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## **Estimating the Value of Lost Earnings in Personal Injury Matters: Concepts and Resources**

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### **Special Note**

This paper was prepared for a presentation to actuaries with no experience in personal injury or litigation matters.

### **Introduction**

Actuaries are often retained to give an expert opinion on the value of lost earnings in personal injury matters. What is involved in such an assignment? What concepts must be understood? What methods are applied? What requirements must be met? What resources are available?

This paper provides a brief introduction to this important area of actuarial evidence practice.

### **Useful Terminology**

Pecuniary damages: compensation that is sought and/or awarded for financial losses such as a loss of earnings, a loss of pension benefits, or future care costs

Non-pecuniary damages: compensation that is sought and/or awarded for non-financial losses such as pain and suffering

Heads of damage: the various categories of pecuniary and non-pecuniary damages. For example, "loss of earnings" is a head of damage.

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Plaintiff: the injured party

Defendant: the party who is alleged to be responsible for the plaintiff's injuries

## Personal Injury Litigation

Personal injury litigation arises when:

- a person sustains an injury
- another party may be responsible for the injury
- legal action is initiated in order to seek compensation for pecuniary losses and/or non-pecuniary damages related to the injury

In order to understand the nature of an actuary's involvement as an economic loss expert in a personal injury matter pertaining to lost earnings, it is important to understand how such personal injury matters unfold.

- First, an accident or incident occurs (a motor vehicle collision or complications from surgery, for example) and a person is injured as a result. In this paper, we will use the term "accident" for the event that results in injury.
- Depending on the severity of the injuries, the person may be hospitalized and/or may require multiple visits to doctors. The time required for recovery, if a full recovery is even possible, may be long.
- A return to work may be attempted at some point. It may or may not be successful.
- In the course of the recovery process, the injured party may contact a lawyer for advice about seeking compensation for the injuries sustained.
- If the lawyer believes that there is merit to the case (i.e., that a pecuniary and/or non-pecuniary loss has occurred and that a court would find that another party is responsible for the losses, then legal action may be initiated.
- The resulting litigation would address both the question of liability (Is another party at fault?) and the question of damages (What is the amount of the loss?).
- There are usually other "heads of damage" in addition to a claim for lost earnings, but we will focus on lost earnings in this paper.
- The lawyer for the plaintiff will advance a claim for a certain amount of money and will argue that the defendant is responsible for the injuries. The lawyer for the defendant will make arguments for a different amount and may argue that the defendant is not entirely (or not at all) responsible for the injuries. Both sides will use the opinions of various experts to support their arguments.
- If the matter goes to trial, it is the judge – as finder of fact – who decides on the question of liability and on the appropriate amount to award the injured party. In arriving at a decision, the judge decides how much weight to place on the various expert opinions presented during the trial.

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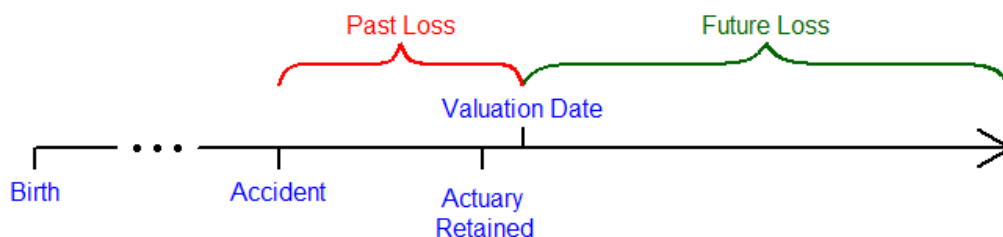
In the course of preparing for settlement negotiations, mediation, and/or trial, the lawyers for both the plaintiff and the defendant will retain a number of experts to prepare reports setting out their opinions. With respect to a claim for lost earnings:

- Medical opinions may be required to understand the nature and extent of injuries, whether a partial or full recovery is likely, what medications and medical interventions may be required, and what the long-term prognosis is for a return to normal activities and a return to work.
- An expert vocational opinion may be helpful when the plaintiff's injuries prevent them from returning to their pre-accident career path. Such an opinion would identify suitable alternate occupations for the plaintiff, as well as any limitations or accommodations that may be required and the probable income in the various alternate occupations.
- An actuary who is retained to provide an economic loss opinion pertaining to lost earnings typically has the benefit of, and is expected to rely on, the other experts' reports.

