

# **OVERVIEW OF ACTUARIAL CALCULATIONS IN CONNECTION WITH FATAL ACCIDENT CLAIMS**

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WS - 46 Actuarial Evidence ; Actuarial Calculations in Fatal Accident Cases**

## **Introduction**

This paper, together with the papers prepared for this meeting session by Doug Townsend and Robin Adolphe, serves to start development of Actuarial Evidence Committee ("AEC") educational resources on fatal accident claims, for eventual dissemination to the C.I.A. membership, perhaps through posting on the C.I.A. website.

Please send comments, suggestions for future improvements, or your own papers on this topic, to Doug Poapst of the AEC. Doug Poapst is responsible for the further development of AEC educational papers and similar resources in the injury and fatality areas. Alternatively, comments can be submitted to the act.evidence email list. Doug Poapst has also committed to writing a basic paper on injury matters, and it will be discussed at a session at of our Sept. 8/9 AE specialty meeting.

Due to time pressure, I have not shown detailed case law citations ; I can discuss with Doug Poapst providing this at a later date. Further extensions would include more detailed comments on other fact patterns (e.g. widow with young children, child(ren) whose single parent has been killed, parents claiming future loss of support and services from a deceased child), and comments from others with differing perspectives and/or working in other parts of Canada. We could also solicit papers from lawyers and/or judges from other parts of Canada.

## **Textbooks For Further Reading**

Doug Townsend mentions the text written by Christopher Bruce, an Alberta economist. This is a very good text on the quantum aspects of injury / fatality cases. (Assessment Of Personal Injury Damages, Third Edition ; Butterworths).

An excellent text, written primarily for lawyers but very useful reading for actuaries, is Personal Injury Damages In Canada, Cooper - Stephenson, Second Edition, Carswell. (Despite the title, the text deals in detail with fatal accident cases as well as injury cases).

## **This Paper Uses Doug Townsend's Fact Pattern, Organization Of Issues**

Doug Townsend's paper is based on a male deceased, age 54 at death and employed full-

time, with a 53 year - old wife who did not work outside the home. The children were grown and had left the house. The man earned about \$55,000 per annum, working for an established company sponsoring a defined - benefit pension plan, planned to retire at 65, and provided a typical level of household services re snow removal, lawn maintenance, and other household services. Doug's paper describes practices in Ontario, and also in England.

I describe below my approach in B.C. to the issues raised by Doug Townsend, using the same fact pattern and organization of issues as Doug Townsend used in his paper.

### **Projected Employment Income (Before Deductions) Of Deceased**

As Doug mentions, the deceased's earnings rate would be fully projected on a "best estimates" basis from date of death to calculation date. Calculation date would typically be the first day of a trial, if a trial was scheduled to start in the near future. If there was no trial scheduled, a convenient date in the near future would be used. I'm using January 1, 2001 for a couple of cases I'm currently working on. It's a handy breakpoint, particularly given all the recent tax changes.

Doug's case apparently didn't involve any projection of promotion or other job change between death and retirement. Based upon the lawyer's instruction, usually based in turn on the views of the deceased's supervisor, I sometimes factor in assumed promotions. (As explained later, it's clear that the annual net discount rates applied in B.C. allow only for general pay increases (i.e. pay increases everybody in the labour force can expect to get), not for promotional increases).

### **Projected Pension Income (Before Deductions) Of Deceased**

Doug points out that projected pension income, after assumed retirement at age 65, would include employment pension income and CPP. The deceased's work history was very likely such that he could have expected to receive the maximum CPP annual benefit, or close to it. To nail this down, I would ask the lawyer for some general information on the deceased's working history, and also suggest that a CPP Contributor Statement be obtained ; I then estimate the portion of full CPP pension to which the individual would be entitled. In B.C., it would be customary to also include Old Age Security ("OAS") in projected pension income.

### **Deductions From Gross Employment Income, Gross Pension Income**

As Doug mentions, income tax would typically be deducted, as would CPP contributions and EI premiums. An important exception relates to income earned by aboriginals on reserve; CPP and EI deductions still apply even though the employment income was not

subject to income tax. (The spouse's income might or might not be taxable, depending upon where it was earned. Further, there would be an income tax gross - up if the widow planned to reside off the reserve).

