Educational Note

Determination of Best Estimate Non-Economic Assumptions for Public Personal Injury Compensation Plan Liability Calculations

Committee on Workers' Compensation

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Members should be familiar with educational notes. Educational notes describe but do not recommend practice in illustrative situations. They do not constitute standards of practice and are, therefore, not binding. They are, however, intended to illustrate the application (but not necessarily the only application) of the Standards of Practice, so there should be no conflict between them. They are intended to assist actuaries in applying standards of practice in respect of specific matters. Responsibility for the manner of application of standards of practice in specific circumstances remains that of the members.

MEMORANDUM

To: All Fellows, Affiliates, Associates, and Correspondents of the Canadian Institute of Actuaries

From: Pierre Dionne, Chair
Practice Council

Crispina Caballero, Chair
Committee on Workers' Compensation

Date: October 19, 2015

Subject: **Educational Note – Determination of Best Estimate Non-Economic Assumptions for Public Personal Injury Compensation Plan Liability Calculations**

This educational note is intended to assist actuaries in determining non-economic assumptions in order to project the benefit payments in valuing the benefits liabilities of a public personal injury compensation plan (PPICP). It provides supplemental information to subsection 5440 of the Standards of Practice – Practice-Specific Standards for Public Personal Injury Compensation Plans.

In accordance with the Institute's Policy on Due Process for the Approval of Guidance Material other than Standards of Practice, this educational note has been prepared by the Committee on Workers' Compensation and has received final approval for distribution by the Practice Council on October 13, 2015.

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Questions regarding this educational note may be addressed to Stan Warawa at his CIA online directory address, stan.warawa@worksafebc.com.

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1. Introduction

This educational note is intended to assist actuaries in determining the non-economic assumptions (i.e., assumptions other than the discount rate and the rate of benefit inflation) in order to project the benefit payments as required under subsection 5440 of the Practice-Specific Standards for Public Personal Injury Compensation Plans (PPICP) in valuing the benefits liabilities of a PPICP. Assumptions with respect to the discount rate and the rate of benefit inflation are addressed in separate educational notes.

This educational note is constructed from the point of view assuming an actuary is performing the liability calculation. However, PPICPs do not all have a rigid requirement that an actuary must value the liabilities, although in reality almost all do use an actuary.

This educational note does not deal with the calculation of the Long Latency Occupational Disease liability.

Subsection 5440 includes the following guidance:

.01 When setting non-economic assumptions, the actuary would reflect all material contingencies.

.02 The actuary would recognize the effect of varying experience and settlement patterns that result from definitive or virtually definitive revisions to the plan's benefits or claims practices and would consider the relevance of historical claims experience.

.03 When setting the assumptions for wage loss, disability, pension and other benefits, the actuary would take into account all applicable material contingencies, including the possibility of recoveries, relapses, mortality improvements, changing benefit levels and the intermittence of income replacement and rehabilitation benefits throughout the lifetime of claimants. Further, the actuary would consider the potential effect on future benefit payments of factors such as changing economic conditions, employment levels, the claimant's occupation and industry and seasonal variations.

The specific assumptions utilized would reflect the circumstances of the entity for which benefits are being valued. As a result, not all of the considerations mentioned in this note may be appropriate for a specific situation.

Benefits provided by PPICPs include the following:

- Income replacement benefits (IRBs);
- Loss of function benefits;
- Survivor benefits payable to the survivors of a deceased worker;
- Health care benefits required to treat health issues arising from the accident and provide physical rehabilitation; and
- Vocational rehabilitation benefits intended to assist the injured worker to return to employment.

The specific benefits provided are described in legislation and policies. Although the general principles are similar, there are significant differences in the details of the legislation and/or

policies from jurisdiction to jurisdiction. There may be additional administrative directives and procedures that further describe jurisdictional practices.

Legislation, policies, directives, and procedures are subject to change from time to time. In many cases, this will lead to changes in the ongoing benefits provided to workers injured prior to the change. In some cases, the changes may be retroactive. In other cases, previous benefits may be grandfathered.

Once a claim has been established, the PPICP has a responsibility to the claimant that may last throughout the lifetime of the claimant (and possibly beyond, in the case of survivor benefits). Commonly, IRBs have periodic starts and stops over the life of the claim. In addition, the claimant's progression through the various stages of income replacement and rehabilitation benefits generally reflects the progression of the claim, rather than following a schedule as may be imposed by a private insurance policy. Health care benefits related to the injury are often provided for life regardless of the income replacement status of the claim.

