Survivor Reduction Factors Preliminary Report

LEOFF Plan 2 Retirement Board

June 23, 2009

Key Issues

- Survivor Retirements use the same 100% Joint and Survivor Reduction Factors as a Service or Disability Retirement

Other Policy Issues

- Consistency with other Plans
- Recalculation of Benefit

Options

- Create a New Table of Actuarial Factors for Survivor Retirements
- Eliminate Joint 100% Survivor Reduction Factor for Survivor Retirements

Survivor Reduction Factors

Questions?

LAW ENFORCEMENT OFFICERS' AND FIRE FIGHTERS' PLAN 2 RETIREMENT BOARD

Recalculation of Retirement Benefits

Preliminary Report

October 22, 2008

1. Issue

Implementation of new actuarial factors as the result of the last experience study resulted in significantly different retirement benefits for members with nearly identical careers.

2. Staff

Greg Deam, Senior Research and Policy Manager
(360) 586-2325
greg.deam@leoff.wa.gov

3. Members Impacted

As of June 30, 2006 there were 16,099 active members and 924 retirees as reported in the Office of the State Actuary's *2007 Actuarial Valuation Report*. This issue would apply to all LEOFF 2 retirees whose benefits were calculated using a survivor reduction factor or an early retirement reduction factor. The same issue exists in other retirement systems.

4. Current Situation

A member who chooses to provide a survivor benefit at the time of retirement has their benefit reduced so that the lifetime benefit covering both the retiree and beneficiary is actuarially equivalent to a lifetime benefit for the retiree only. Similarly, a retiree who goes out on a disability retirement prior to age 53 or the beneficiary of a member who died prior to retirement may have had their benefit actuarially reduced for "early retirement."

The Office of the State Actuary produces experience studies for LEOFF Plan 2 every five years which compare previous actuarial projections to actual experience regarding assumptions for such things as mortality, rates of disability, and retirements. New reduction factors for survivor benefits and early retirements are calculated using the updated experience. The LEOFF Plan 2 Retirement Board is responsible for adopting the actuarial reduction factors for LEOFF Plan 2. The Department of Retirement Systems puts the new reduction factors in WAC and uses updated factors to calculate benefits for new retirees but does not recalculate the benefits of members who have already retired using the prior factors. The Board will be adopting new reduction factors during the 2009 Interim.

5. Background Information

Economic and Demographic Assumptions
Actuaries use both economic and demographic assumptions to determine the projected liabilities of a plan.

"Economic assumptions" include such items as inflation and the rate of return on assets invested in the plan. These types of assumptions are usually set in statute and change infrequently.

"Demographic assumptions" are assumptions about member behavior and include such things as life expectancy, probability of disablement and probability of service retirement at a certain age. These types of assumptions are published in actuarial valuations and comprehensive annual financial reports and are adjusted periodically based on the results of actuarial studies. The most common type of study in Washington is the Actuarial Experience Study which is conducted by the Office of the State Actuary every five years.

Experience studies play an important part in younger retirement plans because they validate or adjust the demographic assumptions on which the plan's funding is based. For example, if the original life expectancy assumptions for members are found to be low, then the liabilities of the plan increase because retirees will now be expected to receive their benefits longer. The resulting increase in liabilities would tend to increase the contributions necessary to fund the plan.

Results of the Previous Experience Study (2002)
During the previous experience study the Office of the State Actuary discovered that both LEOFF members and their beneficiaries tended to live longer than the assumptions predicted.

The increase in life expectancy for beneficiaries was based largely on a new national table (RP 2000) developed by the Society of Actuaries. LEOFF Plan 2 members also showed an increase in life expectancy based on Washington LEOFF experience. The effect of this positive life expectancy experience on survivor reduction factors was significant.

Although the effect of increased life expectancy would generally be to increase reduction factors, in this case the new factors were 2.5% to 16.5% lower. Presumably, this was because the life expectancy of members increased at a far greater pace than the life expectancy for beneficiaries. Table One in the Appendix compares the previous survivor reduction factors to the new factors.

Example One below shows the how the factor changed for a retiree aged 53 with a spouse one year younger and how the retiree's benefit would be different using the updated factor.

> **Example One:**
> The survivor factor for a retiree who chose a joint and 100% survivor option for a spouse one year younger changed from 0.771 to 0.865 as a result of the 2002 Actuarial Experience Study. A member who retired with 20 years of

service and an average final salary of $65,000 would have received a base benefit of $1670.50/month using the old factors. But, a member with the same years of service and average final salary who retired using the new factors would receive a base benefit of $1874.7/month.

$65,000/12 x 20 x 2% x 0.771 = $1,670.50
$65,000/12 x 20 x 2% x 0.865 = $1,874.17

Actuarial Equivalence
Statues require certain types of benefit options, such as survivor benefits, to be "actuarially equivalent." For example, RCW 41.26.460 provides that the service retirement beneficiary options shall be calculated so as to be actuarially equivalent to each other.

Table One in the Appendix shows the various reduction factors for the three survivor options currently available to LEOFF Plan 2 retirees: Option 2 (Joint and 100%), Option 3 (Joint and 50%) and Option 4 (Joint and 66.67%).

6. Policy Questions

Ongoing Actuarial Equivalence
RCW 41.26.460 does not specifically address the question of whether the required "actuarial equivalence" is for the time of retirement only or whether the required equivalence should be maintained throughout the period of time that a retiree or beneficiary receives payments. Ongoing actuarial equivalence would mean that the benefit being paid to a retiree or beneficiary would be adjusted when actuarial factors are changed due to changing assumptions.

The Department of Retirement Systems has resolved this question via agency rule development. WAC 415-02-300(6) provides that "the tables, schedules and factors in this chapter shall apply to the calculation of retirement allowances for those who retire on or after September 1, 2002, (until subsequent amendment)." The Department did not adjust the benefits of prior retirees when the new factors were adopted. A change in that practice would require DRS to implement a method for recalculating a retiree's benefit using new factors.

However, when the Department adopted WAC 415-108-805 and 415-112-555 implementing the new minimum benefit for Plan 1 retirees in the Teachers' Retirement System and the Public Employees' Retirement System, the Department used the "the same factors used to calculate their benefit at the time of retirement; or for beneficiaries, at the time benefit payments commenced." The same policy approach would be an option for implementing revised actuarial factors.

The Office of the State Actuary does not recalculate the liabilities associated with retired members for actuarial valuation purposes when new factors are adopted. A change in that practice could mean increased liabilities in the next actuarial valuation since the experience in the plan so far appears to have been positive. An increase in liabilities could mean an

increase in the amount of member, employer and state contributions necessary to fund the plan although the number of retirees in LEOFF Plan 2 is fairly small.