## Timeline

It can take years for personal injury matters to reach a conclusion, and the actuary's involvement usually happens quite late in the process. The time from the accident date to the date the actuary prepares their report is often 5 or 6 years. "Maximum medical recovery" is generally assumed to occur two or more years after the injury. It would be unusual for the lawyer to ask the vocational and economic loss experts to prepare their reports prior to maximum medical recovery having been achieved. After that point, the injured party's limitations and pecuniary losses will be more clearly understood.

The timeline is shown below. The actuary estimates the value of losses as of a valuation date that is usually a few months in the future, sometimes a trial or mediation date. The loss associated with the period from the accident date to the valuation date is called the past loss, and the loss associated with the period after the valuation date is called the future loss. Since past and future losses are typically treated differently, it is necessary to estimate them separately.



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The part of the timeline between birth and the accident date is quite important. This is the period during which the career path of the plaintiff may be established. The formal education of the plaintiff may occur during this time, and one or more periods of employment may occur.

## Important Concepts

The following concepts are important in estimating lost earnings:

- **Pre-accident earning capacity** refers to the trajectory of annual earnings that would have occurred if the accident had not happened. So, in this context, “pre-accident” means “if not for the accident.”
- **(Post-accident) residual earning capacity** refers to the annual earnings trajectory that is achievable given that the accident occurred.

For simplicity, we often refer to the former as **capacity** and the latter as **residual**.

Determining these earnings trajectories can be the most challenging step in estimating the value of lost earnings and is the focus of this paper. These trajectories include both future earnings (after the valuation date) and past earnings (between the accident date and the valuation date). The past residual earning capacity, or just residual earnings, may be known to the extent that they were earned prior to the time at which lost earnings are being estimated.

Our lost earnings estimates are determined as follows:

### ***Future Lost Earnings***

***= PV of Future Pre-accident Earning Capacity – PV of Future Residual Earning Capacity,***

and

### ***Past Lost Earnings***

***= AV of Past Pre-accident Earning Capacity – AV of Past Residual Earnings.***

The interest rate used to obtain the present values (*PV*) in the future lost earnings calculation is prescribed by legislation in most provinces. Also, the two present values may involve different decrement assumptions. An expert medical opinion might indicate higher mortality rates post-accident. It may also be appropriate to assume different disability incidence rates and/or different retirement ages pre- and post-accident.

The past lost earnings are normally accumulated with interest to the valuation date according to the rules on pre-judgement interest, which depend on the province. The actuary may or may not be asked to do this accumulation.

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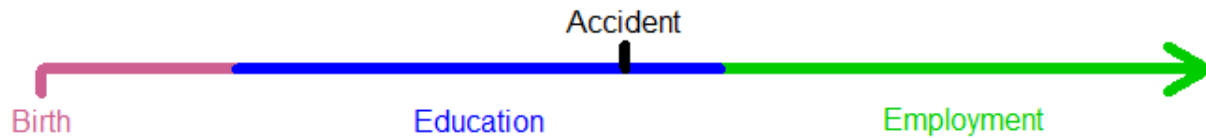
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## When Did the Accident Occur?

As indicated above, when the accident occurs in the life course of the individual has a significant impact on the estimation of lost earnings. If the accident occurs before or early in an individual's formal education, as illustrated below, then a career path has not yet been established and earnings data for specific occupations cannot be used in estimating pre-accident earning capacity.



If the accident occurs late in an individual's formal education, as illustrated below, it may be quite reasonable to base the pre-accident earning capacity on the chosen career direction.



If the accident occurs after an individual has been employed for a period of time, as illustrated below, then the employment and earnings history of the individual can be used in establishing pre-accident earning capacity.

