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Article abstract

In Alberta, automobile insurers are liable for medical costs of casualties who are not responsible for the accident. There is a levy (\$43 million in 1999) but there is also a considerable degree of uncertainty about the amount that should be transferred for medical costs. We conducted an analysis of these costs that included the following data: motor vehicle accident claims for most insurance companies in Alberta in 1999 (which were linked to provincial health insurance registrations); all hospitalizations and emergency room visits in the province that were related to motor vehicle accidents; records (physician, inpatient hospital, outpatient hospital, ambulance, insured drugs) for subsequent one year post accident utilization; and unit administrative costs for health services, set by the province. A second analysis, using 1997 - 2000 data and only hospital inpatient and emergency admissions, was conducted for 3 year utilization experience, and projected beyond. Liability reduction factors were obtained from provincial transportation statistics. Our results indicated that total costs (using administrative prices) amounted to \$119 million in 1999 and estimated liability was \$82 million. Several areas of uncertainty remained; these included the actual costs beyond three years post - accident, the relationship of administrative prices to actual resource costs; and the roles played in liability by other groups (Workers Compensation and non-insured drivers). This study forms a basis for setting the insurance levy which is more objective than methods used before.

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**by Philip Jacobs, Douglas Lier
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ABSTRACT

In Alberta, automobile insurers are liable for medical costs of casualties who are not responsible for the accident. There is a levy (\$43 million in 1999) but there is also a considerable degree of uncertainty about the amount that should be transferred for medical costs. We conducted an analysis of these costs that included the following data: motor vehicle accident claims for most insurance companies in Alberta in 1999 (which were linked to provincial health insurance registrations); all hospitalizations and emergency room visits in the province that were related to motor vehicle accidents; records (physician, inpatient hospital, outpatient hospital, ambulance, insured drugs) for subsequent one year post accident utilization; and unit administrative costs for health services, set by the province. A second analysis, using 1997 – 2000 data and only hospital inpatient and emergency admissions, was conducted for 3 year utilization experience, and projected beyond. Liability reduction factors were obtained from provincial transportation statistics. Our results indicated that total costs (using administrative prices) amounted to \$119 million in 1999 and estimated liability was \$82 million. Several areas of uncertainty remained; these included the actual costs beyond three years post – accident, the relationship of administrative prices to actual resource costs; and the roles played in liability by other groups (Workers Compensation and non-insured drivers). This study forms a basis for setting the insurance levy which is more objective than methods used before.

Keywords: Alberta, automobile insurers, medical costs, motor vehicle accident claims, liability reduction factors.

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En Alberta, les assureurs souscrivant à l'automobile s'engagent à indemniser les frais médicaux encourus par les personnes non responsables d'un accident. Il s'agit d'un paiement obligatoire (prélèvement de 43 millions de dollars en 1999) dont le montant qui doit être transféré, à titre de frais médicaux, engendre un degré d'incertitude considérable. Nous avons entrepris d'analyser ces coûts à partir des données suivantes : les réclamations découlant d'accidents d'automobile faites aux principaux assureurs albertains en 1999 (reliés au réseau des compagnies de l'assurance santé immatriculés dans la province); toutes les admissions dans les hôpitaux ou les salles d'urgence dans la province découlant d'accidents d'automobile; tous les dossiers ouverts dans l'année suivant l'accident (rapports médicaux, dossiers des patients hospitalisés, dossiers des patients non hospitalisés, dossiers se rapportant aux médicaments assurés); les coûts liés aux services administratifs pour soins de santé, établis par le gouvernement provincial. Puis, nous avons mené une deuxième analyse portant sur l'expérimentation étalée sur une période de trois ans, avec une projection au delà de cette période, laquelle portait sur les données de 1997 à 2000 relatives exclusivement aux patients hospitalisés et aux admissions dans les salles d'urgence. Nous avons tenu compte des facteurs pouvant réduire la responsabilité des accidentés à partir de statistiques sur le transport dans la province. Les résultats de notre étude montrent que les coûts totaux (comprenant les frais d'administration) s'élevaient à 119 millions de dollars en 1999 et que les montants pour responsabilité étaient évalués à 82 millions de dollars. Il restait plusieurs zones d'incertitude, comprenant les coûts réels au delà de la période triennale de l'accident, la relation entre les frais d'administration, les frais réels d'allocation des ressources et le rôle joué par d'autres groupes d'individus sur le plan de la responsabilité (à savoir les conducteurs aptes à recevoir des indemnités d'accidents du travail et les conducteurs non assurés). Cette étude sert de fondement à l'établissement d'un paiement obligatoire d'assurance qui s'avère plus objectif que les méthodes utilisées auparavant.

