PENSION PLAN TURNOVER RATE
TABLE CONSTRUCTION

FINAL
REPORT

by

Steve Kopp, FSA, FCIA

**Department of Statistical
and
Actuarial Sciences**

**University of Western Ontario
London, Ontario**

November, 1997

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Society of Actuaries and two of its special interest sections, the Pension Section and the Health Section, set about creating a pension plan turnover table for use by actuaries to assist in calculating benefit costs for employment-based pension and retiree medical plans.

A study of this magnitude had never before been attempted. This was the first time employee termination and retirement rates had been rigorously studied. It was a complex study of a complex phenomenon. Termination and retirement are not random events and so a methodology different from a mortality study had to be designed. Termination and retirement rates reflect many different things, including employers' hiring, retention and termination practices, and the state of the underlying economy that these employers and employees work in.

The paper that follows is a walk through the process that was used to analyze the pension plan turnover data.

Section 2 describes the data supplied by 41 large pension plans. The data varied substantially by plan, so the past aggregate experience of a particular plan is probably the best predictor of that plan's future aggregate experience. Nevertheless, it seemed reasonable to combine the data and construct tables.

There were some problems with the data. The main problem was that the data supplied by 39 of the 41 plans did not give decrement information. A methodology had to be created to determine the decrements (i.e. terminations and retirements) for these 39 plans given the information they supplied. The methodology used was to take the difference between the number of active plan

members at the start of a plan year and the number of active members at the end of the plan year. This led to the "negative decrement" problem, that is, in some circumstances, there were more active members at the end of a plan year than at the start of the year due to re-hires and possible mergers/acquisitions. Section 3 discusses in more detail this and other problems and the techniques used to deal with them.

Data from 38 plans without decrement information were analyzed first (one relatively small plan was eliminated due to suspect data). Then, the two other plans that gave proper decrement information were reviewed separately, with the results given in section 12.

Section 4 discusses the final termination and retirement tables. The tables (hereafter referred to as the "base" tables) are given in appendix 1 (termination ages) and 2 (retirement ages). It should be noted that these two base tables are tables of <u>net decrement ratios</u>, not termination/ retirement rates, due to the aforementioned negative decrement problem. The values in appendices 1 and 2 are <u>ratios</u> representing the net result, over a one year period, of individuals leaving employment due to terminations/retirements, death or disability and individuals entering employment due to being newly hired or rehired.

No attempt was made to separate deaths from the other causes of decrement. The base tables ended up remarkably smooth and were not graduated.

Section 5 analyzes the data separately by the variables of gender, industry code, location, compensation type, and city size. Section 6 analyzes the interaction of all five variables and develops a system of pluses and minuses (similar to a mortality underwriting system) that an actuary

could use to multiply the base tables by to take account of the specifics of the plan they are valuing. The main findings of these two sections were that higher net decrement ratios at termination ages were associated with females, heavy manufacturing, financial services, small cities, and the Northeast region. Higher net decrement ratios at retirement ages were associated with females and the Northeast region.

Section 7 analyzes termination data by years of service. The results are given in appendix 11. Net decrement ratios for duration 1 were lower than for durations 2 to 8. This was as a result of the negative decrement problem mentioned above. Despite this, there did appear to be three levels of net decrement ratios. From duration 1 to 8, the ratios were roughly 15%. For durations 9 to 11, ratios were around 10% and for durations 12 to 28, ratios were pretty steady at 4%. There was a significant drop in the net decrement ratio at duration 29 with a significant rise in the ratio at duration 30. This rise at duration 30 could be due to individuals who had actually retired after 30 years with a company, but who were treated as terminations either due to an error in the coding of the data or due to the method of treating all decrements prior to age 50 as terminations. (See section 4.1 for a description of the methodology used to determine terminations/retirements).

Section 8 analyzes retirement data by years eligible for benefits. The results are given in appendix 12. The main finding was that net decrement ratios for employees who were eligible for reduced pension benefits were lower than for employees who were eligible for non-reduced benefits.

Section 9 gives a 5-year and 10-year select table, the results of which are given in appendices 13, 14 and 17. In particular, the 5-year select table exhibited a relatively low net decrement ratio for duration 1, again due to the negative decrement problem. The ratios for durations 2 to 5 were

basically level at each age. The 10-year select table exhibited similar results. Included in this section is a comparison to the Vaughn 3-year select table with the results given in appendix 16.

Early retirement windows (ERWs) are discussed in section 10. Their impact can be seen in appendices 18 and 19. The termination and retirement base tables of appendices 1 and 2 do not contain any early retirement window data. There was only a minimal impact on the termination base table by putting ERWs back into the data. Termination net decrement ratios increased by one percentage point from age 48 to 51, two percentage points from age 52 to 59 and 2.7 percentage points from age 60 to 64. As for retirement age, putting ERWs back into the data increased retirement net decrement ratios by two to three percentage points. A total of 13 out of the 38 plans offered some sort of early retirement window. The impact of the ERW varied significantly by plan. For some plans, the presence of an ERW tripled their net retirement ratios, while other plans only saw their net retirement ratios increase by 25%.

In Section 11, the experience is observed for the years 1989-92 and 1993-94 to see if there had been any change in net decrement ratios over these two time periods. The results are given in appendices 20 and 21. There was no discernible change in net decrement ratios at retirement ages between these two time periods. Net decrement ratios at termination ages were lower during the later period, when there was an economic downturn and corporate downsizing.

Two plans gave actual decrement information and thus termination and retirement rates could be calculated. Section 12 analyzes the data from these two pension plans. The results are given in appendix 22. Termination rates started at just under 9% at age 22 and fell slowly and smoothly to

almost 0% at age 64. Retirement rates were almost 0% from age 50 to 54, before starting to rise at

age 55. At age 65, retirement rates were over 50%.

Finally, a comparison of the termination base table to the Sarason T-tables is given in section 13.

The results are given in appendix 25. The termination base table had higher net decrement ratios

than the termination rates of the T-1, T-3 and T-5 Sarason tables. Only the T-9 table had higher

termination rates and that was only for ages up to 47.

A final cautionary note. The base tables of appendices 1 and 2 are intended to be used as a starting

point or as a guide by an actuary who is calculating employees benefit costs for pension plans or

retiree medical plans. The tables should be used <u>with caution</u>, recognizing that there was a great deal

of variability in plan experience and that these tables are net decrement ratios, not decrement rates.

The actuary must use his/her judgment and knowledge of the plan being evaluated when applying

the results of this study.

SECTION 1 - INTRODUCTION

Phase 1 of the project was to create a database. The Actuarial Consulting Center at the University of Iowa completed this phase of the project in March 1996.

The Department of Statistical and Actuarial Sciences at the University of Western Ontario was chosen to complete phase 2 of the project. The goal of this phase was to create a termination rate and a retirement rate table from the data received from the University of Iowa and to analyze the data to determine which variables warranted separate tables. This phase also was to include an analysis of the impact of early retirement windows.

SECTION 2 - DESCRIPTION OF DATA

The database consisted of data from 41 large pension plans. Two of the plans, which gave actual decrement and exposure information by age and sex, were not included in the base table data set because their format differed significantly from the other 39 plans. A separate analysis of these two plans is given in section 12. A third, very small, plan was eliminated due to incongruities in the data.

Data from the remaining 38 plans were used. There was a total of 296,357 lines of data representing over 3,065,000 life years of exposure. The data covered the years from 1989 to 1994. Some plans provided data from only one plan year, while others provided data for up to six plan years.

SECTION 3 - METHODOLOGY FOR DETERMINING DECREMENTS

3.1 Problems Encountered

3.1.1 - Negative Decrements

The data from the 38 plans did not give decrement information. To determine the number of terminations/retirements at each age, a "matching cell" methodology was used. A cell was defined by the following attributes: plan ID, year, age, years of service, and gender (a cell also had various other attributes). A cell had a number or a symbol for each of these attributes at the start of a plan year (i.e. first census point). At the end of the plan year (i.e. at the second census point), a "matching cell" would have the same plan ID and gender, but year, age and years of service would be one larger.

Let T_0 represent the number of members in a cell at the start of a plan year and let T_1 represent the number of members in the matching cell at the end of the same plan year. Also, define D_x to be the decrements for members who were age x at the start of a plan year (for a certain plan ID and gender). Then:

$$D_x = T_0 - T_1 \quad \text{(given years of service as at the start of the plan year)}$$

Problems

1. Some cells , which existed at the first census point, did not have a matched cell at the second census point. For these cells, $T_1 = 0$. In other words, all T_0 members in that cell were considered to have terminated or retired.

2. Some cells, which existed at the second census point, did not have a matched cell at the first census point.

- Cells with 0 or 1 year of service essentially represented new entrants in that plan year. These cells were ignored in calculating exposures and decrements for that plan year.

- Cells with more than 1 year of service essentially represented new entrants, but with more than 1 year of credited service. These cells were ignored in calculating exposures and decrements.

3. A problem similar to point number 2 came up for <u>matched</u> cells. This problem became known as the "negative decrement" problem. It occurred when:

$$T_0 - T_1 < 0$$

That is, a negative decrement occurred when a matched cell had more members at the second census point than at the first census point. In these cases, there may have been terminations or retirements, but there were more new entrants (e.g. rehires) so that the result was $T_1 > T_0$.

The negative decrement problem was not anticipated when the task force asked companies to submit data. It was expected that the number of members in a cell at the end of a plan year would be equal to or less than the number of members at the beginning of the same plan year, with the difference representing the number of members terminating or retiring in that plan year.

In any event, the methodology calculates only the <u>net</u> decrement for each cell (i.e. the value of $T_0 - T_1$). The data did not provide information that allowed the breakdown of $T_0 - T_1$ between new entrants and decrements due to termination/retirement, death or disability to be calculated.

At first, the thought was to simply ignore the problem if it did not affect that many plans or that many cells. Work was done to determine how many cells were "polluted", that is, how many cells

had negative decrements. An analysis showed that every one of the 39 plans had some "polluted" cells, with some plans having more than 20% of their cells being "polluted".

The total percentage of polluted cells was 7.86%. This left 92.14% "good" cells. However, even for the good cells, only _net_ decrements could be calculated. Even in these so called good cells, the breakdown between new entrants and decrements was unknown.

The percentage of polluted cells by year was calculated to see if there was any trend:

Year	% of Polluted Cells
1989	9.88%
1990	6.79%
1991	8.08%
1992	7.55%
1993	8.79%
1994	6.93%

As can be seen from the chart, there was no apparent trend.

Also analyzed was the percentage of polluted cells by age grouping. Two observations can be made:

1. The percentage of polluted cells appeared to be lower for retirement ages

2. The percentage of polluted cells appeared to decrease as age increased

However, for many individual plans, there was no apparent trend by age.

The final conclusion was that the negative decrement problem was a serious one, affecting all plans. The final decision of the Task Force was to go ahead with the project with the understanding that the ratios calculated would be net decrement ratios, instead of termination and retirement rates.

Net Decrement Ratios vs. Termination/Retirement Rates

Since only net decrement numbers could be calculated for each cell, the rates calculated in this report are actually _net decrement ratios_. The numerator of these ratios represents the net change over a one year period from age x to age x +1, taking into account new entrants (increments) and terminations, retirements, deaths, and disabilities (decrements). The denominator is the number of individuals who start out at age x.

3.1.2 - Age Last Birthday vs. Age Nearest Birthday

Of the 39 plans in the data, 16 gave age information using age nearest birthday (ANB) (representing 46.3% of total exposure). The other 23 plans gave age information using age last birthday (ALB) (representing 53.7% of total exposure).

For ANB plans, members who were age x on a census date could be anywhere from age x − 0.5 to x + 0.5. On average, these members would be age x on the census date.

For ALB plans with members who were age x on a census date, they could be anywhere from age x to x + 1. On average, these members would be age x + 0.5 on the census date.

The method used to adjust the ALB plans to get integer values of age is described below.

3.2 Methodology Used to Calculate Net Decrement Ratios

A uniform distribution assumption for ALB plans was used where the decrements and exposure for any age x +0.5 were split in half. Half of the decrements and exposure were used for age x and the other half were used for age x+1. The following notation will illustrate the method used:

$E_{x-0.5}$ = exposures for age x – 0.5 $E_{x+0.5}$ = exposures for age x + 0.5

$D_{x-0.5}$ = decrements for age x – 0.5 $D_{x+0.5}$ = decrements for age x + 0.5

Averages were calculated:

$$E_x = (E_{x-0.5} + E_{x+0.5}) / 2 \qquad\qquad D_x = (D_{x-0.5} + D_{x+0.5}) / 2$$

Finally, the net decrement ratio for age x is

$$q_x = D_x / E_x$$

The methodology was the same for ANB plans, except that values of D_x and E_x were already available at integer ages and thus a uniform distribution assumption was not needed.

Total exposures, E_x, were calculated by summing the values of T_0 over all years of service, all plan years and all plan ID's for each age x. Total decrements, D_x, were calculated by summing the difference $T_0 - T_1$ over all years of service, all plan years and all plan ID's for each age x.

Slightly different notation will help describe the method used to find D_x and E_x :

$^p T^y_{x,n}$ = number of members at the start of plan year y who are age x with n years of service for plan ID p

Thus,

$$D_x = \sum_p \sum_y \sum_n ({}^P T^y_{x,n} - {}^P T^{y+1}_{x+1,n+1})$$

$$E_x = \sum_p \sum_y \sum_n {}^P T^y_{x,n}$$

The net decrement ratio is: $q_x = D_x / E_x$

3.3 Differences Between ALB and ANB plans

A base table of net decrement ratios was calculated separately for ALB plans and for ANB plans.

When the results were graphed, the ratios for the ALB plans were much <u>higher</u> than the ratios for

ANB plans. The graph of the ALB and ANB plans are given in **graph 1**.

This was not expected. There was no reason to expect that the method used to calculate the age of

members would be a variable that would warrant a separate table.

The reason for this unexpected difference between ALB plans and ANB plans was due to one

particular ALB plan that had ratios which were <u>significantly</u> higher than any other plan. This ALB

plan had been undergoing significant downsizing and it offered an early retirement package in 1994.

As a result, its termination/retirement numbers were high. When this plan's experience was

excluded from the ALB graph, the two graphs became very close to each other. This is shown in

graph 2.

This plan represented 12.9% of the total exposure of all plans, so deleting it from the data was not an option. However, it was a very influential plan and its inclusion made the overall net decrement ratios significantly higher than had it been excluded.

SECTION 4 - FINAL BASE TABLE OF NET DECREMENT RATIOS

4.1 Rules To Determine Terminations and Retirements

In early analysis, it was decided that a decrement which occurred at age 54 or under, was assumed to be a termination and a decrement which occurred at age 55 or above, was considered a retirement (graphs 1 and 2 use this methodology). However, this rule missed some retirements at ages under 55 and some terminations from ages 55 to 65.

The final rules adopted for allocating net decrements between terminations and retirements are:

Termination - A decrement is a termination if it occurs under age 65 AND has an 'N' in the eligible for retirement column (i.e. person is Not eligible for retirement benefits). If a decrement occurs under age 50, it is automatically considered to be a termination.

Retirement - A decrement is a retirement if it occurs above age 49 AND has either a 'U' or an 'R' in the eligible for retirement column (U stands for eligible for an unreduced benefit and R stands for a reduced benefit). If a decrement occurs at age 65 or above, it is automatically considered to be a retirement.

This approach resulted in a relatively small number of retirements being included in termination net decrement ratios, since retirements prior to age 50 were treated as terminations even when the data

indicated otherwise. It is also likely that some of the termination net decrement ratios in the "gray" area from age 50 to age 64, where the termination and retirement tables overlap, include retirements. The reader should keep these points in mind when reviewing the results of this study.

4.2 Early Retirement Window Decrements Taken Out of Data

Early retirement windows (ERWs) were taken out of the data in creating the base tables since they would unduly increase the net decrement ratios, especially at the retirement ages. Plans that included ERWs had those plan years with ERWs excluded from the final base table of net decrement ratios. ERWs are analyzed separately in section 10.

The impact on total life years of exposure were as follows:

Termination:	Total exposure (including ERWs) =	2,653,202	life years
	Total exposure (excluding ERWs) =	2,223,859	life years
	loss in exposure =	429,343	(16.2%)
Retirement:	Total exposure (including ERWs) =	414,926	life years
	Total exposure (excluding ERWs) =	358,373	life years
	loss in exposure =	56,553	(13.6%)

4.3 Not All Ages Shown

At the very youngest ages for termination and the very oldest ages for retirement, there were only limited exposures and the net decrement ratios at these ages were somewhat erratic. Only ratios for ages 22 to 64 for terminations and ages 50 to 73 for retirements are shown in this study.

For terminations (excluding ERWs), the exposure for ages 14 to 21 was 15,819 life years. Total exposure for the remaining termination ages was 2,208,039 life years. The loss in exposure due to eliminating experience for ages 14 to 21 resulted in a decrease of only 0.71% of exposure.

For retirements (excluding ERWs), exposure from ages 74 to 92 totaled just 688 life years, representing only 0.19% of total exposure from ages 50 to 92. Total exposure for ages 50 to 73 was 357,685 life years.

4.4 Final Base Table of Net Decrement Ratios

Appendices 1 and 2 contain the final base table of net decrement ratios for termination ages and for retirement ages, respectively. The graphs of both base tables are shown in **graph 3**.

4.4.1 - Shape of the Base Table

In graph 3, the solid line represents termination net decrement ratios. They begin at 15% at age 22. They rise to a peak of 16% at age 25 and then begin a slow, but steady decrease to 6.8% at age 42. They remain fairly flat until age 52 when they begin to rise, jumping to almost 12% at age 55 and rising steadily to just under 29% at age 64. The marked jump at age 55 and above could be due to retirements, deaths, and disabilities that are included in the termination net decrement ratios as described in section 4.1. It was expected that termination rates would decline to close to zero by age 64 except for short term employees.

In graph 3, the dashed line represents retirement net decrement ratios. They begin at 8.7% at age 50, rising slowly to 12.3% at age 58. The ratios then begin a steep increase, reaching an initial peak of

47% at age 65 and 66. The ratios then fall to 42%, but rise to another peak of 60% at age 71 remaining there for ages 72 and 73.

There is a hump between ages 22 and 27 which may be the termination of younger employees who have not been with a company very long. It appears that once employees reach age 28, their position becomes a bit more secure and terminations fall and level out. Terminations begin to rise at age 52, but this may be due to retirements that are defined as terminations.

Retirement ratios begin to rise at age 58, perhaps due to some employees taking early retirement without the benefit of an "official" early retirement window. Retirement ratios peak at the "normal" retirement age of 65 followed by a second higher peak at age 71, this latter age being the age at which, perhaps, the tax advantages of saving for retirement end.

4.4.2 - Base Tables Split By Male and Female

Separate base table net decrement ratios were calculated for males and females. The results are presented numerically in **appendix 3** (termination ages) and **appendix 4** (retirement ages) and graphically in **graph 4** (termination ages) and **graph 5** (retirement ages).

From graph 4, it is very clear that females have much higher termination ratios than males, especially at the younger ages. The gap between female and male termination ratios decreases as age increases, and by age 56, males and females have basically the same ratios. The ratios for females and males have a very similar pattern and shape, although the female graph is not as smooth, due to smaller exposures for females.

Graph 5 indicates that from age 50 to 54, there is no major difference in retirement ratios between males and females. One is no more likely to retire at a very young age than the other. From age 55 to 62, females have higher ratios. From age 63 to 67, males and female ratios are about the same, with male ratios exceeding female ratios at a few ages. After age 67, exposure levels become very small, which would limit the validity of any conclusions.

4.4.3 - Variability by Plan

To help determine the variability among the 38 plans used to create the base tables, an "actual to expected" methodology was used.

The base table was used to calculate <u>expected</u> decrements by age by taking a plan's actual exposure for a particular age and multiplying it by the base table ratio at that age. The ratio of the plan's actual decrement for each age was divided by the expected decrement for that age. This gave an actual to expected (A/E) ratio at each age for each plan. This use of the term "expected" is not intended to imply that the base tables represent expected net decrement experience. A/E ratios are used in this study simply to highlight variations from the base tables.

Actual to expected ratios were calculated for each plan for each of the following age groupings:

> age 29 and under; age 30 to 39; age 40 to 49; age 50 to 64 (termination);

> age 50 to 64 (retirement); age 65 and above

An overall A/E ratio was also calculated for each plan.

An A/E ratio above 1.00 indicated that a plan had higher than average net decrement ratios. Conversely, a plan with an A/E ratio below 1.00 indicated they had lower than average net decrement ratios.

This analysis led to two main conclusions. First, if a plan had an overall A/E ratio in excess of 1, it had high A/E ratios at all age groups. The same was true for plans with low overall A/E ratios.

The second conclusion is given in the next section.

4.4.4 - Past Experience of A Plan Is Important

The second conclusion was that there was a great deal of variability between plans and there was a large range in overall A/E ratios. From this fact, it can be concluded that the correct net decrement ratios to use in pension plan calculations for any particular plan may depend on the recent experience of the plan if known by the actuary.

If a plan has no recent experience, then an actuary could use the base table ratios. However, if it is known from past experience that a plan has higher than normal turnover rates, either at the termination ages or retirement ages, then the base table ratios should be multiplied by a factor greater than 1.00 as determined by the actuary. Similarly if a plan has a history of low turnover rates, the base table should be multiplied by a factor less than 1.00.

For many plans, the base table should be used only as a starting point or as a guide. The ultimate decision as to what actual termination/retirement rates should be used, rests with the actuary.

4.5   Zero Years of Service

The negative decrement problem, which affected all plans at almost every age and year of service, was worst for those cells with 0 years of service. It was decided to eliminate the 0 years of service data from the analysis by years of service (see section 7).

Also, the cells with 0 years of service were "polluting" the base table of net decrement ratios more than any other cell. These cells were eliminated from the data used to create the final base tables. This had the effect of reducing the exposure but increasing the decrements, thus increasing the net decrement ratios. This increase in net decrement ratios was most visible at the younger ages, where most of the 0 years of service exposure was concentrated. There was no impact at the retirement ages.

The base table of net decrement ratios given in appendices 1, 2, 3 and 4 does exclude 0 years of service cells (along with excluding ERWs).

Appendix 5 compares net decrement ratios including and excluding 0 years of service for termination ages. The impact of removing 0 years of service can be seen in **graph 6.**

As might be expected from the preceding discussion, the impact is greatest at the younger ages. For example, at age 22 the net decrement ratio rises from 9% to 15% when 0 years of service cells are excluded. The gap between the ratios steadily decreases as age increases. The difference in net decrement ratios is 3% at age 25, 1.5% at age 30, 0.7% at age 35 and 0.5% or lower from age 40 and up.

Removing 0 years of service cells from the data had only a minimal impact on exposure. At the termination ages, 32,618 life years of exposure were lost by removing 0 years of service cells, or a drop of only 1.3% in exposure.

SECTION 5 - ANALYSIS BY VARIABLES

An actual to expected methodology was used to analyze the data by the variables of gender, industry code, location, compensation type and city size. Recall that an A/E ratio that is greater than 1 indicates that a variable has higher than average net decrement ratios (higher than the base table). Conversely, an A/E ratio less than 1 indicates that a variable has lower than average net decrement ratios.

The following analysis was done on each variable independently of any other variable. Section 6 analyses the impact of each variable taking into account interaction with other variables by using multiple regression techniques.

5.1 By Gender

As mentioned in section 1, not all plans gave gender information. A total of six plans, representing 17.9% of total exposure, did not give any male-female information. These plans were excluded from the analysis. The results of the A/E analysis are given in **appendix 6**.

Termination Ages

Males represented 69% of the total exposures and females 31%. As pointed out in section 4.4.2, females had higher termination ratios at all ages under 56. The A/E analysis also showed this to be true as at all age groups, females had A/E ratios around 1.40, while males had A/E ratios around 0.95.

Retirement Ages

Males represented almost 76% of total exposures. As noted in section 4.4.2, females had slightly higher ratios up to age 62, after which ratios were roughly the same. This was confirmed in the A/E analysis. For the 50 to 64 age group, females had an A/E ratio of 1.135, while males had a ratio of 0.91. For ages 65 and up, both male and females had ratios near 1.00.

Conclusion

The results of this analysis suggest that separate tables may be warranted for males and females, if not for all ages, then at least at the termination ages. If a separate table is not practical, then a gender adjustment factor, based on the percentage of females in a plan, should be found by which to multiply the base table. Suggestions for this gender adjustment factor are given in section 6.

5.2 By Industry Code

The 38 plans were placed into eight industry codes set up in phase 1 of the project by the University of Iowa. They are as follows:

    1 Manufacturers of food and textile products

    2 Lumber processors

    3 Chemicals, glass, plastics, printing

    4 Manufacturers of motor vehicles, aircraft and other machinery

    5 Manufacturers of electronic and communications equipment

    6 Utilities and communications services

    7 Retail and medical services

    8 Financial services

The results of the A/E analysis are given in **appendix 7**.

Termination Ages

It was clear that industry code 8 (financial services) had much higher A/E ratios than any of the other seven industry codes. The A/E ratio for industry code 8 was in excess of 2.50, while all other industry codes had ratios less than 1.00, except industry code 1 which had a ratio of 1.05. Industry code 8 provided 15.2% of the total exposure.

Retirement Ages

The results were the same as for the termination ages, but not as severe. Industry code 8 had the highest A/E ratio, nearly 1.70, while all other industry codes had A/E ratios less than 1.00.

Conclusions

Separate tables are not warranted by industry code. However, adjustments might be considered to the base table to adjust for specific industry codes. Section 6 will suggest what adjustments can be made for industry code when taking into consideration the interaction of all variables.

5.3 By Location

The 38 plans were placed into seven different geographic regions. These regions were determined by the University of Iowa during phase 1 of this project. The regions are as follows:

CA   California

NC   North Central (Illinois, Iowa, Michigan, Minnesota, Ohio, Ontario, west New York)

NE   North East (includes New England, eastern New York, New Jersey, Pennsylvania)

NW   North West (includes Idaho, Oregon)

SC   South Central (includes Arizona, Texas)

SE   South East (includes North Carolina, Tennessee, Virginia)

US   Plan location was not easily identifiable

The results of the A/E analysis are given in **appendix 8**.

Termination Ages

The North East (NE) location had the highest A/E ratio. The ratio for the NE was 1.80, while the ratios for all other locations were under 1.00. The North Central (NC) location had a low A/E ratio of 0.64. The NC represented the biggest percentage of exposure of all locations with over 48% of the exposure.

Retirement Ages

The NE region again had the highest A/E ratios (1.35) with the North West (NW) just around 1.00. All other locations had ratios less than 1.00, including the NC.