Future experience could result in either higher or lower factors. Application of new factors to decrease a retiree's pension might not be legally permissible.

All of the State's public retirement plans use actuarial reduction factors to calculate survivor benefits and the reductions associated with retiring before normal retirement age. The question of how to apply new actuarial reduction factors has not been discussed by the Select Committee on Pension Policy or its predecessor, the Joint Committee on Pension Policy.

The question of implementing new actuarial reduction factors which would result in a reduced pension for retirees has not been addressed in the Courts. The Supreme Court in Washington has long held that new reduction factors may be applied to retirements that occur after the effective date of the new factors [*King County Employees' Association v. State Employees' Retirement Board*, 54 Wn.2d 1, 336 P.2d 387 (1959)].

RCW 41.26.720(a) provides that the LEOFF Plan 2 Retirement Board is required to adopt actuarial tables, assumptions and cost methodologies for LEOFF Plan 2. The next Actuarial Experience Study from the Office of the State Actuary is expected in 2006-07. The Board will be required to adopt any changes to actuarial reduction factors at that time.

7. Appendix

Table One:
Changes in Survivor Reduction Factors as a result of the 2002Expereince Study
OPTION 2 FACTORS

Joint and 100%

Age Difference Beneficiary Younger	9/1/02 Factor	1/1/96 Factor	Factor Difference
-20	0.9530000	0.9280000	0.0250
-19	0.9500000	0.9230000	0.0270
-18	0.9470000	0.9180000	0.0290
-17	0.9440000	0.9120000	0.0320
-16	0.9400000	0.9060000	0.0340
-15	0.9370000	0.8990000	0.0380
-14	0.9330000	0.8920000	0.0410
-13	0.9290000	0.8850000	0.0440
-12	0.9250000	0.8770000	0.0480
-11	0.9210000	0.8690000	0.0520
-10	0.9170000	0.8610000	0.0560
-09	0.9130000	0.8540000	0.0590
-08	0.9080000	0.8460000	0.0620
-07	0.9040000	0.8380000	0.0660
-06	0.8990000	0.8300000	0.0690
-05	0.8940000	0.8230000	0.0710
-04	0.8900000	0.8140000	0.0760
-03	0.8850000	0.8060000	0.0790
-02	0.8800000	0.7980000	0.0820
-01	0.8750000	0.7900000	0.0850
0	0.8700000	0.7800000	0.0900
01	0.8650000	0.7710000	0.0940
02	0.8600000	0.7600000	0.1000
03	0.8550000	0.7510000	0.1040
04	0.8500000	0.7430000	0.1070
05	0.8450000	0.7350000	0.1100
06	0.8400000	0.7280000	0.1120
07	0.8350000	0.7210000	0.1140
08	0.8300000	0.7140000	0.1160
09	0.8250000	0.7060000	0.1190
10	0.8210000	0.7000000	0.1210
11	0.8160000	0.6940000	0.1220
12	0.8120000	0.6870000	0.1250
13	0.8080000	0.6810000	0.1270
14	0.8030000	0.6730000	0.1300
15	0.7990000	0.6640000	0.1350
16	0.7950000	0.6560000	0.1390
17	0.7920000	0.6500000	0.1420
18	0.7880000	0.6440000	0.1440
19	0.7840000	0.6390000	0.1450
20	0.7810000	0.6340000	0.1470
21	0.7770000	0.6290000	0.1480
22	0.7740000	0.6250000	0.1490
23	0.7710000	0.6200000	0.1510

24	0.7680000	0.6160000	0.1520
25	0.7650000	0.6120000	0.1530
26	0.7630000	0.6080000	0.1550
27	0.7600000	0.6040000	0.1560
28	0.7570000	0.6010000	0.1560
29	0.7550000	0.5980000	0.1570
30	0.7530000	0.5950000	0.1580
31	0.7500000	0.5920000	0.1580
32	0.7480000	0.5890000	0.1590
33	0.7460000	0.5860000	0.1600
34	0.7440000	0.5830000	0.1610
35	0.7420000	0.5810000	0.1610
36	0.7410000	0.5780000	0.1630
37	0.7390000	0.5760000	0.1630
38	0.7370000	0.5740000	0.1630
39	0.7360000	0.5710000	0.1650
40	0.7340000	0.5690000	0.1650

OPTION 3 FACTORS

Joint and 50%

Age Difference Beneficiary Younger	9/1/02 Factor	1/1/96 Factor	Factor Difference
-20	0.9760000	0.9630000	0.0130
-19	0.9740000	0.9600000	0.0140
-18	0.9730000	0.9570000	0.0160
-17	0.9710000	0.9540000	0.0170
-16	0.9690000	0.9510000	0.0180
-15	0.9670000	0.9470000	0.0200
-14	0.9650000	0.9430000	0.0220
-13	0.9630000	0.9390000	0.0240
-12	0.9610000	0.9350000	0.0260
-11	0.9590000	0.9300000	0.0290
-10	0.9570000	0.9260000	0.0310
-09	0.9540000	0.9220000	0.0320
-08	0.9520000	0.9170000	0.0350
-07	0.9490000	0.9120000	0.0370
-06	0.9470000	0.9070000	0.0400
-05	0.9440000	0.9030000	0.0410
-04	0.9420000	0.8980000	0.0440
-03	0.9390000	0.8930000	0.0460
-02	0.9360000	0.8880000	0.0480
-01	0.9330000	0.8830000	0.0500
0	0.9300000	0.8770000	0.0530
01	0.9270000	0.8710000	0.0560
02	0.9240000	0.8640000	0.0600
03	0.9220000	0.8580000	0.0640
04	0.9190000	0.8530000	0.0660
05	0.9160000	0.8480000	0.0680
06	0.9130000	0.8430000	0.0700
07	0.9100000	0.8380000	0.0720