As a result, a fairly broad range of assumptions may be used, and these may be specific to the benefit components (e.g., the mortality assumption appropriate for long-term disability claimants may be different from that appropriate for survivor benefits recipients).

2. Benefit Descriptions

The list of benefits covered by PPICPs, as shown below, is not meant to be exhaustive, but rather offers examples of typical types of benefit coverage offered. The purpose of these descriptions of benefits is to provide a framework for the discussion in this educational note, and not to limit possible interpretations. Terminology may vary across the PPICPs.

2.1 Income Replacement Benefits

IRBs are benefits that provide compensation for the loss of income due to a workplace injury.

Other terminology includes loss of earnings, wage loss benefits, compensation, disability benefits, short-term disability (STD), and long-term disability (LTD).

Many PPICPs value the early part of the claim (STD) and the later part of the claim (LTD) differently. However, some PPICP's may determine the appropriate assumption without segregating the claims costs into STD and LTD.

2.1.1 Short-Term Disability

STD usually refers to impairments that are believed to be temporary in nature where the injured worker has a high or reasonable probability of recovery.

Other terminology or subsets for STD may include temporary total disability, temporary partial disability, temporary economic loss, and other short-term disability.

2.1.2 Long-Term Disability

LTD usually refers to impairments that are believed to be permanent in nature where the injured worker has either little or no probability of recovery. This designation can be initiated by reaching a specific duration since date of injury, a defined severity of injury, or simply an

administrative decision. LTD benefits are typically payable to a limiting age, such as 65, or in some cases for life. For lifetime benefits there is sometimes a reduction at age 65, recognizing the commencement of retirement income from other sources.

2.2 Loss of Function Awards

Lump sum benefits are commonly awarded to compensate for permanent physical impairments arising from an accident. A loss of function award is usually determined at a point when medical opinion indicates that no further significant medical change is likely. This usually happens after sufficient time has elapsed following the accident to allow for a reasonable stabilization of the claimant's condition. Loss of function awards are usually based on a physical impairment schedule, with the award expressed as a percentage of the maximum award (e.g., *x*% for the loss of an arm, *y*% for hearing loss, etc.). The amount of the award may reflect the degree of impairment, which may increase over time if the claimant's condition deteriorates. For some PPICPs, this lump sum is paid only for small impairment levels—for larger impairment levels, a monthly annuity (generally to age 65) may be awarded, rather than a lump sum.

Subsequent to the initial loss of function award, the claimant's physical condition may deteriorate. If this happens the claimant could request a review, which may result in an additional award being made to reflect this deterioration.

2.3 Survivor Benefits

Survivor benefits are benefits that are paid to the surviving dependants of a deceased worker (or in some cases to the dependants' guardians). Payments include lump sums for items such as funeral expenses or annuities to the surviving spouse (sometimes lifetime) or children (to a defined age, such as 19, or until formal education is completed), compensating them for the income loss incurred to the family due to the death of the worker. In some cases, the legislation may provide for the extension of benefits for the full lifetime of a disabled dependent child.

Benefits may also be provided for other individuals who were dependent on the deceased worker for support (parents or grandchildren, for example).

2.4 Health Care

Injured workers are typically entitled to health care as a result of the injury. This usually includes their immediate medical needs, plus treatment to improve or maintain the worker's functional abilities, minimize the risk of further injury, and reduce the severity of the symptoms of the workplace injury. All health care costs that are the result of a workplace injury are covered by the PPICP from the first dollar of cost. Government health care systems do not participate in any of these costs, with very few exceptions.

Benefits may include, but are not limited to, professional services provided by a health care practitioner, services provided by hospitals and health facilities, drugs, attendant services, home or vehicle modifications, assistive devices and prostheses, transportation costs, a clothing allowance, and home care.

Other terminology includes medical aid and medical assistance.

2.5 Rehabilitation

Rehabilitation benefits are benefits that assist the injured worker to return to work and to lessen or eliminate any handicap resulting from the injury. Benefits include, but are not limited to, a health or return to work assessment; determination of suitable and available employment; physical, social, and psychological services; relocation; vocational training; assistance with job searches, and job placement.

Other terminology includes vocational rehabilitation and labour market re-entry. Rehabilitation benefits may also apply to the spouse of a deceased worker.

3. Valuation Models

The calculation requires a model, simple or complex, into which assumptions are set. The actuary would strike a balance between the complexity needed for reasonable representation of reality and the simplicity needed for a practical calculation. Paragraph 1710.06 of the Standards of Practice states:

> If the model does not take into account a matter, then the result is an implicit assumption about that matter, usually an assumption of zero probability or of zero rate.

