

Factors Influencing Quantum

IN MEDICAL MALPRACTICE CASES

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Assessing Loss and Future Costs

In medical malpractice cases, there are certain key outcomes that can influence the work that the quantum expert will do to assess the potential loss of income and future cost of care awards (and, following that, the tax gross-up award if a structured settlement is not pursued). The two most common challenges are forecasting income for infants and children (when they have not had an opportunity to complete an education and/or establish a career path), and factors that the quantum expert must be aware of if life expectancy is shortened due to the incident.

Infants,¹ Children and Youth

The most common example in this category is with children and youth who had not yet entered the labour market when the incident occurred.² However, there are other instances where the same principle applies: for instance, with respect to homemakers who withdrew from the labour force to raise children or attend exclusively to family matters, with plans of re-entering the work force; or with respect to entrepreneurs who established their business or operation immediately before the incident.

Because so little information is available to an economist (or lawyer/insurer) when s/he has been asked to project a child's career path, reliance on statistics assumes a greater role than

it might in a case involving an adult plaintiff. It is my view that these statistics assist in cases involving children because they are based on large, random samples and they reflect the experiences of all types of families. Although the results generated by the studies may not completely capture the uniqueness of the family in question, they do combine all of the variances observed amongst families. On average then, the use of academic findings reflects all of the inherent possibilities for the child. (Application of the statistics avoids the disadvantages of drawing from one's own experience regarding his or her educational path or from knowledge about another family's experiences. Predictions made on this basis can be

disadvantageous to the injured child because the sample of one's experiences is so small that they are unlikely to aid in predicting another child's outcomes.)

For models that have attempted to predict the relationship between family background, child's attributes, and eventual socio-economic status, I have reproduced two diagrams as Figures 1-2 (p. 1-39) and 1-3 (p. 1-40) in my Canada Law Book text, *Damages*. The reader can discern from these diagrams the various "inputs" researchers have considered in attempting to predict a child's ultimate income level. The reader can also see that many of these characteristics cannot be observed or evaluated *by an economist* (i.e., "home atmosphere", "perceived expectations", "quality of time inputs"); only the "human capital" characteristics, such as education, on-the-job training, occupation and income can be correlated by an economist when predicting a child's income. (This is not to say that other "unobservable" characteristics do not matter; indeed, they may matter as much or more than the "human capital" ones, but economists can only speak to the observable attributes). This narrows the field considerably for what a quantum expert can consider when attempting to predict a child's income level, since parental occupation and income are weak correlates to a child's income level. In most cases, a quantum expert will use income data by the level of the highest education level that will eventually be attained by the child.⁴

To predict the level of educational attainment, the economist can rely on

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the **parents' education levels** and the **siblings' education levels**,⁵ because many economic studies have *statistically correlated* the parental education level with their offspring's education level. In other words, when economists have used large databases containing information about the education and income of parents and their children, they have found that *parental education level is by far the single, largest factor that can be used to predict the child's education level*. Of course, since these are studies by economists, they can only speak to observable, tangible, human capital characteristics, such as education level. Economists cannot speak to the intangible attributes that coalesce to determine a child's eventual position in the labour market (such as ambition, talent, drive/intensity level, concentration, ability, etc.)

In the text *Damages*, Table 1-4 (p. 1-36.10) shows education levels of the Canadian population, for the age group

25-29 from 1995 to 2014. By 2014, 60% of females and males in Canada possessed college or university certification. Not unexpectedly, this is a major shift from prior years; we can see from Table 1-4 (p. 1-36.10) that in 1995, only 40% of females had completed college or university versus 45% of males who had done so. This is a major transformation in only 20 years, and labour market researchers expect that job hiring criteria will continue to "up the ante" in requiring higher and higher levels of education from labour market entrants.⁶ We also know from a 1991 Statistics Canada study (*Ups and Downs on the Ladder of Success: Social Mobility in Canada*) that by 1986, almost two-thirds of children had surpassed their parents' educational attainment; one-quarter attained the same level of education; and only 10% "moved down" compared to their parents. Given the changes in educational attainment from Table 1-4, we would expect this result is still applicable and in fact the "two-thirds" who surpassed their parents' education levels has likely risen *above* 67% given that this finding is from 1986 data.