Also, other possible deductions would include employee pension contributions, employee contributions toward group insurance programs, and union (or professional association) dues.

### **Allocation Of Family Take - Home Pay Among Family Members**

#### Doug Townsend's Approach

Under Ontario law, Doug would assume that 70% of the deceased's income would benefit the widow, but he would reduce the 70% figure if the widow worked outside the home. Doug apparently assumes (as I would, in most cases) that 100% of the deceased's take - home pay would have been spent, and makes no allowance for savings.

#### General Approach In B.C.

In B.C., if there is no specific expenditure information on the deceased and on his family, analysis is usually based on Statistics Canada expenditure data. (Family Expenditure in Canada, Statistics Canada Catalogue 62 - 555). However, I observed that my past analyses based on Statistics Canada data tended to put the percentage spent on "common expenses" (essentially, those used to maintain the family home) at between 29% and 37% of total expenditures. So I adopted the practice of approximating that figure at one - third of total expenditures. Assuming that remaining ("personal") expenditures are split equally between husband and wife, expenditures are thus assumed to be split into three equal portions. The law in B.C. makes very clear that the widow would be entitled to claim based on two - thirds of total expenditures; one - third re "common expenses" and an additional "one - third" re the widow's personal expenditures. So the final result, assuming zero income on the part of the widow, would be an assumption that the widow's annual loss of support equals two - thirds of the deceased husband's take - home pay. This is exactly the same result as Doug says would apply in England.

#### Case Where The General Approach Would Not Apply, Or Would Be Modified

In most cases, there is no detailed expenditure information available. But where there is, it must be analyzed and the population results modified, if appropriate. This does not necessarily mean that such information is assigned "full credibility". First, the quality and accuracy of any such information must be carefully scrutinized. (For example, it should cover at least a 12 - month period so that seasonal bias is avoided). Second, the specific information relates to a past period, and may not necessarily be representative of

expected expenditures during the (future) loss period. In my experience, such specific information usually leads to a final result close to the result under the statistical approach, particularly re families with young children. Thus, whether or not there is specific spending information available, I am normally somewhat hesitant to depart from the statistical average. One exception would be a situation where the deceased was paying child support to children from a previous marriage. I would treat such items as if they were deductions from gross pay (i.e. the same as income tax) and therefore not available for the widow's support.

#### Allowance For Widow's Employment Earnings

I would project the widow's income. Even if she had no employment earnings, she would receive OAS. Further, she might be entitled to CPP (based on employment earlier in life) even if she was now not working. Rather than attempt to adjust the two - thirds dependency rate, I would subtract one - third of the widow's projected take - home pay from the annual loss of support. This would allow for the widow's "gain" attributable to her husband no longer consuming a portion of her take - home pay. Another (mathematically equivalent) way of putting it is that the widow's loss is  $\frac{2}{3}$  of combined family take - home pay, less her own take - home pay.

The English method in effect assumes that the widow has zero earnings, regardless of the widow's actual earnings. This grossly overcompensates widows with substantial earnings of their own.

#### **Annual Loss Of Household Services**

##### Usually Based On Statistics Canada Information

Occasionally, the lawyer retaining me will have a rehabilitation consultant ("cost of care" expert) prepare a report on annual loss of household services suffered by the survivor(s). However, usually, the lawyer will instruct me to assume loss of services in line with Statistics Canada averages. In exceptional cases, e.g. deceased was a skilled tradesman engaged in renovation work at home, the lawyer will instruct me to assume services 25%, 50%, or 100% greater than indicated by the Statistics Canada average. An assumption less than the average may be stipulated where the deceased's work took him away from home, and/or he worked such long hours (e.g. lawyer, consulting actuary!) that he did relatively little around the home.

If the instruction from the lawyer was to quantify the loss in line with the (unmodified) statistical average:

- i. I would base number of hours worked on Statistics Canada data, as would Doug.
- ii I would deduct one - third of the hours in i. above, to allow for hours which solely benefit the deceased. (“Own use deduction” ; by analogy to expenditures).
- iii. To allow for the deceased being able to do less as he aged, I would cut off loss of services at about age 75, and I also ignore (re the period after age 65) the greater number of hours spent by retirees, as compared to employed persons.