While a variety of models may be used in the valuation of the benefit liabilities of a PPICP, they would generally fall into either the seriatim or aggregate category.

3.1 Seriatim Models

Seriatim models are those models by which the liability is calculated on a per claim basis. This most frequently occurs for approved long-term benefits where the injured worker's condition has stabilized and monthly payments under the award are expected to continue either for the life of the claimant or to some specified duration (such as age 65), or to benefits payable to the survivors of a deceased worker.

In this case, there is detailed information about the specific benefit being valued and also detailed information on each recipient (i.e., who is the benefit recipient, their age and gender, how much the current benefit is, for how long the benefit might be payable, and how the benefit is indexed from time to time). Appropriate assumptions to be applied to the specific circumstances of the recipient may include mortality, recovery, and recurrence. An additional assumption may be required if the benefit is subject to ongoing re-evaluation due to changes in the recipient's circumstances (e.g., earnings capacity).

Seriatim methods may also be used to value short-term IRBs. Detailed information on the benefit and each recipient is also required for this model.

3.2 Aggregate Models

Aggregate models are those models by which the liability is calculated in bulk for a particular block of claimants. In this case, detailed information at the claim level is not directly taken into account (i.e., who the benefit recipient is, the value of a specific benefit payable or how long benefits for a specific claimant might continue) but taken as an average over the particular block of claimants.

It is common practice for benefits valued using aggregate methods to be handled in blocks. Specifically, historical claim cost data are displayed in a two-dimensional run-off triangle by year of injury and year of payment.

For many benefits, particularly those that have a wide range of services or unpredictable payment patterns, a common practice is to use an aggregate model such as the loss development model. Under this approach, future benefit payments for a block of claims are estimated based on prior payment patterns by benefit duration (e.g., calendar year of payment minus calendar year of injury). This may involve the application of historical link ratios by duration to cumulative payments to date or to payments in the most recent duration. Another option may be to calculate unit costs by duration from accident year based on recent payment years, where the unit may be, for example, claim counts or days of income loss in the accident year.

As loss development models are based on past payment patterns, there are implicit allowances for mortality, recovery, and recurrence built into the resulting factors. As a result, specific assumptions for these elements would not generally be necessary.

Liabilities for future awards for income replacement, loss of function, and survivor benefits may also be calculated using aggregate methods. An example is the estimate of the liability for long-term disability benefits expected to be awarded to claimants who are currently in the short-term benefit stage or who have not yet been approved for long-term IRBs. In this case, there may be an estimate of the number of future awards by duration coupled with an estimate of the average cost of future awards by duration. Similar estimates may be required for future survivor awards.

Aggregate liability models, being based on historical data, already automatically allow for both reported claims and incurred but unreported claims, so no separate calculation for the incurred but unreported element would be required.

Before using the aggregate model, any discontinuities in historical payments by calendar year—for example, due to delays or a catch-up in claim processing, or changes in legislation, policies, or practice—would normally be adjusted accordingly if the impact was deemed to be significant.

4. Assumptions by Benefit Type

The following subsections from the General Standards of Practice are of particular relevance to PPICP actuaries when determining valuation assumptions: 1710 – Needed assumptions, 1720 – Selection of assumptions, and 1730 – Appropriate assumptions. Also, there are paragraphs from part 5000 presented in the introduction to this educational note that would be considered by the actuary when determining assumptions.

The actuary would conduct periodic reviews of assumptions used in the valuation of liabilities.

4.1 Income Replacement Benefits

Valuation of IRBs may employ seriatim or aggregate methods or both. Many PPICPs use an aggregate method to value the early or commonly-referred-to STD part of the claim. Some PPICPs, however, do value the early durations using seriatim models. In the earlier durations of

the claim, recovery and benefit level changes are relatively unpredictable. As the claim matures and moves into a more permanent status, there is less likelihood of these events occurring. Most, or perhaps all, PPICPs value these permanent LTD claims (if paid as a monthly annuity rather than a lump sum) using seriatim models. Seriatim models would typically have specific non-economic assumptions for mortality, recovery, and benefit level changes. These will be discussed individually.

4.1.1 Mortality Assumptions

The actuary would generally have to develop a set of assumed mortality rates for annuity-type benefits such as IRBs.

Larger PPICPs may be able to develop a PPICP-specific mortality table or adjustments to a published table such as a population mortality table. Smaller PPICPs may have insufficient data on which to base a PPICP-specific table or even credible adjustments to a population table. The actuary may perform actual-to-expected ratios to determine if the population tables need to be adjusted. Also, the actuary would consider mortality improvements over the projection period.