Conclusions

Separate tables by location are not warranted. However, adjustments might be considered to the base table to adjust for specific regions. Section 6 will suggest what adjustments can be made for location when taking into consideration the interaction of all variables.

5.4 By Compensation Type

There were three types of compensation: plans that had only salaried employees, plans that had only hourly employees and plans that had a combination of salaried and hourly employees. No attempt was made in the latter category to estimate the percentage of salaried and hourly employees for each plan. The results of the A/E analysis are given in **appendix 9**.

Termination Ages

Both salaried and salaried/hourly plans had A/E ratios in excess of 1.00, while hourly plans had an A/E ratio of 0.52. This seems to indicate that hourly plans had lower termination ratios.

Retirement Ages

The results were similar to the termination ages, but salaried and salaried/hourly plans had A/E ratios close to 1.00, while hourly plans had a ratio of 0.74.

Conclusions

Although it appears from the analysis above that a negative adjustment may be considered for hourly plans when using the base table for both termination and retirement ages, section 6 will show that compensation type is not a significant variable. Thus, no adjustment to the base table will be needed for compensation type.

5.5 By City Size

The 38 plans were grouped by whether they came primarily from a large or small city. This grouping was done by the University of Iowa during phase 1 of this project. The results of the A/E analysis are given in **appendix 10**.

Conclusions

At both termination and retirement ages, small city sizes had A/E ratios significantly less than 1.00 suggesting that termination ratios and retirement ratios were lower in small cities. However, as will be seen in section 6, when taking into consideration the interaction of all variables, city size will be a significant variable only in certain age groups, with a positive adjustment being suggested for small cities.

SECTION 6 - MULTIPLE REGRESSION ANALYSIS

6.1 - Introduction

The analysis of section 5 was done on each variable independently of the interaction with the other variables. To take account of this interaction, a multiple regression analysis was used.

The purpose of this analysis was two fold:

1. Identify which of the variables were significant when interaction of all variables was taken into account.

2. Use the coefficients in the resulting equation to represent the factors to be used to multiply the base table by to take account of the variables.

A multiple regression was performed on the 38 plans in the base table. The dependent variable was A/E ratios (not the actual net decrement ratio). The regression was performed by age group. Termination ages were broken into four age groups: 22-29, 30-39, 40-49 and 50-64, while retirement ages were broken into two age groups: 50-64 and 65 & over.

There were too many categories for the industry code and location variables. This left many categories with little or no data in them. It was decided to group some of the categories together.

The eight industry codes were compressed into five codes. Code 8 was kept by itself as was code 1. Code 2 was combined with code 3, as were 4 with 5 and 6 with 7. The groupings were done based on the analysis of variables of section 6, by attempting to group together codes that had similar A/E ratios.

The resulting A/E ratios of the combined codes were as follows:

Code	Termination	Retirement
1	1.05	0.91
2/3	0.45	0.72
4/5	0.80	0.83
6/7	0.35	0.80
8	2.52	1.68

For location, NE was kept by itself as was CA. The NC and SE were combined as were the NW, SC and US. This left four locations, down from the original seven. The groupings were chosen by attempting to group together locations that had similar A/E ratios as shown in the analysis of section 5.

The resulting A/E ratios of the combined locations were as follows:

Location	Termination	Retirement
CA	0.66	0.74
NC/SE	0.67	0.76
NE	1.80	1.35
NW/SC/US	0.37	0.64

No groupings were done for compensation type or city size.

To include gender as a variable, a percentage female was calculated for each plan based on total life year exposure. For the six plans that did not give gender information, an average percentage female was used based on the average of all groups with the same code, location, compensation and city size.

A variable representing duration was also included in the regression analysis. For termination ages, duration was taken to be the number of years of service. For retirement, duration was taken to be the number of years eligible for benefits. The duration variable was calculated to be the average duration for each plan for each particular age group.

6.2 - Methodology

A multiple regression with repeated measures was performed on the 38 plans and broken down over the six different age groups. For each age group, a variable was considered significant if its coefficient had a p-value of 20% or less. Once it was determined which variables were significant, a regression equation was created from the analysis at each age group.

The results were validated using the following procedure:

1. The resulting regression equation was used to calculate *predicted* A/E ratios for each plan at each age group.

2. These *predicted* A/E ratios were then converted to *predicted* net decrement ratios by taking the base ratio for that age group and multiplying by the predicted A/E ratio.

3. This *predicted* net decrement ratio was then compared to the *actual* net decrement ratio for each plan at each age group. The absolute value of the difference between these two numbers was calculated.

4. Step 3 was repeated, but this time comparing the *base table* ratio to the *actual* net decrement ratio for each plan at each age group.

For many plans, the deviation of the *actual* ratio and the *predicted* ratio was less than the deviation of the *actual* ratio and the *base table* ratio, which indicated the regression equation did a <u>better</u> job of predicting net decrement ratios than using the base table only. For other plans, the regression equation proved to be a poorer fit.

The mean absolute deviations were summed over <u>all</u> 38 plans for each age group. The total mean absolute deviation was <u>lower</u> using the predicted ratios (obtained by using the regression equation) than the total mean absolute deviation using the base table at every age group. This indicated that using the regression equation led to <u>better</u> predicted results overall than simply using the base table and ignoring the impact of any of the variables.

6.3 - Observations On The Original Regression Results

1. Industry code was a significant variable at all termination ages, although it was not industry code 8 that had the biggest increase. Code 4/5 had the biggest increase at all age groups, while code 6/7 had the biggest decrease.

2. Code 8 had the highest A/E ratio on its own (see section 5.2), but it had a higher percentage of female employees than average (about 60% female vs. the average of 32.1%). Code 8 also had 3 of the 5 groups in the NE region, which also had a high A/E ratio. Code 8 were all salaried or both hourly/salaried, both of which were compensation types which had A/E ratios in excess of 1.00. Also, code 8 plans had a fairly low average duration (for example, in age group 30-39 the average duration was 6.9 years vs. the overall average of 8.2 years -- lower duration means

higher net decrement ratios). When all these factors were taken into account, this lowered the impact of industry code 8.

3. On its own, code 4/5, had an A/E ratio of around 0.80. Yet, this combined code had the largest positive adjustment when taking into account all other variables. Part of the reason for this was that seven out of the 11 code 4/5 plans were in the NC/SE location which already had a low A/E ratio of about 0.67. The 11 groups for age group 0-29 had an average duration of 8.5 years. This is the point where termination ratios drop (see section 7). Code 4/5 also had about 73% male employees versus the overall average of 67.9%. Male employees have lower A/E ratios. When all these factors were taken into account, this increased the impact of code 4/5.

4. For the retirement age group 50-64, industry code was not a significant variable.

5. Location was a significant variable for age groups 30-39 and 40-49, and for both retirement age groups. In all these age groups, location NE had the greatest impact, except at ages 65 & over, where the location NW/SC/US had a slightly higher impact.

6. City size was a significant variable at all age groups between 30 and 64. The multiple regression analysis found that it was small cities that led to an increase in A/E ratios. In the independent variable analysis, small cities were seen to have A/E ratios well below 1.00 (see section 5.5).

7. Compensation type was only significant for the age group 30-39.

8. Gender was a significant variable at all age groups, with the exception of 50-64 in retirement. The higher the percentage of females in a plan, the higher the A/E ratio.

9. Duration was only significant at two age groups: 30-39 and 40-49. This is consistent with the results of section 7, where it was found that there seemed to be three plateaus in the net decrement ratios by years of service. The first drop occurs around duration 8-9. The average duration for plans in the 30-39 age group is 8.2 years. The second drop occurs at duration 12. The average duration for plans in the 40-49 age group is 12.9 years.

6.4 - Adjusting the Original Regression Equations

One of the main purposes of the multiple regression model was to allow the user to make adjustments, either up or down, to the base table of net decrement ratios depending on the characteristics of the plan they are looking at. The original regression results did not allow users to do this easily. Also, for certain combinations of industry code, location, compensation and city size, along with various values for the percentage of female, the regression equations led to a <u>negative</u> A/E ratio. Although mathematically correct, this type of result was not an acceptable one for practical purposes. As a result, a number of changes were made:

1. The original regression equations were shifted so that they began at 100, where 100 represents taking the base table and multiplying all the values by 1 (i.e. doing nothing to the base table). The new equations would now give a value that could then be used to multiply the base table numbers by to get the final net decrement ratios for a plan with a certain combination of variables, gender and duration. This eliminated the first problem and kept the basic regression equations intact.

2. To deal with the second problem, further work was done on the shifted equations to find an intercept coefficient and a slope coefficient for the percentage female. There were two main constraints:

   a) For any combination of variables, the final result could not be negative and could not be any lower than 30 (i.e. multiply the base table values by 30%). There was no set upper limit. (note: the lower bound of 30 was set arbitrarily)

   b) The mean absolute deviation for all 38 plans must be reduced by using the new predicted equations.

Once this was done, the adjustment coefficients of each significant variable in each age group were rounded to the nearest 5, with no final coefficient greater than 60 or lower than –60.

The final equations kept the same significant variables, with the coefficients still being positive or negative as they were in the original equations. However, compensation was removed as a significant variable from the only age group in which it appeared (30-39), and the gender variable was put back in the 50-64 retirement age group, even though the original equations did not show gender as being significant.

6.5 - The Final Equations

The final equations are below. Included is the percentage reduction in mean absolute deviation by using the final predicted equations instead of the base table.

Age 22-29   reduction in mean absolute deviation = 19.3%

$$
\begin{array}{lll}
& \underline{\text{industry code}} & \underline{\text{gender}} \\
\text{Adjustment factor} \;=\; 90 & -\,20\,(\mathrm{I}\,1) & +\,40\,(\%\text{ female}) \\
& +\;\;\,0\,(\mathrm{I}\,8) & \\
& -\,50\,(\mathrm{I}2/3) & \\
& +\,40\,(\mathrm{I}4/5) & \\
& -\,60\,(\mathrm{I}6/7) &
\end{array}
$$

<u>Age 30-39</u>   reduction in mean absolute deviation = 18.6%

	industry code	location	city size	gender
Adjustment factor = 125	− 60 (I 1)	− 30 (CA)	− 5 (large)	+ 30 (% female)
	+ 10 (I 8)	− 15 (NC/SE)	+ 30 (small)	
	− 50 (I2/3)	+ 40 (NE)		
	+ 35 (I4/5)	− 15 (NW/SC/US)		duration
	− 45 (I6/7)			− 10 (average duration − 8.2)

<u>Age 40-49</u>   reduction in mean absolute deviation = 19.3%

	industry code	location	city size	gender
Adjustment factor = 125	− 45 (I 1)	− 35 (CA)	− 5 (large)	+ 21 (% female)
	+ 35 (I 8)	− 15 (NC/SE)	+ 30 (small)	
	− 55 (I2/3)	+ 40 (NE)		
	+ 25 (I4/5)	− 20 (NW/SC/US)		duration
	− 55 (I6/7)			− 5 (average duration − 12.9)

<u>Age 50-64 (termination)</u>   reduction in mean absolute deviation = 20.6%

	industry code	city size	gender
Adjustment factor = 95	− 25 (I 1)	− 5 (large)	+ 16 (% female)
	+ 35 (I 8)	+ 30 (small)	
	− 40 (I2/3)		
	+ 20 (I4/5)		
	− 50 (I6/7) ˎ		

Age 50-64 (retirement)   reduction in mean absolute deviation = 8.8%

		location	city size	gender
Adjustment factor	= 95	− 10 (CA)	+ 0 (large)	+ 20 (% female)
		− 5 (NC/SE)	+ 10 (small)	
		+ 15 (NE)		
		+ 0 (NW/SC/US)		

Age 65 & over   reduction in mean absolute deviation = 13.1%

		industry code	location	gender
Adjustment factor	= 90	− 20 (I 1)	− 20 (CA)	+ 40 (% female)
		− 30 (I 8)	− 5 (NC/SE)	
		− 5 (I2/3)	+ 15 (NE)	
		+ 15 (I4/5)	+ 25 (NW/SC/US)	
		− 15 (I6/7)		

6.6 - Examples of How To Use The Above Equations

Age 0-29

1. Code 1 with 30% females : $90 - 20 + 0.4 (30) = 82$ (i.e. 0.82 times the base table)

2. Code 5 with 52% females: $90 + 40 + 0.4 (52) = 150.8$ (i.e. 1.508 times the base table)

Age 30-39

1. Code 8, location NC, small city, 26% female, avg duration = 7.2 :

    $125 + 10 - 15 + 30 + 0.30 (26) - 10 (7.2 - 8.2) = 167.8$ (i.e. 1.678 times the base table)

2. Code 6, location SC , large city, 40% female, avg duration = 9.4 :

    $125 - 45 - 15 - 5 + 0.30 (40) - 10 (9.4 - 8.2) = 60$ (i.e. 0.60 times the base table)

<u>Age 40-49</u>

1. Code 2, location NE, large city, 20% female, avg duration 14 :

    $125 - 55 + 40 - 5 + 0.21 (20) - 5 (14 - 12.9) = 103.7$ (i.e. 1.037 times the base table)

2. Code 4, location CA, small city, 38% female, avg duration 11.2:

    $125 + 25 - 35 + 30 + 0.21 (38) - 5 (11.2 - 12.9) = 161.48$ (i.e. 1.615 times the base table)

<u>Age 50-64 (termination)</u>

1. Code 7, large city, 58% female : $95 - 50 - 5 + 0.16 (58) = 49.28$ (i.e. 0.493 x base table)

<u>Age 50-64 (retirement)</u>

1. Location SE, small city, 22% female: $95 - 5 + 10 + 0.20 (22) = 104.4$ (1.044 x base table)

<u>Age 65 & over</u>

1. Code 3, location US, 31% female: $90 - 5 + 25 + 0.4 (31) = 122.4$ (1.224 times base table)

SECTION 7 - TERMINATION AGES: ANALYSIS BY YEARS OF SERVICE

An analysis by years of service was carried out for all plans at the termination ages only, for both

male and female combined. In the data, it was not made clear whether years of service was defined

to be the number of years since an employee joined a company or the number of years since the

employee became eligible to join the company's pension plan. In many cases, an employee is

eligible to join the pension plan as soon as he/she begins employment with the company. This is the

assumption made in defining years of service for this section.

An analysis for the retirement ages by years eligible for benefits is done in section 8.

The net decrement ratios are shown in **appendix 11** and are graphed in **graph 7**. Zero years of service cells are excluded.

Observations

1. The net decrement ratio for one year of service was much lower than for two or three years of service. This was not expected. If anything, the termination ratio for one year of service should be one of the highest, if not the highest ratio. The termination ratio for one year of service was half the ratio for three years of service.

2. The relatively low ratio for one year of service was due to the negative decrement problem, as discussed in section 3.1.1. This problem exists at almost every age and duration, but was worst for the zero years of service cells. There were also many negative decrements occurring in the one year of service cells. This caused the net decrements to be lower than they should be, thus causing the net decrement ratio for one year of service to be lower than expected.

3. As can be seen from graph 7, there appear to be three distinct levels of ratios. The first level applies to durations 1 to 8, where net decrement ratios are around 15%. The second level is from durations 9 to 11 where net decrement ratios are about 10%. The third level stretches from durations 12 to 28, where net decrement ratios are fairly level at around 4%.

4. There was a noticeable drop in the net decrement ratio at duration 29. The ratio drops from 3.7% to less than 1%. This is possibly due to 30 years of service being the "magical" number for many workers to become eligible for full pension benefits. Very few workers would be willing to quit their jobs at that point.

5. There was a significant rise in the ratio at duration 30. The ratio jumps from less than 1% to about 8.5%. This increase may be due to retirements that have been classified in the study as terminations.

SECTION 8 - RETIREMENT AGES:

ANALYSIS BY YEARS ELIGIBLE FOR BENEFITS

An analysis by years eligible for benefits was carried out for all plans at the retirement ages, for both male and female combined. The results were split by eligibility for reduced and unreduced benefits. Years eligible for benefits is defined to be the number of years since an employee first became eligible for either reduced or unreduced benefits.

The net decrement ratios are shown in **appendix 12** and are graphed in **graph 8**. Zero years eligible for benefit cells were included.

Observations

1. The table for reduced benefits was cut off after 20 years, with the level of exposure after duration 10 being very small. The table for unreduced benefits was cut off after 40 years. Exposure levels were very small after duration 10 as well, although they remained level at around 800 life years up to duration 30.

2. Retirement ratios for reduced benefits were much smaller than for unreduced benefits, being roughly one third as high for durations 0 to 5 and about half as high for durations 6 to 10.

3. The net retirement ratios for unreduced benefits started at around 28% and rose quickly to 36% at duration 4. Ratios basically leveled off at around 35% until duration 10. After duration 10, ratios fell very quickly to around 13% at duration 15. They remained basically level until duration 20 when they fell to 10%. They remained at this level until duration 29 when they

jumped to 13.5%. At this point, exposure levels were too small to draw any credible conclusions.

4. The net retirement ratios for reduced benefits had a similar shape as for the unreduced benefits. Ratios started out at around 11.5% and steadily increased to 26% at duration 9, after which they steadily dropped to around 11% at duration 12. After that, exposure numbers began to get too small to draw any credible conclusions.

SECTION 9 - AGE vs. DURATION TABLES

9.1 Five Year Select Table

A five year select table was created, even though the analysis by years of service of section 7 indicated that there was no advantage to producing an age and duration table, especially at the termination ages (unless you used the duration blocks of 1 to 8, 9 to 11 and 12 & over).

This table is given in **appendix 13** for termination ages (where duration = years of service) and **appendix 14** for retirement ages (where duration = years eligible for benefits).

Observations

The ratios in the one year of service column are much lower than in the 2 to 5 year duration columns. This is due to the negative decrement problem as mentioned in observation 1 of section 7.

The ratios for durations 2 to 5 are, for the most part, level. As noted in observation 2 of section 7, termination rates are level from duration 2 to 8.

The ratios in the 6 & over column are much lower than the ratios in the duration 5 column. The 6 & over column is the average net decrement ratio for durations 6 to 35. At durations 11 and greater, the net decrement ratio is around 4%.

9.2 Comparison to Vaughn 3 Year Select and Ultimate Table

In the early 1990s, a research project was undertaken by Roger Vaughn to analyze patterns of employee terminations for some of his clients. The results of the study were published by Mr. Vaughn in the August 1992 Pension Forum. The study resulted in a 3-year select and ultimate table of employee termination rates from age 20 to 54. The data used in the study came from experience data provided by 14 companies from 1987 to 1989, based on employees with at least one year of service. The table is reproduced in **appendix 15** and has become known as the Vaughn Table.

A comparison was made between the Vaughn Table and the 5 year select table of Appendix 13.

It should be carefully noted that the Vaughn table has been graduated to produce a very smooth declining pattern, both by age, and by duration within each age. On the other hand, the termination table given in appendix 13 is based on raw data representing net decrement ratios and was not graduated.

The table of appendix 13 is a 5 year select and ultimate table, while the Vaughn table is a 3 year select table. To do comparisons, the 6 & over column was compared to the 4 or more column of the Vaughn table.

The results of the comparison are given in **appendix 16**, which gives the ratio of the Vaughn rates divided by the net decrement ratios of appendix 13. A ratio greater than 1.00 represents a higher termination rate for the Vaughn table.

<u>Observations</u>

1. At duration 1 it was clear that the Vaughn termination rates were much higher that what was found in this study. A large part of the reason is due to the negative decrement problem as mentioned in section 9.1, which has caused the net decrement ratios for duration 1 to be understated in this study.

2. For both durations 2 and 3, the Vaughn rates were higher than the ratios found in this study at the younger ages. This difference in rates steadily declined until the Vaughn rates were lower than the ratios in this study. This occurred around age 45 for duration 2 and around age 35 for duration 3. However, overall the Vaughn rates and the ratios of this study were fairly similar.

3. For the ultimate part of the table, the ratios of this study were lower than the Vaughn rates. Part of the reason is that the comparison is made between those with four or more years of service (Vaughn) and those with six or more years of service (base table).

9.3 Ten Year Select Table

In addition to the 5 year select table of section 9.1, a 10 year select table for termination ages was created. This table is shown in **appendix 17**. A ten year select table was not produced for retirement ages.

The 10 year select table has the same problem associated with the one year of service column as the 5 year select table. The main advantage of the 10 year select table is that the ratios do not decline as much in the 11 & over column as they had in the 6 & over column in the five year select table.

SECTION 10 - IMPACT OF EARLY RETIREMENT WINDOWS

There were 13 plans that offered an early retirement window (ERW), with three of them offering an ERW in two different years.

The final base tables of appendices 1 and 2 do not include early retirement windows. ERW data were taken out of both the retirement <u>and</u> termination ages, the thought being that a company that offered an ERW during a year may also see a rise in its terminations due either to the ERW being part of a larger downsizing effort on the part of the company or due to employees leaving the company because they see an ERW as a signal that the company plans more downsizing in future years.

Two analyses were performed to measure the impact ERWs had on both retirement ratios and termination ratios. The first, described in section 10.1, assessed the overall impact on ratios by putting the ERW data back into the final base tables. The second analysis, described in section 10.2, considers the affect on termination and retirement ratios in those plans and those years, in which an ERW window was offered.

The ERW analysis was performed <u>including</u> the 0 years of service cells. The base table that includes 0 years of service was used (this table is not given in any appendix) rather than the final base tables of appendices 1 and 2. For the actual-to-expected analysis of section 10.2, the base table that includes 0 years of service was also used to calculate the expected net decrements.

Given that the aim of this analysis is to compare ratios with and without ERWs, it does not matter whether 0 years of service cells are included or excluded.

10.1 Base Tables With and Without ERWs

Appendix 18 gives base net decrement ratios for terminations and retirements including and excluding ERW data. This appendix also gives the difference between the ratios including ERWs and the ratios excluding ERWs. This latter column gives an indication of the impact of ERW on both termination and retirement ratios.

Termination net decrement ratios with and without ERWs are graphed in **graph 9** and the corresponding retirement ratios are graphed in **graph 10**.

10.1.1 - Termination Ratio Observations

From graph 9, it appears as though there was only a minimal impact on termination ratios due to ERWs until about age 48. Appendix 18 shows that ERWs increased termination ratios by roughly one percentage point at the younger ages 22 to 27. From age 28 to 43, there was no discernible increase in termination ratios due to ERWs and only a 0.5 percentage point increase for ages 44 to 46. At age 47, the increase was once again one percentage point, rising to about two percentage points from age 52 to 59 (note the increase at age 55 is 2.7 percentage points). From age 60 to 64, ERWs increased termination ratios by about 2.7 percentage points, on average. Part of the reason for this higher increase from age 60 to 64, was due to retirements that are defined to be terminations.

10.1.2 - Retirement Ratio Observations

Graph 10 shows that the impact of ERWs on retirement ratios was a bit more prominent. Retirement ratios including ERWs were higher at every age than the ratios excluding ERWs. Appendix 18 shows that retirement ratios with ERWs were about two percentage points higher for ages 50 to 55, about 2.5 percentage points higher for age 56 to 59, reaching a peak difference of 2.9 percentage points at age 60, then falling to about two percentage points higher at age 65 and one point higher at age 71. The larger difference in ratios at ages 50 to 60 was expected as these are the ages for which companies target their ERW offers.

10.2 Only Those Plans and Plan Years With ERWs

To try and isolate the impact of an ERW, an analysis was done on the 13 plans that offered ERWs, looking only at those years in which an ERW was offered. Total net decrements were calculated at each age and then compared to an expected decrement that was based on the base table (which included 0 years of service, but excluded ERWs). An actual to expected ratio was then calculated for

each age. The results, for both termination and retirement ages, are shown in **appendix 19**. The A/E ratios for termination ages were graphed and the results are shown in **graph 11**. The graphed A/E ratios for retirement ages are shown in **graph 12**.

10.2.1 - Termination Ages Observations

An A/E ratio of 1.00 represents a net decrement ratio that is the same as the base table. From graph 11, it can be seen that A/E ratios were greater than 1 at all ages. Terminations ratios in an ERW year were about 75% higher at age 22 than in a non ERW year. Ratios in an ERW year were about 40% higher at ages 23-24, falling fairly smoothly to about 6.5% higher at age 40. From age 41 to 54, there was a steep increase from 16% higher to almost 200% higher (i.e. termination ratios in an ERW year at age 54 are almost <u>triple</u> those in a non ERW year). The increase declined to about 70% at age 57, then rose again to about 100% higher (i.e. double) from ages 59 to 64.

Graph 11 indicates that there was a significant impact on termination ratios due to the existence of an ERW. However, caution must be used before concluding that ratios double or triple from age 50 to 64 because many of these terminations may actually be retirements.

10.2.2 - Retirement Ages Observations

As can be seen from graph 12, there was a significant impact on retirement ratios due to the existence of an ERW. At age 50, ratios were more than double those in non ERW years. This increase rises steadily to about a 170% increase (nearly triple) in ratios at ages 56, 57 and 58. This graph confirms that the major impact on retirement ratios occurred at the ages 50 to about 60. These are the ages at which workers generally would not retire unless they were offered some sort of early

retirement package. The data seems to shows the existence of an early retirement package had the intended effect of increasing retirements.

10.3 Impact of an ERW Varies by Plan

In addition to the analysis of section 10.2, net decrement ratios by year were also calculated for each of the 13 plans that offered an ERW. This showed what a plan's normal termination and retirement ratios looked like and what they increased to in the year the ERW was offered.

The results of this analysis are not included in this report, but one major conclusion of this analysis was that the impact on termination, and especially retirement ratios due to an ERW, varied significantly by plan. For some plans, retirement ratios tripled due to an ERW, while for a few other plans, retirement ratios only went up 20% to 30%.

The success of an ERW depends, for a large part, on how generous was the early retirement package. Although the data did not indicate how generous the early retirement package was, it can be speculated that a low rise in retirement ratios for a plan may have been due to having offered a less generous early retirement package, at least in the eyes of the employees to whom it was offered, or perhaps due to the fact that the employer was only targeting a small reduction in employment.

SECTION 11 - ANALYSIS OF 1989-92 vs. 1993-94

The final base table data covered data from 1989 to 1994. The data was broken up into two time periods: the first four years from 1989 to 1992 and the last two years from 1993 to 1994. Analyses were performed to determine if there had been any noticeable change in net decrement ratios over the time periods studied. It was suspected that termination ratios (and perhaps retirement ratios as well) would increase as the 1990s progressed, due to the impact of downsizing.

The net decrement ratios for the termination ages are given in **appendix 20** and the results are shown in **graph 13**. The ratios for the retirement ages are given in **appendix 21** and graphed in **graph 14**. Note that the data used in this analysis does not include early retirement windows, but it <u>does</u> include 0 years of service cells.

11.1 Observations - Termination Ages

From appendix 20, total exposure for the six year period 1989-1994 was split 68% for the first four years and 32% for the last two years, 1993-94.

