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Educational Note

Selection of Mortality Assumptions for Pension Plan Actuarial Valuations

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Committee on Pension Plan Financial Reporting

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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 in the pension practice area.

Memorandum

To: All Pension Practitioners

From: Jacques Tremblay, Chairperson
Practice Council

Stephen Butterfield, Chairperson
Committee on Pension Plan Financial Reporting

Date: March 12, 2008

Subject: **Educational Note –Selection of Mortality Assumptions for Pension Plan Actuarial Valuations**

This educational note is intended to assist actuaries in the selection of appropriate mortality assumptions for pension plan valuations. The focus is on establishing best estimate post retirement mortality assumptions suitable for use in going concern valuations for funding purposes and actuarial valuations for accounting purposes, under Sections 3300 through 3500 of the Standards of Practice.

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 Pension Plan Financial Reporting and has received final approval for distribution by the Practice Council on March 7, 2008.

As outlined in subsection 1220 of the Standards of Practice, "*The actuary should be familiar with relevant educational notes and other designated educational material.*" That subsection explains further that a "*practice which the notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation.*" As well, "*educational notes are intended to illustrate the application (but not necessarily the only application) of the standards, so there should be no conflict between them.*"

Should you have any questions or comments regarding this educational note, please contact Stephen Butterfield at his CIA Online Directory address, stephen.butterfield@towersperrin.com.

JT, SB

SELECTION OF MORTALITY ASSUMPTIONS FOR PENSION PLAN ACTUARIAL VALUATIONS

There are two key components to the selection of an appropriate best estimate mortality assumption,

the best estimate of the current rates of mortality for the plan, and

appropriate adjustment for future improvements in mortality.

The actuary would normally consider these two components separately in developing the assumption for future rates of mortality.

Current Levels of Retiree Mortality

The first step in developing an appropriate best estimate mortality assumption is to determine the best estimate of the current levels of mortality.

In developing the best-estimate of the current levels of mortality, a key consideration is the size of the plan and the amount of data available to the actuary.

Very Large Plans – For very large plans, say 10,000+ retirees, experience studies would typically be prepared every three to five years. For these plans, mortality tables can be customized to reflect the experience of the specific plan using percentage adjustments to standard table mortality rates by age group and sex or, in cases where the data are sufficiently credible (typically involving significantly more than 10,000 retirees), by preparing plan-specific mortality tables.

Mid-size Plans – Regular review of mortality experience is also valuable for mid-size plans, say 1,000+ retirees. Although the mortality experience would generally not be fully statistically credible, useful information may be derived and significant trends may be observed. Studies at this level can be used to develop broad adjustments to published mortality tables (e.g., 80% or 90% of the standard table rates) or, in some cases, different adjustment factors may be used for a range of ages.

Small Plans – For plans where the number of retirees is insufficient to conduct a credible mortality experience study, but where there are a significant number of retirees, say 100+, it is useful to examine the experience gain/loss related to pensioner mortality arising from past actuarial valuations. Such a review may give an indication of the validity of the mortality assumption and any strong trend in mortality experience.

Very Small Plans – For plans with few retirees, where there are not sufficient experience data, considerable judgment is required in selecting an appropriate mortality assumption. Important factors to consider include the nature of employment and relative amount of the pension payments. For example, the RP-2000 Mortality Table Study clearly indicates that rates of mortality are greater for former blue collar workers than for former white collar workers and that rates of mortality are greater for pensioners receiving small pensions than for pensioners receiving large pensions. Data are presented in the study as to the extent of these effects and possible adjustments that may be applied to the base mortality table to

allow for them. Unfortunately, the RP-2000 Committee was unable to derive adjustments that would allow for the combined effect of collar type and pension amount at the same time.

After making adjustments to standard table mortality rates or preparing a plan-specific table, the rates in the resulting table may need to be smoothed so that the rates progress in a reasonable pattern from age to age. In some situations, graduation techniques may be useful for purposes of smoothing the mortality rates.

Other important considerations in developing the current levels of mortality include the following:

Recent Improvements in Mortality Levels – At the time this guidance is being prepared, the most commonly used mortality tables are based on the UP 1994 or the GAM 1994 tables. While there is no available broad experience study for Canadian pension plans, anecdotal evidence suggests that mortality has improved since these tables were prepared and in some cases the improvement in mortality has been greater than predicted by Scale AA¹ (currently Scale AA is the most commonly used basis for projecting mortality improvements). The actuary would consider such recent trends in developing the current best estimate levels of mortality. In particular, unless supported by credible mortality experience, at this time, use of the UP 1994 or the GAM 1994 table without projection, at least to the valuation date, may be an inappropriate measure of current mortality levels except, possibly, for blue collar groups or plans providing very small pensions. For white collar groups with large pensions, the best estimate assumption of current mortality levels would typically be significantly lower than standard table mortality rates. There is anecdotal evidence that current levels of mortality in the range of 50%-70% of UP 1994 mortality rates have been observed for some plans.

