

## Appendix J-1

### Extension of 2001 CSO Tables to Gender-Blended and Age Last Birthday ("ALB") Bases

As was done for the 1980 CSO Tables, gender-blended and ALB tables have been developed from the gender-distinct 2001 CSO Tables. Separate tables were developed for the following proportions of males and females: 100/0; 80/20; 60/40; 50/50; 40/60; 20/80; and 0/100. These percentages were chosen to be consistent with those used for the gender-blended 1980 CSO Tables, per the direction of the LHATF. Those tables and documentation of the underlying formulas are shown in Appendices J2 and J3.

Relative to the gender-blended tables, the first issue addressed was the method to be used in converting the mortality rates in the ultimate portion of the tables (the "ultimate  $q$ 's") to a gender-blended basis. Three methods were considered:

**Average approach:** Compute the ultimate gender-blended  $q$ 's by adding a) the product of the male  $q$  and the specified proportion of males to b) the product of the female  $q$  and the specified proportion of females.

**Issue-age approach:** For each issue age and specified male/female split, a) compute the number of surviving lives for males and females separately utilizing the gender-distinct tables, and then b) compute the gender-blended  $q$ 's directly from the sum at each duration of the male and female lives assuming the specified male/female split at issue.

**Pivot-age approach:** Designate an age at which the specified male/female proportions are assumed to occur. Compute the number of surviving lives for males and females separately for all ages (i.e., both prior and subsequent to the pivot age) utilizing the gender-distinct tables, and then compute the gender-blended  $q$ 's directly from the sum at each age of the male and female lives.

While the "issue-age" approach is the theoretically correct answer, it was rejected because it is administratively cumbersome to require a unique set of  $q$ 's for every issue age and the added precision does not justify the additional burden. The "average" approach was also rejected because the  $q$ 's that result from this method do not produce reasonable approximations to the "issue-age" approach. The "pivot-age" approach, with a pivot age of 45, was selected because: a) this is the approach which was used to create the 1980 CSO gender-blended tables (described in the NAIC Proceedings – 1984 Vol. 1); and b) it produces reasonable approximations to the theoretically correct answers for most issue ages.

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Next, the gender-blended select  $q$ 's were developed. In essence, the same approach was utilized that had been applied in developing the select factors for the 1980 CSO gender-blended tables (page 457 of the NAIC Proceedings – 1984 Vol. 1). Two modifications were made. First, the actual ratios of ultimate female mortality to ultimate male mortality at each attained age was used in lieu of the fixed 60 percent ratio incorporated into the 1980 CSO calculation. (Note: See Appendix J-2, Item 5). Second, the actual male/female split based on the derivation of the ultimate  $q$ 's was used in lieu of the specified male/female split.

Relative to the ALB tables, the approach utilized in creating the 1980 ALB CSO Table was followed (pages 671-672 of Volume XXXIII of the Transactions of the Society of Actuaries (1981)). During the select period, the " $l_x$ 's" utilized were those derived from adjacent issue ages.