From graph 13, it can be seen that termination ratios were higher for the years 1989-92 than for the years 1993-94 at every age except the youngest age of 22. The difference in ratios averaged between two and three percentage points. This result was the opposite of what was expected.

There are two types of terminations: employer driven and employee driven. During periods of downsizing, most of the terminations would be employer driven, although there would still be some employee driven terminations as employees leave the company due to the perceived uncertainty of their job or due to the stress of remaining on the job if they have managed to avoid being downsized.

During periods where the economy is performing poorly, there may be less employee driven terminations as employees may feel that they won't be able to find a job anywhere else. On the other hand, when the economy is performing well, employees may be more likely to leave a job because there are ample opportunities available elsewhere.

11.2 Observations - Retirement Ages

From appendix 21, total exposure for the six year period was split 73% for the first four years and 27% for the last two years.

From graph 14, there appears to be no discernible difference in retirement ratios between 1989-92 and 1993-94, other than at ages 67 and up where it appears that retirement ratios are substantially lower in the years 1993-94. However, exposure levels begin getting low at age 67 making it difficult to draw any meaningful conclusions.

SECTION 12 - ANALYSIS OF TWO OTHER LARGE PLANS

As mentioned in section 2, the database originally contained data from 41 plans. Two of these plans were not used because their data was in a format which differed significantly from the other 39 plans. These two plans gave decrement and exposure information by age and sex (i.e. they gave the number of members who left employment due to termination, retirement, death or disability). Since decrement rates could be produced using these two plans rather than net decrement ratios, their data was inconsistent with that of the other 39 plans. As a result, the two sets of data could not be combined.

For these two large plans, termination and retirement rates were calculated. The results for both terminations and retirements are given in **appendix 22**. The two tables were graphed together in **graph 15**. The termination table was graphed separately in **graph 16** and the retirement table was graphed separately in **graph 17**.

12.1 Observations

Termination Ages

Total exposure for terminations was 526,659 life years. This represented 24.2% of the total exposure used in the final base table of appendix 1, indicating that these two plans were indeed quite large and had results that were credible. There were terminations as young as age 15 (similar to the data from the other 39 plans), but to be consistent with the final base table, it was decided to look at terminations from age 22 to 65 (note: the final base table went to age 64).

From graph 16, it can be seen that termination rates started at 8.4% and had a small hump at age 25 before beginning a slow but steady (and smooth) decline to almost 0 by age 65. Compared to the final base table of graph 3, termination rates were much lower at all ages. The shape is fairly similar, as the hump at age 25 also showed up in graph 3. However, the final base table ratios took an upward turn at age 52 whereas the rates for the two other plans continued to decline to close to 0 by age 65. This added credibility to the point made earlier that some of the decrements for termination exposures between ages 50 and 64 in the final base table were actually retirements, deaths, or disabilities.

Retirement Ages

Total exposure for retirements was 126,360 life years. This represented 35.3% of the total exposure used in the final base table of appendix 2. There were retirements from age 50 to 72, which is consistent with the final base table.

Graph 17 shows that retirements were almost negligible for ages 50 to 54. Starting at age 55, retirement rates began a slow rise from 2.6% to 12.4% at age 64. At the normal retirement age of 65, there was a large jump in the rate to over 50% and then to 93% at age 66. Rates took a big drop after age 66 (although as can be seen from appendix 22, so does exposure), and then reached another peak at age 71 and 72. Compared to the final base table, retirement rates were much lower at every age except 65, 66, 71 and 72.

12.2 Conclusions

1. When this study was started, it was expected that termination rates would have the following form: start high at the younger ages, perhaps remaining high for a few of the younger ages, before falling slowly as age increased, reaching a rate close to zero at age 64 or 65. On the other hand, retirement rates would begin at age 50, but be almost zero until age 55, which could be considered the first age at which a typical worker may seriously consider retiring. Rates would remain low, but rising, up to age 64. At age 65, a spike in the retirement rate was expected, perhaps spilling over to age 66. It was expected that rates would fall with a second jump occurring at age 71.

   This was precisely the shape that these two plans gave. However, the base tables of appendix 1 and 2 did not follow this expected pattern.

   This does not mean that the final base tables produced by the main 38 plans have no validity. However, it does suggest that the next time a study of this magnitude is conducted, contributors should be requested to provide data on the number of new entrants, deaths and disablements, in addition to data on terminations and retirements. Contributors should also continue to ensure, as much as possible, the integrity of their data contributions, including that terminations and retirements are classified correctly.

2. The rates determined by these two plans were much lower than for the other 39 plans. This was consistent given the location and industry code of these two plans. Plans in both the location and industry code of these two plans showed lower termination and retirement ratios than certain other locations and industry codes.

12.3 Analysis by Male and Female

An analysis by gender was also made from the data of the other two plans. The results are given in

appendix 23 for terminations and **appendix 24** for retirements. The termination rates are graphed in

graph 18 and the retirement rates are graphed in **graph 19.**

Termination Ages

There was 54% male exposure and 46% female exposure. Similar to the final base tables, female

rates were higher than male rates at every age until age 62. Female rates were about 2 percentage

points higher at age 22, reaching a maximum difference of 4 percentage points at age 25. After age

25, the gap between female and male rates slowly but steadily declined (as it did in the final base

tables), until it was basically zero at age 62. However, the difference between female and male rates

was much smaller than under the final base tables.

Retirement Ages

There was 66.5% exposure for males and 33.5% exposure for females. From graph 19, it can be

seen that there was not much difference between male and female retirement rates until age 67 (an

age at which exposure became very low). This was a bit different than the final base tables which

did show that female retirement ratios were a bit higher than male ratios for ages 55 to 62.

SECTION 13 - COMPARISON TO SARASON T-TABLES

In 1950, Crocker, Sarason, and Straight published the T-tables. The T-tables later appeared in the "The Actuary's Pension Handbook", published in 1955. Since that time, the T-tables and variations thereof, have been used by pension actuaries in many applications, including calculating employee benefit costs for pension and retiree medical plans. These tables have become known over time as the Sarason T-tables (with apologies to Crocker and Straight).

It should be noted that these tables were constructed in 1950, which pre-dates ERISA. In 1950, it was not uncommon for pension plans to have a 5 year eligibility period. That is, an employee had to wait until he/she had worked for an employer for five years before becoming a member of the pension plan. Today, in the US, an employee needs only to wait a maximum of one year before becoming a member, and in many cases, an employee is eligible the day he/she joins a company. As a result of this, the T-tables have been generally accepted as being conservative.

A comparison was made of the termination base table of appendix 1 and four of the T-tables. The four T-tables chosen were T-1, T-3, T-5 and T-9. The results are given in **appendix 25** and the graph of the results is shown in **graph 20**.

Observations

It should be kept in mind that the T-tables represent annual rates of termination, while the termination base table gives net decrement ratios. The rates calculated in the T-tables represent termination decrements divided by exposure. The net decrement ratios of the base table are net decrements (terminations + deaths + disabilities + retirements − new entrants) divided by exposure. In effect, we are not precisely comparing the same things, although terminations represent most of

the net decrement in many valuation cells where there are few new entrants, no retirements, and the number of deaths and disabilities is relatively insignificant.

The ratios given in the last four columns of appendix 25 are the net decrement ratios divided by the T-table termination rates. A ratio in excess of 1.00 indicates that the base table ratios exceeded the T-table rates at that age.

1. The termination base table net decrement ratios exceed the T-table termination rates at every age for tables T-1, T-3 and T-5. This was not totally unexpected since, as pointed out above, the T-tables are conservative.

2. A comparison was made to table T-9 because this was the first T-table for which the termination base table ratios were less than the T-table rates. Ratios are less than 1.00 at every age up to age 48. Table T-9 seems closest to the termination base table.

3. In all four comparisons, the ratios climb to 13.07 by age 64, indicating that the termination base table ratios are 13 times higher than the T-table rates by age 64. In all four cases, the ratios in the last four columns begin rapidly increasing after age 50. Part of the reason is that the T-tables use the 1951 Group Annuity Mortality table from age 50 and up, whereas the base table still uses termination data. Also, as seen in appendix 1 and graph 3, the termination base table ratios begin to rise after age 50, whereas the T-table rates also rise after age 50, but not nearly as rapidly.

In conclusion, the termination base table net decrement ratios are higher at every age when compared to the T-tables T-1, T-3 and T-5. This indicates that terminations have increased since the year the T-tables were produced (1950). Table T-9 appears to be the T-table that is closest to the termination base table.

SECTION 14 - FINAL COMMENTS AND SUGGESTIONS

Despite the problems with the data, there were many useful and interesting observations as a result of the analysis. A few final comments are listed below.

1. The form in which data was submitted led to calculating net decrement ratios, which included new hires and rehires. This was not what was originally intended when the data was first collected. It was hoped that termination and retirement rates could be calculated. Again, it must be stressed that the base tables given in this report should be used only as a guide or as a starting point for calculating termination or retirement rates. An actuary should use his or her judgment along with a plan's history when performing any future benefit calculations.

2. The negative decrement problem also led to relatively low net decrement ratios for employees with one year of service. This resulted in the 5 year and 10 year select tables of section 9 having unusually low ratios in year one. They should be used with caution.

3. Net decrement ratios include the effect of decrements due to death and disability, in addition to termination and retirement. This may be the reason that the net decrement ratios for termination exposures started to rise at age 50, reaching a peak of almost 30% at age 64.

4. Most plans used in this report also gave salary and accumulated benefit information. However, the data were not suitable to create termination and retirement tables with the exposure bases of salary or accumulated benefit, which had been one of the original objectives of this study.

The data of the other two large pension plans (see section 12) is a good model as to how data for the next study should be collected. However, even this data had shortcomings. It did not give any years of service information, nor did it give salary or accumulated benefit information. The data was not given separately by year, so that no analysis by year could be made. It did not give information regarding the number of years an employee was eligible for reduced and unreduced benefits. On the

other hand, the data from the 38 plans used in this study had every type of information that could possibly be needed in a study like this, except it contained only census data and no information on decrements.

For future studies, an improvement in the results can be expected if the data were collected so as to give the following:

1. Total decrement and exposure information for each cell (age, sex, years of service, and experience year).

2. Decrements should be identified by cause of decrement. New entrants should also be identified.

3. Salary and accumulated benefit information should be included by cause of decrement and for those who do not decrement for each cell.

4. It should be clearly defined what it means for an employee to have 0 years of service.

Plan years in which an early retirement window was offered should continue to be noted, as was done for this study.

SECTION 15 - ACKNOWLEDGMENTS

Oversight of this project on behalf of the Society of Actuaries was provided by the Non-Mortality Decrements Task Force. This task force was appointed by the Committee on Retirement Systems Research to collect and analyze the current turnover and retirement experience of private pension plans. This report is ultimately the result of the efforts of these volunteers.

The Society of Actuaries would like to thank these volunteers, the researchers from the University of Iowa (Bruce Jones and Kelley McKeating) who assembled the contributed data into a reliable database, and the researchers from the University of Western Ontario (Steve Kopp, John Mereu, and Rob Jackson) who analyzed the data and produced this report. The Society of Actuaries would also like to extend a special thanks to the consulting firms who contributed the data which made this study possible:

Base Table of Net Decrement Ratios - Termination
Life Years Exposure Base
Excludes 0 Years of Service

age	Net Decrement	Net Exposure	Net Decrement Ratio
14	2.0	2.0	1.0000
15	2.0	2.5	0.8000
16	42.0	70.0	0.6000
17	49.0	141.5	0.3463
18	122.0	315.5	0.3867
19	100.0	1045.5	0.0956
20	450.5	3109.0	0.1449
21	662.0	8174.0	0.0810
22	2255.0	15053.0	0.1498
23	3393.5	22420.0	0.1514
24	4872.0	30740.0	0.1585
25	6124.5	38405.0	0.1595
26	7034.5	45246.5	0.1555
27	7885.5	51394.0	0.1534
28	8207.5	56576.5	0.1451
29	8373.5	61505.0	0.1361
30	8884.0	66135.5	0.1343
31	9193.5	69843.0	0.1316
32	8469.5	72896.0	0.1162
33	8126.0	75562.0	0.1075
34	7798.0	77760.0	0.1003
35	7688.5	79372.0	0.0969
36	7198.5	79974.0	0.0900
37	6648.0	80503.0	0.0826
38	6543.0	80884.5	0.0809
39	6276.0	80924.5	0.0776
40	6170.5	80862.5	0.0763
41	5713.5	80837.0	0.0707
42	5629.5	83201.0	0.0677
43	6007.5	82178.0	0.0731
44	5475.5	81540.5	0.0672
45	5208.0	79586.0	0.0654
46	5501.0	79654.0	0.0691
47	5422.0	75436.5	0.0719
48	5899.0	73070.5	0.0807
49	5042.0	69654.0	0.0724
50	3626.0	59084.5	0.0614
51	3344.5	53503.0	0.0625
52	3626.0	48901.0	0.0741
53	3597.0	44851.0	0.0802
54	3226.0	41191.0	0.0783
55	1870.5	15721.5	0.1190
56	1199.5	7633.0	0.1571
57	1079.0	6854.5	0.1574
58	985.0	6200.5	0.1589
59	928.5	5542.5	0.1675
60	802.5	4476.5	0.1793
61	796.0	3985.0	0.1997
62	624.5	2894.0	0.2158
63	445.5	1910.0	0.2332
64	420.5	1458.5	0.2883
	209,040.0	2,188,281.0	

Base Table of Net Decrement Ratios - Retirement
Life Years Exposure Base
EXCLUDES 0 Years of Service

age	Net Decrement	Net Exposure	Net Decrement Ratio
50	636.0	7323.5	0.0868
51	808.0	9314.0	0.0868
52	854.5	10058.0	0.0850
53	924.5	10739.5	0.0861
54	1131.5	11365.0	0.0996
55	3327.0	33775.0	0.0985
56	4119.0	38314.0	0.1075
57	3853.5	35534.5	0.1084
58	4099.0	33373.5	0.1228
59	4444.0	30872.0	0.1439
60	4950.5	28549.5	0.1734
61	5749.5	25189.5	0.2282
62	6715.0	22209.5	0.3023
63	5566.0	17276.0	0.3222
64	4645.0	13041.0	0.3562
65	5042.5	10707.5	0.4709
66	3213.0	6748.0	0.4761
67	1791.5	4293.5	0.4173
68	1290.5	3097.0	0.4167
69	939.5	2214.0	0.4243
70	716.5	1552.5	0.4615
71	610.5	1015.5	0.6012
72	363.5	602.5	0.6033
73	211.0	352.0	0.5994
74	128.0	225.0	0.5689
75	89.5	161.5	0.5542
76	52.0	105.5	0.4929
77	36.0	62.0	0.5806
78	21.0	37.5	0.5600
79	14.5	26.5	0.5472
80	9.5	17.0	0.5588
81	5.0	10.0	0.5000
82	4.5	7.5	0.6000
83	7.0	10.0	0.7000
84	8.0	10.0	0.8000
85	2.5	3.0	0.8333
86	1.5	1.5	1.0000
87	2.0	2.0	1.0000
	66,382.5	358,196.0	

Net Decrement Ratios — Termination Ages
By Gender — 0 Years of Service Excluded

	Male			Female		
age	Net Decrement	Net Exposure	Net Decrement Ratio	Net Decrement	Net Exposure	Net Decrement Ratio
22	849.0	7114.0	0.1193	1042.0	5294.0	0.1968
23	1339.0	10278.0	0.1303	1605.5	8241.0	0.1948
24	1903.5	13675.5	0.1392	2464.0	11625.5	0.2119
25	2554.5	17036.5	0.1499	2988.5	14447.5	0.2069
26	3050.0	20318.0	0.1501	3320.0	16685.0	0.1990
27	3627.0	23486.5	0.1544	3553.0	18420.0	0.1929
28	3961.0	26251.0	0.1509	3471.0	19542.5	0.1776
29	4139.5	28918.0	0.1431	3399.5	20501.0	0.1658
30	4398.5	31541.5	0.1395	3668.0	21320.0	0.1720
31	4585.0	33994.5	0.1349	3807.5	21600.0	0.1763
32	4192.0	36440.5	0.1150	3484.5	21549.5	0.1617
33	4236.0	38931.0	0.1088	3143.0	21388.0	0.1470
34	3986.0	41186.5	0.0968	3057.5	21256.5	0.1438
35	3987.5	43192.5	0.0923	2994.5	20936.5	0.1430
36	4074.0	44464.5	0.0916	2557.5	20334.0	0.1258
37	3872.0	45354.0	0.0854	2226.0	20116.5	0.1107
38	3705.5	46212.0	0.0802	2279.0	19852.0	0.1148
39	3455.5	46630.5	0.0741	2286.5	19455.0	0.1175
40	3644.0	47326.0	0.0770	2041.0	18736.0	0.1089
41	3531.0	47819.0	0.0738	1758.0	18412.0	0.0955
42	3417.0	50160.0	0.0681	1810.0	18678.5	0.0969
43	3622.0	49730.5	0.0728	1977.5	18250.0	0.1084
44	3138.5	49823.5	0.0630	1901.0	17723.0	0.1073
45	3144.5	49360.0	0.0637	1639.0	16887.5	0.0971
46	3397.0	50692.0	0.0670	1719.5	16630.5	0.1034
47	3271.5	48559.0	0.0674	1802.5	15721.5	0.1147
48	3570.0	47994.5	0.0744	1994.5	14928.0	0.1336
49	3053.5	46354.0	0.0659	1647.5	13842.0	0.1190
50	2196.0	39680.0	0.0553	1148.0	11697.0	0.0981
51	2129.5	36401.0	0.0585	992.5	10996.0	0.0903
52	2198.0	32978.0	0.0667	1219.5	10353.5	0.1178
53	2176.5	30169.5	0.0721	1220.0	9581.0	0.1273
54	1913.5	27677.0	0.0691	1076.0	8853.0	0.1215
55	1072.0	8578.0	0.1250	623.0	4274.5	0.1457
56	745.5	4318.5	0.1726	374.0	2129.0	0.1757
57	714.5	4001.0	0.1786	293.5	1849.0	0.1587
58	607.0	3609.5	0.1682	313.5	1702.0	0.1842
59	580.5	3272.5	0.1774	284.5	1468.5	0.1937
60	513.0	2688.5	0.1908	226.5	1092.5	0.2073
61	566.0	2442.5	0.2317	156.5	939.5	0.1666
62	402.0	1672.0	0.2404	151.0	708.5	0.2131
63	248.0	1006.5	0.2464	142.5	496.5	0.2870
64	253.0	791.0	0.3198	96.5	368.0	0.2622
	112,019.5	1,242,129.0		77,955.5	558,882.0	

Net Decrement Ratios -- Retirement Ages
By Gender -- 0 Years of Service Excluded

	Male			Female		
age	Net Decrement	Net Exposure	Net Decrement Ratio	Net Decrement	Net Exposure	Net Decrement Ratio
50	470.0	5075.0	0.0926	103.0	1167.0	0.0908
51	621.0	6229.0	0.0997	85.0	1156.5	0.0735
52	661.5	7148.0	0.0925	109.5	1147.0	0.0955
53	739.5	8016.0	0.0923	89.0	1088.5	0.0818
54	896.0	8782.5	0.1020	103.5	1072.5	0.0965
55	2434.5	25955.0	0.0938	663.0	5092.5	0.1302
56	2910.0	27936.0	0.1042	911.0	6508.5	0.1400
57	2712.5	25836.0	0.1050	851.0	6105.0	0.1394
58	2964.5	24372.5	0.1216	834.5	5662.0	0.1474
59	3082.0	22457.5	0.1372	1010.0	5361.5	0.1884
60	3532.0	20909.0	0.1689	1029.5	4965.5	0.2073
61	4033.0	18552.5	0.2174	1227.5	4387.5	0.2798
62	4925.0	16575.0	0.2971	1288.0	3856.0	0.3340
63	4391.0	12979.5	0.3383	853.0	2989.5	0.2853
64	3427.5	9590.0	0.3574	904.5	2463.0	0.3672
65	3566.0	7422.5	0.4804	979.5	2013.0	0.4866
66	2403.0	4836.0	0.4969	632.5	1395.5	0.4532
67	1246.5	2943.5	0.4235	439.5	1007.0	0.4364
68	856.5	2086.0	0.4106	358.5	770.5	0.4653
69	638.0	1521.0	0.4195	251.5	530.0	0.4745
70	481.0	1056.0	0.4555	202.5	386.0	0.5246
71	388.5	655.5	0.5927	192.5	287.5	0.6696
72	229.5	390.5	0.5877	113.5	172.0	0.6599
73	156.5	251.0	0.6235	46.0	79.5	0.5786
	47,765.5	261,575.5		13,281.0	59,663.5	

Base Table of Net Decrement Ratios - Termination Including and Excluding O Years of Service Cells			
age	include 0 yrs of service	exclude 0 yrs of service	difference
22	0.0917	0.1498	0.0581
23	0.1082	0.1514	0.0432
24	0.1240	0.1585	0.0345
25	0.1293	0.1595	0.0302
26	0.1309	0.1555	0.0246
27	0.1309	0.1534	0.0226
28	0.1258	0.1451	0.0193
29	0.1195	0.1361	0.0166
30	0.1198	0.1343	0.0145
31	0.1178	0.1316	0.0138
32	0.1047	0.1162	0.0114
33	0.0981	0.1075	0.0094
34	0.0916	0.1003	0.0086
35	0.0894	0.0969	0.0074
36	0.0832	0.0900	0.0069
37	0.0762	0.0826	0.0064
38	0.0757	0.0809	0.0052
39	0.0723	0.0776	0.0052
40	0.0708	0.0763	0.0056
41	0.0651	0.0707	0.0056
42	0.0631	0.0677	0.0046
43	0.0685	0.0731	0.0046
44	0.0641	0.0672	0.0030
45	0.0623	0.0654	0.0031
46	0.0668	0.0691	0.0022
47	0.0697	0.0719	0.0022
48	0.0787	0.0807	0.0020
49	0.0709	0.0724	0.0015
50	0.0596	0.0614	0.0018
51	0.0603	0.0625	0.0022
52	0.0720	0.0741	0.0021
53	0.0785	0.0802	0.0017
54	0.0766	0.0783	0.0018
55	0.1165	0.1190	0.0025
56	0.1508	0.1571	0.0064
57	0.1519	0.1574	0.0055
58	0.1523	0.1589	0.0065
59	0.1590	0.1675	0.0085
60	0.1723	0.1793	0.0069
61	0.1947	0.1997	0.0051
62	0.2138	0.2158	0.0020
63	0.2352	0.2332	-0.0019
64	0.2911	0.2883	-0.0028

Actual to Expected Ratios
Results by Gender

% of total exposure	Gender	A/E Ratios				
		Termination				
		(29&under	(30 to 39)	(40 to 49)	(50 to 64)	Overall
31.2%	Female	1.4094	1.4013	1.5170	1.3800	1.4270
68.8%	Male	0.8087	0.9729	0.9692	0.9553	0.9397
		Retirement				
		(50 to 64)	(65& over)			Overall
24.3%	Female	1.1352	1.0329			1.1106
75.7%	Male	0.9131	1.0144			0.9363

Actual to Expected Ratios by Gender
Termination Ages

Actual to Expected Ratios
Retirement Ages
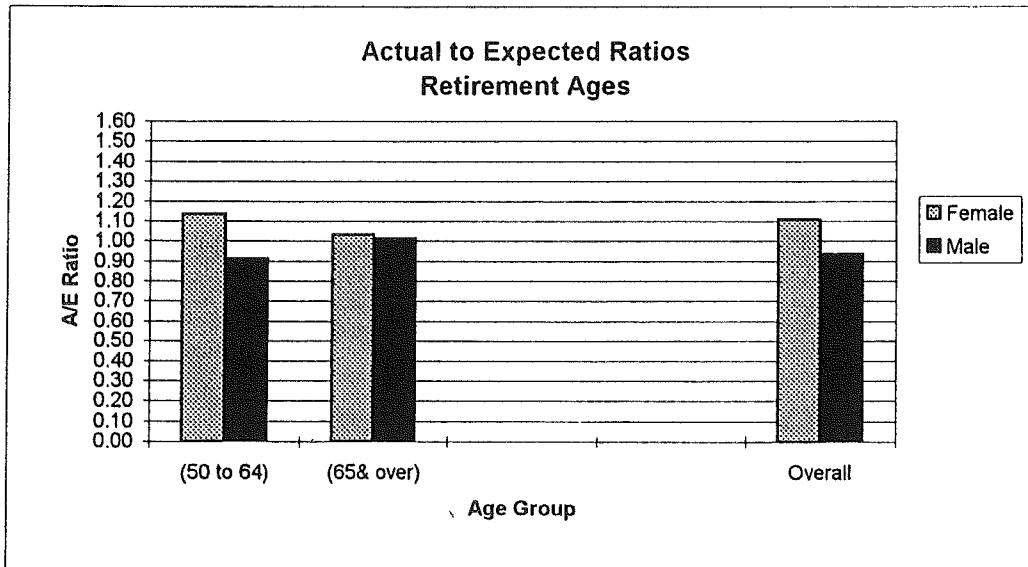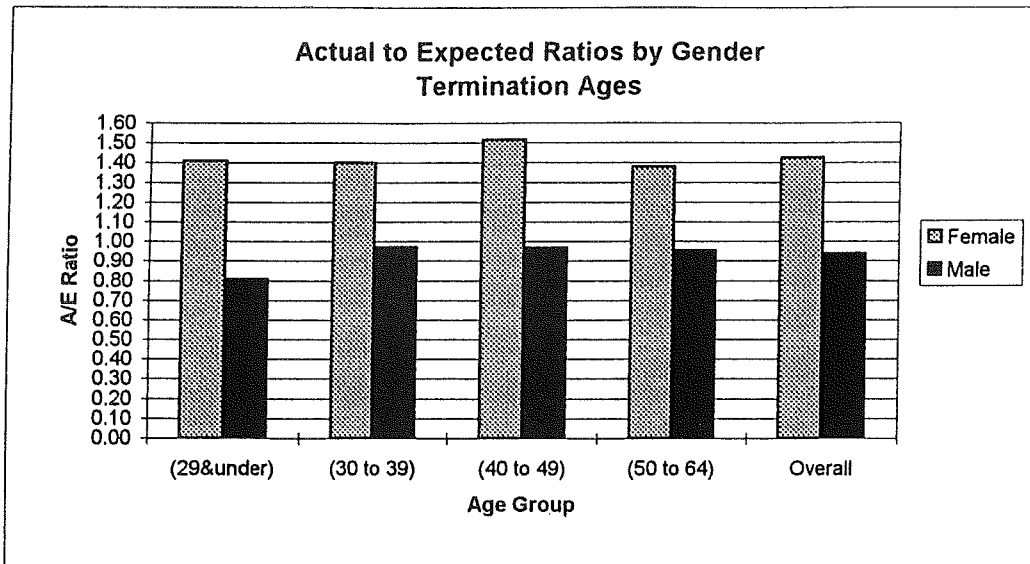
Actual to Expected Ratios
Results by Industry Code