For benefits terminating at age 65, mortality assumptions are less critical. However, some PPICPs have substantial income replacement or survivor benefits that are paid for life, rather than to age 65. The mortality assumptions for these lifetime awards are important.

The use of either static or generational tables and gender-specific or gender-neutral tables is currently acceptable practice. However, the use of generational mortality tables is generally preferred to static mortality tables. Most large PPICPs in Canada are currently using generational mortality tables, although some smaller ones are using static tables. If it is nonetheless decided that a static mortality table is to be used in lieu of a generation table, appropriate analysis would be done to ensure that the results are acceptable for the intended purpose of the work. For example, the actuary would verify that the static table used is a good approximation to an appropriate generational table. Also, if pensions are paid only to age 65 where mortality is not a significant assumption, a static mortality table may be used.

4.1.2 Recovery Rates

Recovery rates may be important contingencies to be included when determining the liability for IRBs. For some IRB structures the liability is very sensitive to variations in this assumption.

Some of the factors that may influence recovery rates include the following:

- Claimant age;
- Claim duration;
- Nature of injury;
- Education level;
- Claimant motivation;
- Personal factors unrelated to the accident;
- Economic conditions;

- Employment levels;
- Claimant's occupation;
- Industry and seasonal variations;
- Employer claim management; and
- Gender.

There are very few PPICPs for which the actuary would be able to develop a set of recovery rates that reflect all possible factors. Normally the actuary would directly consider only three or four items. It is also unlikely that any published data will be wholly satisfactory, as the factors influencing recovery rates tend to be specific to the details of the legislation, policies, and administrative procedures applicable to the PPICP and the specific environment in which the PPICP operates.

The most important recovery rate predictors are the claim duration and the claimant's age at the date of the accident. The PPICP's legislation and/or policies surrounding the timing of approval of IRBs and the subsequent follow-up practices could also have a significant impact on observed recoveries. The actuary would be careful in reflecting changing practices, as it calls for significant judgement.

Also, economic conditions may play a key role in the recovery experience of a plan. The actuary would consider those factors related to economic conditions. When determining recovery rates assumptions to be used in the valuation, adjustments to experience would be considered.

Although the expectation at the time of approval of IRBs is that the claimant has suffered a permanent loss of function or a permanent loss of earnings capacity, some claimants would ultimately be able to increase their earnings levels to the point that there would no longer be a residual loss of earnings. In that case, the claimant is no longer qualified for IRBs, and is said to have recovered. Depending on the practices of each PPICP, these 'recoveries' may be very infrequent.

For example, some PPICPs do not have a formal schedule for the initial approval of IRBs. For these entities, the claim may progress through medical rehabilitation up to the point of attainment of a medical plateau. At that time, a functional evaluation test may be used to determine whether or not there is a functional loss and/or a residual loss of earnings capacity. If not, the claim is terminated. If there is a residual loss, vocational rehabilitation opportunities would be explored. At the conclusion of vocational rehabilitation, the claimant's residual earnings capacity would be assessed and an appropriate level of IRBs be awarded. For these PPICPs, IRBs could be awarded almost immediately in the case of the most severely disabled claimants. On the other hand, for some claimants a period of many years may be required to reach a medical and vocational plateau. For these claimants, recovery rates may be relatively low.

Recovery from disability may also be provided for in the liability by aggregate methods rather than seriatim methods. For example, the capitalized value of each claim recovery (negative cost or credit) can be recorded and then a negative liability determined in aggregate.

4.1.3 Benefit Level Changes

There may be situations that result in a significant change to the benefits being valued due to changes in legislation, policies, or practice. In such cases, the past payments may be adjusted to account for the revised circumstances and avoid an overstatement or understatement in the liabilities that may result if the raw data were used to develop the factors.

Benefit levels for IRBs may be subject to change from time to time as the claim matures:

- To the extent integration is applicable, the amount, timing, and potential retroactive applicability of Canada/Québec Pension Plan (C/QPP) disability awards and other employment-related disability benefits may cause changes in IRBs and lead to overpayments that may be recovered in part through a reduction of ongoing benefit payments.
- To the extent integration is applicable, the amount and timing of C/QPP retirement benefits and other employment-related retirement benefits may result in changes to IRBs.
- As the claim matures, there may be changes to the claimant's actual and/or potential earnings that may lead to a change in IRBs.
- The future benefit level, or even perhaps the past benefit level, may change with a court decision.
- Benefits may be indexed.
- Income tax rates may change.

For some PPICPs, LTD IRBs may be subject to a final review at a fixed benefit duration, with few, if any, changes to the benefit other than indexation beyond that point.