08	0.9070000	0.8330000	0.0740
09	0.9040000	0.8280000	0.0760
10	0.9020000	0.8240000	0.0780
11	0.8990000	0.8200000	0.0790
12	0.8960000	0.8150000	0.0810
13	0.8940000	0.8110000	0.0830
14	0.8910000	0.8050000	0.0860
15	0.8880000	0.7990000	0.0890
16	0.8860000	0.7930000	0.0930
17	0.8840000	0.7880000	0.0960
18	0.8810000	0.7840000	0.0970
19	0.8790000	0.7800000	0.0990
20	0.8770000	0.7760000	0.1010
21	0.8750000	0.7730000	0.1020
22	0.8730000	0.7700000	0.1030
23	0.8710000	0.7660000	0.1050
24	0.8690000	0.7630000	0.1060
25	0.8670000	0.7600000	0.1070
26	0.8650000	0.7570000	0.1080
27	0.8640000	0.7540000	0.1100
28	0.8620000	0.7510000	0.1110
29	0.8600000	0.7480000	0.1120
30	0.8590000	0.7460000	0.1130
31	0.8570000	0.7440000	0.1130
32	0.8560000	0.7410000	0.1150
33	0.8550000	0.7390000	0.1160
34	0.8530000	0.7370000	0.1160
35	0.8520000	0.7350000	0.1170
36	0.8510000	0.7330000	0.1180
37	0.8500000	0.7310000	0.1190
38	0.8490000	0.7290000	0.1200
39	0.8480000	0.7270000	0.1210
40	0.8470000	0.7250000	0.1220

OPTION 4 FACTORS

Joint and 66.67%

Age Diff	9/1/02 Factor	1/1/96 Factor	Factor Difference
-20	0.9680000	0.9510000	0.0170
-19	0.9660000	0.9470000	0.0190
-18	0.9640000	0.9440000	0.0200
-17	0.9620000	0.9400000	0.0220
-16	0.9590000	0.9350000	0.0240
-15	0.9570000	0.9300000	0.0270
-14	0.9540000	0.9260000	0.0280
-13	0.9520000	0.9210000	0.0310
-12	0.9490000	0.9150000	0.0340

-11	0.9460000	0.9090000	0.0370
-10	0.9430000	0.9030000	0.0400
-09	0.9400000	0.8980000	0.0420
-08	0.9370000	0.8920000	0.0450
-07	0.9340000	0.8860000	0.0480
-06	0.9300000	0.8800000	0.0500
-05	0.9270000	0.8750000	0.0520
-04	0.9240000	0.8680000	0.0560
-03	0.9200000	0.8620000	0.0580
-02	0.9160000	0.8560000	0.0600
-01	0.9130000	0.8500000	0.0630
0	0.9090000	0.8420000	0.0670
01	0.9050000	0.8350000	0.0700
02	0.9020000	0.8270000	0.0750
03	0.8980000	0.8200000	0.0780
04	0.8940000	0.8130000	0.0810
05	0.8910000	0.8070000	0.0840
06	0.8870000	0.8010000	0.0860
07	0.8830000	0.7950000	0.0880
08	0.8800000	0.7890000	0.0910
09	0.8760000	0.7830000	0.0930
10	0.8730000	0.7780000	0.0950
11	0.8700000	0.7730000	0.0970
12	0.8660000	0.7680000	0.0980
13	0.8630000	0.7620000	0.1010
14	0.8600000	0.7550000	0.1050
15	0.8570000	0.7480000	0.1090
16	0.8540000	0.7410000	0.1130
17	0.8510000	0.7360000	0.1150
18	0.8480000	0.7310000	0.1170
19	0.8450000	0.7260000	0.1190
20	0.8420000	0.7220000	0.1200
21	0.8400000	0.7180000	0.1220
22	0.8370000	0.7150000	0.1220
23	0.8350000	0.7100000	0.1250
24	0.8320000	0.7070000	0.1250
25	0.8300000	0.7030000	0.1270
26	0.8280000	0.7000000	0.1280
27	0.8260000	0.6960000	0.1300
28	0.8240000	0.6940000	0.1300
29	0.8220000	0.6900000	0.1320
30	0.8200000	0.6880000	0.1320
31	0.8180000	0.6850000	0.1330
32	0.8170000	0.6820000	0.1350
33	0.8150000	0.6800000	0.1350
34	0.8140000	0.6770000	0.1370
35	0.8120000	0.6750000	0.1370
36	0.8110000	0.6730000	0.1380

37	0.8090000	0.6710000	0.1380
38	0.8080000	0.6690000	0.1390
39	0.8070000	0.6660000	0.1410
40	0.8060000	0.6640000	0.1420

Purchase of Annuity Final Proposal

LEOFF Plan 2 Retirement Board

December 16, 2009

Key Issues

- Service credit purchase limits the defined contribution assets that can be converted to defined benefits
- Process in place for purchase of annuity out of trust funds for Plan 3 members

Background Summary

- Service credit purchase
- Federal legislation
- Plan 3 annuity purchase

Proposal Summary

- Permit LEOFF Plan 2 retirees to purchase an actuarially equivalent life annuity from the LEOFF Plan 2 retirement fund.

- Cost insufficient to increase contribution rates.

Purchase of Annuity

Questions?

LAW ENFORCEMENT OFFICERS' AND FIRE FIGHTERS' PLAN 2 RETIREMENT BOARD

Purchase of Annuity

Final Proposal

December 17, 2008

1. Issue

Members are limited in the amount of money they can convert to LEOFF Plan 2 by the amount required to purchase five years of service.

2. Proposal Summary

Allow LEOFF Plan 2 retirees to purchase an actuarially equivalent life annuity from the LEOFF Plan 2 retirement fund.

3. Staff

Greg Deam, Sr. Research and Policy Manager
(360) 586-2325
greg.deam@leoff.wa.gov

4. Members Impacted

Purchase of annuity could affect any active LEOFF Plan 2 member. As of June 30, 2007 there were 16,099 active members and 924 retirees as reported in the Office of the State Actuary's *2007 Actuarial Valuation Report*.

5. Current Situation

Under current law, only Plan 3 members (TRS, PERS & SERS) can purchase an annuity out of the combined trust fund. However, LEOFF Plan 2 members may purchase up to five years of service credit at the time of normal retirement or early retirement. The member must pay the actuarial cost of the additional service credit.

6. Background Information

Under traditional defined benefit plans, retirees receive an automatic and definite level of lifetime payouts based on a fixed accrual formula, regardless of financial market conditions. By contrast, most defined contribution plan participants are left to figure out a distribution strategy on their own, and they continue to be vulnerable to the ups and downs of financial markets in their retirement years. Research shows that one of the most effective ways to reduce the risk of outliving assets is by converting at least some of those assets to an annuity.