% of Total Exposure		Industry Code	A/E Ratios	
Termination	Retirement		Termination	Retirement
9.2%	11.6%	1	1.0484	0.9136
2.1%	1.7%	2	0.3273	0.8181
12.4%	10.6%	3	0.4647	0.7081
36.5%	42.2%	4	0.7694	0.7993
12.4%	10.6%	5	0.8922	0.9416
9.1%	9.1%	6	0.1604	0.7943
3.0%	1.5%	7	0.9050	0.8321
15.2%	12.7%	8	2.5202	1.6848

Actual to Expected Ratios by Industry Code
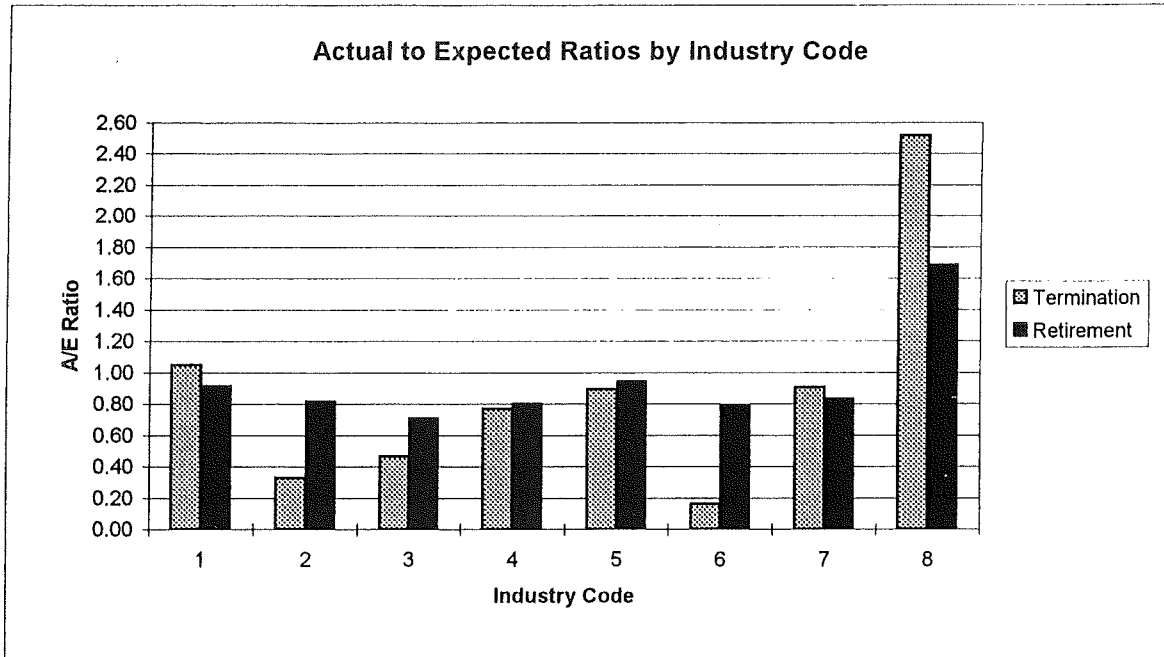
Appendix 8

**Actual to Expected Ratios
Results by Location**

% of Total Exposure		Location	A/E Ratios	
Termination	Retirement		Termination	Retirement
9.8%	10.4%	CA	0.6643	0.7404
48.1%	46.1%	NC	0.6428	0.7494
30.2%	29.9%	NE	1.8005	1.3474
1.2%	1.1%	NW	0.5145	0.9644
1.9%	1.9%	SC	0.3540	0.4756
6.4%	8.5%	SE	0.8417	0.8420
2.4%	2.2%	US	0.3167	0.6157

Actual to Expected Ratios by Location
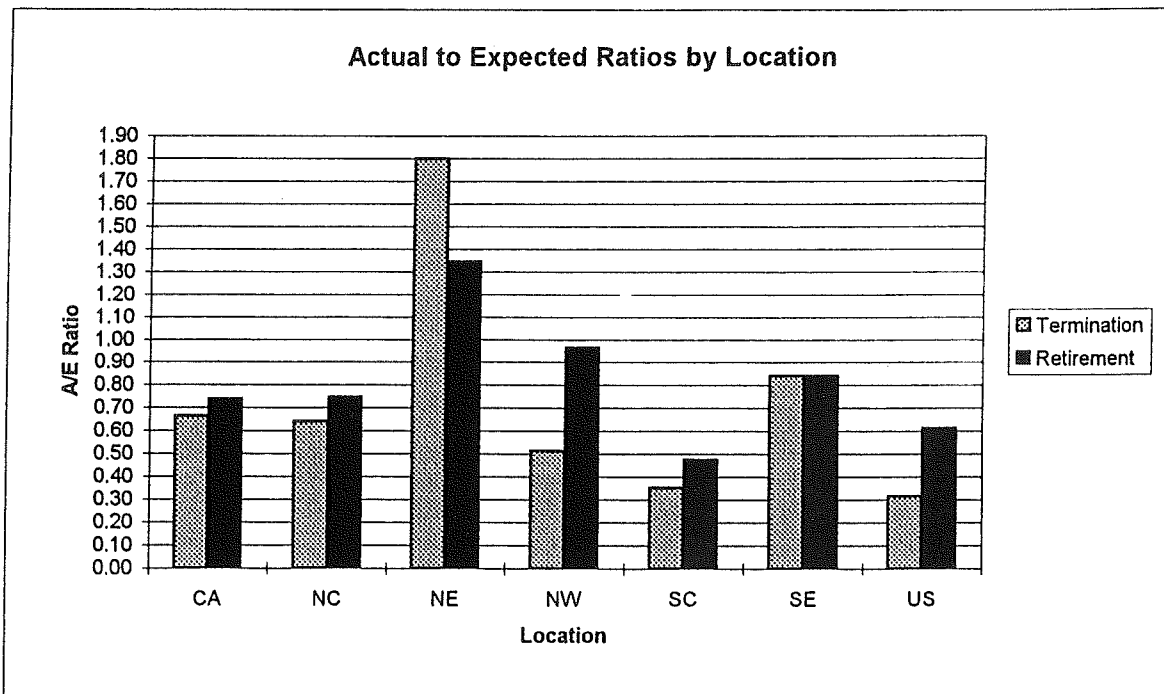
Appendix 9

Actual to Expected Ratios
Results by Compensation

% of Total Exposure		Comp Type	A/E Ratios	
Termination	Retirement		Termination	Retirement
15.1%	11.1%	Salaried	1.2844	1.0230
28.4%	31.2%	Hourly	0.5152	0.7374
56.5%	57.8%	Both	1.1386	1.0370

Actual to Expected Ratios by Compensation Type
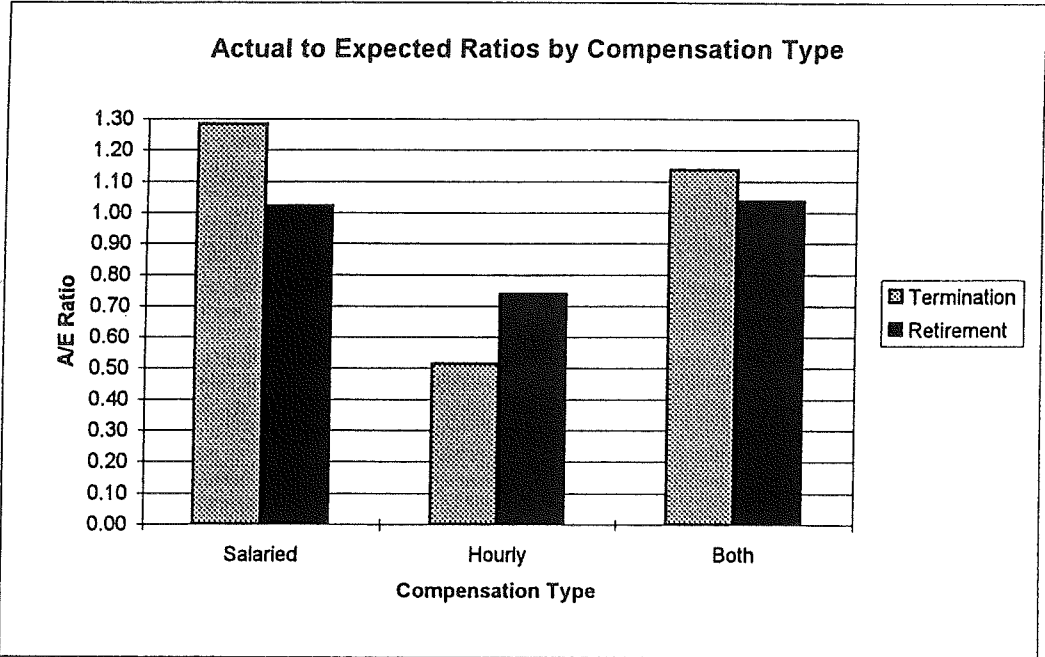
**Actual to Expected Ratios
Results by City Size**

% of Total Exposure		City Size	A/E Ratios	
Termination	Retirement		Termination	Retirement
86.3%	84.2%	Large	1.0659	1.0251
13.7%	15.8%	Small	0.5975	0.8660

Actual to Expected Ratios by City Size
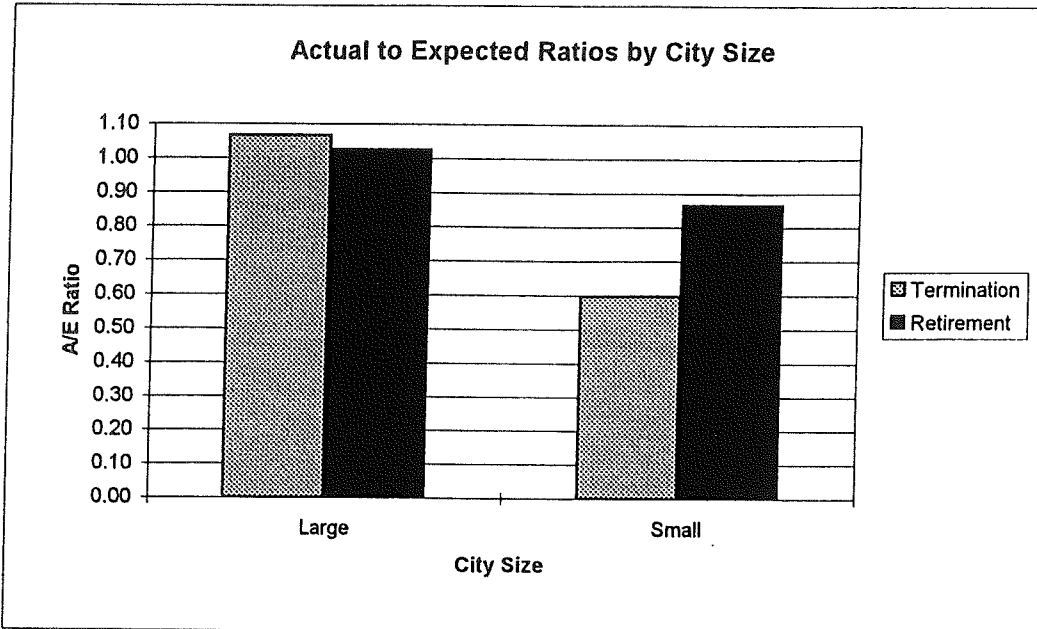
Appendix 11

| Net Decrement Ratios - Termination |
| By Years of Service |
| All Genders Combined |

Years of Service	Net Decrement	Net Exposure	Net Decrement Ratio
1	7521.0	98504.5	0.0764
2	19781.5	143698.5	0.1377
3	22706.0	146587.0	0.1549
4	22317.0	141592.0	0.1576
5	22978.0	133916.5	0.1716
6	19392.0	121440.5	0.1597
7	16878.5	106452.0	0.1586
8	13371.5	92095.5	0.1452
9	7477.0	82551.0	0.0906
10	8231.0	80510.0	0.1022
11	8131.0	77858.0	0.1044
12	3518.0	77206.5	0.0456
13	3047.0	74384.0	0.0410
14	3510.5	69857.5	0.0503
15	3252.5	66065.0	0.0492
16	3551.0	65076.5	0.0546
17	3148.5	62647.0	0.0503
18	2259.5	59957.5	0.0377
19	2190.5	58879.0	0.0372
20	2253.5	57189.5	0.0394
21	2079.0	52969.0	0.0392
22	1786.5	50173.5	0.0356
23	1779.0	50260.0	0.0354
24	1830.0	50052.5	0.0366
25	1880.5	44235.0	0.0425
26	1150.0	35742.5	0.0322
27	828.0	30377.0	0.0273
28	840.0	22763.0	0.0369
29	164.5	16920.0	0.0097
30	574.5	6786.0	0.0847
31	372.0	4076.0	0.0913
32	211.0	2593.0	0.0814
33	86.5	1928.5	0.0449
34	87.5	1482.0	0.0590
35	66.0	1053.0	0.0627
	209,250.5	2,187,879.0	

Net Decrement Ratios - Retirement By Years Eligible for Benefits Reduced Benefits			

Years Eligible	Net Decrement	Net Exposure	Net Decrement Ratio
0	4833	41354	0.1169
1	4129	36562	0.1129
2	3694	33761	0.1094
3	3648	30719	0.1188
4	3793	27275	0.1391
5	3255	21714	0.1499
6	4044	20515	0.1971
7	1598	8961	0.1783
8	1416	6973	0.2031
9	1273	4910	0.2593
10	428	2637	0.1623
11	272	1475	0.1844
12	157	1177	0.1334
13	96	848	0.1132
14	84	655	0.1282
15	41	435	0.0943
16	55	380	0.1447
17	27	253	0.1067
18	11	119	0.0924
19	3	140	0.0214
20	60	127	0.4724
	32,917.0	240,990.0	

Net Decrement Ratios - Retirement By Years Eligible for Benefits Unreduced Benefits			

Years Eligible	Net Decrement	Net Exposure	Net Decrement Ratio
0	6499	23248	0.2796
1	5159	18122	0.2847
2	4565	14397	0.3171
3	3771	11094	0.3399
4	3048	8421	0.3620
5	2147	6194	0.3466
6	1674	4508	0.3713
7	1257	3367	0.3733
8	765	2298	0.3329
9	671	1741	0.3854
10	426	1205	0.3535
11	244	899	0.2714
12	196	886	0.2212
13	162	903	0.1794
14	160	883	0.1812
15	120	955	0.1257
16	129	990	0.1303
17	137	1007	0.1360
18	136	959	0.1418
19	121	1002	0.1208
20	107	953	0.1123
21	88	892	0.0987
22	90	859	0.1048
23	84	809	0.1038
24	79	725	0.1090
25	81	746	0.1086
26	77	792	0.0972
27	77	785	0.0981
28	62	775	0.0800
29	96	804	0.1194
30	96	713	0.1346
31	78	597	0.1307
32	79	557	0.1418
33	78	487	0.1602
34	60	428	0.1402
35	63	384	0.1641
36	70	353	0.1983
37	78	312	0.2500
38	65	240	0.2708
39	44	147	0.2993
40	29	98	0.2959
	32,968.0	115,535.0	

Appendix 13

| Age and Years of Service Table of Net Decrement Ratios |
| 5 Year Select Period - Termination Ages |

	years of service					
age	1	2	3	4	5	6&over
22	0.094					
23	0.114	0.149				
24	0.120	0.142	0.143			
25	0.107	0.155	0.153	0.147		
26	0.091	0.143	0.154	0.149	0.160	
27	0.109	0.136	0.150	0.148	0.161	0.183
28	0.072	0.139	0.148	0.151	0.154	0.159
29	0.059	0.130	0.152	0.155	0.148	0.138
30	0.055	0.123	0.145	0.157	0.155	0.135
31	0.055	0.116	0.148	0.163	0.177	0.126
32	0.052	0.112	0.135	0.154	0.171	0.106
33	0.055	0.123	0.130	0.149	0.163	0.095
34	0.059	0.124	0.132	0.145	0.161	0.086
35	0.052	0.138	0.145	0.157	0.156	0.081
36	0.056	0.127	0.145	0.145	0.145	0.076
37	0.028	0.128	0.145	0.146	0.153	0.068
38	0.039	0.130	0.155	0.149	0.175	0.065
39	0.034	0.144	0.159	0.151	0.164	0.061
40	0.046	0.142	0.171	0.159	0.159	0.060
41	0.045	0.144	0.162	0.154	0.164	0.055
42	0.046	0.151	0.167	0.146	0.159	0.053
43	0.036	0.139	0.164	0.149	0.172	0.060
44	0.038	0.137	0.180	0.154	0.176	0.053
45	0.089	0.153	0.157	0.166	0.175	0.050
46	0.080	0.158	0.170	0.179	0.203	0.051
47	0.075	0.142	0.187	0.178	0.202	0.058
48	0.049	0.152	0.190	0.180	0.220	0.068
49	0.084	0.158	0.176	0.183	0.205	0.060
50	0.091	0.142	0.151	0.164	0.158	0.050
51	0.035	0.135	0.166	0.167	0.183	0.051
52	0.086	0.153	0.194	0.198	0.226	0.060
53	0.120	0.174	0.158	0.216	0.214	0.067
54	0.073	0.143	0.211	0.172	0.171	0.068
55	0.074	0.151	0.212	0.174	0.173	0.103
56	0.042	0.211	0.214	0.200	0.206	0.129
57	0.051	0.203	0.218	0.209	0.218	0.125
58	0.076	0.201	0.239	0.187	0.189	0.132
59	0.096	0.187	0.214	0.176	0.219	0.150
60	0.107	0.166	0.242	0.243	0.251	0.143
61	0.106	0.200	0.250	0.246	0.254	0.173
62	0.199	0.179	0.218	0.219	0.265	0.210
63	0.176	0.176	0.216	0.284	0.351	0.212
64	0.211	0.289	0.299	0.310	0.387	0.265

Age and Years Eligible for Benefits Table of Net Decrement Ratios
5 Year Select Period - Retirement Ages

age	years eligible for benefits					
	1	2	3	4	5	6&over
50	0.108	0.055	0.095	0.023	0.086	0.070
51	0.084	0.087	0.101	0.038	0.065	0.060
52	0.093	0.076	0.058	0.062	0.050	0.063
53	0.105	0.081	0.070	0.070	0.050	0.063
54	0.134	0.110	0.075	0.104	0.071	0.066
55	0.136	0.131	0.098	0.114	0.102	0.089
56	0.101	0.164	0.113	0.136	0.099	0.099
57	0.119	0.102	0.120	0.114	0.135	0.101
58	0.111	0.142	0.113	0.124	0.130	0.127
59	0.145	0.142	0.158	0.138	0.172	0.138
60	0.206	0.116	0.155	0.197	0.156	0.166
61	0.281	0.188	0.223	0.213	0.229	0.216
62	0.324	0.335	0.329	0.317	0.382	0.333
63	0.327	0.364	0.335	0.297	0.250	0.311
64	0.271	0.323	0.403	0.405	0.375	0.400
65	0.460	0.421	0.428	0.513	0.540	0.534
66	0.425	0.512	0.465	0.474	0.618	0.479
67	0.394	0.481	0.432	0.345	0.364	0.501
68	0.409	0.494	0.462	0.420	0.375	0.374
69		0.500	0.491	0.525	0.548	0.353
70			0.571	0.556	0.560	0.392
71				0.778	0.585	0.613
72					1.000	0.614
73						0.611

Table 1
V Select & Ultimate Table
Number of Employee Exits per 100

Age	Years of Service			
	1	2	3	4 or more
20	29.8	25.0	21.0	18.6
21	29.4	24.5	20.5	17.6
22	29.0	24.0	20.0	16.6
23	28.6	23.5	19.5	15.6
24	28.2	23.0	19.0	14.6
25	27.8	22.5	18.5	13.6
26	27.4	22.0	18.0	12.6
27	27.0	21.5	17.5	11.6
28	26.6	21.0	17.0	11.1
29	26.2	20.5	16.5	10.6
30	25.8	20.0	16.0	10.1
31	25.4	19.5	15.5	9.6
32	25.0	19.0	15.0	9.1
33	24.6	18.6	14.6	8.7
34	24.2	18.2	14.2	8.3
35	23.8	17.8	13.8	7.9
36	23.4	17.4	13.4	7.5
37	23.0	17.0	13.0	7.1
38	22.6	16.6	12.6	6.9
39	22.2	16.2	12.2	6.7
40	21.8	15.8	11.8	6.5
41	21.4	15.4	11.4	6.3
42	21.0	15.0	11.0	6.1
43	20.6	14.7	10.7	5.9
44	20.2	14.4	10.4	5.7
45	19.8	14.1	10.1	5.5
46	19.4	13.8	9.8	5.3
47	19.0	13.5	9.5	5.1
48	18.6	13.2	9.2	4.9
49	18.2	12.9	8.9	4.7
50	17.8	12.6	8.6	4.5
51	17.4	12.3	8.3	4.3
52	17.0	12.0	8.0	4.1
53	16.6	11.7	7.7	3.9
54	16.2	11.4	7.4	3.7

Average ultimate termination rate = 7.8%.

Vaughn Table Ratios / Turnover Table Ratios			

	Years of Service			
age	1	2	3	4
22	3.09			
23	2.51	1.58		
24	2.35	1.62	1.33	
25	2.60	1.45	1.21	0.93
26	3.01	1.54	1.17	0.85
27	2.48	1.58	1.17	0.72
28	3.69	1.51	1.15	0.70
29	4.44	1.58	1.09	0.77
30	4.69	1.63	1.10	0.75
31	4.62	1.68	1.05	0.76
32	4.81	1.70	1.11	0.86
33	4.47	1.51	1.12	0.92
34	4.10	1.47	1.08	0.97
35	4.58	1.29	0.95	0.98
36	4.18	1.37	0.92	0.99
37	8.21	1.33	0.90	1.04
38	5.79	1.28	0.81	1.06
39	6.53	1.13	0.77	1.10
40	4.74	1.11	0.69	1.08
41	4.76	1.07	0.70	1.15
42	4.57	0.99	0.66	1.15
43	5.72	1.06	0.65	0.98
44	5.32	1.05	0.58	1.08
45	2.22	0.92	0.64	1.10
46	2.43	0.87	0.58	1.04
47	2.53	0.95	0.51	0.88
48	3.80	0.87	0.48	0.72
49	2.17	0.82	0.51	0.78
50	1.96	0.89	0.57	0.90
51	4.97	0.91	0.50	0.84
52	1.98	0.78	0.41	0.68
53	1.38	0.67	0.49	0.58
54	2.22	0.80	0.35	0.54

Appendix 17

| Age and Years of Service Table of Net Decrement Ratios |
| 10 Year Select Period - Termination Ages |

	years of service										
age	1	2	3	4	5	6	7	8	9	10	11&over
22	0.094										
23	0.114	0.149									
24	0.120	0.142	0.143								
25	0.107	0.155	0.153	0.147							
26	0.091	0.143	0.154	0.149	0.160						
27	0.109	0.136	0.150	0.148	0.161	0.177					
28	0.072	0.139	0.148	0.151	0.154	0.157	0.175				
29	0.059	0.130	0.152	0.155	0.148	0.143	0.170	0.162			
30	0.055	0.123	0.145	0.157	0.155	0.144	0.182	0.177	0.092		
31	0.055	0.116	0.148	0.163	0.177	0.159	0.187	0.177	0.103	0.106	
32	0.052	0.112	0.135	0.154	0.171	0.166	0.166	0.165	0.084	0.096	0.060
33	0.055	0.123	0.130	0.149	0.163	0.132	0.152	0.151	0.082	0.109	0.058
34	0.059	0.124	0.132	0.145	0.161	0.142	0.145	0.132	0.069	0.100	0.058
35	0.052	0.138	0.145	0.157	0.156	0.131	0.145	0.130	0.081	0.095	0.056
36	0.056	0.127	0.145	0.145	0.145	0.132	0.134	0.136	0.083	0.093	0.054
37	0.028	0.128	0.145	0.146	0.153	0.129	0.137	0.140	0.077	0.099	0.045
38	0.039	0.130	0.155	0.149	0.175	0.155	0.153	0.134	0.071	0.102	0.041
39	0.034	0.144	0.159	0.151	0.164	0.142	0.131	0.125	0.082	0.100	0.042
40	0.046	0.142	0.171	0.159	0.159	0.132	0.111	0.119	0.081	0.092	0.046
41	0.045	0.144	0.162	0.154	0.164	0.135	0.123	0.118	0.075	0.091	0.040
42	0.046	0.151	0.167	0.146	0.159	0.132	0.123	0.112	0.084	0.085	0.039
43	0.036	0.139	0.164	0.149	0.172	0.153	0.137	0.101	0.083	0.098	0.047
44	0.038	0.137	0.180	0.154	0.176	0.165	0.124	0.108	0.068	0.107	0.039
45	0.089	0.153	0.157	0.166	0.175	0.159	0.131	0.098	0.065	0.110	0.037
46	0.080	0.158	0.170	0.179	0.203	0.174	0.126	0.101	0.091	0.117	0.037
47	0.075	0.142	0.187	0.178	0.202	0.170	0.110	0.133	0.126	0.129	0.044
48	0.049	0.152	0.190	0.180	0.220	0.199	0.149	0.155	0.134	0.118	0.054
49	0.084	0.158	0.176	0.183	0.205	0.196	0.145	0.146	0.117	0.103	0.047
50	0.091	0.142	0.151	0.164	0.158	0.159	0.132	0.099	0.117	0.101	0.038
51	0.035	0.135	0.166	0.167	0.183	0.164	0.121	0.092	0.082	0.082	0.041
52	0.086	0.153	0.194	0.198	0.226	0.169	0.145	0.134	0.088	0.111	0.048
53	0.120	0.174	0.158	0.216	0.214	0.157	0.180	0.161	0.103	0.113	0.055
54	0.073	0.143	0.211	0.172	0.171	0.165	0.168	0.110	0.063	0.083	0.060
55	0.074	0.151	0.212	0.174	0.173	0.171	0.150	0.114	0.085	0.121	0.090
56	0.042	0.211	0.214	0.200	0.206	0.198	0.158	0.135	0.087	0.125	0.078
57	0.051	0.203	0.218	0.209	0.218	0.173	0.161	0.150	0.077	0.084	0.092
58	0.076	0.201	0.239	0.187	0.189	0.172	0.178	0.148	0.113	0.102	0.079
59	0.096	0.187	0.214	0.176	0.219	0.221	0.164	0.130	0.135	0.146	0.109
60	0.107	0.166	0.242	0.243	0.251	0.213	0.168	0.140	0.113	0.143	0.056
61	0.106	0.200	0.250	0.246	0.254	0.215	0.210	0.163	0.157	0.177	0.089
62	0.199	0.179	0.218	0.219	0.265	0.274	0.248	0.203	0.190	0.166	0.133
63	0.176	0.176	0.216	0.284	0.351	0.338	0.252	0.231	0.158	0.065	0.130
64	0.211	0.289	0.299	0.310	0.387	0.321	0.294	0.270	0.179	0.179	0.305