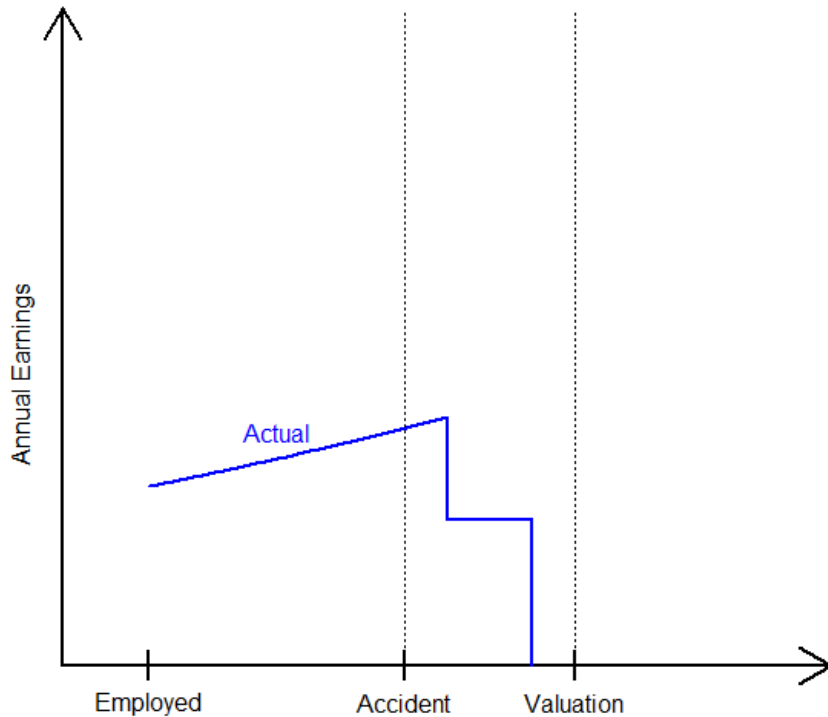


## Example

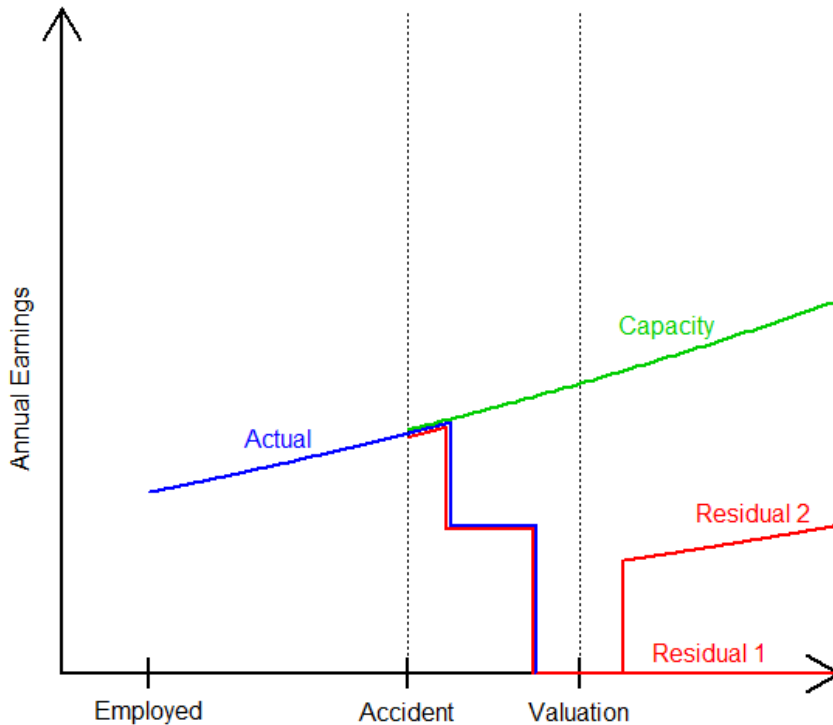
A simplified example is illustrated on the following page. The first graph shows the actual earnings of the plaintiff. The accident occurs after a period of time during which the plaintiff is employed and earning a stable salary that increases gradually with inflation. The salary continues for a short time after the accident due to a return to work or sick leave salary continuance. The plaintiff then realizes that they are not able to continue working full-time, and earnings are reduced. Finally, it becomes clear that, due to the impact of injuries suffered in the accident, the plaintiff is unable to continue working at all. Earnings are then reduced to zero. Soon after this, the actuary is retained to estimate the lump-sum value of lost earnings.