Brief History

The LEOFF Plan 2 Retirement Board studied both the Purchase of Service Credit and Purchase of Annuity during the 2004 Interim. Of these two concepts, the Board recommended legislation providing the option to purchase up to five years of service credit at the time of retirement. The legislation was passed by the 2005 Legislature (HB 1269). Although annuities were not available from the trust fund in 2004 when this issue was first studied by the Board, annuities have since become available from the trust fund and have been defined by the Department of Retirement Systems. The Purchase of Annuity topic was studied by the Board during the 2006 and 2007 Interims reaching the Final Proposal stage in 2006, but no legislation was recommended to the Legislature and the topic was deferred for further study in 2008.

The Purchase of Annuity issue was sent to the Select Committee on Pension Policy (SCPP) as one of the issues that might be worked on cooperatively to develop legislation. The Purchase of Annuity issue was not scheduled to be part of the SCPP work-plan this interim.

Federal Law

Changes in federal law have liberalized the rules on the transfer of funds between tax-deferred accounts, including government defined benefit pension plans like LEOFF Plan 2, and deferred compensation accounts such as 457, 403(b), and 401(k) plans. Many state and local government pension plans have subsequently provided the opportunity for members to transfer funds, including funds from tax-deferred accounts, into these plans to add value to a member's defined benefit through the purchase of additional service credit or the purchase of an annuity.

Members of LEOFF Plan 2 generally have the opportunity to participate in deferred compensation plans. These plans permit an individual to place a portion of salary into a special account prior to payroll tax reductions. The Department of Retirement Systems (DRS) operates a deferred compensation program consistent with the federal tax requirements of 26 United States Code section 457, commonly called a "457 Plan", in which employees of the state, counties, municipalities and other political subdivisions may participate. Some employers may also participate in other 457 plans or deferred compensation-type plans commonly referred to as "403(b)" or "401(k)" plans.

The Pension Protection Act of 2006 affirmed the purchase of up to 5 years of service credit or "air-time" as permissible under the definition of service credit and made permanent the rules allowing the transfer of funds between the various plan types as described above.

Annuities

At a basic level, annuity contracts are offered by organizations which take a current lump-sum amount of money and pay it out over a period of years. These contracts are regulated by various jurisdictions. Annuities have been in existence for well over two hundred years. The very first mention of Annuities in the United States was the use of these products by the Presbyterian Church in 1740 to provide security for the clergy and widows. Annuities provide the ability to accumulate tax-deferred funds for retirement and then receive a guaranteed income (this process is called Annuitization) payable for life or for a specified period of time.

The specific terms of an annuity will determine how much a person will receive as a stream of guaranteed income in exchange for the lump-sum dollar amount paid up front. There are several different features that may be available with an annuity which affect the price/value of the annuity. The terms and conditions of an annuity contract will specify features such as, whether the annuity will be for a single life or a joint annuity (like a survivor benefit feature), the payment frequency, adjustments for cost of living, and death provisions.

Annuity Purchase Examples in Washington

Some Washington State pension plans currently have provisions that allow the purchase of an annuity:

- RCW 41.50.088 provides members and survivors in the Teachers' Retirement System (TRS) Plan 3, the School Employees' Retirement System (SERS) Plan 3, and the Public Employees' Retirement System (PERS) Plan 3 optional actuarially equivalent life annuity benefit payment schedules that may be purchased from the combined Plan 2 and Plan 3 funds under RCW 41.50.075.
- RCW 41.32.067 provides Teachers' Retirement System (TRS) Plan 1, Plan 2 and Plan 3 members the ability to purchase additional benefits in the form of an annuity, by making a member reserve contribution which is actuarially converted to a monthly benefit at the time of retirement.

Plan 3 Annuity

A member of Teachers' Retirement System (TRS) Plan 3, the School Employees' Retirement System (SERS) Plan 3, and the Public Employees' Retirement System (PERS) Plan 3 may use funds from their Plan 3 Defined Contribution account to purchase a life annuity. A life annuity is a contract that provides a guaranteed income for the rest of a member's life in exchange for a lump-sum dollar amount that is paid up front. The contract specifies the amount paid to purchase the annuity, the benefit amount the member receives each month, and any other terms and conditions. Prior to 2005, a member could only purchase an annuity contract from an insurance company using defined contribution funds invested in the Self-Directed Investment Program.

Beginning July 1, 2005 Plan 3 members were provided with the opportunity to purchase an annuity directly from the pension trust fund using funds invested in the Washington State Investment Board Investment Program (WSIB). The WSIB annuity option is administered by the State of Washington. As defined by the Department of Retirement Systems, the WSIB annuity has several features and options as described in the following table.

WSIB Investment Program Annuity Features and Options	
Contract Provider	Washington State
Minimum Purchase Price	$25,000
Annuity Payment Frequency	Monthly
Rescission Period	15 calendar days from date of purchase
Single Life Annuity	• Provides regular payment for as long as annuitant lives. • Automatic 3% Annual Cost of Living Adjustment (COLA) • Conversion option to Joint Life Annuity • Balance Refund
Joint Life Annuity	• Provides regular payment for as long as member or joint annuitant is alive. • Joint annuitant survivorship options: 100%, 66 2/3%, or 50% • Automatic 3% Annual COLA • Monthly payment pops-up to Single Life Annuity amount if joint annuitant predeceases member. • Balance Refund

Annuitant – The member/owner who purchases the annuity; the payee who receives lifetime monthly payments.

Balance Refund – Any remaining balance equal to the original purchase price minus the total of all annuity payments made to the single or joint annuitants, may be refunded to the specified beneficiary.

Conversion Option – If a single life annuity is purchased and then a subsequent marriage occurs, a one-time opportunity is available to convert to a joint life annuity with the new spouse as the joint annuitant. If a joint annuity is purchased with someone other than a spouse named as the joint annuitant, the annuity may be converted to a single life annuity after payments have begun.

Joint Annuitant – The person designated to receive an ongoing payment in the event of the annuitant's death.

Pop-up – An increase from a joint annuity payment amount to the full single life annuity amount if the annuitant outlives the joint annuitant.

Rescission Period – A period of time (typically 7 to 15 days) during which the terms of the contract may be canceled or altered

Service Credit Purchase

The Legislature passed the Service Credit Purchase benefit during the 2005 Session. This benefit provides LEOFF Plan 2 members the opportunity to purchase up to five years of additional service credit at the time of retirement. The cost of the additional service credit is the actuarial equivalent value of the resulting increase in the member's benefit. A member may pay all or part of the cost of the additional service credit with an eligible transfer from a qualified retirement plan.