In the case Doug describes, I would calculate an annual loss of \$5,230 (July, 1999 dollars), but it would only continue until the deceased’s age 75. See Appendices A and B hereto for details. This is higher than the \$3,811 per annum Doug obtained. The factor most responsible for the difference in results is the greater hourly rate I use (about \$12) ; Doug uses minimum wage, about \$7 per hour.

### **Assumed Mortality**

#### “Default” Assumption ; Most Recent Canadian Life Tables

I use the same assumptions as Doug ; most recent Canadian Life Tables, separate discounts for widow’s mortality and deceased’s mortality. Note that this requires a discount for the chance that the deceased might not have survived from date of death to date of valuation.

#### Cases Where There Are Significant Health Problems

I always ask for health information. Usually, there are no substantial health problems, and the population table is used without adjustment. If there are serious health / lifestyle problems, these would need to be addressed. This could be done by having the lawyer hire an MD specializing in providing life expectancy opinions, by the actuary arriving at a reduced life expectancy, or simply by report language describing the nature of the health problems, and stressing that the possibility of mortality rates greater than average is a “negative contingency” affecting results.

#### Cases Of Alleged Medical Negligence

Different considerations apply to cases arising out of alleged medical negligence. In a typical case, even had the alleged medical negligence not occurred, the deceased would still have been very sick. In such cases, plaintiff’s counsel normally retains a medical expert re causation and liability issues, and I urge the lawyer to have that expert (normally a specialist in the field of medicine corresponding to the deceased’s illness) also provide a life expectancy opinion.

## **Assumed Annual Net Interest Rates**

### Prescribed Annual Net Discount Rates

We use the term annual “net discount rate” in B.C. In 1981, the (then) Chief Justice of the Supreme Court of British Columbia prescribed, pursuant to Section 51 of the Law and Equity Act, the following rates, which have remained the same since 1981:

- i. 2.5% per annum rate was prescribed, as the "future difference between the investment rate of interest and the rate of increase of earnings due to inflation and general increases in productivity".
- ii. 3.5% per annum rate was similarly prescribed as the "future difference between the investment rate of interest and the rate of general price inflation".

### Appropriate Annual Net Discount Rate Re Various Categories Of Loss

Re loss of support from employment income, 2.5% would apply.

Re loss of support from CPP benefits, 2.5% would apply until payments started, and 3.5% would apply once payments started.

Re loss of support from OAS benefits, 3.5% would apply both before and after payments started.

Re loss of support from employment pension, the annual net discount rate would depend on the assumed rate of indexing. If the Plan was “final pay” and “fully indexed”, 2.5% would apply until payments started, and 3.5% would apply once payments started. If the Plan benefits were expected never to increase, I would apply an annual net discount rate of 6.605%. The 6.605% rate is based on assumed annual price inflation 3.0% for all future years, and the above described 3.5% annual net discount rate ( $1.06605 = 1.03 \times 1.035$ ). For most big private sector plans, I assume annual indexing at 50% of CPI after retirement, so that the annual net discount rate would be the average of 3.5% and 6.605%, or about 5%.

### Appropriate Rate Re Loss Of Services Is In Dispute

The appropriate discount rate re loss of services is in dispute in B.C. My view is that 3.5% should apply, since what is being valued is the cost of hiring a replacement service for a few hours a week. The opposing argument, accepted by the courts in two cases in the mid - 1990's, is that 2.5% is appropriate, on the basis that 2.5% applies to wage - related

items and what is being costed is the wage of a replacement worker.

Using a 3.5% annual net discount rate assumes that the value of services will rise in accordance with price inflation. I think that this is appropriate. The 2.5% and 3.5% rates differ because wage increases are assumed to be 1% higher than price inflation each year. This 1% difference arises because there is an assumed 1% annual improvement in productivity. Thus, in effect, each employee's efforts are assumed to produce 1% more goods or services each year. If lost services are replaced by hiring an individual directly for a few hours per week, the individual's remuneration is a wage which should rise in line with wage increases. But the **per - hour cost** of hiring the service rises only in line with price increases. This is because the individual can (in theory) do the work with 1% less effort each year and thus charge for 1% less time. Similarly, if the replacement worker is hired through an agency, assumed productivity improvements of 1% per year allow the agency (in theory) to raise its price to clients in line with price increases, while giving 1% per year higher pay increases to its employees. To my knowledge, the above argument has yet to be tested in court.