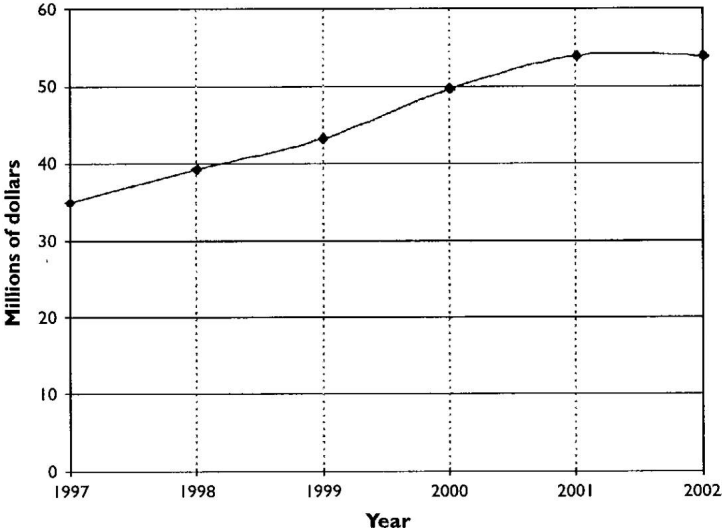
Mots clés : Alberta, compagnies d'assurance automobile, frais médicaux, réclamations découlant d'accidents d'automobile, facteurs de réduction de responsabilité.

■ INTRODUCTION

In Canada, almost all motor vehicle owners have insurance coverage for motor vehicle accidents. Differences exist between provinces in how this coverage is organized; in Alberta, Ontario and the Atlantic provinces automobile insurance markets are private; in Quebec, Manitoba, British Columbia, and Saskatchewan there is a mixture of public and private organization. In the private markets, insurance companies set premiums to cover liabilities arising from medical costs, income, and other economic losses, and pain and suffering. Motor vehicle premiums in Alberta amounted to \$1,900 million in 2001; a portion of these premiums covers third party liability for medical costs of motor vehicle accidents. Most of the medical costs are incurred in the first instance by the provincial health ministries, which are responsible for payments for hospital, physician, and other services under provincial health insurance plans. A levy is set

for medical costs claimed by the government of Alberta; this levy has increased from \$35 million in 1997 to \$54 million in 2002. In Figure 1 we show how the annual levy has increased since 1997.

FIGURE I
LEVY PAID BY MOTOR VEHICLE INSURERS TO
ALBERTA GOVERNMENT TO COVER MEDICAL
COST LIABILITY, 1997 TO 2002



Source: Alberta Health and Wellness.

In Alberta, medical care cost liability on the part of the private automobile insurers stems from the Alberta Hospitals Act (1) which states that “the Crown has the right to recover from the wrongdoer the Crown’s cost of health services.” The levy on the insurance companies goes to cover those medical costs which the government incurs *and* that are related to driver liability; since it is not clear how close this levy was to actual medical costs and liability, a more objective basis was desired by both the insurance industry and the provincial government to measure the medical costs of motor vehicle casualties and the liability related to them.

Currently there are estimates available for medical costs related to motor vehicle accidents in Canada, and selected Canadian provinces that were developed by SMARTRISK (SMARTRISK, 2002).

These estimates are based on a model which uses accident – related inpatient hospitalization costs from various Canadian provinces and estimates of other costs from United States studies (Miller et al., 1993; Blincoe, 1994; Miller et al., 2001). However, since the SMARTRISK studies were developed, new data (primarily based on the development of emergency room visit data and on the creation of person records rather than individual hospital admission records) has become available which permit a more direct, observational approach to motor vehicle accident costs in Alberta. As well, using data directly obtained from Alberta insurers and linked to provincial health records, it is possible to directly estimate the extent and cost of low severity (non – hospital) cases, thus providing a more complete picture of motor vehicle accident costs. Finally, the SMARTRISK study measures resource costs of accidents, not driver liability.