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The graph on the next page adds earnings trajectories for pre-accident earning **capacity** and **residual** earning capacity. The former is quite straightforward. Since earnings before the accident were very stable, an inflation-adjusted average of those earnings leads to a reasonable assumed trajectory. The past residual earnings follow the actual earnings. In this case, actual earnings are known throughout the period of past loss, and no assumption is required for past residual earnings. The future residual earning capacity is less clear. Ideally, additional information would be available. Two scenarios are illustrated in this graph. The first assumes no residual earnings, and the second assumes that the plaintiff will be able to return to part-time work at some point after the valuation date. In general, it is helpful to use multiple scenarios to reflect uncertainty. The finder of fact (the judge) can then decide what is most appropriate. Note that the graph provides no information on what retirement ages are assumed pre- or post-accident.



**Three Cases**

To further illustrate the challenges associated with estimating the value of lost earnings as well as some resources that are helpful in determining assumptions about pre-accident earning capacity and residual earning capacity, we consider three cases.

Case 1: Fatima	Case 2: Pierre	Case 3: Lingling
Age 42 on accident date, now 47	Age 20 on accident date, now 26	Age 13 on accident date, now 16
Canada Post letter carrier for 17 years	Second year actuarial science student, C average	Straight-A student, wanted to be a doctor
Can now only work part-time doing non-physical work	Has not continued education or worked since accident	Has recently returned to school with accommodations

**Fatima** was well-established in her career at the time of the accident. The pre-accident earning capacity will not be difficult to determine. Our main questions relate to residual earning capacity. Specifically, how much can she work? What occupation? For how long?

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Resources that will be useful for estimating Fatima's **pre-accident earning capacity** include income tax return summaries and collective agreements. Income tax return information allows us to construct an earnings history for Fatima. If we have her annual earnings for several years leading up to the accident, we can observe any fluctuations and better project how her earnings may have unfolded if not for the accident. For unionized occupations like Canada Post letter carriers, collective agreements can be very helpful, as they typically include salary grids that allow one to determine annual salaries based on calendar year, job category, and years of service. Thus, a collective agreement can provide the pre-accident earning capacity through most or all of the period of past loss and even into the future.

Resources that help in establishing **residual earning capacity** include reports providing expert medical and vocational opinions. An expert medical opinion describes the nature of the injuries suffered by the plaintiff, the surgical and therapeutic interventions that may be necessary, as well as the prognosis for recovery and the long-term limitations that may persist. Informed by the medical opinion, interviews with the plaintiff, and various tools of their profession, vocational experts provide opinions on the plaintiff's work capabilities, suitable occupations, and necessary accommodations. If such expert opinions are available, the actuary's job is to determine one or more residual earnings trajectories that are consistent with those opinions.

A resource that is very helpful with this is the census tabulation tool provided by Statistics Canada and licensed to the Canadian Institute of Actuaries for use by its members. The current version is based on data from the 2016 census, linked to income tax records for 2015. The tool allows the actuary to obtain sample estimates of earnings information for various groups in the Canadian population. In doing so, one can distinguish by geographic location, educational attainment and National Occupation Classification (NOC), among other variables.

Suppose that a vocational expert indicates that Fatima, who resides in Nova Scotia, could work (post-accident) part-time in one of the occupations included in NOC 1511: Mail, postal and related workers (not letter carriers). In this case, the table below, obtained using the census tabulation tool, may be useful. It provides estimates of average earnings (in 2015 dollars) of Nova Scotians who worked full-time, full year in these occupations. Zeros appear in the table for age groups in which the sample size was too small to release earnings information. Given the data in the table, actuaries would typically use the "career average" for all age groups combined, recognizing that for younger ages the correct average would be less, and for older ages the correct average would be more. This annual amount would be adjusted to the valuation year based on the Consumer Price Index and then adjusted to reflect the percentage of full-time that Fatima is capable of working, according to the vocational expert.