Since the inception of the benefit through August of 2007, 15 service credit purchase billings have been requested from the Department of Retirement Systems and paid in full. 11 of the 15 billings were to purchase the maximum of 60 months of service credit; four billings requested to purchase between 30 and 43months of service credit. The average cost of all fifteen billings was $103,045. The average benefit increase from the fifteen billings was $597 per month. The average break even point is just over 14 years, or at age 69.

Months Purchased	Status	Monthly Benefit Increase	Cost	Age at Retirement
30	Paid	$293.39	$56,246.89	56
30	Paid	$309.73	$51,363.14	56
37	Paid	$293.69	$53,187.37	51
43	Paid	$352.54	$69,021.27	57
60	Paid	$849.30	$143,605.96	55
60	Paid	$755.76	$138,952.01	50
60	Paid	$586.12	$100,961.17	54
60	Paid	$662.43	$109,852.08	56
60	Paid	$789.39	$122,791.54	59
60	Paid	$689.26	$117,195.88	62
60	Paid	$591.65	$108,779.19	50
60	Paid	$544.19	$105,764.19	55
60	Paid	$743.28	$137,227.41	54
60	Paid	$869.56	$135,262.18	59
60	Paid	$628.35	$95,476.51	60

Below is an example calculation for the purchase of five years of service credit by an average LEOFF Plan 2 retiree. At the time of retirement, an average LEOFF Plan 2 retiree is age 56, has 17 years of service, and a monthly final average salary of $5,000.

Service Credit Purchase Calculation

1. Calculate Base Benefit:

2% × 17 YOS × $5,000 = $1,700 per month

2. Calculate Benefit With Additional 5 Years Of Service Credit:

2% × 22 YOS × $5,000 = $2,200 per month

3. Calculate Increase in Monthly Benefit from Additional Service Credit:

$2,200 - $1,700 = $500 increase per month

4. Calculate Service Credit Purchase Cost:

$500 ÷ 0.0060302 [1] = $82,916

Trust Fund Annuity Purchase

An annuity purchase calculation is similar to the service credit purchase calculation in that the Department of Retirement uses the same actuarial factors for computing the monthly benefit per $1.00 of accumulation for defined benefits. A key difference between an annuity purchase and a service credit purchase is that the annuity purchase does not limit the lump-sum amount that can be converted to a defined benefit. The service credit purchase is limited to converting only up to the amount that would purchase the maximum of five years of service.

In the service credit example above, the retiree would be limited to converting $82,916 into defined benefit payments. An annuity purchase from the trust fund would not have the same constraint and would allow a member to roll-in all assets held from a deferred compensation account or other qualified account. For example, if the average retiree above had $100,000 in a deferred compensation account, the entire amount could be converted into defined benefits through an annuity purchase.

Annuity Purchase Calculation

1. Calculate Base Benefit:

2% × 17 YOS × $5,000 = $1,700 per month

2. Calculate Benefit Increase from a $100,000 Annuity Purchase:

$100,000 × 0.0060302 = $603.02 increase per month

3. Calculate New Benefit (Base Benefit *plus* Annuity):

$1,700 + $603.02 = $2,303.02 per month

Commercial Market Annuity

[1] The factor for the "Monthly benefit per $1.00 of accumulation for defined benefit plans" for an age 56 LEOFF Plan 2 member as found in WAC 415-02-340.

Annuities can be purchased through insurance agents, financial planners, banks and life insurance carriers. However, only life insurance companies issue policies. Products developed by life insurance companies are often marketed through banks and stock brokerage firms.

Generally, commercial market annuities are not available with the same features available on a trust fund annuity and do not provide as favorable annuity payment amounts. Quotes were obtained from five different insurance companies based on an average LEOFF Plan 2 retiree. The annuity quote was based on $100,000 annuity purchase, included a 3% COLA, and had a monthly payment frequency. The income quotes were as follows:

Insurance Company	Quote
American General	$389
Aviva	$402
Fidelity & Guaranty Life	$421
Genworth Life Insurance	$406
Integrity Life Insurance	$400

7. Policy Option

Policy Option: Purchase of Annuity

A member, or survivor of a member who applies for retirement benefits from LEOFF Plan 2 may, at the time of application may purchase an actuarially equivalent life annuity from the LEOFF Plan 2 retirement fund. The member may pay all or part of the cost of the annuity purchase with an eligible transfer from a qualified retirement plan. This option is actuarially neutral and would not increase the cost of the plan.

8. Supporting Information

Appendix A – RCWs

- RCW 41.50.088
- RCW 41.32.067

Appendix B – WAC 415-02-340

Appendix C – Bill Draft

Appendix A

RCW 41.50.088
Employee retirement benefits board -- Duties.

(1) The board shall adopt rules as necessary and exercise the following powers and duties:

(a) The board shall recommend to the state investment board types of options for member self-directed investment in the teachers' retirement system plan 3, the school employees' retirement system plan 3, and the public employees' retirement system plan 3 as deemed by the board to be reflective of the members' preferences;

(b) By July 1, 2005, the board shall make optional actuarially equivalent life annuity benefit payment schedules available to members and survivors that may be purchased from the combined plan 2 and plan 3 funds under RCW 41.50.075; and

(c) Determination of the basis for administrative charges to the self-directed investment fund to offset self-directed account expenses;

(2) The board shall recommend to the state investment board types of options for participant self-directed investment in the state deferred compensation plan, as deemed by the board to be reflective of the participants' preferences.

[2000 c 247 § 602. Prior: 1998 c 341 § 507; 1998 c 116 § 10; 1995 c 239 § 302.]

NOTES:

Effective dates -- Subchapter headings not law -- 2000 c 247: See RCW 41.40.931 and 41.40.932.

Effective date -- 1998 c 341: See note following RCW 41.34.060.

Intent -- Purpose -- 1995 c 239: See note following RCW 41.32.831.

Effective date -- Part and subchapter headings not law -- 1995 c 239: See notes following RCW 41.32.005.

Benefits not contractual right until date specified: RCW 41.34.100.

RCW 41.32.067
Purchase of additional benefits -- Conditions.

A member may purchase additional benefits subject to the following:

(1) The member shall pay all reasonable administrative and clerical costs; and

(2) The member shall make a member reserve contribution to be actuarially converted to a monthly benefit at the time of retirement.

[1992 c 212 § 13; 1991 c 278 § 2.]

Appendix B

WAC 415-02-340
Monthly benefit per $1.00 of accumulation for defined benefit plans.