### **Present Value Of Investment Management Expenses ; Income Tax Gross - Up**

In B.C. it's customary to calculate both present value of investment management expenses, as well as income tax gross - up. In settlement negotiations, the defence will usually argue that these heads of damage are not needed since the plaintiff can agree to a structured settlement. The calculation of these amounts raises numerous difficult legal and actuarial issues, and I will not attempt to get into them in this brief paper. Various Canadian actuaries have recently mentioned that income tax gross - up is an area needing further discussion. An excellent session on this topic was run by Paul Michaud and Luc Rivest at the November, 1999 Montreal C.I.A. meeting.

### **Contingencies Of Divorce And Remarriage**

#### Introductory Comments

I always ask for details of any separations the couple had, as well as details of any cohabitation of the widow since the death. I always mention the contingencies of divorce and remarriage in my reports. If requested to do so, I quantify the effects of divorce and/or remarriage on a "population averages" basis.

#### Contingency Of Divorce

This didn't factor into Doug's case. In B.C., it's usually not a major factor. The Court seems reluctant to make any significant discount for the possibility of divorce, where the marriage was relatively happy. Also, any quantification would need to factor in the wife's

expected proceeds from support payments and/or a matrimonial property settlement (including her share of the husband's pension), as well as a possible future remarriage. I can't think of many cases where a widow suffered a substantial reduction in damages due to allowance for the contingency of divorce, particularly where there had been no history of marital strife. One possible explanation is that widows who have had marital problems would be understandably reluctant to have these matters aired in court, which is of course a public forum, and may therefore settle their claims rather than litigate them. Another possible explanation is that defence counsel may consider it unseemly to ask the widow probing questions about the possibility of marital difficulties.

#### Contingency Of Remarriage

If the widow has remarried to someone earning at least as much as the deceased, and just as able as the deceased to provide household services, the plaintiff will sometimes voluntarily limit the claim to amounts lost up to the time of remarriage/cohabitation. However, just because there is a close relationship or cohabitation, does not mean the plaintiff's claim is so drastically limited. In fact, the B.C. courts would be more likely to make only a "population averages" discount. See Appendix C for details.

#### Source For "Population Average" Rates Of Divorce And Remarriage

As a measure of general population averages, I would apply annual rates derived from "The Decline in Marriage in Canada, 1981 - 91" (Statistics Canada Catalogue 84 - 536 - XPB, p. 44). These annual rates are year - by - year probabilities of a widow remarrying, (or a married man or married woman divorcing), varying by attained age, ignoring the possibility of death, and based upon 1991 data.

#### **Unusual Fact Situations Which Have Arisen In Practice**

Doug quite rightly selected a straightforward, typical fact pattern. However, one important role the actuary plays is to help the lawyer make sense of unusual fact patterns. I find that I am increasingly dealing with such unusual fact patterns. This may be because lawyers are sometimes able, based on past cases and legal precedents, to quickly settle cases which do not involve unusual facts. I describe below several unusual situations which have arisen in my practice.

A pregnant young woman notified the natural father of her pregnancy. The natural father was killed in a plane crash on his way to meet with the young woman. The young woman gave birth to a daughter. A claim was made on behalf of the daughter (the young woman not having a claim) in respect of the natural father, even though the young woman had formed a new relationship. My report, prepared for plaintiff, quantified the potential loss,

but spelled out that the calculation made no allowance for support and services provided by the young woman's current husband.

A husband and wife with two young children separated. A few months later, the husband was killed in an accident. The husband had a stable, high - paying job. The widow maintained that the couple was about to reconcile; the defence disputed this. I was retained by defence, and asked to prepare a report quantifying a wide range of scenarios. Some scenarios (those assuming that the couple would not have reconciled) involved projecting child support according to Federal Government guidelines. The widow ultimately remarried before the case resolved, and final settlement followed shortly thereafter.

The married male deceased spent a lot of time looking after his elderly mother, who lived nearby. I was asked by the plaintiff to assume that the annual loss of services by the mother was equal to that incurred by the widow.

The female deceased was a nursery school teacher in a commune. Her own children were among her charges. An issue arose as to a possible overlap between loss of support and loss of services.

The male deceased was aged 64 at death, was employed, and very vigorous with no immediate intention of retiring. I was asked by the plaintiff to assume retirement at age 70.