The purpose of this paper is to report on a project in which estimates are developed for insurance company medical liability resulting from motor vehicle casualties of insured persons in Alberta. The study was conducted by the Institute of Health Economics, an independent university – related research group. A joint advisory committee, consisting of members from the Insurance Bureau of Canada and Alberta Health and Wellness, met regularly during the course of the study to set project objectives, provide advice, monitor progress, and review results. Institute investigators maintained final control over study results and dissemination.

■ METHOD

Insurer liability for medical costs has two major components: those provincial medical costs that are attributable to the motor vehicle accidents, and the reduction factor, which represents the degree to which casualties are considered personally responsible for these costs. To estimate the first component – costs of motor vehicle casualties – we divided the severity of cases into three groups – those who were admitted to hospital, those who were seen in an emergency room only, and those who were initially treated in a non – hospital setting only.

Two sets of data were used to develop our estimates for the entire Alberta population. These were the Alberta Health and Wellness provincial health care data bases and individual accident claims from insurance companies operating in Alberta during 2001.

Alberta Health and Wellness maintains data bases related to provincial health care insurance coverage for virtually the entire population of Alberta. These data bases include a provincial registry, containing names, birth dates, region of residence, dates of death, and other identifying information including a unique person identifier; hospital discharge summaries for all admissions to provincial hospitals containing personal identifiers, dates of admission and discharge, diagnoses in ICD9-CM format and a derived Case Mix Group (CMG) (Canadian Institute for Health Information, 1998); the Alberta Ambulatory Care Classification System (ACCS) data base, which identified all ambulatory visits to Alberta hospitals, including emergency room visits, and included personal identifiers, date of service and diagnosis codes (Alberta Health and Wellness, 2002); physician billings for all services provided under the medical care insurance plan including date of service and billing amounts (Alberta Health and Wellness, 2001); and files with services and billings for ambulance trips, aids to daily living and drug costs for persons over 65.

We identified the low severity (non – hospital) group using the second component data base developed with the help of the Insurance Bureau of Canada (IBC). All motor vehicle insurers operating in Alberta were requested by the IBC to submit the full name, date of birth and date of accident of all claimants for bodily injuries for accidents occurring during 1999. Alberta Health and Wellness (AHW) conducted an exercise to match these claimants to individuals' records in the provincial registry, using name and date of birth. As Alberta insurance companies did not provide a complete population of claims, we estimated total provincial low severity claim costs based on the ratio of the dollar volume of premiums for reporting companies to the corresponding total dollar volume for all companies.

Claimants were identified using both sets of data bases. Cases who were hospitalized (high severity), or treated in an emergency room (moderate severity) were identified in the Alberta Health and Wellness 1999 hospitalization or ACCS data bases by ICD-9-CM diagnosis codes (E810 – E819) indicating a motor vehicle related diagnosis. The date of the accident (the index date) was taken as the first such encounter within a period of 12 months. Claimants from the IBC claimant data base who did not appear in the high or moderate severity groups were classified separately as low severity.

A cost was assigned to each health care encounter, based on administrative rates (called Third Party Liability or TPL rates) set by Alberta Health and Wellness. Hospital costs were based on hospital specific standard ward fees, established by methods agreed upon between federal and provincial governments. The cost of each hospital

stay is equal to the number of days stay times the standard fee plus a capital surcharge of 25 % which was set by the provincial government. Outpatient hospital costs were also based on the administrative rates plus a capital surcharge. Costs for physician and other services were based on provincial billings.

The time horizon for costs in the first year post – accident (short term costs) was one year or the date from the accident until the person died or left the province (de-registered). (When persons leave the province, the Alberta government no longer pays for health care costs)

A matched cohort, based on age, sex, and region of residence was chosen from those persons in the registry who did not have a motor vehicle accident during the study period. The observation period for these persons was identical to those of the matched person. Costs for the matched cohort were calculated in a similar manner to those for motor vehicle accident casualties. For each casualty, attributable costs were measured as the difference in cost between the casualty and the matched person.