In other cases, an annual benefit review may be required as long as the claim is active. In this case, there may be a review of the claimant's actual or potential earnings and any other income that affects the benefit calculation. For those PPICPs that apply benefit offsets or all-source maxima, the changes occurring at an annual benefit review can be significant. For example, C/QPP disability awards can create a significant benefit offset, leading to a significant change in the benefit payable. And, as these awards are often made with retroactive application, a sizable overpayment of past LTD benefits can occur. If the overpayment is recovered through an offset to ongoing benefits, the actuary would avoid understatement of the projected cash flows by projecting a temporary benefit level with no increase except indexation. This may require individual investigation of the affected cases.

One approach adopted by some PPICPs that helps to address this problem is to assume that all claims become LTD claims at a fixed point following the year of accident, with the fixed point being determined based on a time beyond which most of the C/QPP disability awards are in place. Under this approach, LTD benefits payable prior to the assumed start date may be valued combined with STD benefits using a loss development method. The LTD component may then be developed by separately valuing the STD benefits and backing these out from the combined results. This approach also helps to deal with the integration of other employment-related

benefits and increases the likelihood that the claimant's actual and/or potential earnings will have stabilized.

4.2 Loss of Function Awards

The liability for future loss of function awards may be valued using either an aggregate method (with results calculated on an accident year basis) or a seriatim method. Currently the aggregate method is more commonly used among PPICPs in Canada.

If the seriatim method is used, it would likely be for claims that have larger impairment levels where a monthly annuity has been awarded instead of a lump sum payment. The actuary would make the usual assumptions for mortality, recovery and benefit level changes. If applied to smaller impairment claims the actuary may make additional assumptions regarding the following:

- The probability, timing, and amount of an *initial* award.
- The probability, timing, and amount of a *subsequent* adjustment(s) to the award.
- If the claimant's condition deteriorates, an adjustment to a previous loss of function award may become payable.

An aggregate method may also be chosen to value the loss of function awards, similar to the aggregate approach used to value future IRBs. This approach may be used for determining a separate liability for initial loss of function awards, recurrences, or both.

4.3 Survivor Benefits

Lump sum payments and survivor benefits that will be awarded to dependants of existing claimants who will die from a compensable condition are generally valued using an aggregate model.

For annuity-type payments to the spouse or dependent children, the amount of the benefit is known and is not likely to change significantly over time, both characteristics that fit a seriatim model. As such, these payments are usually valued using a seriatim model.

The key non-economic assumption for these cases is mortality. Recovery rates are not a factor and benefit level changes are due mostly to indexing, unless the legislation includes some sort of all-source maximum based on a family income test, in which case that would be an additional item for consideration.

Surviving spouses may be expected to present an average mortality risk equivalent to the population as a whole. Thus, unless there is credible evidence to the contrary, the most appropriate mortality assumption may be the applicable national or provincial mortality table as published periodically by Statistics Canada. Mortality improvement factors would also be considered, similar to that for IRBs under Section 4.1.1.

Population mortality may also be the most appropriate assumption for dependent children, except in the case of disabled dependent children who have been awarded a lifetime benefit. In this case, a loading factor applied to the mortality rate may be appropriate, but testing may suggest that, due to the very small number of such awards, the reduction in benefit liabilities due to the use of a loaded mortality rate is negligible.

4.4 Health Care

Virtually all PPICPs use an aggregate model to value health care benefits. This is due to the fact that there is a wide range of benefits covered with many different characteristics and payment patterns. Many of the benefits are not highly sensitive to age, gender, and mortality but are more directly linked to the severity of the injury. There is usually insufficient data to develop seriatim assumptions by type of benefit. Such characteristics would naturally lead to an aggregate approach. Adjustments to historical data may be necessary if the data contains unusual fluctuations such as the introduction of a new benefit or changes in pricing assumptions.

More than one aggregate model may be employed as the run-off patterns vary by benefit type. As an example, the run-off tables for hospital payment benefits are more front-loaded, whereas the run-off tables for other medical payment benefits are more back-end loaded.

Aggregate models may also be refined with a select period for the first *n*-years followed by an ultimate period where the payment pattern changes significantly by duration, such as hospital payment benefits and other medical payment benefits.

Seriatim models may be used if there is sufficient information available; as examples, where the monthly health care provided payments exceed a high threshold and where there may be an appropriate load to the regular mortality table.

4.5 Rehabilitation

Similar to health care and for the same reasons, virtually all PPICPs use an aggregate model to value rehabilitation benefits.