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Geography: Nova Scotia 00000 ( 5.5%)  
 Work Activity: Worked 49-52 weeks full time  
 Employ. Income: Average employment income \$  
 Place of Birth: Total - Place of birth  
 Education: Total - Highest certificate diploma or degree  
 NOC 2016: 1511 Mail, postal and related workers

	Total - Sex	Male	Female
Total - Age groups ...	48,023	51,301	45,909
15 to 19 years .....	0	0	0
20 to 24 years .....	0	0	0
25 to 29 years .....	0	0	0
30 to 34 years .....	0	0	0
35 to 39 years .....	43,984	0	44,087
40 to 44 years .....	43,388	0	44,690
45 to 49 years .....	50,179	55,423	0
50 to 54 years .....	51,055	54,411	49,916
55 to 59 years .....	52,352	51,369	53,236
60 to 64 years .....	49,082	53,482	44,816
65 years and over ..	44,040	0	37,799
65 to 69 years .....	43,901	0	0
70 years and over	0	0	0
70 to 74 years ....	0	0	0

**Pierre** was a 20-year-old, second-year university student at the time of the accident. He was in an actuarial science program, but his C average suggests that his success with this career path was far from certain. He has not returned to school or worked during the 6 years that have passed since the accident. With respect to pre-accident earning capacity, we need to consider whether Pierre would have gone on to become a successful actuary, transferred to another program and completed his Bachelor's degree, or left university for another pursuit. To determine residual earning capacity, we need to understand whether or not Pierre can return to school or work, how much he will be able to work given his injuries, what occupations would be appropriate, and whether he will need to retire at an earlier age than normal.

Resources that will be useful in establishing pre-accident earning capacity include census tabulations that provide earnings information by educational attainment. If we wish to consider a scenario that involves a successful career as an actuary, results of surveys of actuarial salaries would probably be more relevant than census tabulations by occupation, since NOC 2161 (Mathematicians, statisticians and actuaries) is not specific enough.

As with Fatima, resources that help in establishing residual earning capacity include reports that provide expert medical and vocational opinions. In cases where no such reports are available, information from the 2017 Canadian Survey on Disability (CSD) may be useful in estimating residual earning capacity. The Canadian Institute of Actuaries (CIA) recently published a paper that we authored, which was based on a CIA-funded research project that involved an analysis of labour force participation rates and average earnings by sex, age group, educational attainment, and severity of disability, estimated from the 2017 CSD. If one uses results from

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this paper, it is important to understand how the severity categories are determined, and to recognize the substantial sampling variability of the estimates, which is quantified for all estimates provided.

**Lingling** was 13 years old on the accident date and is now 16. She recently returned to school with accommodations – she is allowed extra time to complete tests and other school work. While she wanted to become a doctor, it is not appropriate for us to consider the career aspirations of a 13-year-old as the sole scenario in establishing pre-accident earning capacity.

There are research publications that provide predictive models for educational attainment of children based on educational attainment of the parents. Such models may be useful in identifying scenarios about educational attainment for the purpose of estimating pre-accident earning capacity. Census tabulations that provide earnings information by educational attainment can then be used to obtain annual earnings estimates.

Once again, medical and vocational opinions, census tabulations by occupation classification, and possibly estimates based on the 2017 CSD may be useful in establishing residual earning capacity scenarios.

## Key Things to Remember

There is no single recipe for estimating the value of lost earnings in personal injury matters. The approaches and resources used, as well as how they are used, depend on the specifics of the case and the information available.

When there is a high degree of uncertainty about pre-accident earning capacity or residual earning capacity, multiple scenarios should be used to capture the degree of uncertainty and produce a range of plausible results for the parties and the judge to consider.

## Useful Resources

- Canadian Institute of Actuaries Rules of Professional Conduct: <https://www.cia-ica.ca/publications/206091e/>
- Canadian Institute of Actuaries Standards of Practice (4000 – Actuarial Evidence, 1000 – General Standards): <https://www.cia-ica.ca/publications/224058e/> and <https://www.cia-ica.ca/publications/223180e/>
- 2016 Census data concerning employment income by educational attainment or occupation, age, and sex for province, from the Canadian Institute of Actuaries by license from Statistics Canada (available to CIA members only).

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