The widow had remarried, but her (new) second husband had less earning power than her first husband, and her second husband's ability to support her was lessened by the support payments he made to the children of his first marriage. The plaintiff's claim (re the period after remarriage) was based on the difference between the earning power of the deceased husband, and the earning power of the second husband.

## APPENDIX A ; DERIVATION OF ANNUAL LOSS OF SERVICES TO WIDOW

At the lawyer's instruction, I would assume that the deceased's husband's hours of service to his spouse would have been in line with population averages. As a measure of such population averages, I refer to a Table provided to me by Statistics Canada. This Table is an updating of Table 19, contained in Catalogue 11 - 612E, No. 4 "Where Does Time Go", August, 1991. However, the Table on which I have relied is based on more up - to - date time use data (1992 vs. 1986).

The deceased would be projected to retire at the end of future year 9, assuming exact age 54 at death, and exact age 56 (had he lived) as of calculation date. Hours of services are greater for retirees than for active employees. However, I would apply the hours of service for an active employee until the end of future year 19 (when he would have been aged 75), with no services thereafter. This allows for a gradual decline in his ability to perform services, as he got older.

**Male Employed,  
With partner,  
No Children  
Applied For Entire Past And  
Future Periods**

### Hours Per Day

|                  |     |
|------------------|-----|
| 1. Domestic work | 1.2 |
| 2. Shopping      | 0.6 |
| 3. Child care    |     |

### Percentage of Above Hours Assumed To Benefit Widow

|                |                |
|----------------|----------------|
| 4. Re 1. above | 66.7%          |
| 5. Re 2. above | 66.7%          |
| 6. Re 3. above | not applicable |

Thus, re 1 and 2, one-third of time spent by the deceased is assumed to benefit only himself, not his spouse.

### Hours Per Day Benefitting Widow

|                              |      |
|------------------------------|------|
| 7. = (1) X (4) + (2) X (5) : | 1.20 |
|------------------------------|------|

### Hours Per Year Benefitting Widow

|  |     |
|--|-----|
| 8. = 365.25 X (7) : Hours per year benefitting widow | 438 |
|--|-----|

### Hourly Value

|   |       |
|---|-------|
| 9. The appropriate hourly value, in July, 1999 dollars, is \$11.94, derived in Appendix B | 11.94 |
|---|-------|

### Annual Value

|  |      |
|--|------|
| 10. = (8) X (9) : Annual value benefitting Widow | 5230 |
|--|------|

The \$5,230 annual value would be applied in the future period. To allow for past inflation, I would apply a slightly lower figure re the past period.

## APPENDIX B

### DERIVATION OF HOURLY VALUE OF THE DECEASED'S HOUSEHOLD SERVICES

I think that the appropriate hourly value is the cost of hiring a replacement service. The Statistics Canada publication dealing with the issue of hourly value is Catalogue 13 - 603E - Households' Unpaid Work: Measurement and Valuation. This publication sets forth two alternative variations of "replacement cost"; one is the "generalist approach". The other is the "specialist approach", resulting in costs 32% higher. The publication (page 25) describes the two approaches as follows:

"The main variants of the replacement cost method differ in their assumptions regarding the choice of market substitutes. With the market specialist variant, the replacement cost of a given type of unpaid work is imputed on the basis of the hourly earnings of people employed in a similar occupation. The replacement cost for preparing meals or doing laundry for instance is established in relation to the hourly earnings of cooks and chefs or launderers, respectively. The basic premise here is that households can delegate tasks to businesses (and indirectly to their employees). In contrast, with the household generalist variant, the replacement cost for household work is imputed on the basis of the hourly earnings of domestic employees. The basic premise here is that households can delegate tasks directly to paid domestic staff. With either variant, households are assumed to have only one alternative, and household members are deemed as productive as market specialists in one case, or paid domestic staff in the other."

The publication presents results according to both approaches. The relative merits of the two approaches are discussed in the following passages taken from the publication:

"...there are several competing approaches to imputing value, none of which is entirely satisfactory." (p.5). (I restrict my analysis to the "replacement cost method" which focuses on replacement cost, rather than the "opportunity cost method", which focuses on the employment earnings potentially foregone by spending time on household work).

