the nature and severity of claims made by people with chronic injuries in comparison with people that do not have chronic conditions.

It is also possible that primary care providers encourage ACC claims from people with chronic conditions. The financial burden of high levels of primary care contact (i.e. many co-payments) can be significant. Practices could conceivably encourage claims that a patient might not otherwise lodge. This effect could involve both lodging new claims and / or making claims for follow-up treatment of old injuries at the same time as the visit for managing the chronic condition.

Further research

The goal of this research project was to investigate whether there was an association between injury treatment provision and chronic disease in New Zealand primary care data. This project has shown that patients with chronic diseases have nearly twice as many ACC visits than patients that do not have a chronic condition, 0.49 visits per annum compared with 0.26 visits per annum. The difference is highly statistically significant. These differences persist after controlling for age, gender and ethnicity. Some further research could help explain this finding.

Examine ACC diagnoses by chronic disease

To better understand the reasons why people with chronic disease have more ACC funded GP visits, the types of injuries experienced by people with chronic diseases could be examined, comparing them with national injury profiles. This analysis could be undertaken by linking general practice data to data on injury type from national ACC datasets. This could be done by linking NHIs and claim dates, or ACC claim numbers, in general practice computer records with data in the ACC data warehouse

---

[12] Forrester BG, Weaver MT, Brown KC, Phillips JA, Hilyer JC. Personal Health-Risk Predictors of Occupational Injury Among 3415 Municipal Employees J Occup Environ Med.1996;38:515-521.

This study would require ethics committee approval, as identifiable data would need to be collected, however it would probably not require individual patient consent. All analyses would use de-identified data and reporting would only be in the form of statistical tables.

Such a study could also be undertaken by extracting ACC Read code data from practice computer systems, although specific Read codes would only be available for the initial ACC claim, and in many cases this data would not be available in the practice computer system, for example, old injury data might not be available in an electronically retrievable form, and data would not be available if the initial claim was made at another health care facility.

Measure costs of injury treatment provision

The indicator for injury treatment provision that has been utilised does not directly measure costs, although it will be closely associated with primary care servicing costs (subsidies for primary care and prescriptions). Chronic disease might not be so strongly associated with total treatment cost, if this included earnings related compensation. It would be relatively straightforward to investigate the relationship between chronic disease and total injury treatment cost by linking practice data to ACC data warehouse data as described previously.