Base Table of Net Decrement Ratios
With and Without Early Retirement Windows
Includes 0 Years of Service

	Termination Ratios				Retirement Ratios		
age	Includes ERW's	Exlcudes ERW's	Difference	age	Includes ERW's	Exlcudes ERW's	Difference
22	0.1049	0.0917	0.013	50	0.1027	0.0868	0.016
23	0.1169	0.1082	0.009	51	0.1077	0.0868	0.021
24	0.1329	0.1240	0.009	52	0.1051	0.0850	0.020
25	0.1373	0.1293	0.008	53	0.1053	0.0861	0.019
26	0.1373	0.1309	0.006	54	0.1172	0.0996	0.018
27	0.1386	0.1309	0.008	55	0.1153	0.0985	0.017
28	0.1298	0.1258	0.004	56	0.1318	0.1075	0.024
29	0.1219	0.1195	0.002	57	0.1317	0.1084	0.023
30	0.1232	0.1198	0.003	58	0.1480	0.1228	0.025
31	0.1204	0.1178	0.003	59	0.1688	0.1439	0.025
32	0.1072	0.1047	0.003	60	0.2025	0.1734	0.029
33	0.1006	0.0981	0.002	61	0.2553	0.2282	0.027
34	0.0937	0.0916	0.002	62	0.3291	0.3022	0.027
35	0.0921	0.0894	0.003	63	0.3463	0.3212	0.025
36	0.0854	0.0832	0.002	64	0.3779	0.3556	0.022
37	0.0783	0.0762	0.002	65	0.4899	0.4705	0.019
38	0.0772	0.0757	0.001	66	0.4915	0.4755	0.016
39	0.0738	0.0723	0.001	67	0.4290	0.4166	0.012
40	0.0718	0.0708	0.001	68	0.4257	0.4161	0.010
41	0.0668	0.0651	0.002	69	0.4428	0.4246	0.018
42	0.0655	0.0631	0.002	70	0.4736	0.4605	0.013
43	0.0718	0.0685	0.003	71	0.6097	0.6020	0.008
44	0.0689	0.0641	0.005	72	0.6081	0.6048	0.003
45	0.0680	0.0623	0.006	73	0.6034	0.6006	0.003
46	0.0726	0.0668	0.006				
47	0.0784	0.0697	0.009				
48	0.0885	0.0787	0.010				
49	0.0812	0.0709	0.010				
50	0.0699	0.0596	0.010				
51	0.0727	0.0603	0.012				
52	0.0898	0.0720	0.018				
53	0.0978	0.0785	0.019				
54	0.0960	0.0766	0.019				
55	0.1438	0.1165	0.027				
56	0.1687	0.1508	0.018				
57	0.1664	0.1519	0.015				
58	0.1691	0.1523	0.017				
59	0.1798	0.1590	0.021				
60	0.2016	0.1723	0.029				
61	0.2189	0.1947	0.024				
62	0.2404	0.2138	0.027				
63	0.2590	0.2352	0.024				
64	0.3196	0.2911	0.028				

Actual to Expected Ratios
Plans With Early Retirement Windows
ONLY Those Plan Years Where ERW was Offered

	Termination Ages				Retirement Ages		
Age	Actual Decrement	Expected Decrement	A/E Ratio	Age	Actual Decrement	Expected Decrement	A/E Ratio
22	358.0	203.95	1.7553	50	273.5	133.18	2.0537
23	542.0	386.45	1.4025	51	436.5	193.33	2.2579
24	939.0	669.44	1.4027	52	437.0	189.20	2.3097
25	1165.0	863.39	1.3493	53	440.0	190.12	2.3144
26	1291.5	1005.62	1.2843	54	464.5	225.70	2.0580
27	1553.0	1109.47	1.3998	55	1213.0	544.35	2.2283
28	1357.5	1115.57	1.2169	56	1691.0	616.86	2.7413
29	1317.0	1128.45	1.1671	57	1538.5	566.89	2.7139
30	1447.0	1194.02	1.2119	58	1539.0	567.65	2.7112
31	1433.0	1253.29	1.1434	59	1509.0	620.29	2.4327
32	1340.0	1157.02	1.1581	60	1658.0	694.74	2.3865
33	1341.5	1154.97	1.1615	61	1567.0	793.70	1.9743
34	1336.5	1150.05	1.1621	62	1516.0	847.18	1.7895
35	1384.5	1177.25	1.1760	63	1235.5	722.38	1.7103
36	1314.5	1124.52	1.1689	64	891.0	554.57	1.6066
37	1202.0	1039.56	1.1563	65	811.5	584.15	1.3892
38	1154.0	1073.59	1.0749	66	483.5	360.29	1.3420
39	1176.5	1059.12	1.1108	67	268.5	199.77	1.3441
40	1157.5	1087.65	1.0642	68	186.5	147.22	1.2668
41	1207.5	1038.89	1.1623	69	139.0	94.44	1.4718
42	1267.5	1036.29	1.2231	70	90.5	72.09	1.2554
43	1499.0	1194.56	1.2549	71	81.5	76.41	1.0666
44	1506.5	1059.16	1.4224	72	41.5	36.28	1.1439
45	1539.5	1038.08	1.4830	73	17.5	14.47	1.2095
46	1573.0	1057.21	1.4879				
47	1839.0	1079.88	1.7030				
48	1951.0	1107.56	1.7615				
49	1773.0	925.67	1.9154				
50	1320.0	622.77	2.1196				
51	1320.5	535.13	2.4676				
52	1599.5	580.13	2.7571				
53	1566.5	559.07	2.8020				
54	1436.0	483.81	2.9681				
55	799.0	293.60	2.7214				
56	384.5	215.80	1.7817				
57	317.0	187.19	1.6935				
58	291.0	165.98	1.7532				
59	296.0	160.15	1.8483				
60	280.0	126.63	2.2112				
61	244.0	123.90	1.9693				
62	178.0	88.09	2.0207				
63	124.0	65.15	1.9033				
64	121.0	65.80	1.8389				

Appendix 20

Base Table of Net Decrement Ratios - Termination 1989-92 Excludes Early Retirement Windows				Base Table of Net Decrement Ratios - Termination 1993-94 Excludes Early Retirement Windows			
age	Net Decrement	Net Exposure	Net Decrement Ratio	age	Net Decrement	Net Exposure	Net Decrement Ratio
22	874.5	10481.0	0.0834	22	637.5	6004.5	0.1062
23	1768.5	15253.0	0.1159	23	832.0	8779.5	0.0948
24	2802.5	20709.0	0.1353	24	1224.0	11757.5	0.1041
25	3619.0	25673.5	0.1410	25	1573.0	14481.0	0.1086
26	4304.5	30274.5	0.1422	26	1851.5	16748.5	0.1105
27	4858.0	34743.0	0.1398	27	2092.5	18370.0	0.1139
28	5143.5	38109.0	0.1350	28	2179.0	20108.5	0.1084
29	5373.5	41252.0	0.1303	29	2167.5	21831.0	0.0993
30	5888.5	44763.5	0.1315	30	2223.0	22941.0	0.0969
31	6085.0	47569.0	0.1279	31	2323.0	23801.5	0.0976
32	5574.5	49750.5	0.1120	32	2216.0	24627.0	0.0900
33	5309.0	51604.5	0.1029	33	2231.5	25262.0	0.0883
34	5114.0	53314.0	0.0959	34	2118.5	25614.5	0.0827
35	5076.5	54319.0	0.0935	35	2123.0	26169.5	0.0811
36	4865.0	54825.0	0.0887	36	1870.5	26176.0	0.0715
37	4484.0	55329.0	0.0810	37	1719.0	26126.5	0.0658
38	4464.0	55523.0	0.0804	38	1725.0	26225.0	0.0658
39	4266.5	55658.5	0.0767	39	1648.5	26102.5	0.0632
40	4284.0	56124.0	0.0763	40	1490.0	25484.5	0.0585
41	4007.5	56416.0	0.0710	41	1300.5	25157.5	0.0517
42	4061.5	58728.0	0.0692	42	1230.0	25152.0	0.0489
43	4322.0	57897.5	0.0746	43	1350.0	24888.0	0.0542
44	3924.5	57165.0	0.0687	44	1339.0	24915.0	0.0537
45	3616.0	54989.0	0.0658	45	1377.0	25101.5	0.0549
46	4106.0	53860.5	0.0762	46	1251.5	26296.5	0.0476
47	3995.5	52874.0	0.0756	47	1288.0	22976.5	0.0561
48	4405.5	52433.5	0.0840	48	1375.5	20998.0	0.0655
49	3743.0	49198.0	0.0761	49	1216.5	20794.0	0.0585
50	2516.0	40354.5	0.0623	50	1024.0	19103.5	0.0536
51	2407.5	36790.5	0.0654	51	836.5	16982.5	0.0493
52	2696.5	33941.5	0.0794	52	844.0	15200.5	0.0555
53	2599.5	31096.0	0.0836	53	938.5	13972.0	0.0672
54	2278.0	28613.0	0.0796	54	889.5	12759.5	0.0697
55	1247.0	10415.0	0.1197	55	604.0	5475.5	0.1103
56	836.5	5262.0	0.1590	56	337.0	2522.0	0.1336
57	772.0	4766.0	0.1620	57	288.5	2215.5	0.1302
58	692.5	4270.0	0.1622	58	270.5	2051.5	0.1319
59	631.5	3841.0	0.1644	59	266.5	1807.5	0.1474
60	564.5	3058.5	0.1846	60	222.0	1505.0	0.1475
61	576.0	2791.0	0.2064	61	214.5	1269.5	0.1690
62	429.5	1956.0	0.2196	62	197.0	974.0	0.2023
63	300.0	1231.0	0.2437	63	152.5	693.0	0.2201
64	283.5	953.0	0.2975	64	145.5	520.5	0.2795
	139,167.0	1,498,175.5			53,203.5	709,941.5	

Base Table of Net Decrement Ratios - Retirement 1989-92 Excludes Early Retirement Windows				Base Table of Net Decrement Ratios - Retirement 1993-94 Excludes Early Retirement Windows		
age	Net Decrement	Net Exposure	Net Decrement Ratio	age	Net Decrement	Net Exposure	Net Decrement Ratio
50	469.0	5211.0	0.0900	50	165.0	2034.5	0.0811
51	573.5	6558.5	0.0874	51	234.5	2755.5	0.0851
52	630.5	7259.5	0.0869	52	224.0	2798.5	0.0800
53	737.5	7911.0	0.0932	53	187.0	2828.5	0.0661
54	831.0	8427.0	0.0986	54	300.5	2898.0	0.1037
55	2502.5	24509.5	0.1021	55	824.5	9265.5	0.0890
56	2955.5	27643.5	0.1069	56	1163.5	10670.5	0.1090
57	2757.5	25663.5	0.1074	57	1096.0	9871.0	0.1110
58	2910.5	24026.5	0.1211	58	1188.5	9347.0	0.1272
59	3208.5	22526.5	0.1424	59	1235.5	8345.5	0.1480
60	3582.5	20958.5	0.1709	60	1368.0	7591.0	0.1802
61	4027.0	18523.0	0.2174	61	1722.5	6666.5	0.2584
62	4799.5	16364.0	0.2933	62	1918.5	5868.0	0.3269
63	4142.5	12826.0	0.3230	63	1416.0	4480.0	0.3161
64	3380.0	9676.5	0.3493	64	1263.5	3383.0	0.3735
65	3624.0	7639.0	0.4744	65	1236.0	2567.0	0.4815
66	2478.0	5108.5	0.4851	66	739.0	1657.5	0.4459
67	1412.5	3286.0	0.4299	67	381.5	1020.0	0.3740
68	1029.5	2339.0	0.4401	68	263.0	767.0	0.3429
69	736.5	1656.5	0.4446	69	206.5	564 5	0.3658
70	548.5	1123.0	0.4884	70	169.0	435.0	0.3885
71	427.0	736.5	0.5798	71	188.5	286.0	0.6591
72	258.0	441.0	0.5850	72	110.0	167.5	0.6567
73	159.5	260.0	0.6135	73	52.5	93.0	0.5645
	48,181.0	260,674.0			17,653.5	96,360.5	

Termination Rates - For Other Two Plans			

age	Net Decrement	Net Exposure	Net Decrement Ratio
22	347.5	4146.1	0.0838
23	527.0	6359.1	0.0829
24	774.0	8964.0	0.0863
25	983.5	11510.9	0.0854
26	1048.5	13591.1	0.0771
27	1015.0	14956.1	0.0679
28	1022.5	15856.1	0.0645
29	1021.0	16382.6	0.0623
30	930.5	16470.1	0.0565
31	840.5	16394.6	0.0513
32	808.0	16453.1	0.0491
33	757.0	16552.1	0.0457
34	700.0	16683.8	0.0420
35	666.5	16938.5	0.0393
36	647.5	17187.8	0.0377
37	627.0	17303.2	0.0362
38	594.0	17344.8	0.0342
39	540.5	17288.1	0.0313
40	526.5	17176.1	0.0307
41	533.5	17212.7	0.0310
42	496.5	17426.0	0.0285
43	441.5	17092.1	0.0258
44	403.0	15811.0	0.0255
45	344.5	14112.7	0.0244
46	297.5	12926.4	0.0230
47	272.0	12425.2	0.0219
48	225.5	11927.8	0.0189
49	175.0	11260.8	0.0155
50	161.0	10656.2	0.0151
51	166.0	10228.4	0.0162
52	153.0	9873.1	0.0155
53	136.0	9561.2	0.0142
54	112.5	9275.0	0.0121
55	83.5	8932.8	0.0093
56	58.0	8540.2	0.0068
57	49.0	8212.4	0.0060
58	48.0	7843.5	0.0061
59	42.0	7411.3	0.0057
60	30.5	6612.9	0.0046
61	26.0	5692.4	0.0046
62	17.5	5038.9	0.0035
63	18.5	4474.7	0.0041
64	18.0	4164.0	0.0043
65	6.5	2388.7	0.0027
	18,692.0	526,658.6	

Retirement Rates - For Other Two Plans			

age	Net Decrement	Net Exposure	Net Decrement Ratio
50	8.0	10552.4	0.0008
51	14.0	10125.5	0.0014
52	18.0	9781.1	0.0018
53	27.5	9486.3	0.0029
54	44.0	9226.2	0.0048
55	239.5	9060.0	0.0264
56	362.5	8767.8	0.0413
57	294.0	8379.4	0.0351
58	326.5	8031.4	0.0407
59	384.0	7634.7	0.0503
60	669.0	7097.9	0.0943
61	722.5	6225.2	0.1161
62	513.0	5379.6	0.0954
63	530.0	4832.3	0.1097
64	568.5	4586.4	0.1240
65	2357.0	4425.6	0.5326
66	2113.5	2271.3	0.9305
67	76.0	218.0	0.3486
68	32.0	125.8	0.2543
69	22.5	81.1	0.2775
70	20.5	46.6	0.4400
71	13.0	19.7	0.6607
72	4.5	4.9	0.9125
73	0.0	0.0	
	9,360.0	126,359.5	

Appendix 23

Termination Rates -- For Other Two Plans

age	Males			Females		
	terminations	exposure	termination rate	terminations	exposure	termination rate
22	141.5	1942.1	0.0729	206.0	2204.1	0.0935
23	191.5	2890.3	0.0663	335.5	3468.8	0.0967
24	261.0	4065.2	0.0642	513.0	4898.8	0.1047
25	341.0	5344.9	0.0638	642.5	6166.0	0.1042
26	381.5	6463.9	0.0590	667.0	7127.2	0.0936
27	368.5	7277.8	0.0506	646.5	7678.3	0.0842
28	372.0	7913.0	0.0470	650.5	7943.1	0.0819
29	361.0	8428.4	0.0428	660.0	7954.2	0.0830
30	333.5	8756.7	0.0381	597.0	7713.4	0.0774
31	324.0	8932.1	0.0363	516.5	7462.5	0.0692
32	324.5	9060.5	0.0358	483.5	7392.6	0.0654
33	310.0	9147.1	0.0339	447.0	7405.0	0.0604
34	286.5	9258.5	0.0309	413.5	7425.3	0.0557
35	281.0	9460.9	0.0297	385.5	7477.6	0.0516
36	276.0	9671.4	0.0285	371.5	7516.4	0.0494
37	263.5	9789.0	0.0269	363.5	7514.2	0.0484
38	260.5	9784.0	0.0266	333.5	7560.8	0.0441
39	242.5	9637.8	0.0252	298.0	7650.3	0.0390
40	231.5	9461.0	0.0245	295.0	7715.1	0.0382
41	222.0	9368.6	0.0237	311.5	7844.1	0.0397
42	197.0	6412.9	0.0307	299.5	8013.1	0.0374
43	176.0	9175.3	0.0192	265.5	7916.9	0.0335
44	171.0	8413.9	0.0203	232.0	7397.1	0.0314
45	145.0	7432.2	0.0195	199.5	6680.5	0.0299
46	114.0	6755.4	0.0169	183.5	6171.0	0.0297
47	98.0	6508.1	0.0151	174.0	5917.1	0.0294
48	78.5	6309.2	0.0124	147.0	5618.6	0.0262
49	65.0	6034.2	0.0108	110.0	5226.6	0.0210
50	60.5	5750.9	0.0105	100.5	4905.3	0.0205
51	58.5	5561.0	0.0105	107.5	4667.4	0.0230
52	54.5	5441.8	0.0100	98.5	4431.3	0.0222
53	49.5	5359.6	0.0092	86.5	4201.6	0.0206
54	37.0	5303.1	0.0070	75.5	3971.8	0.0190
55	26.0	5196.1	0.0050	57.5	3736.6	0.0154
56	22.0	5054.8	0.0044	36.0	3485.4	0.0103
57	19.0	4951.0	0.0038	30.0	3261.4	0.0092
58	20.5	4806.1	0.0043	27.5	3037.4	0.0091
59	22.5	4575.8	0.0049	19.5	2835.6	0.0069
60	14.5	4066.1	0.0036	16.0	2546.8	0.0063
61	12.0	3520.0	0.0034	14.0	2172.4	0.0064
62	11.0	3193.4	0.0034	6.5	1845.5	0.0035
63	10.0	2882.7	0.0035	8.5	1592.0	0.0053
64	10.5	2670.3	0.0039	7.5	1493.7	0.0050
65	4.5	1498.9	0.0030	2.0	889.8	0.0022
	7,250.5	283,526.2		11,441.5	240,132.5	

Retirement Rates -- For Other Two Plans

age	Males			Females		
	retirements	exposure	retirement rate	retirements	exposure	retirement rate
50	8.0	5714.5	0.0014			
51	14.0	5531.9	0.0025			
52	18.0	5417.4	0.0033			
53	27.0	5343.8	0.0051	0.5	4142.5	0.0001
54	39.5	5305.4	0.0074	4.5	3920.8	0.0011
55	144.5	5287.7	0.0273	95.0	3772.3	0.0252
56	214.5	5195.3	0.0413	148.0	3572.5	0.0414
57	188.0	5066.9	0.0371	106.0	3312.5	0.0320
58	214.0	4935.6	0.0434	112.5	3095.8	0.0363
59	255.5	4725.2	0.0541	128.5	2909.5	0.0442
60	454.5	4405.9	0.1032	214.5	2692.0	0.0797
61	472.0	3880.9	0.1216	250.5	2344.3	0.1069
62	319.5	3408.8	0.0937	193.5	1970.8	0.0982
63	346.5	3119.5	0.1111	183.5	1712.8	0.1071
64	355.0	2940.6	0.1207	213.5	1645.9	0.1297
65	1501.0	2809.9	0.5342	856.0	1615.8	0.5298
66	1354.5	1429.0	0.9479	759.0	842.4	0.9010
67	38.0	123.1	0.3087	38.0	95.0	0.4000
68	16.5	76.9	0.2146	15.5	49.0	0.3163
69	15.0	53.1	0.2825	7.5	28.0	0.2679
70	14.0	32.2	0.4348	6.5	14.4	0.4514
71	10.5	15.3	0.6849	2.5	4.3	0.5814
72	4.0	4.4	0.9091	0.5	0.5	1.0000
73	0.0	0.0		0.0	0.0	
	6,024.0	74,823.3		3,336.0	37,741.1	

Comparison of Base Tables to the T- tables				Net Decrement Ratios	Ratios of Base Table to:			
Annual Rates of Termination								
Age	T-1	T-3	T-5	T-9	Base Table	T-1	T-3	T-5	T-9
22	0.05401	0.05975	0.07925	0.17757	0.14980	2.77	2.51	1.89	0.84
23	0.05291	0.05718	0.07886	0.17617	0.15136	2.86	2.65	1.92	0.86
24	0.05146	0.05510	0.07845	0.17464	0.15849	3.08	2.88	2.02	0.91
25	0.04971	0.05346	0.07800	0.17300	0.15947	3.21	2.98	2.04	0.92
26	0.04770	0.05218	0.07750	0.17121	0.15547	3.26	2.98	2.01	0.91
27	0.04549	0.05120	0.07608	0.16887	0.15343	3.37	3.00	2.02	0.91
28	0.04311	0.05043	0.07578	0.16606	0.14507	3.37	2.88	1.91	0.87
29	0.04060	0.04982	0.07459	0.16285	0.13614	3.35	2.73	1.83	0.84
30	0.03801	0.04930	0.07321	0.15930	0.13433	3.53	2.72	1.83	0.84
31	0.03537	0.04881	0.07166	0.15547	0.13163	3.72	2.70	1.84	0.85
32	0.03272	0.04829	0.06995	0.15143	0.11619	3.55	2.41	1.66	0.77
33	0.03006	0.04769	0.06811	0.14721	0.10754	3.58	2.26	1.58	0.73
34	0.02744	0.04697	0.06617	0.14284	0.10028	3.65	2.14	1.52	0.70
35	0.02487	0.04611	0.06414	0.13836	0.09687	3.90	2.10	1.51	0.70
36	0.02235	0.04510	0.06205	0.13377	0.09001	4.03	2.00	1.45	0.67
37	0.01992	0.04396	0.05992	0.12910	0.08258	4.15	1.88	1.38	0.64
38	0.01759	0.04275	0.05778	0.12433	0.08089	4.60	1.89	1.40	0.65
39	0.01537	0.04154	0.05564	0.11946	0.07755	5.05	1.87	1.39	0.65
40	0.01328	0.04041	0.05350	0.11450	0.07631	5.74	1.89	1.43	0.67
41	0.01138	0.03942	0.05140	0.10943	0.07068	6.21	1.79	1.38	0.65
42	0.00970	0.03859	0.04933	0.10042	0.06766	6.98	1.75	1.37	0.67
43	0.00827	0.03782	0.04730	0.09892	0.07310	8.84	1.93	1.55	0.74
44	0.00711	0.03693	0.04531	0.09348	0.06715	9.45	1.82	1.48	0.72
45	0.00623	0.03573	0.04333	0.08790	0.06544	10.50	1.83	1.51	0.74
46	0.00566	0.03403	0.04134	0.08216	0.06906	12.20	2.03	1.67	0.84
47	0.00540	0.03170	0.03925	0.07623	0.07188	13.32	2.27	1.83	0.94
48	0.00545	0.02872	0.03703	0.07008	0.08073	14.80	2.81	2.18	1.15
49	0.00582	0.02519	0.03465	0.06370	0.07239	12.43	2.87	2.09	1.14
50	0.00648	0.02172	0.03210	0.05712	0.06137	9.48	2.83	1.91	1.07
51	0.00719	0.01900	0.02945	0.05048	0.06251	8.70	3.29	2.12	1.24
52	0.00794	0.01702	0.02678	0.04397	0.07415	9.34	4.36	2.77	1.69
53	0.00873	0.01561	0.02420	0.03784	0.08020	9.19	5.14	3.31	2.12
54	0.00956	0.01455	0.02185	0.03234	0.07832	8.19	5.38	3.58	2.42
55	0.01044	0.01378	0.01983	0.02770	0.11898	11.40	8.63	6.00	4.30
56	0.01135	0.01342	0.01819	0.02385	0.15715	13.85	11.71	8.64	6.59
57	0.01230	0.01347	0.01701	0.02086	0.15741	12.80	11.69	9.25	7.55
58	0.01330	0.01384	0.01633	0.01877	0.15886	11.94	11.48	9.73	8.47
59	0.01438	0.01454	0.01615	0.01756	0.16752	11.65	11.52	10.38	9.54
60	0.01556	0.01556	0.01646	0.01717	0.17927	11.52	11.52	10.89	10.44
61	0.01687	0.01687	0.01723	0.01752	0.19975	11.84	11.84	11.59	11.40
62	0.01835	0.01835	0.01845	0.01852	0.21579	11.76	11.76	11.70	11.65
63	0.02007	0.02007	0.02007	0.02007	0.23325	11.62	11.62	11.62	11.62
64	0.02207	0.02207	0.02207	0.02207	0.28831	13.07	13.07	13.07	13.07
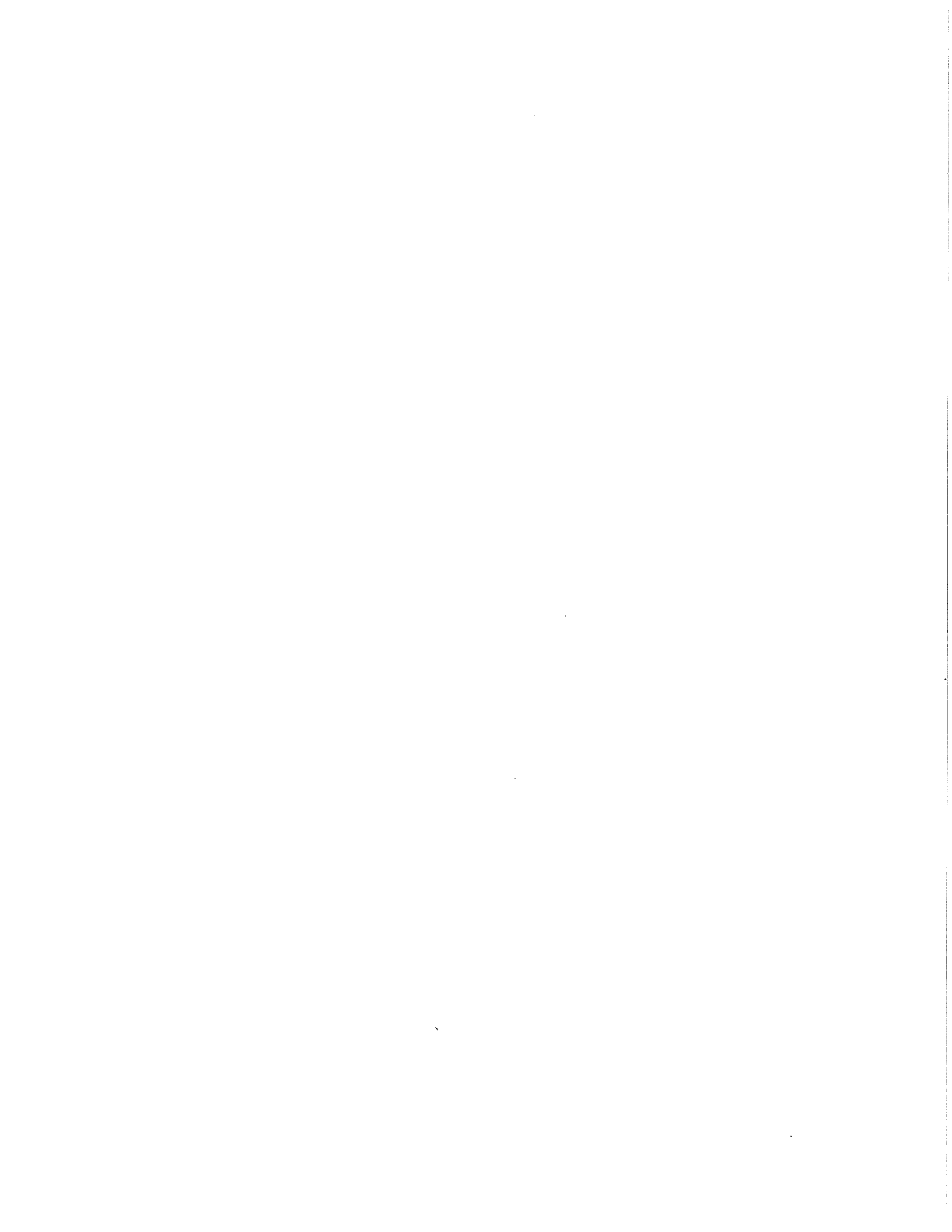
Graphs
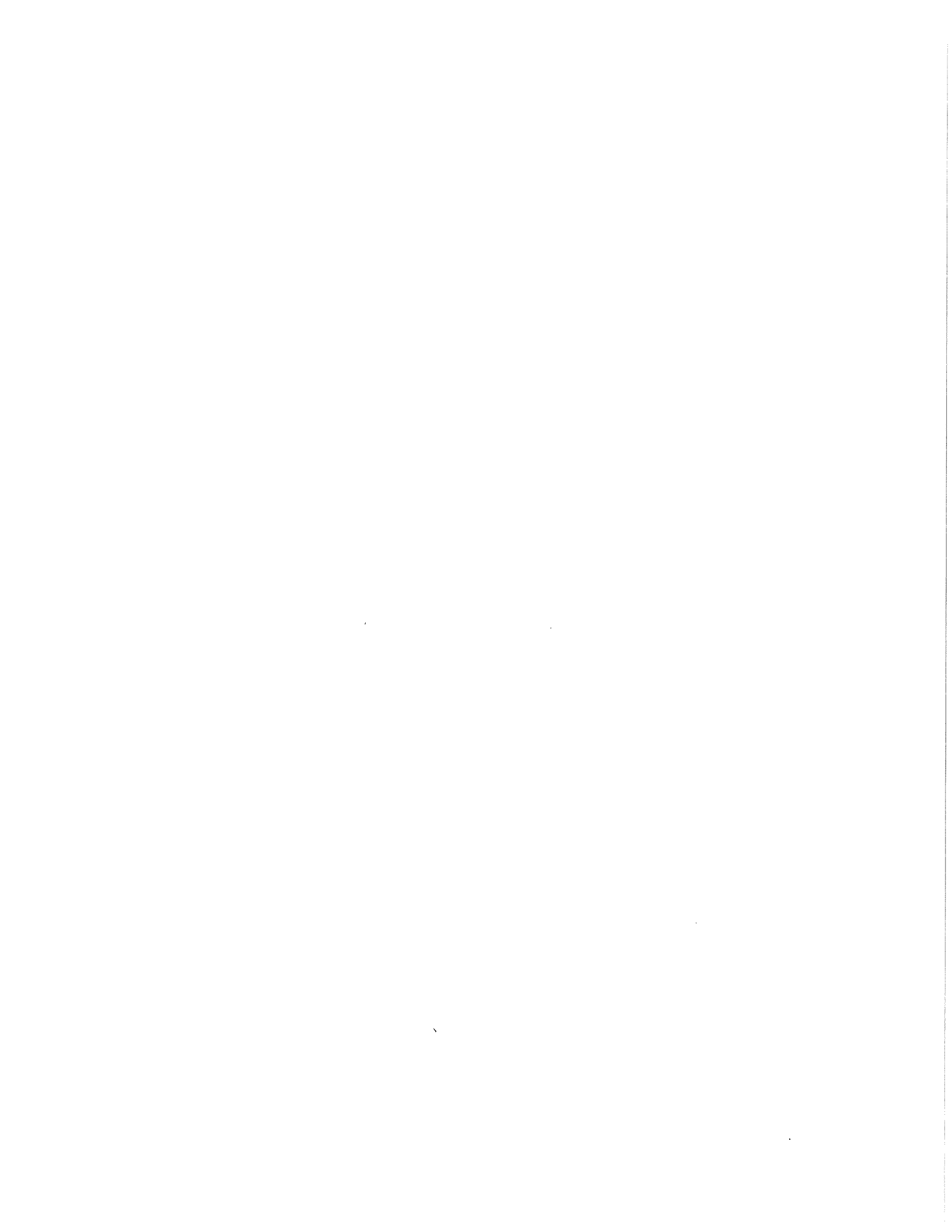
Graph 1