"The assumption of equal productivity, at least for the market specialist variant [of the replacement cost method], is criticized as being unrealistic. It is emphasized that the work of market specialists is characterized by substantial division of labour, economies of scale and often more capital intensive production, with ensuing productivity gains. The assumption is viewed as more realistic with the household generalist variant, because... domestic employees do not undertake all household tasks..."(p.25).

"...Goldschmidt - Clermont [a leading expert], among others, recommends the generalist variant of the replacement cost method, at least for household work, since domestic employees work in a similar setting and under similar conditions as household members. Hawrylyshyn favours this method as well, on the theoretical grounds that valuation ought

to reflect the productivity and the wages of efficient workers. [In practice however, given the poor quality of data on earnings of housekeepers, Hawrylyshyn judges the specialist variant the better of the two]. Ferber and Birnbaum argue strongly in favour of the same method because it is simpler to apply and less subject to theoretical problems than other methods. The choice of method is complicated by the fact that estimates of the value of unpaid work can be put to several uses. It is a particularly difficult one for a statistical agency which aims to serve the information needs of a variety of users. Some recommend that estimates be developed according to several methods, in recognition of the diversity of needs and of the lack of agreement on a best (and, at the same time, practical) method. This is the route Statistics Canada has taken, although it favours the replacement cost (generalist) method for national accounting purposes". (p. 28).

Thus while there is a recognition that both approaches have strengths and weaknesses, the publication clearly favours the "generalist" approach over the "specialist" approach. However, Statistics Canada advised me that they did not endorse any particular approach, in the context of injury or fatality claims.

Thus, **in the present context**, Statistics Canada does not express a preference for one method over the other. Further, I am unable to say that one approach is clearly better than the other. I have therefore applied the average of the results resulting from the application of each method. From pages 75 - 77 of the publication, I have derived hourly values of services according to each method, as follows.

#### Hourly Value According To Generalist Approach

Value of unpaid work in 1992 in Canada \$234,482 million (p. 76) ; women's share 65.0% (p. 76); men's share 100.0% - 65.0%, equals 35.0% ; men's value 35.0% of \$234,482 million equals \$82,069 million.

Males' hours (p.77) 8,751 million.

Hourly value of males' services \$82,069 divided by 8,751, equals **\$9.38**.

#### Hourly Value According To Specialist Approach

Value of unpaid work in 1992 in Canada \$296,606 million (p. 75) ; women's share 63.4% (p. 75); men's share 100.0% - 63.4%, equals 36.6% ; men's value 36.6% of \$296,606 million equals \$108,558 million.

Males' hours (p.77) 8,751 million.

Hourly value of males' services \$108,558 divided by 8,751, equals **\$12.41**.

#### Average Hourly Value in 1992 Dollars ; Adjustment To 1999 Dollars

The average of \$9.38 and \$12.41 is \$10.895, in 1992 dollars. Allowing for price inflation (based on Canadian CPI) to July 1, 1999 (the valuation date) results in the \$10.895 value

increasing by 9.6% (assuming .9% annual inflation from July 1998 to July 1999) , to **\$11.94.**

## APPENDIX C

### **CASES WHERE WIDOW HAD FORMED A NEW RELATIONSHIP BUT ONLY A “POPULATION AVERAGES” DISCOUNT FOR REMARRIAGE WAS APPLIED**

1. Lake v. Callison Outfitters, 58 BCLR (2d) 99 (SC) ; see p.136

The widow was living with a man. However, the widow gave several reasons why she would not marry him. Further, he had an ex - wife and children in another city, and there was the possibility he would return there to be closer to his children. The Court found that, even if that relationship fell through, the widow might well form another. However, because of the uncertainty re the current relationship, only the “population averages” discount was applied.

2. Law v. Simice, BCSC, Vancouver A914631, May 3, 1994 (see pp. 33- 34) ; upheld on appeal 17 BCLR (3d)1.

The widow was living with a man by whom she was expecting a child, but she did not plan to stay with him. The Court’s assessment of the man’s earning / support capacity was not overly flattering.

3. Lowry and Rondeau v. Canadian Mountain Holidays, Ltd. , BCSC, Vancouver C831074, Nov. 1, 1985 ; see p. 9.

The widow stated that she had no immediate plans to remarry, but acknowledged a close relationship with one man.