Cooper-Stephenson, in *Personal Injury Damages in Canada*, comments about the impact of an injury on a child, and the child's reaction to the injury after recovering:

Very young children may be able to make up lost educational ground quite quickly. Furthermore, *they have more time in which to catch up. They may also have the opportunity to mitigate their loss by steering*

themselves toward a vocational path in which the particular injury will have no impact. However, in many cases childhood injury will have at least some influence on the early years of full-time earning.⁷ (emphasis added)

The reader will notice that nothing has been said yet about predicting a specific occupation or profession. This is because there are thousands of occupations and professions that could be followed, and as a result the correlation between parent and child in terms of the same or similar occupation is weak. As a result, most quantum experts will only present estimates based on general educational attainment (across all occupations) to capture all possibilities.

Even if a quantum expert is encouraged (or chooses to) select an occupation for an infant, child or youth as one scenario to project, *it is incumbent upon the quantum expert to "weight" the scenario by the probability of acceptance (and completion) into the schooling program to qualify for the specific occupation.*⁸ These probabilities are readily accessible since educational institutions are now keeping data on the number of applicants versus those admitted for most programs. While these statistics do not produce ideal probabilities,⁹ they at least provide a crude method for evaluating the *average*¹⁰ chance that acceptance into (and completion from)¹¹ the program would have occurred in the absence of the incident.

Life Expectancy and the "Lost Years" Cases

Table 1 below summarizes the current life expectancy estimates for Canadian males and females, based first on the most recent Statistics Canada survival probabilities (the 2009-11 data). As can be seen in the table, life expectancy is a moving target; at birth, the Statistics Canada tables predict, on average, that Canadian males will live 79 years and Canadian females will live almost 84 years.¹² Of course, these are population averages. Some Canadians will die before the age of 79 or 84, while others will live beyond age 79 or age 84. If a Canadian citizen is *still* alive at age 69, s/he can expect to live, on average, another 16 years (to age 85) if male; or another 18 years (to age 87) if female.

TABLE 1: Working Life / Life Expectancy Estimates, Canada, Male & Females

Age	Working Life (years) ¹		Life Expectancy (years) ²	
	MALE	FEMALES	MALE	FEMALES
In the first year after birth...	n/a	n/a	79.3	83.6
At 20 years old, work/live to...	n/a	n/a	80.0	84.2
At 40 years old, work/live to...	60.2	56.6	80.9	84.6
At 60 years old, work/live to...	66.5	65.4	82.8	86.0
At 65 years old, work/live to...	70.0	69.2	83.8	86.7
At 69 years old, work/live to...	74.6	73.5	84.8	87.5
At 80 years old, live to...	n/a	n/a	88.9	90.6
At 90 years old, live to...	n/a	n/a	94.6	95.4
At 100 years old, live to...	n/a	n/a	102.4	102.6
In 2036 [at birth, "high" assumption]³	n/a	n/a	85.4	88.4

¹ Source: C.L. Brown, *Damages: Estimating Pecuniary Loss*, loose-leaf (Toronto, Ontario: Canada Law Book, a Thomson Reuters business), November 2015 (18th edition), Appendix 4-1, pp. 4-84 to 4-86 (all education levels) [up to age 40]. For ages 60, 65 & 69, the source is F.T. Denton, C.H. Feaver, and B.G. Spencer, "Cohort Working Life Tables for Older Canadians" *SEDAP Research Paper No. 247*, June 2009, Tables A13 and A14

² Source: Statistics Canada, *Life Tables, Canada, Provinces and Territories 2009-11*. Catalogue no. 84-537-X -- No. 005 (Ottawa, Ontario: Minister of Industry), 2013, Tables 1a & 1b

³ Source: Statistics Canada, *Population Projections for Canada, Provinces and Territories* (Ottawa, Ontario: Minister of Industry), June 2010, Text table 1.3, p. 24

If a Canadian citizen is *still* alive at age 90, s/he can expect to live, on average, another 5 years (both sexes).

Table 1 below also shows that the 2009-11 tables, which all quantum experts in Canada are currently using, underestimate the average life expectancy of a Canadian given recent advances in health care and technology in the past 10 years. Indeed, the 2031 projections suggest that by the start of the 4th decade in this century, Canadian males will live another 5.7 years at birth (from 79.3 to 85 years old), and Canadian females will live another 5.0 years at birth (from 83.6 to 88.4 years old) than the 2009-11 data show. By the time it is the year 2031, these estimates will likely be revised again. What this means for quantum assessments is that the mortality contingency routinely included in the income loss and cost of care calculations likely *overstate* the prospect of dying – on average – and therefore *understate* the quantum of damages.