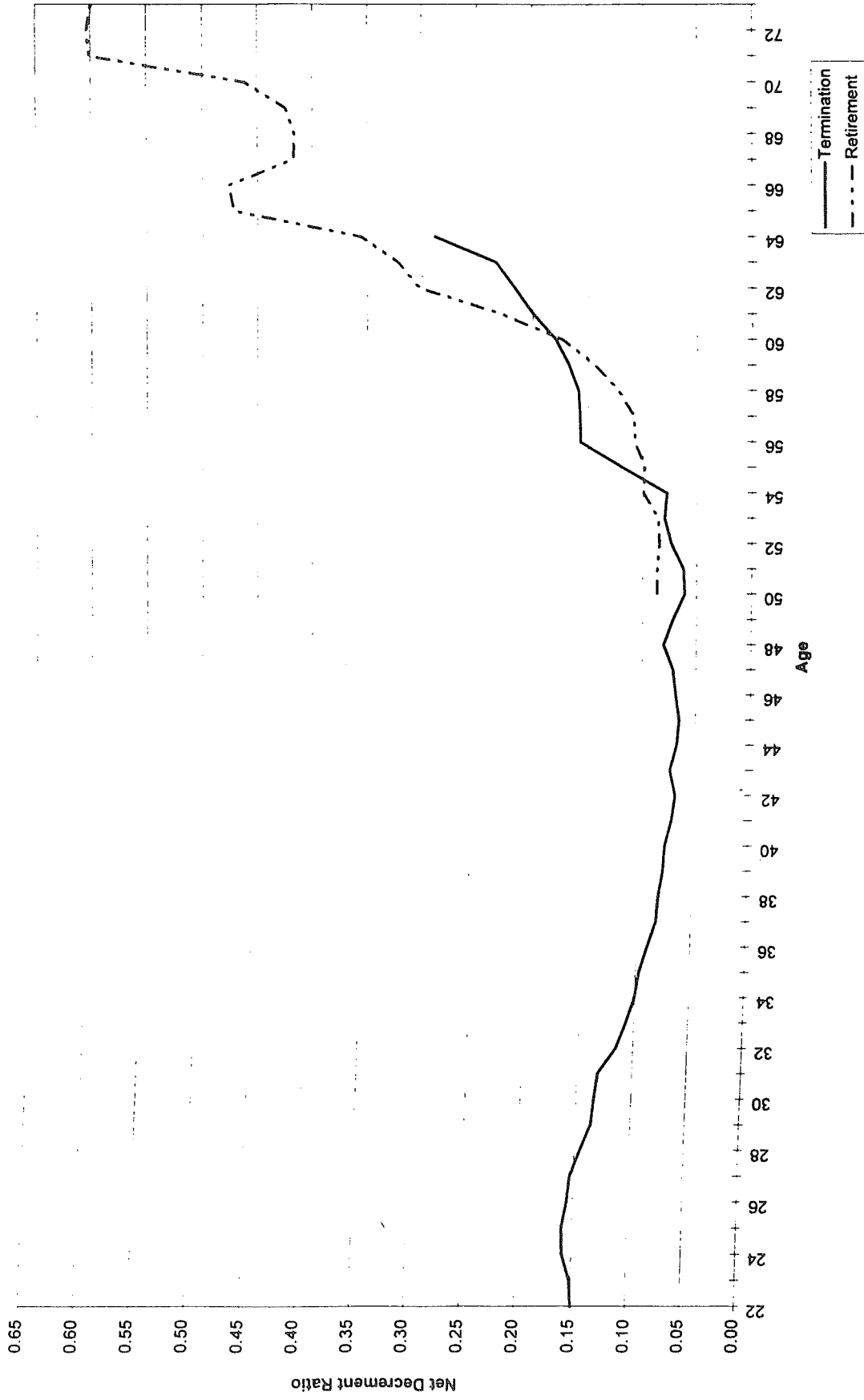Base Table Ratios for ALB and ANB Plans
All Plans Included

Net Decrement Ratio

Age

ALB
ANB
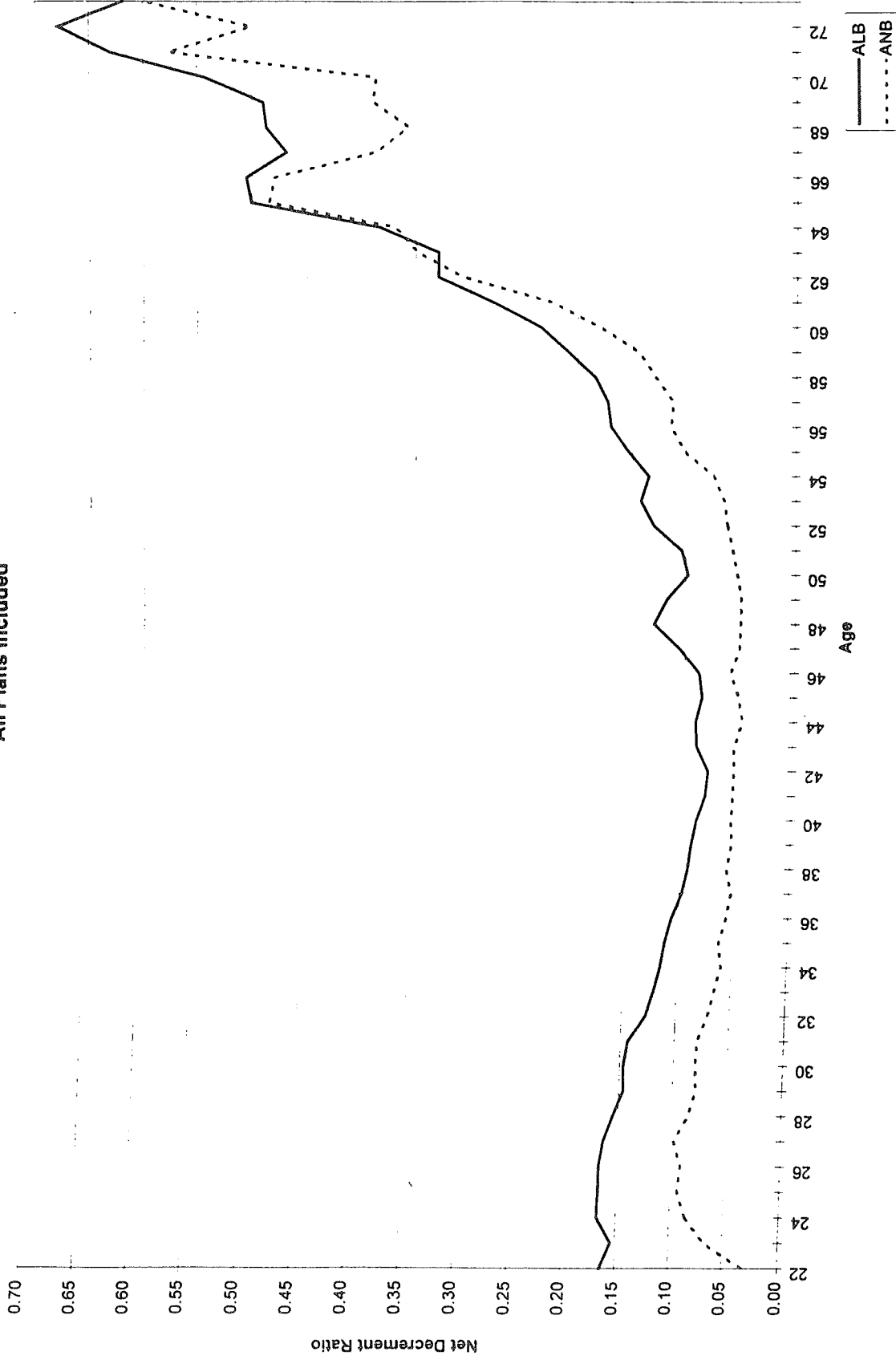
Graph 2

Base Table Ratios for ALB and ANB Plans
One Large ALB Plan Excluded

Net Decrement Ratio

Age

ALB
ANB
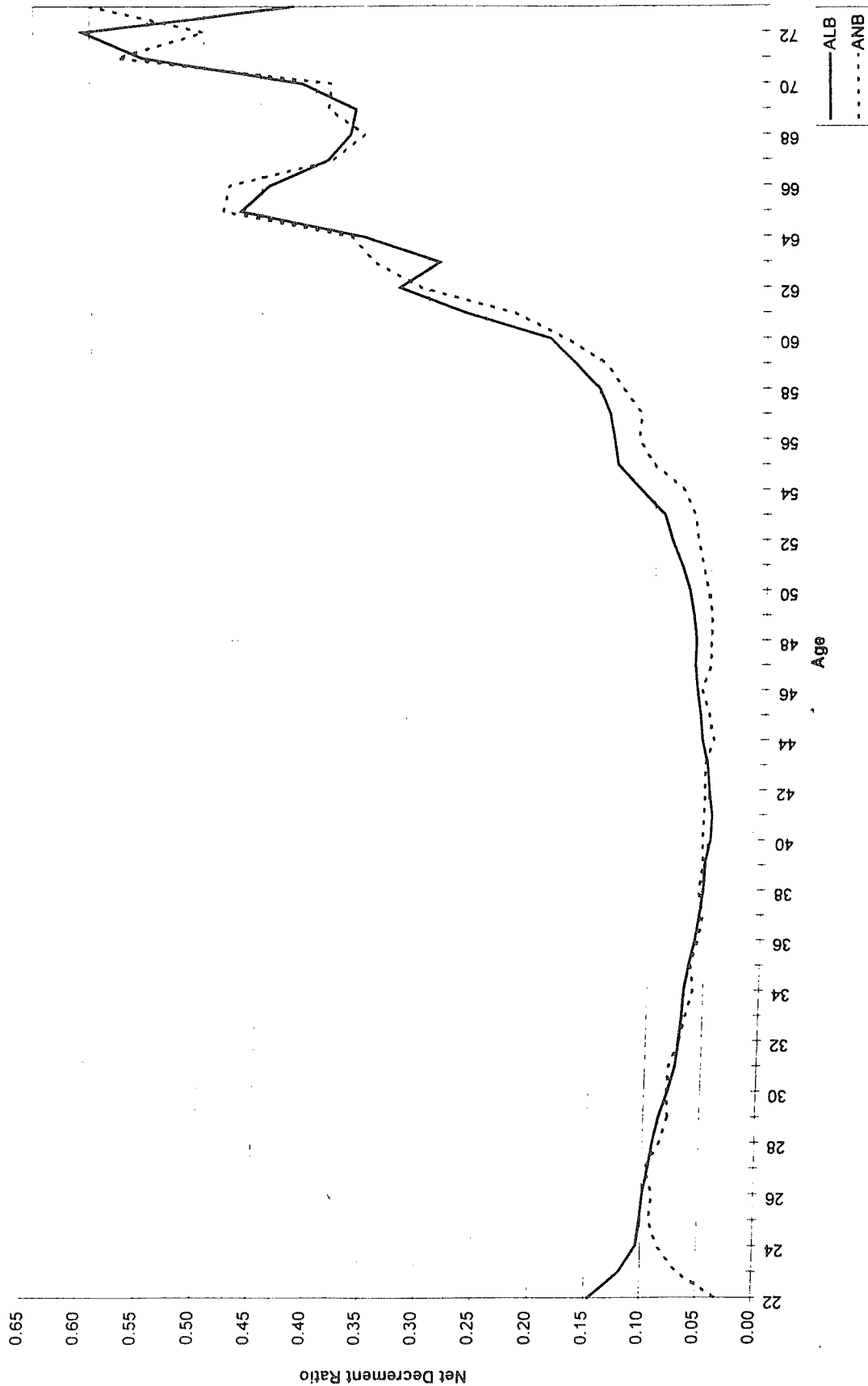
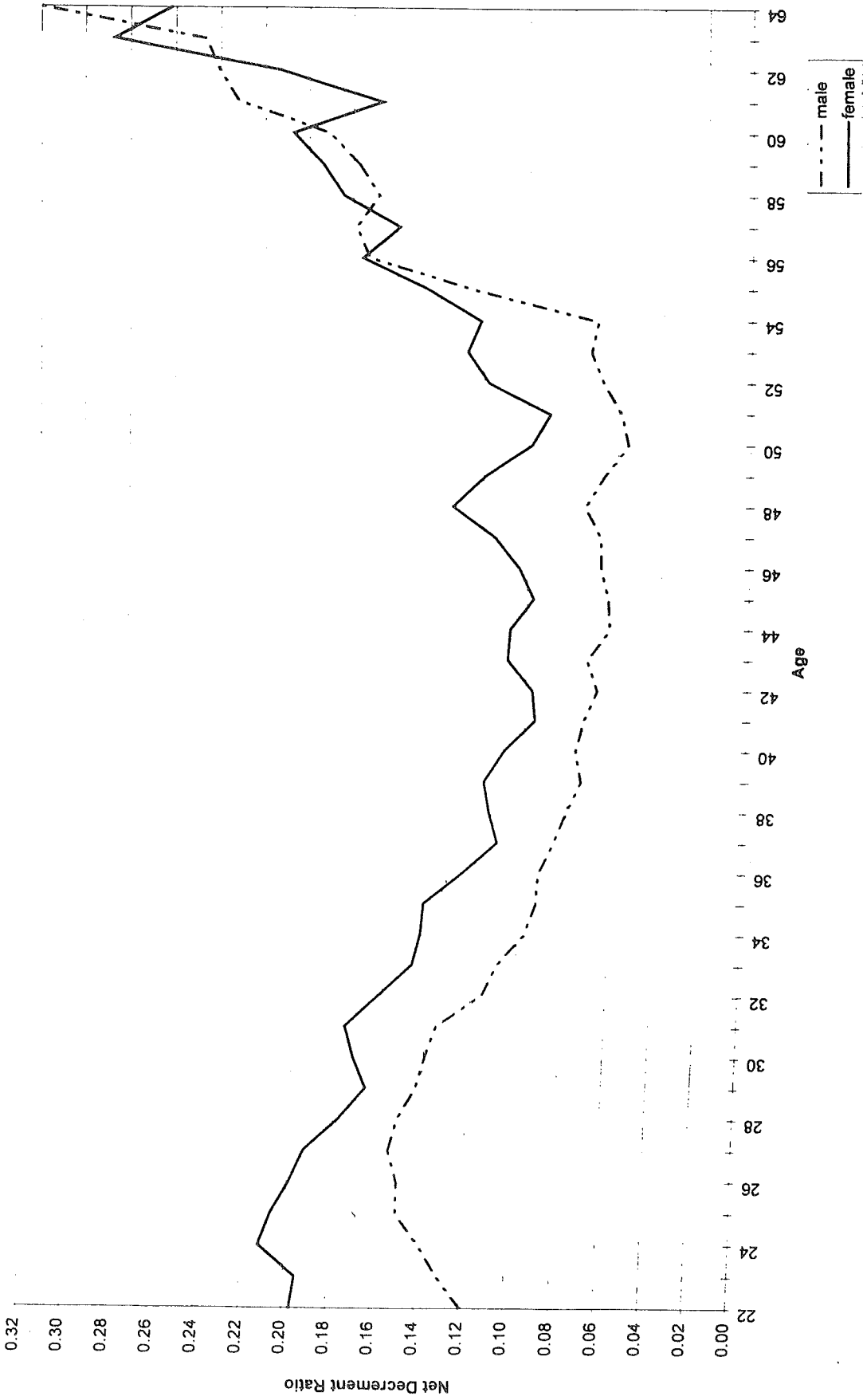Graph 3

Base Table Net Decrement Ratios
Excluding 0 Years of Service and ERWs

Net Decrement Ratio

Age

Termination
Retirement

Graph 4

Net Decrement Ratios - Termination Ages
By Gender -- 0 Years of Service Excluded

- - - male
——— female

Age

Net Decrement Ratio

Graph 5

Net Decrement Ratios - Retirement Ages
By Gender -- 0 Years of Service Excluded
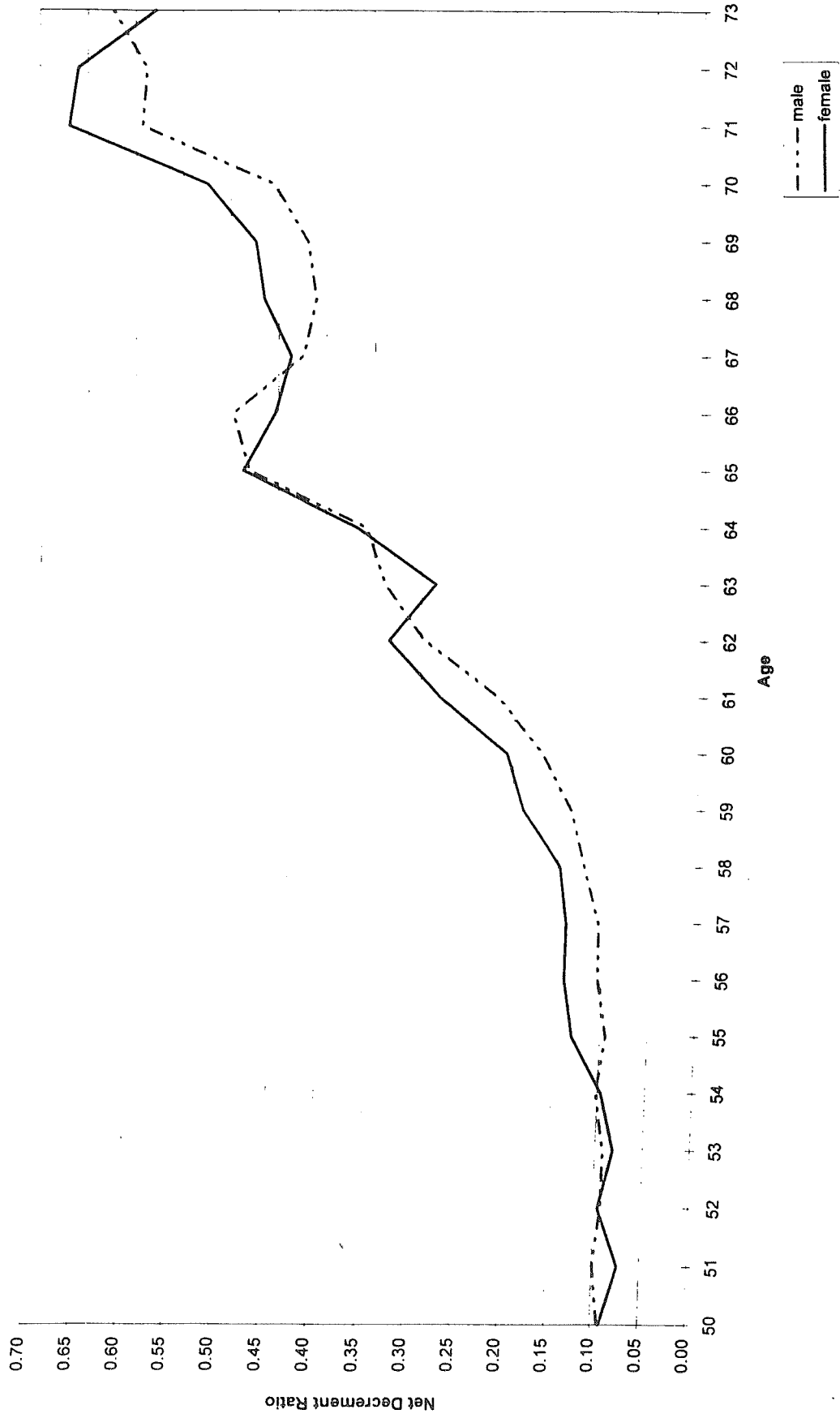
Graph 6

Net Decrement Ratios - Termination Ages
With and Without 0 years of Service

Legend:
- - - include 0 yrs of service
——— exclude 0 yrs of service

Y-axis: Net Decrement Ratio (0.00 to 0.30)
X-axis: Age (22 to 64)