Long term attributable costs are estimated from the beginning of the second year post-accident. To obtain a long enough lead period, we calculated costs for all moderate and high severity persons for 1997 in the same way they were calculated in the 2001 sample. For this sample, costs were calculated for 3 years post index date, and forecast forward for years 4 through 50 using a regression analysis with total cost per quarter as the dependent variable and time (quarter past accident) as the independent variable. We used a double log, third degree polynomial equation, which was the functional form that best fit the data. The estimated costs were truncated at year 22, when net costs (casualty minus match) became zero. All future costs were discounted using a rate of 3 %, and years two and three costs expressed in constant (1999) prices. Survival for the three year period was estimated as those who survived and did not leave the province (de-register). For those who died, or de-registered before the end of three years, this period was used to measure their survival and that of the matched cohort. Survival was assumed to be the same for both groups, casualty and match. Using this second (1997) sample, a long term (post year 1) cost factor was estimated as total costs in years 2 through 22 divided by the total cost of year 1. Total costs for casualties were calculated as total of short term costs and the estimated long term costs (long term cost factor multiplied by the short term costs).

The second component of liability is the reduction factor. This has two parts: the proportion of total costs for which insurers are not

liable: the costs of casualties who were “at-fault” for an accident, and a portion due to the “contributory negligence” of casualties (i.e., not using restraints). The estimated proportion of “at-fault” casualties was based on Alberta Traffic Collision Statistics (Alberta Transportation, 2001), which provides a gross measure of the number of persons who were killed or injured due to improper action. The weighted proportion of casualties not using restraints was also estimated using the Alberta Traffic Collision Statistics and the relative cost weights of severity groups. One-half of this proportion was assumed to represent the proportion of costs related to negligence. The total reduction factor was estimated as 31.4 %. Total insurer liability was obtained by multiplying the total estimated costs by $(1 - \text{the reduction factor})$.

Currently, insurance company liability is based on administrative fees which are set by the provincial government. While these rates have been set by costing exercises, other costing methods, based on diagnosis case mix measures, have been developed. We conducted a sensitivity analysis using these alternative measures. We evaluated inpatient cases using resource intensity weights (RIW) for each case mix group (CMG) as developed by the Canadian Institute for Health Information (CIHI) (CIHI, 1998). A dollar value, based on an Alberta cost per RIW, was used to value each case. Out-patient hospital visits were assigned to outpatient case mix groups (ACCS) as developed by Alberta Health and Wellness (AHW), with dollar values assigned to each category by AHW (AHW, 2002). In addition, as already pointed out, the AHW administrative rates included a 25 % surcharge for hospital capital equipment. We did not have any alternative sources of information to evaluate this measure, but conducted a sensitivity analysis by removing the surcharge to see what impact it had on overall costs.

■ RESULTS

In total, 23 insurance companies comprising 85.3 % of premiums for all companies operating in the province, reported 27,633 separate automobile bodily injury claims. Of these claims, 14,873 (53.8 %) were matched to individuals in the provincial health registry; reasons for non – matching included poor quality records (14.5 %), duplicate records (6.7 %) and an inability to find a matched person (19.8 %). Of these cases, 10,414 were neither hospitalized nor treated in an emergency room, and therefore met our definition

of low severity cases. From the provincial health data bases using ICD-9 codes, we found 2,237 inpatient cases (high severity cases), and 17,686 emergency room only cases (medium severity cases).

The reported number of casualties by severity level is shown in Table 1. Since the claims reported by the insurance industry and matched to the provincial registry were incomplete, we made a projection (estimate B) of the total claims that were reported and matched (estimate A). The average *short term* attributable cost per case (casualty minus matched control) and total short term costs are also shown in Table 1. These are based on 1999/2000 data. Hospitalized cases used the most resources, but emergency room only cases still comprise one – third of total resources. The average combined cost of hospital and emergency room cases is \$2,988 and the total cost is \$59,548,000.