Published mortality studies² and studies for individual plans clearly show that mortality rates are lower when measured by pension amount (or liability) than when measured by number of lives. In particular, those with higher pension amounts typically experience lower rates of mortality than those with lower pension amounts. In using experience studies to establish tables for actuarial valuation purposes, results based on benefit amount (or liability) normally would be considered to be more credible than results based on number of lives.

When assessing the implications of gain/loss experience it is important to consider the effect of any projections built into the mortality rates. For example, a valuation that shows no gain or loss on pensioner mortality where the prior valuation was based on a static mortality table projected 10 years into the future, implies that current experience is at the level expected in 10 years time. Thus, continued use of that table would imply that no provision for future mortality improvement is included. On the other hand, if future improvements in mortality are being reflected

¹ Scale AA as published with the UP 1994 table and also recommended for use with the RP-2000 table.

² See for example, Report of the Group Annuity Experience Committee, Mortality Experience for 2001-2002 (Society of Actuaries) and The RP-2000 Mortality Tables Study (Society of Actuaries)

through the use of a full generational table, no experience gain or loss implies that the table is representative of current experience and that it also includes provision for future improvements in mortality.

Relevance of Certain Mortality Studies – In general, it is inappropriate to use mortality tables derived from general population experience for purposes of a pension plan actuarial valuation, because general population mortality may differ significantly from the subset of the population that participates in pension plans.

Adjustment for Future Improvements in Mortality

Improvements in mortality have occurred over most observed time periods of the past and typically the actuary would assume that improvements will continue to occur for the foreseeable future.

There are two common methods of providing adjustment for future improvements in mortality,

- fully generational mortality tables, and
- static mortality tables with a fixed projection period.

The actuary could allow for future improvements in mortality through the use of generational mortality tables. While there are techniques available for approximating mortality improvements by means other than using generational mortality tables, including the use of static mortality tables with a fixed projection period, the actuary would be aware of the shortcomings of such approaches.

Static mortality rates with a fixed projection period are commonly used to approximate the effect of using generational tables. The report of the Society of Actuaries UP-94 Task Force on the 1994 Uninsured Pensioner Mortality Table³ indicates that, in determining the liabilities of a plan, using a static table projected for a period equal to the duration of the liabilities using projection Scale AA is a close approximation to the use of generational tables. However, the actuary would note that the effective duration of projected benefit payments for current service cost calculations is generally much higher than the duration of projected benefit payments related to accrued actuarial liabilities, and that the duration of active member liabilities is generally higher than the duration of pensioner liabilities. Therefore, if a fixed projection period is used, depending on the manner in which the fixed projection period is determined, the current service costs and/or the allocation of the actuarial liabilities by membership category may be inappropriate.

If static mortality tables with a fixed projection period are used to approximate the effect of using generational tables, the assumption will generally need to be updated at each subsequent valuation to reflect new base year mortality rates and revised projection periods to reflect any change in liability duration.

The rates of future mortality improvement are quite uncertain and there is significant speculation in actuarial literature as to whether there will be a slowing of mortality

³ Transactions of Society of Actuaries 1995 Vol. 47

improvements at pensioner ages as the absolute level of mortality becomes lower. As of the date of preparation of this educational note, no alternative tables have been published to suggest that using Scale AA is not a reasonable projection scale to use.

Pre-retirement mortality

For the majority of Canadian pension plans, pre-retirement mortality assumptions are not of great significance to the calculation of actuarial liabilities, since

rates of mortality at pre-retirement ages are generally very low, and

in many cases, benefits payable on death are equal to the commuted value of a deferred pension entitlement.

Therefore, less rigour is typically required in the selection of the pre-retirement mortality assumption and use of the same assumption as for post-retirement mortality will generally be satisfactory. However, the actuary would give greater consideration to the selection of the pre-retirement mortality assumption in particular cases where

benefits payable on member death are significantly different from the commuted value of accrued pensions, and/or

actual observed rates of mortality for active members are significantly higher than expected based on the standard mortality tables.

Disabled Life Mortality

The published mortality study data identify that higher mortality is experienced by individuals who were disabled prior to retirement compared to individuals who were not disabled prior to retirement. Where data are available, use of a separate mortality assumption for those members who were disabled prior to retirement may be appropriate. Where a separate table is used for members who were disabled prior to retirement, the assumed mortality rates for other retired members would be adjusted to reflect the fact that standard mortality tables such as UP 1994 or GAM 1994 reflect the combined expected rates of mortality for all retired members, including those who were disabled prior to retirement.

Summary

This educational note provides guidance on principles for the selection of best estimate mortality assumptions. It is not intended to preclude the application of judgment in the selection of the actual mortality assumption to be used in a going concern valuation, which may include the use of reasonable approximations and/or margins for adverse deviations where appropriate.