Graph 7

Net Decrement Ratios - Termination Ages
By Years of Service
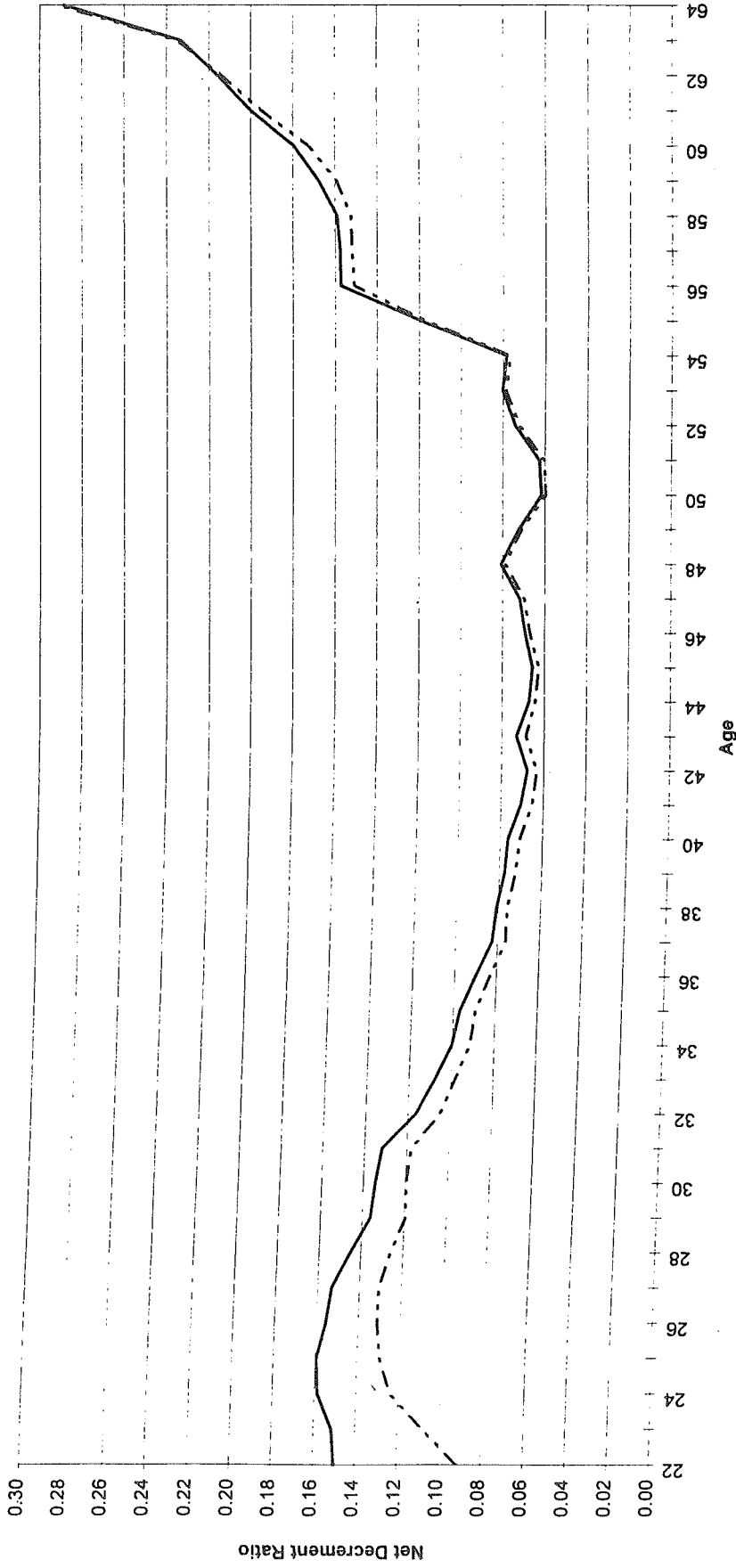
Net Decrement Ratio

Years of Service
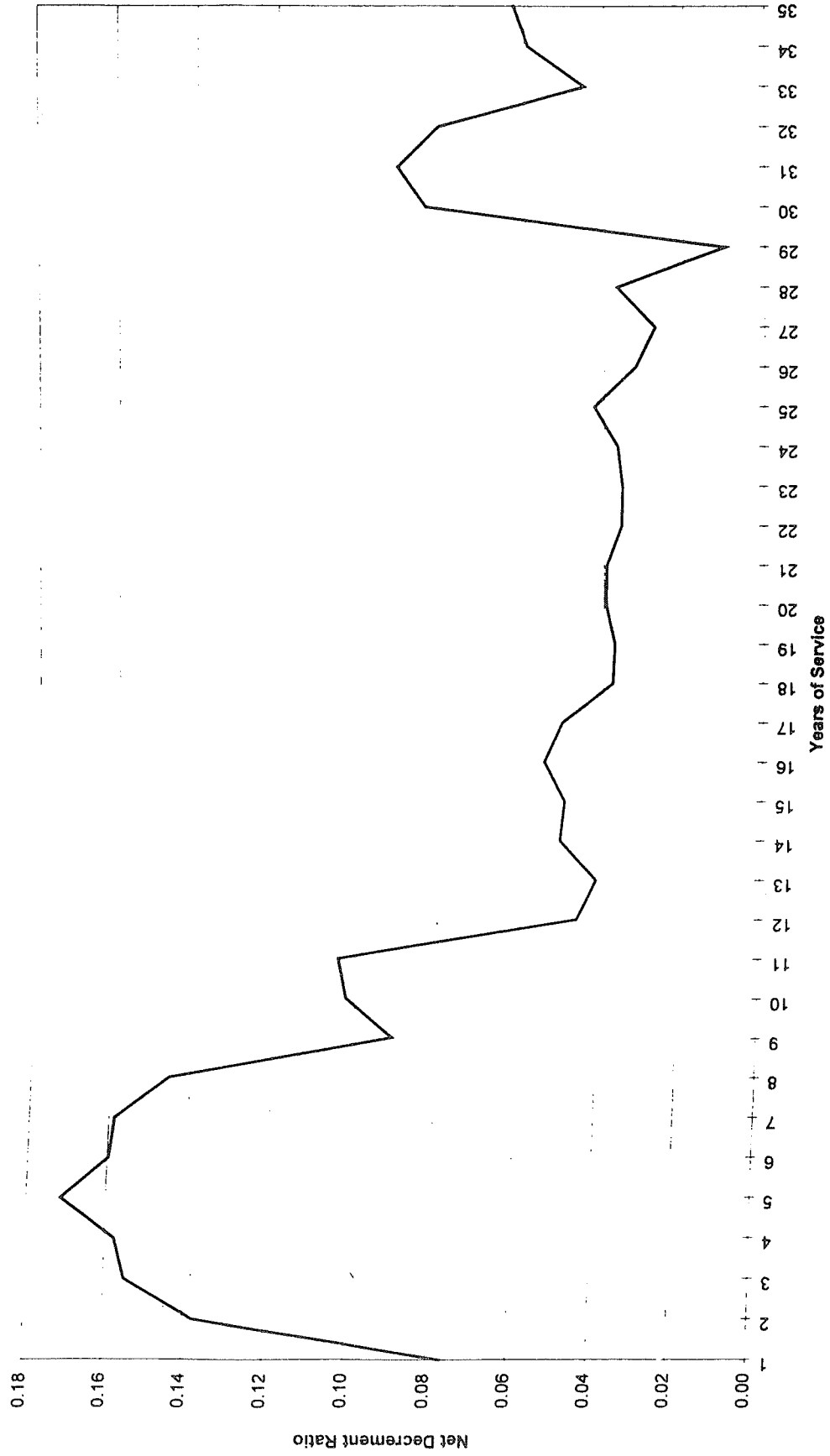
Graph 8

Net Decrement Ratios - Retirement
By Years Eligible For Benefits
Split by Reduced and Unreduced Benefits

Reduced Benefits
Unreduced Benefits
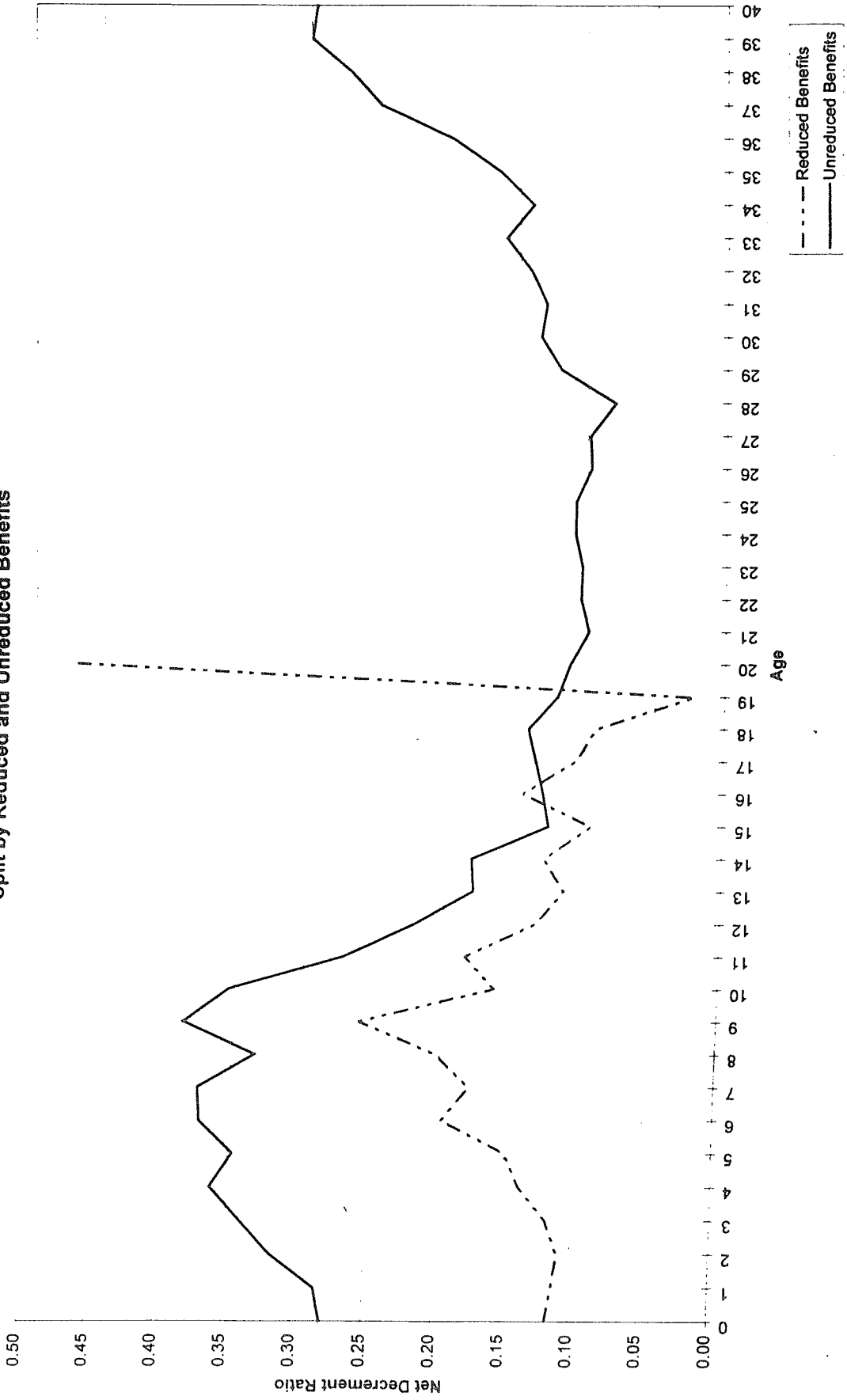
Graph 9

Net Decrement Ratios-Termination Ages
With and Without Early Retirement Windows

Includes ERW
Excludes ERW
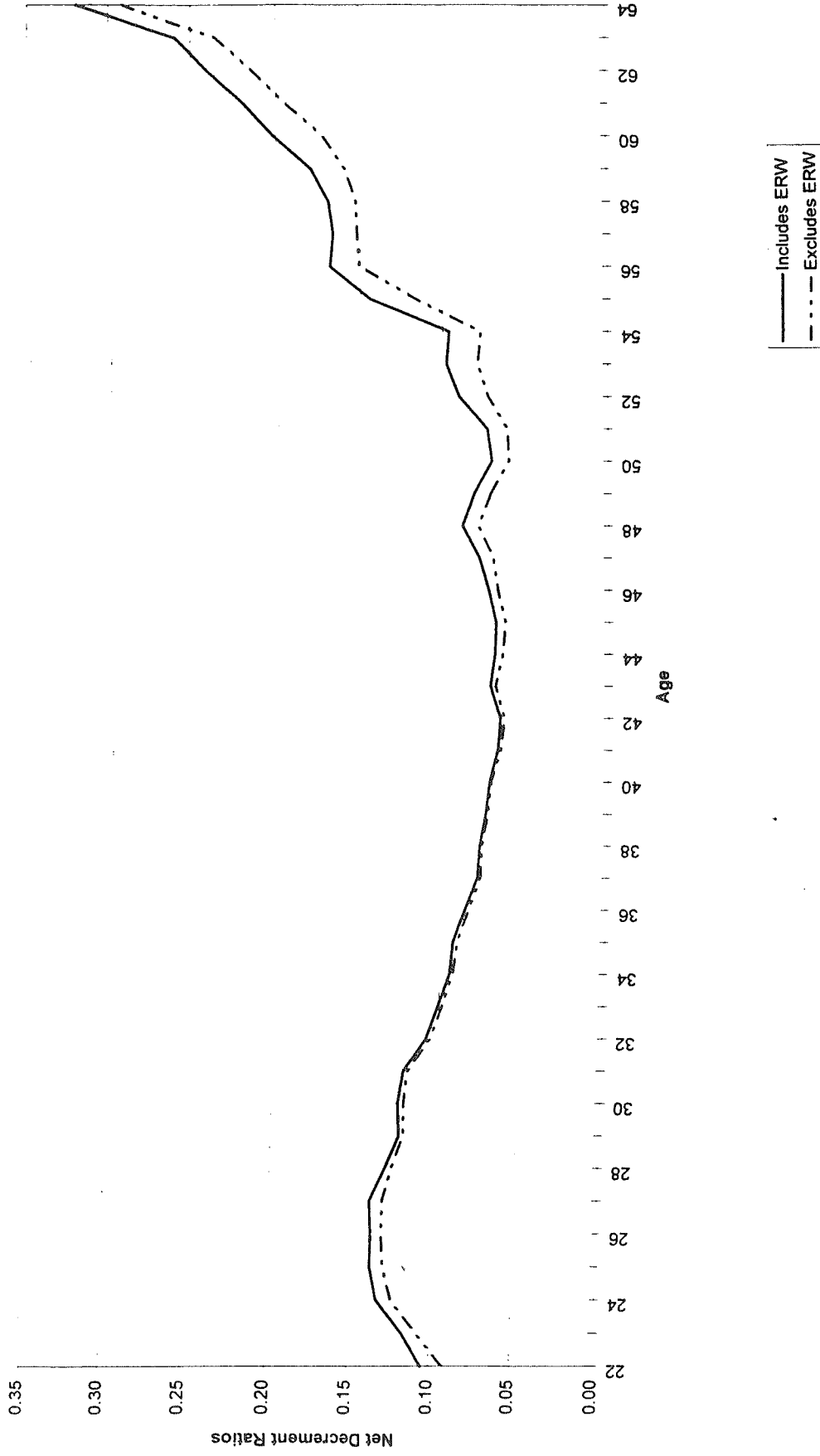
Graph 10

Net Decrement Ratios - Retirement Ages
With and Without Early Retirement Windows

Net Decrement Ratio

Age

—— Includes ERW
— - — Excludes ERW
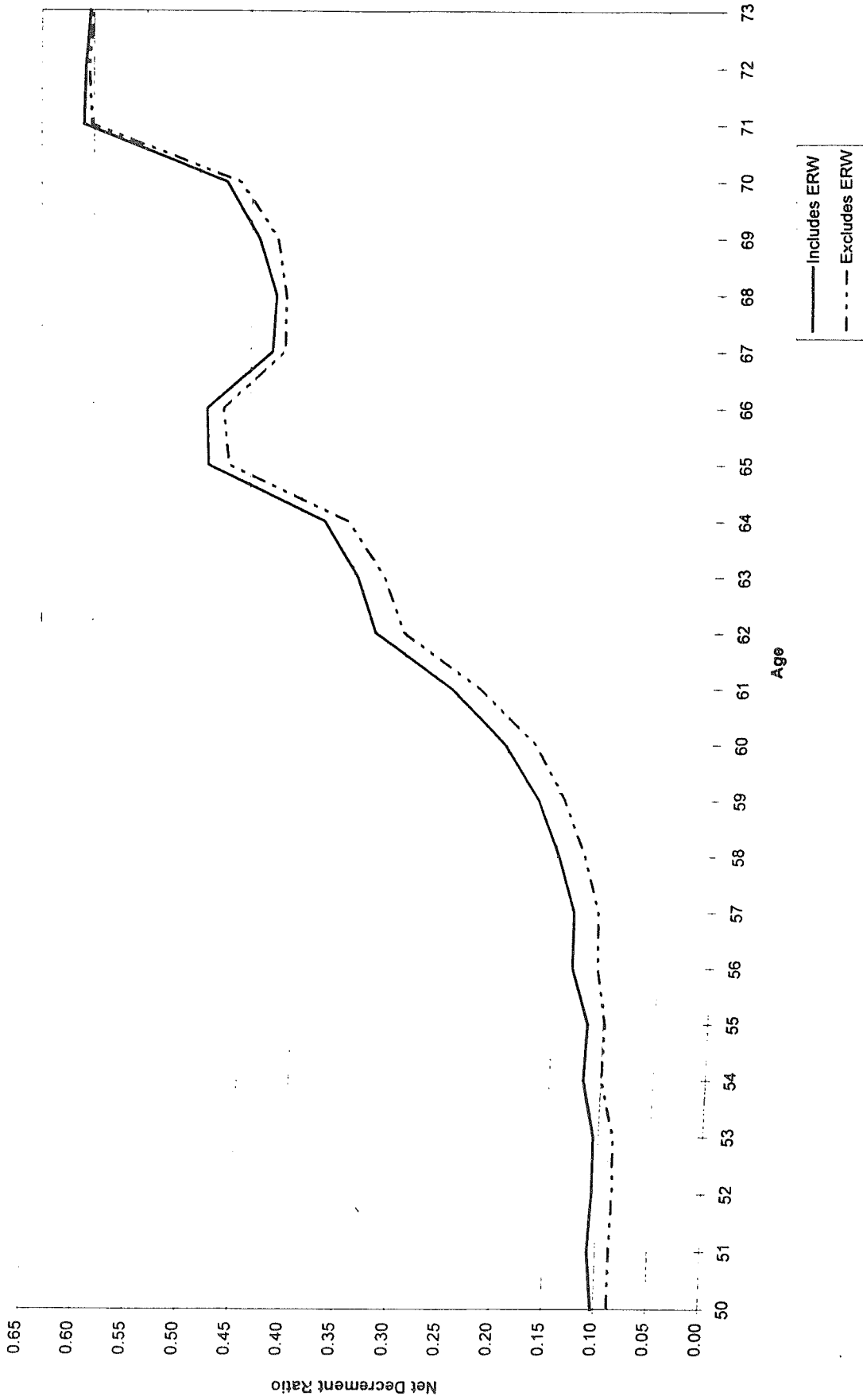
Graph 11

Plans With Early Retirement Windows
Actual to Expected Ratios - Termination Ages
ONLY Those Plan Years With ERW's

A/E Ratio

Age
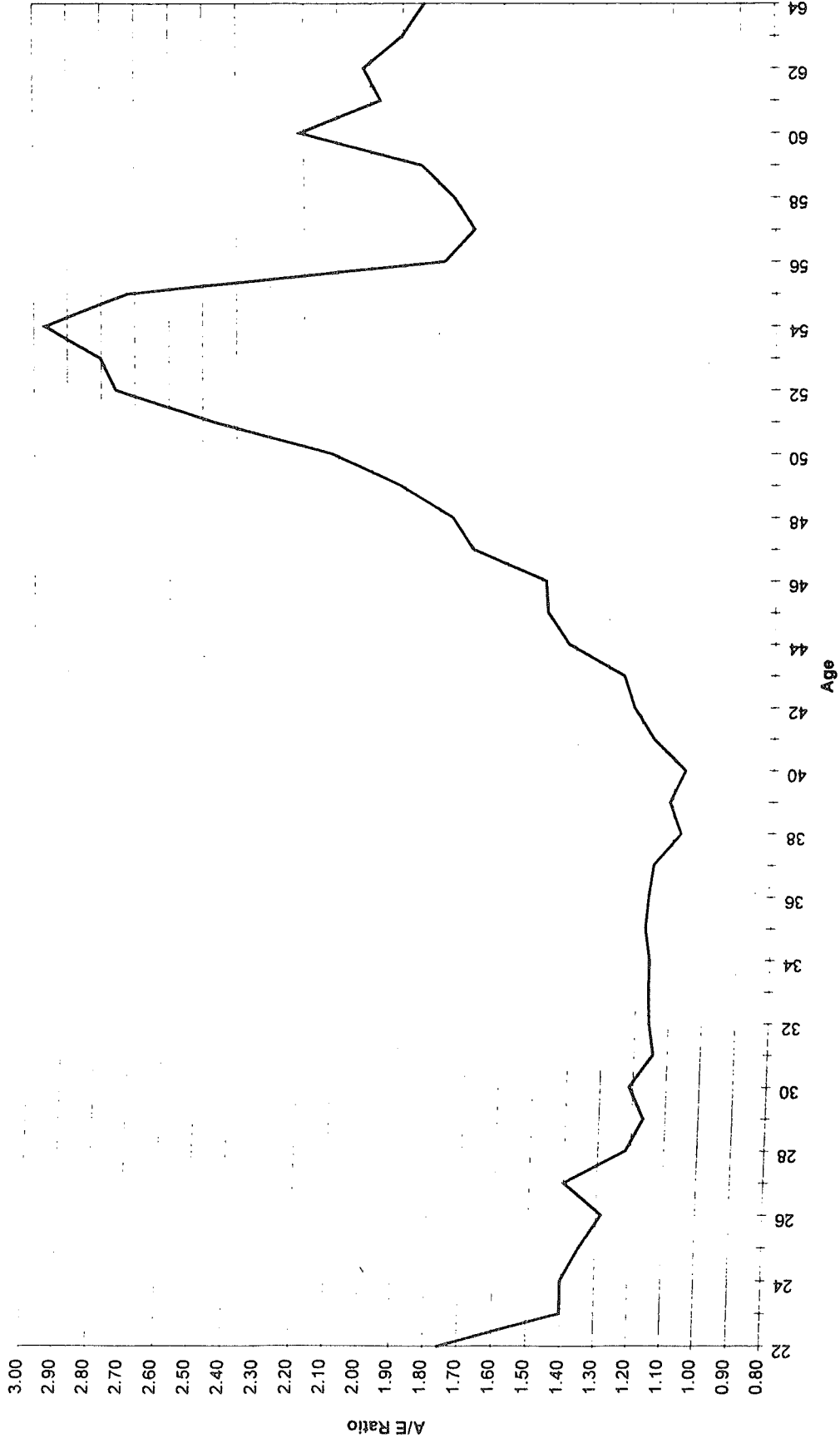
Graph 12

Plans With Early Retirement Windows
Actual to Expected Ratios - Retirement Ages
ONLY Plans Years With ERW's

A/E Ratio

Age
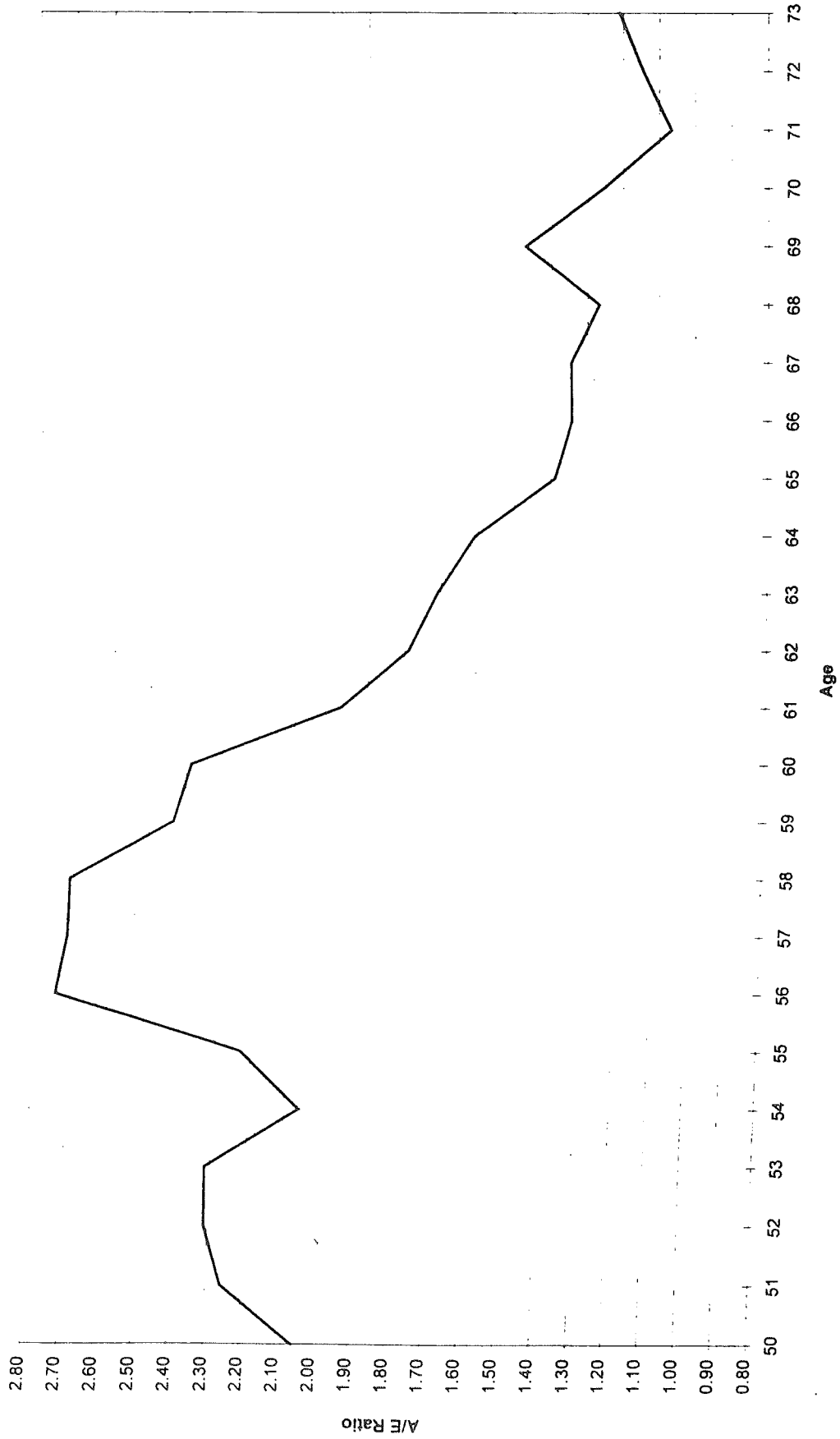
Graph 13

Net Decrement Ratios - Termination Ages
Comparison of 1989-92 vs. 1993-94
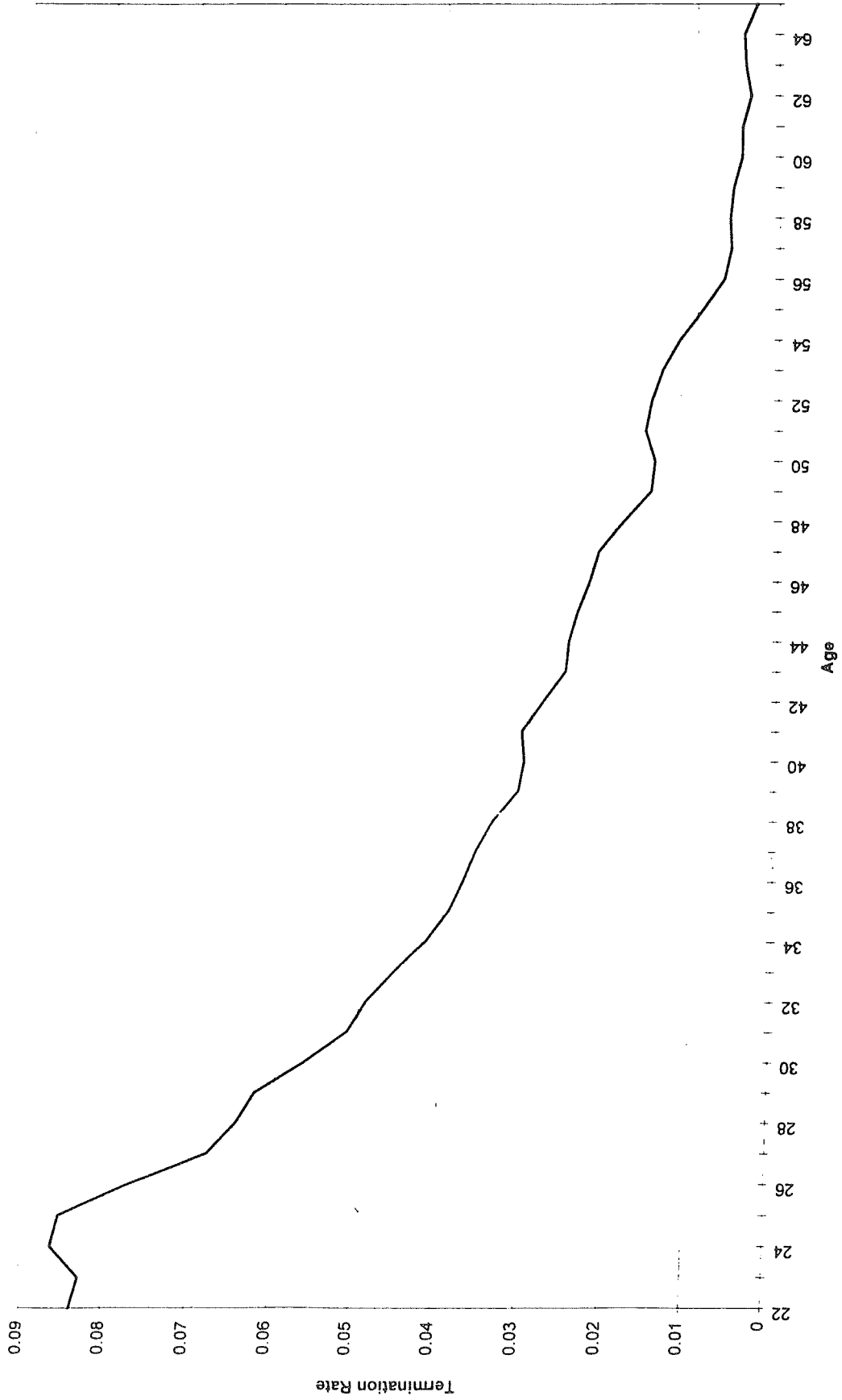