(1) How does the department use the information in the table called "monthly benefit per $1.00 of accumulation for defined benefit plans"? The department uses this information to:

(a) Determine what a future lifetime monthly benefit is worth in present-day dollars;

(b) Determine the equivalent value of a lump sum when compared with monthly payments; and

(c) Reduce the monthly retirement benefit in TRS Plan 1 if you take a lump sum cash out for some or all of your funds.[2]

(2) What type of information is in this table? The information in this table reflects the expected duration of lifetime payments for recipients over a range of ages. These values differ by system and plan, and all reflect an assumed rate of return of 8.0%.[3]

(3) Examples

(a) Example (a):

Celina is a 65-year-old PERS Plan 2 member who is eligible to receive $45.00 per month. She wants to know how much money she could receive if she accepted a lump sum payment instead. Celina looks at the row in the table for age 65 in the PERS Plan 2 column and learns that $0.0072458 per month for life is equivalent to one dollar in cash for this system, plan, and age class. Celina divides $45.00 by 0.0072458 and learns that her lump sum payment would be $6,210.49.

(b) Example (b):

Fred is a 58-year-old TRS Plan 1 member. The balance in Fred's account is $124,934.00. Upon retirement, Fred chooses to withdraw the $124,934.00 (as only members of TRS Plan 1 can do). From the row in the table for age 58 in the TRS Plan 1 column, Fred learns that $0.0077573 per month for life is the equivalent to one dollar in cash for this system, plan, and age class. Fred multiplies the lump sum cash-out amount of $124,934.00 by 0.0077573, and learns that his monthly retirement will be reduced by $969.15 per month because of the lump sum cash out made at retirement.

(4) Table - Monthly benefit per $1.00 of accumulation for defined benefit plans:

Based on the 1995-2000 actuarial experience study monthly benefit per $1.00 of accumulation defined benefit (DB) single life pension:

Age	LEOFF 1	LEOFF 2	PERS 1	PERS 2/3	SERS 2/3	TRS 1	TRS 2/3	WSPRS 2
20	0.0039835	0.0043310	0.0065444	0.0043102	0.0042786	0.0065267	0.0042774	0.0043319
21	0.0039997	0.0043459	0.0065518	0.0043243	0.0042911	0.0065329	0.0042897	0.0043469
22	0.0040168	0.0043615	0.0065598	0.0043390	0.0043042	0.0065396	0.0043027	0.0043626
23	0.0040347	0.0043780	0.0065684	0.0043546	0.0043181	0.0065468	0.0043165	0.0043791
24	0.0040535	0.0043955	0.0065778	0.0043710	0.0043327	0.0065546	0.0043309	0.0043966

[2] This option is only available in TRS Plan 1.

[3] The younger a person is, the longer the anticipated lifetime of payments would be, and the greater the sum required to provide for these payments. Put another way, the amount of monthly lifetime benefit that a present-day dollar buys goes up as the remaining life expectancy of the recipient goes down.

Age	LEOFF 1	LEOFF 2	PERS 1	PERS 2/3	SERS 2/3	TRS 1	TRS 2/3	WSPRS 2
25	0.0040734	0.0044139	0.0065878	0.0043884	0.0043481	0.0065630	0.0043462	0.0044150
26	0.0040943	0.0044333	0.0065987	0.0044067	0.0043644	0.0065720	0.0043622	0.0044346
27	0.0041163	0.0044539	0.0066105	0.0044261	0.0043816	0.0065818	0.0043792	0.0044552
28	0.0041396	0.0044757	0.0066232	0.0044466	0.0043997	0.0065924	0.0043971	0.0044771
29	0.0041641	0.0044988	0.0066370	0.0044682	0.0044189	0.0066038	0.0044161	0.0045002
30	0.0041899	0.0045231	0.0066517	0.0044911	0.0044391	0.0066162	0.0044361	0.0045246
31	0.0042171	0.0045488	0.0066676	0.0045152	0.0044605	0.0066295	0.0044572	0.0045503
32	0.0042456	0.0045758	0.0066845	0.0045405	0.0044830	0.0066438	0.0044795	0.0045774
33	0.0042755	0.0046042	0.0067025	0.0045672	0.0045067	0.0066592	0.0045031	0.0046059
34	0.0043069	0.0046340	0.0067217	0.0045952	0.0045316	0.0066756	0.0045278	0.0046358
35	0.0043398	0.0046654	0.0067421	0.0046247	0.0045578	0.0066930	0.0045539	0.0046672
36	0.0043745	0.0046984	0.0067639	0.0046558	0.0045854	0.0067116	0.0045812	0.0047004
37	0.0044109	0.0047333	0.0067873	0.0046886	0.0046145	0.0067315	0.0046101	0.0047353
38	0.0044494	0.0047701	0.0068123	0.0047233	0.0046452	0.0067527	0.0046404	0.0047723
39	0.0044900	0.0048091	0.0068393	0.0047600	0.0046777	0.0067754	0.0046725	0.0048114
40	0.0045330	0.0048505	0.0068682	0.0047988	0.0047120	0.0067998	0.0047065	0.0048529
41	0.0045784	0.0048944	0.0068994	0.0048400	0.0047483	0.0068261	0.0047423	0.0048969
42	0.0046266	0.0049409	0.0069329	0.0048837	0.0047868	0.0068543	0.0047803	0.0049436
43	0.0046777	0.0049904	0.0069690	0.0049300	0.0048275	0.0068846	0.0048206	0.0049932
44	0.0047319	0.0050430	0.0070078	0.0049791	0.0048706	0.0069172	0.0048632	0.0050460
45	0.0047894	0.0050989	0.0070495	0.0050312	0.0049163	0.0069523	0.0049084	0.0051021
46	0.0048504	0.0051584	0.0070945	0.0050866	0.0049647	0.0069900	0.0049562	0.0051617
47	0.0049153	0.0052218	0.0071429	0.0051455	0.0050161	0.0070305	0.0050070	0.0052253
48	0.0049844	0.0052894	0.0071953	0.0052082	0.0050707	0.0070740	0.0050609	0.0052932
49	0.0050581	0.0053617	0.0072519	0.0052752	0.0051287	0.0071210	0.0051183	0.0053657
50	0.0051368	0.0054390	0.0073132	0.0053466	0.0051905	0.0071717	0.0051793	0.0054432
51	0.0052210	0.0055218	0.0073796	0.0054231	0.0052564	0.0072265	0.0052444	0.0055264
52	0.0053104	0.0056098	0.0074510	0.0055044	0.0053265	0.0072858	0.0053139	0.0056147
53	0.0054060	0.0057042	0.0075283	0.0055914	0.0054014	0.0073500	0.0053881	0.0057094
54	0.0055084	0.0058054	0.0076121	0.0056846	0.0054813	0.0074191	0.0054671	0.0058110
55	0.0056182	0.0059141	0.0077029	0.0057845	0.0055668	0.0074939	0.0055515	0.0059201
56	0.0057354	0.0060302	0.0078008	0.0058912	0.0056581	0.0075749	0.0056420	0.0060367
57	0.0058601	0.0061539	0.0079058	0.0060049	0.0057557	0.0076627	0.0057388	0.0061608
58	0.0059937	0.0062865	0.0080192	0.0061265	0.0058600	0.0077573	0.0058422	0.0062940
59	0.0061368	0.0064287	0.0081415	0.0062566	0.0059712	0.0078589	0.0059524	0.0064368
60	0.0062900	0.0065812	0.0082732	0.0063959	0.0060901	0.0079685	0.0060703	0.0065898
61	0.0064540	0.0067444	0.0084149	0.0065448	0.0062172	0.0080866	0.0061963	0.0067538
62	0.0066294	0.0069191	0.0085668	0.0067036	0.0063529	0.0082138	0.0063311	0.0069292
63	0.0068167	0.0071058	0.0087294	0.0068729	0.0064976	0.0083506	0.0064751	0.0071168
64	0.0070165	0.0073050	0.0089030	0.0070531	0.0066517	0.0084970	0.0066285	0.0073169
65	0.0072307	0.0075186	0.0090893	0.0072458	0.0068158	0.0086537	0.0067919	0.0075315
66	0.0074600	0.0077474	0.0092891	0.0074517	0.0069903	0.0088208	0.0069657	0.0077614
67	0.0077052	0.0079921	0.0095028	0.0076715	0.0071765	0.0090000	0.0071514	0.0080073
68	0.0079692	0.0082556	0.0097332	0.0079076	0.0073755	0.0091921	0.0073497	0.0082721
69	0.0082539	0.0085400	0.0099823	0.0081620	0.0075879	0.0093974	0.0075612	0.0085580
70	0.0085622	0.0088479	0.0102523	0.0084366	0.0078162	0.0096186	0.0077883	0.0088676
71	0.0088938	0.0091793	0.0105419	0.0087308	0.0080615	0.0098577	0.0080327	0.0092008
72	0.0092539	0.0095393	0.0108558	0.0090487	0.0083261	0.0101166	0.0082964	0.0095628