**TABLE I
SAMPLE COUNTS AND COST BY SEVERITY LEVELS
FOR SHORT TERM COSTS**

Severity level	Reported number	Average net cost (standard deviation)	Total cost
Hospitalized	2,237	\$17,188 (34,341)	\$38,449,556
Emergency room only	17,686	1,193 (8,782)	21,099,398
Low severity	(A) 10,414 (B) 21,192	147 (6,788)	(A) 1,530,858 (B) 3,115,224
Total short term costs	(A) 30,337 (B) 41,115		(A) \$61,079,812 (B) \$62,664,178

Estimation methods for low severity cases

- a) Actual reported.
- b) Of reported records, 25,780 are unduplicated and 14,873 (57.6 %) were complete and matched. Reporting companies consisted 85.3 % of all premiums. Complete matched records formed an estimated 49.13 % of all claims over all companies. This formed the basis for blowing up the sample of 10,414 claims to an estimated population of 21,192.

The breakdown of short term costs by type of service for the two highest severity groups indicates that hospital costs account for 65 % of costs, outpatient hospital for 16.6 %, physician services by 15 % and the remaining services (aids to daily living, ambulance services, drugs for seniors and out of province costs), 3.4 %.

The long term cost factor, applicable only to hospital and emergency cases, is shown in Table 2. These costs are based on actual attributable costs (1997/8 through 2000/1) for years 1 to three of our analysis, and on projected costs for years 4 and beyond. Actual observed data (by quarter) and projected data, based on the regression analysis, are shown in Figure 2. The annual net costs are projected to decline to zero at a time value of 22 years. Using these values, we estimated a long term cost factor (LTC) of 0.949. That is, costs for years 2 through 22 are equal to 94.9% of short term (year 1) hospital and emergency costs.

TABLE 2
DETERMINATION OF LONG TERM COST FACTOR

Year	Average cost per hospital and emergency case***	Probability of survival	Expected value
1*	\$2,790	1.000	\$2,790
2*	773	0.976	754
3*	592	0.492	564
4 – 22**	1,509	0.920 to 0.608	1,330
Total	\$5,664	–	\$5,438
LTCF: Row 1 / Rows 2 – 22			0.949

* : Based on actual data

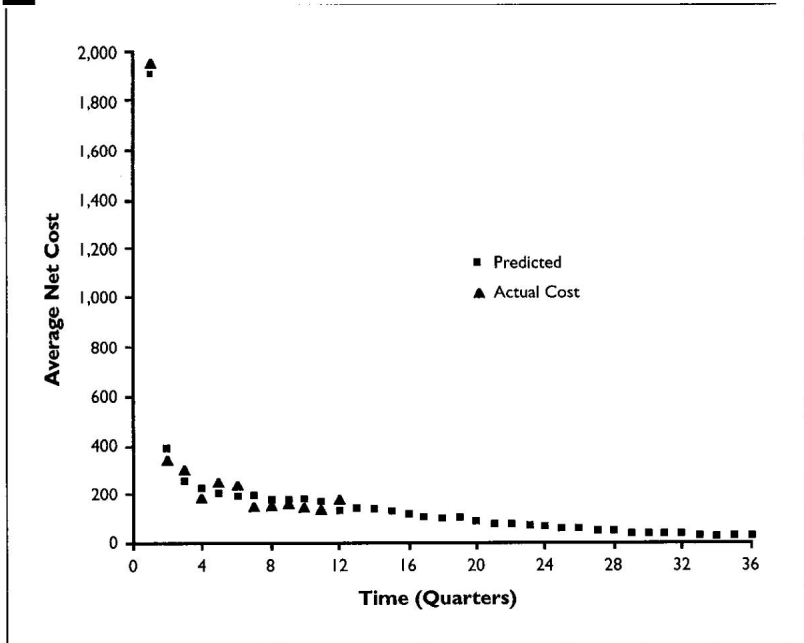
** : Projected

*** : Discounted at 3%

LTCF : Long term cost factor

The breakdown of costs by type of service shows hospital costs falling from 66 % in year 1 to 53 % in year 3, and both outpatient and physician costs increasing from 15 % each in year 1 to 20 % each in year 3.