In some cases, a claimant has a pre-existing illness that suggests s/he has a substandard life expectancy. Ideally, a quantum expert requires two sources to predict the plaintiff's sub-standard mortality: a doctor's report, and an actuarial report. The doctor's report, while missing the proper statistical sample from which to derive survival in number of years, has the benefit of being based on a personal interview by the doctor of the patient, and knowledge of his/her particular health status. Actuarial evidence is more objective, deriving the number of years left to live by observing groups of people with the same illness.

While often it is the insurers who have the benefit of actuarial advice (since insurance companies routinely determine life insurance and other

kinds of premiums based on survival probabilities for normal life expectancies and sub-standard life expectancies), there *are* sources that plaintiff's counsel can consult to obtain a modified survival table.¹³

It is important to remember, however, that sub-standard mortality rates rarely affect the income loss calculations, because a claimant's life expectancy would have to be fore-shortened by more than 20 years before it would matter in the income loss calculations – which normally cease at retirement age (62 to 65). Only if the claimant intended to work until age 70 or 75 would a sub-standard mortality table cause the estimates to diverge significantly.

In cases of catastrophically injured infants, when life expectancy is shortened dramatically because of the incident in question (i.e., the injured infant is projected to expire long before retirement age), the quantum expert should be aware of the calculation that needs to be performed during the "lost years": that is, the earnings that the injured infant would have accumulated if s/he had not died (early) because of the incident in question. A more formal definition is reproduced below:

If an injury has shortened the plaintiff's expected work life, then the lost years are those years in which the plaintiff would be earning income (if uninjured) but would no longer be alive to spend it.

For example, if the plaintiff is expected to die at 25, 30 or 35 years of age, then the lost years deduction occurs from his or her 25th, 30th, or 35th birthday to his or her estimated

retirement age in the absence of the accident and assuming normal mortality. Hence, the present value of living expenses for 35, 30 or 25 years will be deducted from the present value of plaintiff's lifetime earnings, assuming pre-accident retirement at age 60.¹⁴

The definition reproduced above refers not only to the *calculation of lost earnings* after the plaintiff is expected to pass on; it also refers to a *deduction from these lost earnings* for the "living expenses" the plaintiff would have incurred while s/he was alive and earning his or her lifetime income. This is known as the "lost years' deduction".

The "lost years" deduction became a popular topic in the late 1990s in Alberta after the decision in *Duncan v. Baddeley*,¹⁵ wherein Sulyma, J. made an award of \$425,000 to the estate of Dean Duncan, who had been only 16 years old when he died, in grade 11, and without dependents. This award was based on specific facts, some of which were agreed upon by counsel for both parties. One of Sulyma, J.'s key findings was the affirmation of the plaintiff's expert's 35% lost years' deduction assuming that Dean Duncan would have married at age 28 and had two children.¹⁶ The 35% "lost years' deduction" constituted the living expenses that had to be deducted from the income the decedent would have earned, had he lived. This is the same type of deduction that is applied to the lifetime earnings in catastrophic injury cases during the "lost years" after the plaintiff is assumed to pass away, but is varied for the predicted size of the plaintiff's family during the lost years.¹⁷

The award in *Duncan* (1999) was ultimately appealed to the Alberta Court of Appeal and upheld by the appeal

court in 2000. However, legislation was subsequently introduced and passed in Alberta, which outlawed claims arising from the *Survival of Actions Act* as of November 1, 2002 for situations in which a decedent leaves no dependents.

To my knowledge, the Northwest Territories is now the only jurisdiction in Canada that still permits *Survival of Actions* claims for the “lost years” when someone dies without dependents.

Nevertheless, the “lost years” awards are still relevant in cases when the injury in question causes a dramatic reduction to the plaintiff’s life expectancy.

Sub-standard Mortality and Cost of Care Recommendations

While the “lost years” represent the main focus on earnings when life expectancy is shortened, sub-standard mortality tables *do* affect cost of care calculations, since cost of care experts almost always recommend items or services for the plaintiff’s “lifetime”. To quantum experts, this means extending the actual calculation until age 109 (the last age in the life tables)¹⁸ and incorporating a negative contingency each year to reflect the probability of survival in that year. As can be expected, the probability of survival *after* the average life span in years (which is at 83.8 or 86.7 years old when the claimant reaches age 65 in the above table) becomes so small that the negative contingency is so large as to render the “cost” or “loss” in those years to be imperceptible. In other words, the lump sum award for cost of care that is extended to age 109 is almost equivalent to the lump sum award for cost of care by age 85: once the mortality contingency is applied and the discounting to present value is done, the

annual “loss” each year from ages 85 to 109 is negligible.¹⁹

Brown Economic hosts an online calculator that provides ready estimates of life expectancy and working life expectancy. A “snapshot” of this (free) online calculator is reproduced below. The user can access this calculator directly from www.browneconomic.com. The user only has to enter the plaintiff’s birth date; select the gender; and select the plaintiff’s education level.²⁰ The calculator then returns an *estimate* of the number of working years and living years remaining, based on the plaintiff’s current age. Of course, this data is an estimate only and is based on Canadian population averages.