Age	LEOFF 1	LEOFF 2	PERS 1	PERS 2/3	SERS 2/3	TRS 1	TRS 2/3	WSPRS 2
73	0.0096446	0.0099300	0.0111955	0.0093919	0.0086093	0.0103939	0.0085784	0.0099559
74	0.0100684	0.0103538	0.0115628	0.0097624	0.0089142	0.0106939	0.0088826	0.0103824
75	0.0105280	0.0108135	0.0119604	0.0101627	0.0092422	0.0110180	0.0092104	0.0108451
76	0.0110267	0.0113124	0.0123914	0.0105960	0.0095951	0.0113678	0.0095637	0.0113472
77	0.0115688	0.0118547	0.0128599	0.0110662	0.0099757	0.0117460	0.0099450	0.0118933
78	0.0121597	0.0124460	0.0133705	0.0115778	0.0103875	0.0121558	0.0103575	0.0124885
79	0.0128051	0.0130919	0.0139278	0.0121352	0.0108344	0.0126012	0.0108049	0.0131389
80	0.0135111	0.0137984	0.0145368	0.0127433	0.0113202	0.0130863	0.0112914	0.0138505
81	0.0142843	0.0145725	0.0152030	0.0134074	0.0118492	0.0136157	0.0118211	0.0146303
82	0.0151240	0.0154130	0.0159279	0.0141293	0.0124242	0.0141938	0.0123986	0.0154769
83	0.0160353	0.0163252	0.0167162	0.0149136	0.0130497	0.0148256	0.0130286	0.0163958
84	0.0170241	0.0173149	0.0175726	0.0157650	0.0137302	0.0155137	0.0137139	0.0173927
85	0.0180966	0.0183884	0.0185016	0.0166876	0.0144701	0.0162628	0.0144589	0.0184740
86	0.0192583	0.0195513	0.0195059	0.0176841	0.0152736	0.0170771	0.0152680	0.0196456
87	0.0205119	0.0208062	0.0205851	0.0187541	0.0161432	0.0179605	0.0161446	0.0209102
88	0.0218550	0.0221507	0.0217347	0.0198932	0.0170791	0.0189147	0.0170905	0.0222656
89	0.0232781	0.0235752	0.0229444	0.0210916	0.0180779	0.0199388	0.0181048	0.0237021
90	0.0247625	0.0250609	0.0241977	0.0223336	0.0191323	0.0210275	0.0191823	0.0252008
91	0.0262789	0.0265782	0.0254717	0.0235975	0.0202301	0.0221705	0.0203134	0.0267317
92	0.0278427	0.0281429	0.0267640	0.0248804	0.0213620	0.0233525	0.0214834	0.0283116
93	0.0294384	0.0297392	0.0280581	0.0261661	0.0225126	0.0245532	0.0226729	0.0299249
94	0.0310505	0.0313517	0.0293389	0.0274402	0.0236656	0.0257646	0.0238739	0.0315562
95	0.0326651	0.0329665	0.0305940	0.0286908	0.0248057	0.0269704	0.0250708	0.0331914
96	0.0342704	0.0345719	0.0318149	0.0299099	0.0259197	0.0281559	0.0262493	0.0348186
97	0.0358572	0.0361585	0.0329987	0.0310951	0.0269980	0.0293096	0.0273986	0.0364281
98	0.0374173	0.0377185	0.0341503	0.0322517	0.0280348	0.0304239	0.0285118	0.0380114
99	0.0389423	0.0392433	0.0352857	0.0333956	0.0290309	0.0314979	0.0295884	0.0395582

[Statutory Authority: RCW 41.50.050(5) and chapter 41.45 RCW. 02-18-048, § 415-02-340, filed 8/28/02, effective 9/1/02.]

Appendix C

Annuity Purchase Bill Draft

NEW SECTION. **Sec. 1.** A new section is added to chapter 41.26 RCW under the subchapter heading "plan 2" to read as follows:

(1)The department of retirement systems shall make optional actuarially equivalent life annuity benefit payment schedules available to members and survivors that may be purchased from the Washington law enforcement officers' and fire fighters' system plan 2 retirement fund.