**FIGURE 2
ACTUAL VERSUS PREDICTED AVERAGE NET COST
PER SURVIVOR**



In Table 3 we combine short and post year 1 costs to obtain total long term costs. In total, medical costs for motor vehicle accidents are estimated to be \$119 million. Third party liability is estimated to be \$82 million.

**TABLE 3
ESTIMATE OF TOTAL MEDICAL COSTS AND THIRD
PARTY LIABILITY FOR MOTOR VEHICLE ACCIDENTS,
ALBERTA, 2003 (\$,000 CANADIAN)**

Item	Amount
Short term low severity costs	\$3,115
Short term hospital and emergency costs	\$59,548
Add long term cost factor (Short term costs x .949)	\$56,511
Total long term costs	\$119,174
Liability reduction factor	0.314
Total third party liability	\$82,945

The results of our sensitivity analyses indicated that the TPL administrative costs were close to the case mix costs. For inpatient hospitalization, case mix costs were 3 per cent below TPL rates. Outpatient hospital case mix costs were 4 per cent below TPL rates. As for the 25 % capital surcharge on hospital costs, this surcharge resulted in an addition to total costs of 16.9 %.

■ CONCLUSION

We conducted an economic assessment of the medical costs of motor vehicle accidents in Alberta and the liability associated with these costs. We conclude that the costs of these accidents were \$119 million in 1999 and the third party liability stemming from these costs was \$82 million. To our knowledge, this is the first study which links insurance company claims information and provincial medical administrative data on a per person basis, and so it is largely observational in nature.

Our results can be compared with those of another study, conducted by SMARTRISK of Toronto (SMARTRISK, 2002), which was a modeling study conducted for motor vehicle accidents in Alberta. In that study the authors used a combination of hospitalization data from Alberta and modeling techniques to develop their estimate of motor vehicle accident medical costs, which was \$115, very close to our own measure. However, our study uses different definitions and measurements, as it was conducted with a different purpose in mind, and so the closeness of the results cannot be taken as a validation for either study. However, highlighting the differences between the two studies can help bring out the role and features of each.

The SMARTRISK study was designed to measure the *economic* cost of medical services used as a result of MVAs. Our study was designed to assist in the measurement of insurer liability. One of the differences in method that resulted from the differences in purpose between the two studies is the timeline: if the casualty dies or leaves the province, the government payment ends, and the costs of the matched control are not measured beyond this point. When the purpose of the study is to examine resource use, regardless of who pays, a death results in no further costs for the casualty, but costs for the matched control should be counted, because these costs would have continued to occur had the accident not taken place (Etzioni, 2001; Jacobs et al., 2002).

Secondly, the government has set administrative fees for services used. When the purpose of the study is to examine resource use, economic costs should be used, but these may not be equal to administrative fees. We have conducted sensitivity analyses to measure the differences between these concepts. In the case of capital charges, the difference was substantial, but an alternative measure of the economic cost of capital equipment was not available. Total cost using other administrative prices was quite close to costs when other resource use prices in the analysis.

In addition, our analysis assumes that insurer liability to government was determined by the cost and the reduction factor. In fact, there are additional factors that might influence insurer liability. One of these is the pool of uninsured drivers, whose liabilities are not assumed by insurers. This is likely to be quite small. A second possible pool of casualties would be those whose accidents are the responsibility of the Workers' Compensation Board. We do not know how much this would reduce insurer liability.

There are several limitations to our report. First, the long term factor was projected from 3 year data. At the time of the preparation of this project, these data were all that was available. As time goes on, observational data can be increasingly used to analyze the LTC factor over longer periods. Second, several cost items were not included, as these services were not contained in the provincial data bases. The major missing elements were long term care and rehabilitation services for persons who have long term disability.

In conclusion, we have identified a method of assessing costs and third party liability for motor vehicle casualties. This method is largely transparent, is largely observational, and covers virtually all the high cost and a large portion of lower cost casualties. Such an analysis can form the basis of negotiations and compensation between government and payers, in those provinces with private automobile insurance components. There are, of course, some uncertainties in our study, but the areas of uncertainty surrounding the financial aspects of this issue are greatly reduced in light of this analysis.

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