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NOTES

¹ Cooper-Stephenson commented on the role of gender when projecting incomes of infants or young children: “Great care should be taken with the assessment of loss of earnings for girls and young women, since the cases indicate a judicial tendency to badly under-evaluate their potential. In the first place, actuarial figures are often based on stale data founded on past (or at best current) workforce and lifestyle demography, rather than on any figures reflecting predictions for changing patterns in the future. Even the most conservative estimate of the progress of equal-pay-for-equal-work and a gradual upswing in women’s earnings toward the goal of gender equality would anticipate significant gains. And principle requires the *best* estimate, not the most conservative” (*Personal Injury Damages In Canada* 2nd edition (Toronto: Carswell Thomson Professional Publishing), 1996, p. 267). The court in *McCabe v. Westlock Roman Catholic Separate School District* No. 110 [2001] A.J. No. 1278 2001 ABCA 257 appeared to have recommended that for infant plaintiffs who are so injured that they are unable to express their pre-accident intentions, then it may be

appropriate to present scenarios using negative contingencies as if the plaintiff were male (see para. [122]) in order to avoid perpetuating historical female age-earnings profiles that may embody discrimination. For further discussion, see Ireland, Thomas R. and Anne E. Winkler, *Reading 3: Projecting the Lost Future Economic Contribution of a Female Child: Refining Income Data to Reflect True Losses* in Thomas R. Ireland and John O. Ward (eds.), *Assessing Damages in Injuries and Deaths of Minor Children* (Tucson, AZ: Lawyers & Judges Publishing Company, Inc.), 2002, pp. 57-77. Ireland and Winkler propose that estimates for female children underestimate the losses not only due to using gender-specific data but also by then ignoring why the earnings for females are lower than the earnings for men: because “...women, on average, spend twice as much time on household production than men, especially married women with children”. (p. 58) Ireland and Winkler find that “When a female child’s lost future economic contribution is computed using earnings of never-married women instead of earnings of all women, the estimate increases by 14.2 to 20.9 percent, depending on whether maximum educational attainment is assumed to be college or high school only.” (p. 67)

² This section draws on a number of sources: an excerpt from chapter 1 of C.L. Brown, *Damages: Estimating Pecuniary Loss*, loose-leaf (Toronto, Ontario: Canada Law Book, a Thomson Reuters business), 18th edition, November 2015; a paper authored for the *Atlantic Provinces Trial Lawyers Association* in November of 2010 entitled “Scouting Report: Predicting Future Employment Outcomes for Children” at the legal education conference entitled *ADVANCED DAMAGES: QUARTERBACKING YOUR CLAIM FOR ECONOMIC LOSS*; a paper authored for the *Canadian Institute* in January of 1996 entitled “Child Personal Injury Claims” at the conference entitled *MOTOR VEHICLE PERSONAL INJURY DAMAGES*.

³ For instance, in Table 1-9 (pp. 1-45 to 1-48 of *Damages*), we see that “Father’s Occupation” has a positive impact on a child’s education, occupation or earnings, but only in the order of 0.2% to 28%. Birth order and number of siblings can have as much if not a bigger effect (a large family leads to a -19.6% negative impact on earnings, whereas first-born placement has an 11% positive impact on educational attainment). “Mother’s occupation” has not been studied enough to provide statistically sound estimates.

⁴ Not only is this the accepted approach in Canada, it is the acknowledged wisdom in the US as well: see, for instance,

Spizman, Lawrence M. and John Kane, *Reading 8: Loss of Future Income in the Case of Personal Injury to a Child: Parental Influence on a Child's Future Earnings* in Thomas R. Ireland and John O. Ward (eds.), *Assessing Damages in Injuries and Deaths of Minor Children* (Tucson, AZ: Lawyers & Judges Publishing Company, Inc.), 2002, pp. 144-145; and Thomas R. Ireland and John O. Ward, *Reading 2: Evaluating Child Loss in Child Injuries and Fatalities: Roles of an Economic Expert* in Thomas R. Ireland and John O. Ward (eds.), *Assessing Damages in Injuries and Deaths of Minor Children* (Tucson, AZ: Lawyers & Judges Publishing Company, Inc.), 2002: "Since a child has no work record, there is no background information that directly reveals the child's earning capacity, either before or after an injury. In general, economic experts deal with this problem by using educational outcomes to develop proxy estimates of lost earnings capacity." (p. 14)

⁵ To compile information about the injured child's parents and siblings, the reader can access our *Family Profile Form* at www.browneconomic.com > PRODUCTS & SERVICES > Checklists and Diaries > click on "Checklists" on the left-hand sub-menu. *The Family Profile Form* is listed along with various other checklists and forms to aid counsel or insurers.