Net Decrement Ratios

Age

Year 1989-92
Year 1993-94
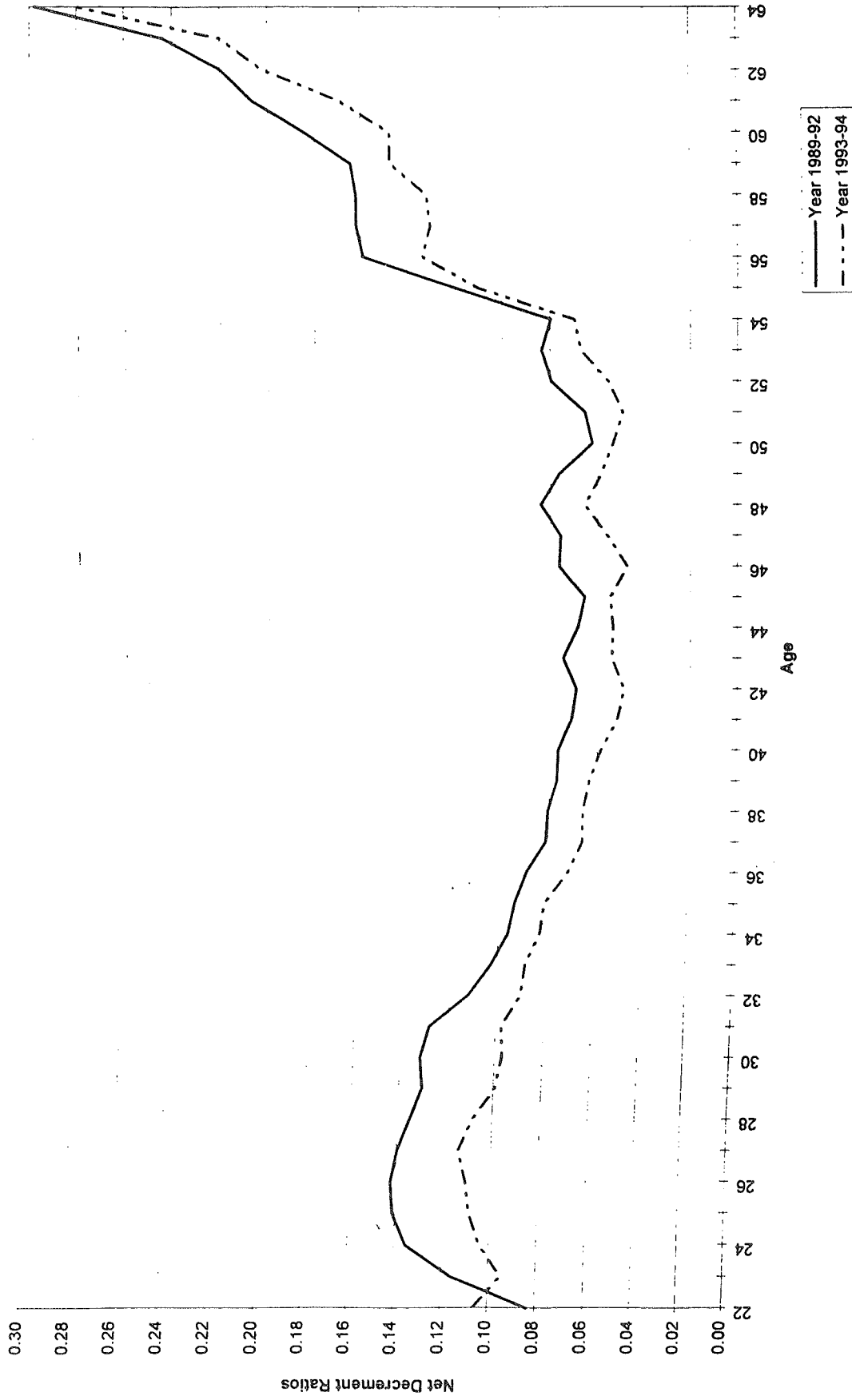
Graph 14

Net Decrement Ratios - Retirement Ages
Comparison 1989-92 vs. 1993-94

Net Decrement Ratio

Age

Year 1989-92
Year 1993-94
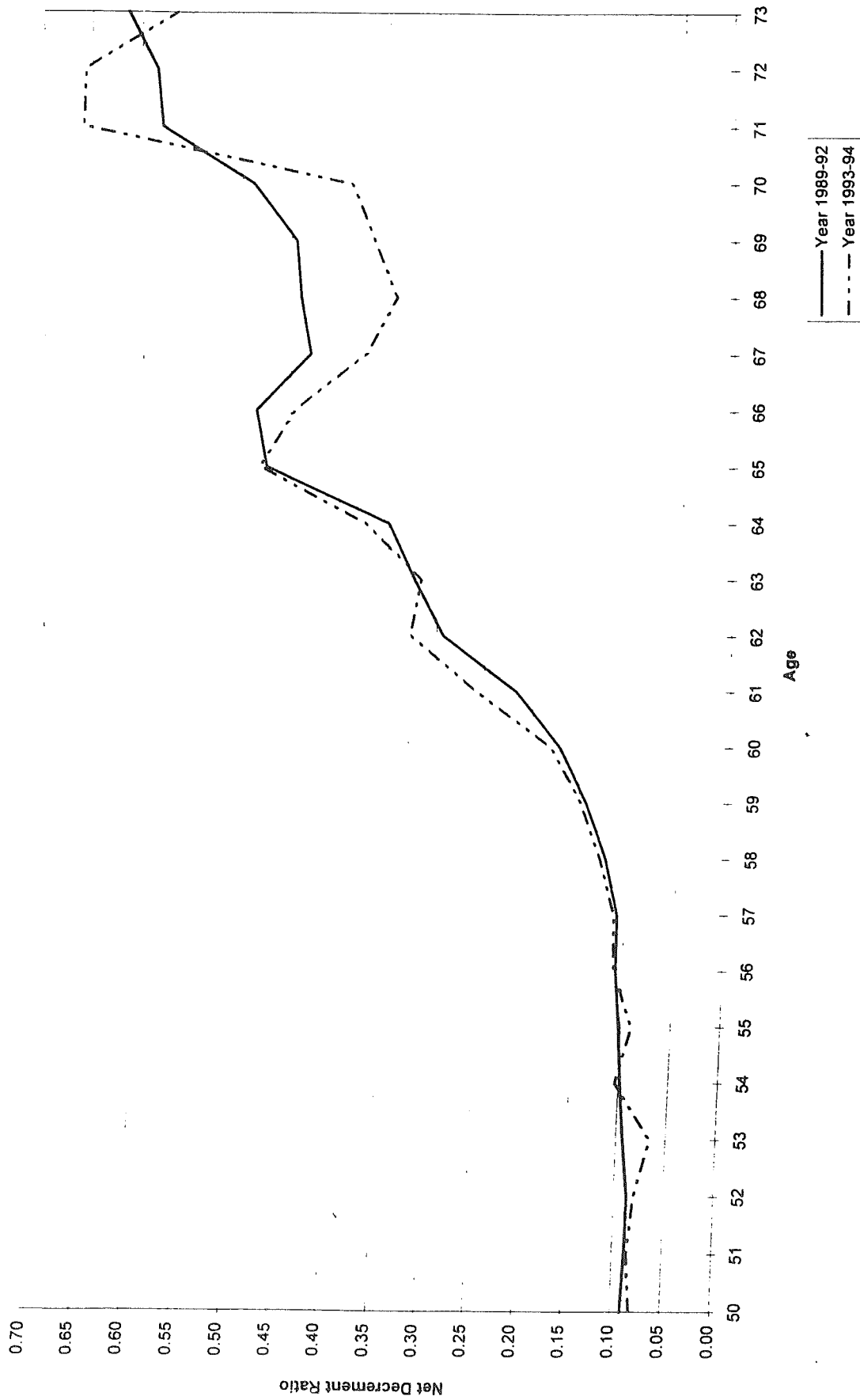
Graph 15

Termination and Retirement Rates
For Other Two Plans

Rates

Age

termination
retirement
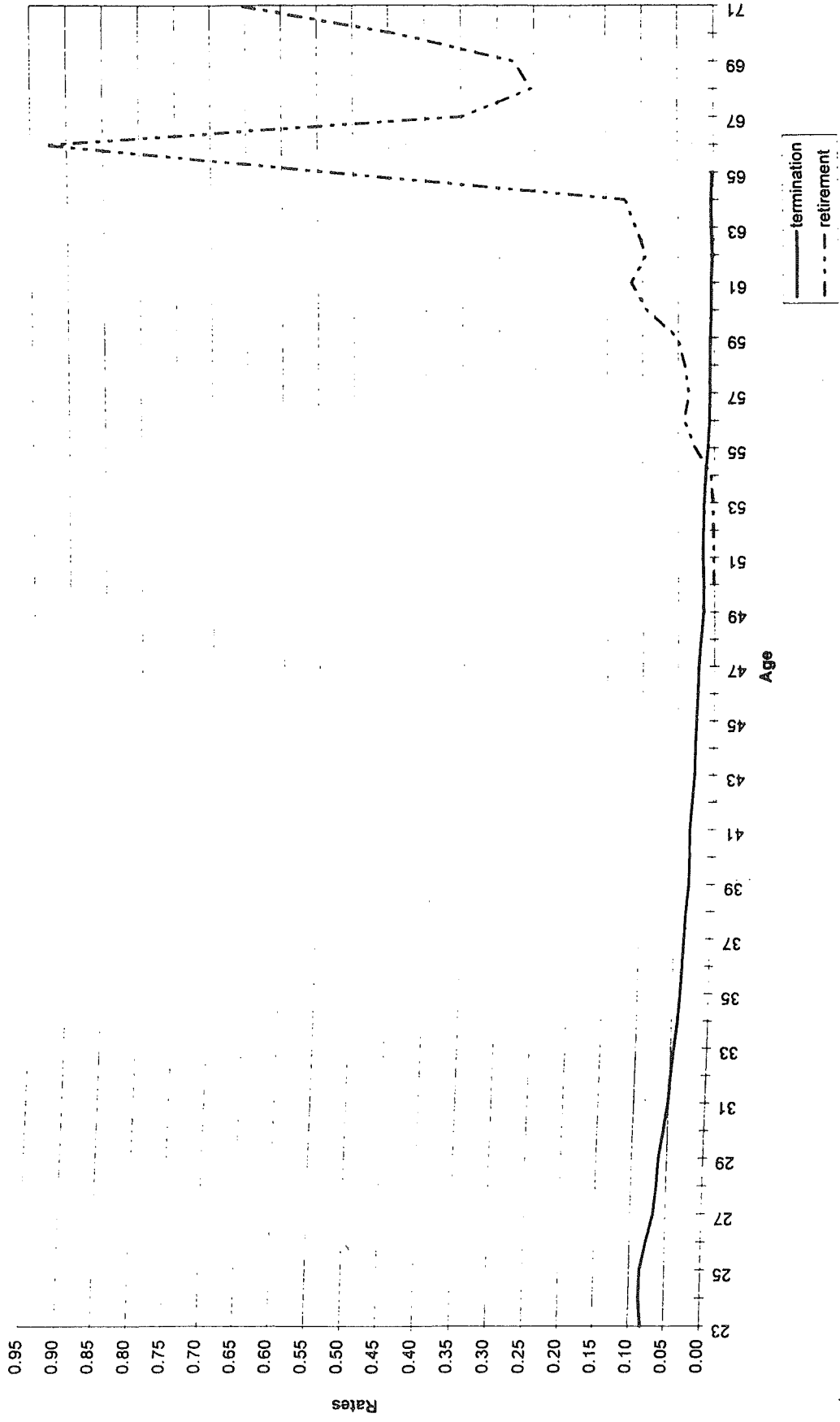
Graph 16

Termination Rates
For Other Two Plans

Graph 17

**Retirement Rates
For Other Two Plans**

Retirement Rate

Age
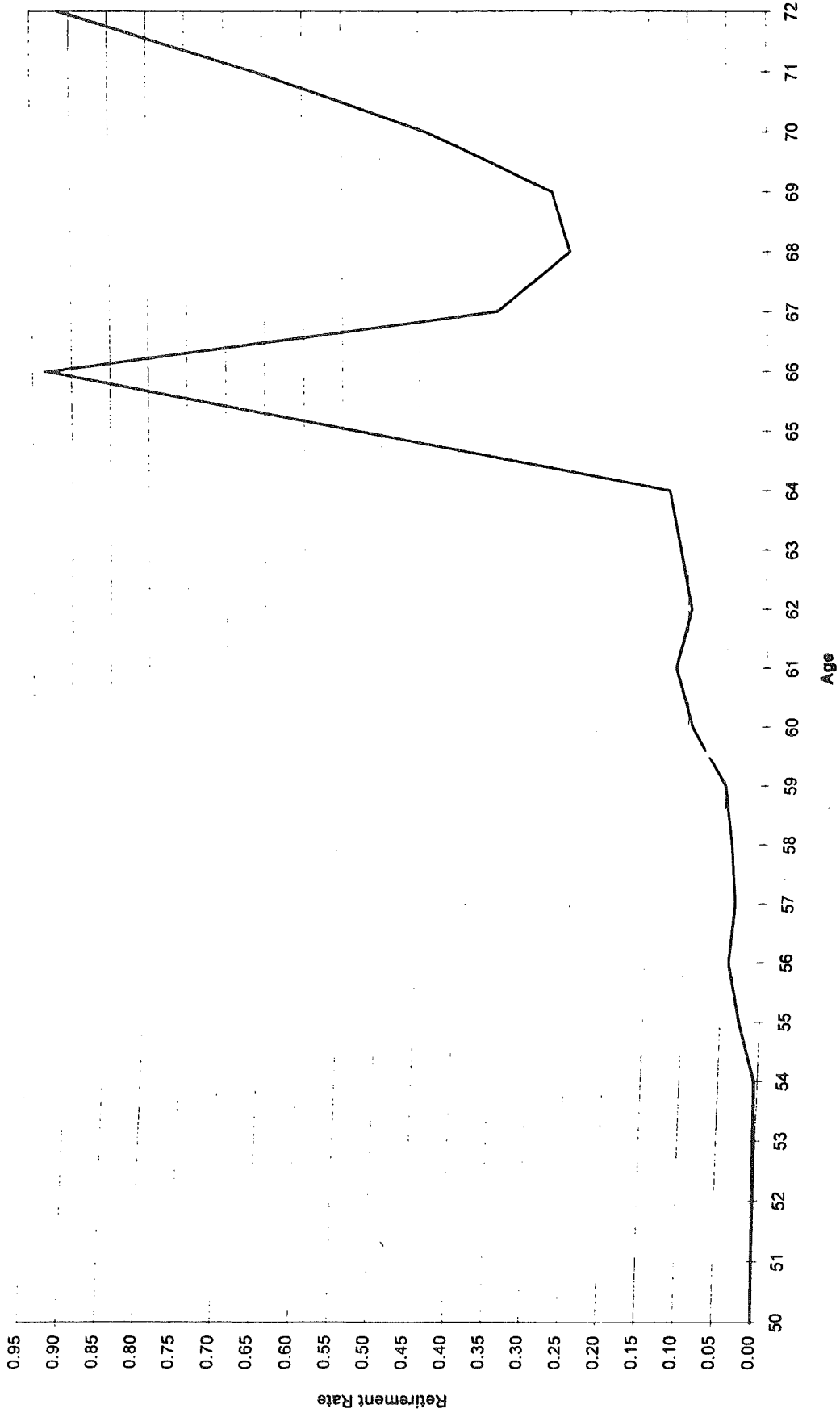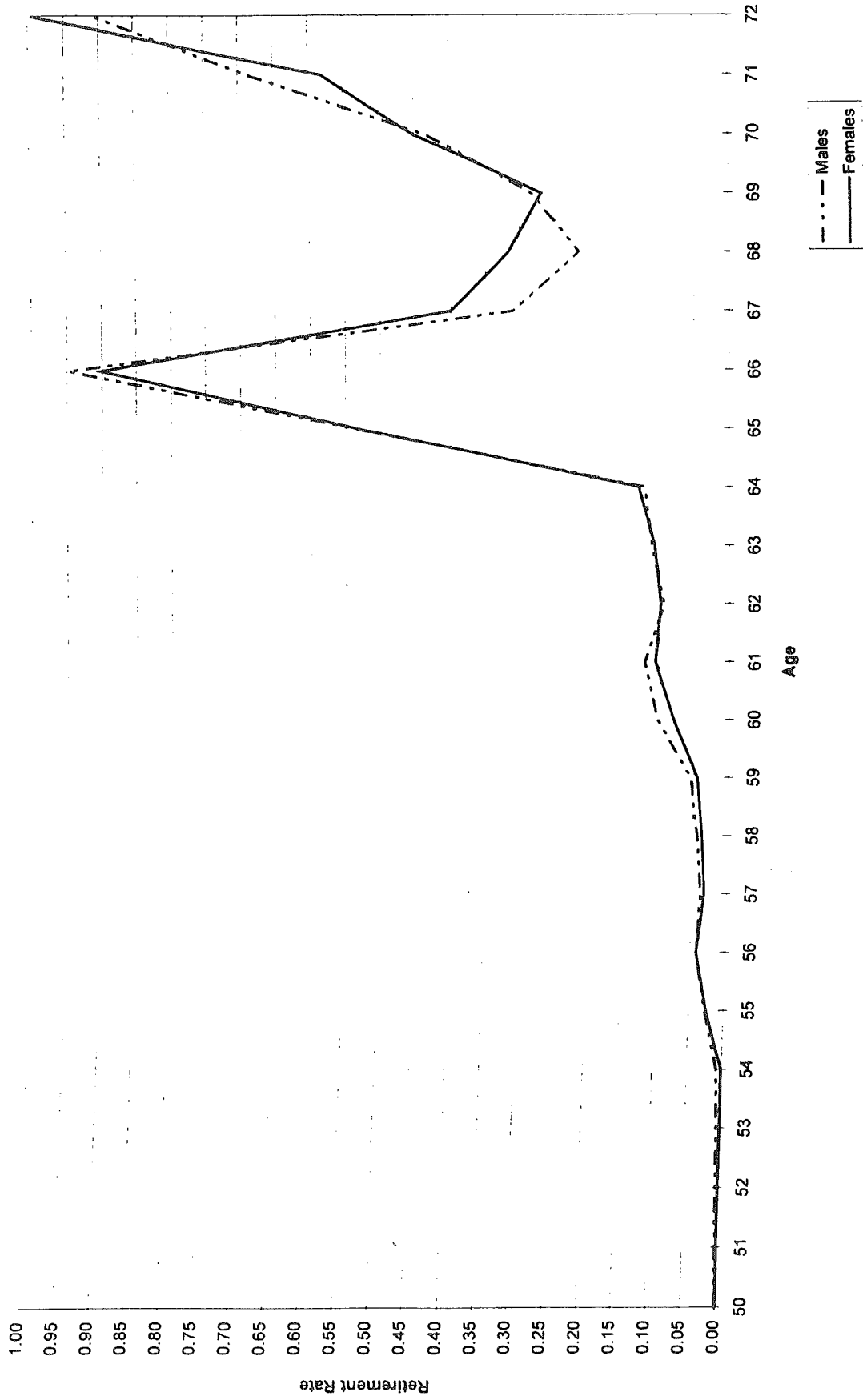
Graph 18

Termination Rates For Other Two Plans
By Gender

Termination Rate

Age

- - - Males
——— Females
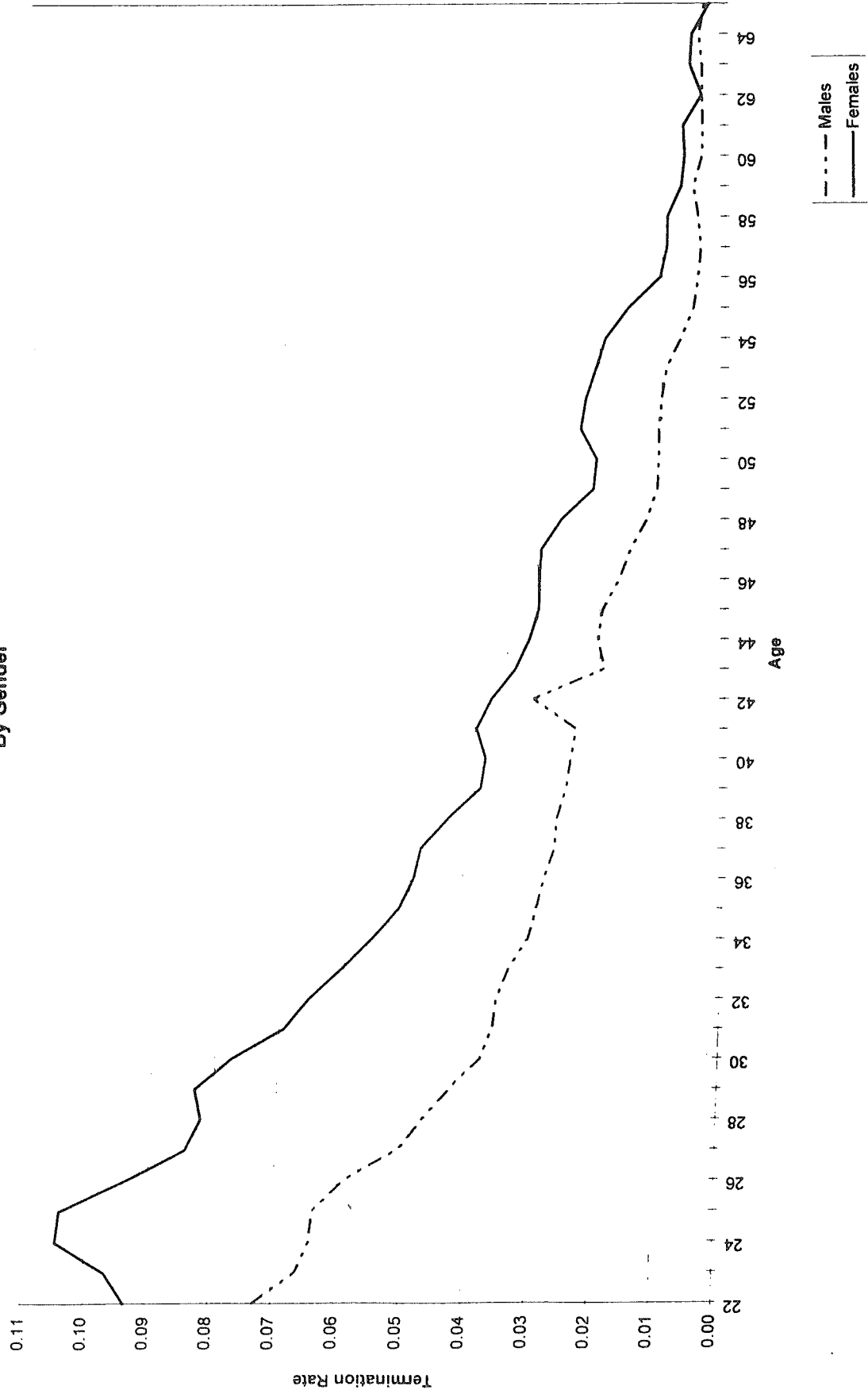
Graph 19

Retirement Rates For Other Two Plans
By Gender

Retirement Rate

Age

- - - Males
—— Females

Graph 20

Comparison of Base Table to Sarason T-tables