⁶ Beaudry, P. and D.A. Green, *Canada in the 21st Century, III. Responding to the Challenges – Individual Responses to Changes in the Canadian Labour Market* (Ottawa, Ontario: Industry Canada), 1998.

⁷ Cooper-Stephenson, K. *Personal Injury Damages in Canada* (2nd ed.) (Toronto, Ontario: Carswell Thomson Professional Publishing), 1996, p. 260.

⁸ The only exception to the weighting procedure is if the plaintiff had already been accepted into the program before the incident occurred (or after the incident occurred).

⁹ These crude "acceptance" ratios are not ideal probabilities because the latter should ideally take into account multi-year applications, from which the applicants who had already been accepted into the specific program are omitted. This data is rarely (if ever) available from the programs; and it is also impossible to track which applicants who were not admitted are also applying in subsequent years. For these reasons, we are unable to completely estimate the exact acceptance ratios.

¹⁰ I stress the word "average" in this context because the acceptance ratios we can calculate reflect the average qualified applicant. Quantum experts are not equipped to evaluate whether the plaintiff in question had a better-than-average or worse-than-average chance of being accepted into a specific program; the

quantum expert can only discover whether the plaintiff in question could have met the objective criteria for selection (i.e., adequate school grades or test scores). Quantum experts cannot comment on how any of the plaintiff's intangible characteristics could have influenced the outcome of applying to a specific program. This aspect of evaluation is left to other experts and/or counsel and/or the court.

¹¹ In most cases, completion or attrition statistics are less readily available than are acceptance statistics. This is not necessarily a large problem in estimation, because it is typically the entry (rather than exit) statistics that serve as the main barrier to entry in most occupations.

¹² The exact definition from Statistics Canada's catalogue no. 84-537-X No. 005, *Life Tables, Canada, Provinces and Territories, 2009 to 2011* is "Life expectancy at age x represents the average number of years remaining to be lived by persons surviving to age x, if these persons would experience, during their lifetime, the mortality observed over the reference period." (p. 3)

¹³ Please contact our HELP line at: 1-888-BEC-ASST (1-888-232-2778) or at help@browneconomic.com for referrals to experts who can provide sub-standard mortality tables, based on health condition or illness (for a separate fee).

¹⁴ C.L. Brown, "Duncan v. Baddeley: Reconciling the "Lost Years" Deduction with Fatal Accident Cases" *Alberta Law Review* [Vol. XXXV, No. 4 1997], p. 1108. This author was the plaintiff's expert witness in the *Duncan v. Baddeley* (1999) trial.

¹⁵ *Duncan Estate v. Baddeley*, [1999] 10 W.W.R. 617, 231 A.R. 330 (Q.B.), affd 192 D.L.R. (4th) 53, [2001] 3 W.W.R. 612 (C.A.).

¹⁶ C.L. Brown, "Duncan v. Baddeley: A Case Comment" *Alberta Law Review* Vol. 37(3) 1999, pp. 772; 774-775; 788-791; 794-795. Note that this article expanded the methodology for deriving the lost years' deductions with families of different sizes such that the 35% deduction was derived specifically for families with four family members.

¹⁷ For a summary of the lost years' deductions by family size, see Table I-4 in C.L. Brown, "Duncan v. Baddeley: A Case Comment" *Alberta Law Review* Vol. 37(3) 1999, p. 802. Assumptions as to when the family size would change are based on demographic statistics on the age of first marriage, etc.

¹⁸ If the quantum expert is using the provincial or territorial mortality table, this age may be closer to 103 or 105, depending on the size of the province or territory.

¹⁹ The reader may wonder why the calculation is extended then to age 109, if it is almost the same at age 85. The answer is that ceasing the calculation when there is no more data is preferable to ceasing the calculation at some arbitrary age between 85 and 109.

²⁰ The education level affects only the estimate of "working years". Statistics Canada has not yet published life expectancy estimates that vary by education level, only by age and gender.

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