DRAFT
ACTUARY'S FISCAL NOTE

RESPONDING AGENCY:	CODE:	DATE:	PROPOSAL [NAME or Z-NUMBER]:
Office of the State Actuary	**035**	**12/07/09**	**LEOFF 2 Annuity Purchase**

WHAT THE READER SHOULD KNOW

The Office of the State Actuary ("we") prepared this draft fiscal note based on our understanding of the proposal as of the date shown above. We intend this draft fiscal note to be used by the Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF) Plan 2 Board throughout the 2009 Interim only. If a legislator introduces this proposal as a bill during the next Legislative Session, we will prepare a final fiscal note based on that bill language. The actuarial results shown in this draft fiscal note may change when we prepare our final version for the Legislature.

We advise readers of this draft fiscal note to seek professional guidance as to its content and interpretation, and not to rely upon this communication without such guidance. Please read the analysis shown in this draft fiscal note as a whole. Distribution of, or reliance on, only parts of this draft fiscal note could result in its misuse, and may mislead others.

SUMMARY OF RESULTS

This proposal would authorize the Department of Retirement Systems (DRS) to provide optional actuarially equivalent annuity purchases from the Law Enforcement Officers' and Fire Fighters' (LEOFF) Plan 2 retirement fund to LEOFF Plan 2 members and survivors.

This proposal does not impact the expected actuarial funding of the system. Please see the body of this draft fiscal note for a detailed explanation.

WHAT IS THE PROPOSED CHANGE?

Summary Of Change

This proposal impacts the LEOFF Plan 2 by authorizing DRS to provide optional actuarially equivalent annuity purchases from the LEOFF Plan 2 retirement fund to LEOFF Plan 2 members and survivors. The proposal allows members to purchase annuities prior to retirement. DRS would develop the life annuity benefit schedules no later than December 31, 2010.

Assumed Effective Date: 90 days after session.

What Is The Current Situation?

Plan 3 members may purchase a similar annuity with contributions invested in the Total Allocation Portfolio of the Washington State Investment Board (WSIB) investment program, but only at the time of retirement. LEOFF Plan 2 members may purchase up to five years of additional service by paying the full actuarial value of the service at the time of retirement.

Who Is Impacted And How?

We estimate this proposal could affect all 16,626 active members of LEOFF Plan 2 with the option of improved benefits.

We estimate this proposal will increase the benefits for a typical member by providing the option to annuitize their retirement savings. Annuitizing their money provides a member security against outliving their assets. In addition, the annuity offered to them through DRS will cost far less than an annuity bought from a private insurer. A private insurer calculates annuities based on a lower interest rate to account for risk and profit.

For example, a private insurer will provide the annuity based on an interest rate of about 4 percent, whereas DRS will provide the annuity based on an interest rate of about 8 percent. For a member age 55 buying a $10,000 life annuity, this would mean they would pay a private company about $165,000, whereas they would pay DRS about $110,000.

WHY THIS PROPOSAL DOES NOT HAVE A COST

Why This Proposal Does Not Have A Cost

This proposal does not have an expected cost because the member is paying the full actuarial value.

Who Will Pay For These Costs/Savings If They Arise?

The member will pay the actuarially equivalent value of the annuity.

However, as the experience of the system emerges, if the payment is more or less than the actual value of the annuity, then LEOFF Plan 2 contribution rates will increase or decrease accordingly.

HOW WE VALUED THESE COSTS

Assumptions We Made

We assumed that the payments made by the members will equal the full actuarial value of the annuity. We would need to make several assumptions to determine the purchase price of the annuity:

- Expected rate of investment return.
- Expected rate of mortality for the annuitant.
- The annuity start date – the member's retirement date (if purchased prior to retirement).

As with any actuarial calculation that involves estimating future events, actual experience may differ from the underlying assumptions made. When actual experience differs from what we assumed would occur, the system experiences an actuarial gain or loss. An actuarial gain would decrease plan liabilities (or increase assets); whereas, an actuarial loss would increase plan liabilities (or decrease assets). Therefore, we cannot say with certainty that this proposal will not impact plan liabilities in the future.

If the members who purchase annuities, on average, live shorter/longer than assumed, the system will experience actuarial gains/losses in the future. If the actual rate of investment return is more/less than the assumed rate, the system will experience actuarial gains/losses from this assumption as well. For these two assumptions, we will not know whether a gain or loss has occurred until DRS has made all payments under the annuity contract.

The assumed annuity start date, or member's retirement date, will also produce a source of actuarial gain or loss for members who purchase annuities prior to their retirement date. For this particular assumption, we can determine whether an actuarial gain or loss has occurred at the time of retirement. DRS may have the option to adjust the purchase price or adjust the annuity amount (a "true up") at the time of retirement to eliminate this source of gain/loss. Without such an adjustment, the potential for significant actuarial gain/loss, on an individual member basis, exists for this particular assumption.

Otherwise, we developed these costs using the same assumptions as disclosed in the 2008 Actuarial Valuation Report.

HOW THE RESULTS CHANGE WHEN THE ASSUMPTIONS CHANGE

To determine the sensitivity of the actuarial results to the best-estimate assumptions selected for this pricing we varied the following assumptions:

- **Mortality rate** – We determined the cost to the system if the annuity amount was calculated based on higher mortality rates than what actually occurs over time (people lived longer than assumed). For this sensitivity we used 100 percent of scale AA mortality improvement rather than the assumed 50 percent.
- **Investment returns** – We determined the cost to the system if the annuity amount was calculated based on a higher investment returns than what actually occurs over time (investments pay less than assumed). For this sensitivity we used a 7.5 percent investment return rather than the assumed 8 percent.
- **Annuity start date** – We determined the cost to the system if the annuity amount was calculated based on a later retirement date than what actually occurs over time (people start collecting the annuity earlier than assumed). For this sensitivity we used a start age of 53 rather than an assumed age of 55.
- **All of the above** – We determined the cost to the system if all three of the assumptions are incorrect, as described above, at the same time.

The table below shows the expected results versus the four sensitivity runs outlined above. The example outlines the impact due to one member currently age 40 who purchases an annuity with $100,000. When all three occur at once, the liability is larger than the sum of each of the three individually because of the interaction of these assumptions.

Sensitivity Example – 40-Year- Old Male Purchases Retirement Annuity With $100,000			
Scenario	Cash Paid From Member To Plan	Present Value of Plan Annuity	Cost to the System
1) Expected	$100,000	$100,000	$0
2) Lower Mortality Than Expected	$100,000	$102,549	$2,549
3) Lower Asset Returns Than Expected	$100,000	$112,980	$12,980
4) Earlier Retirement Age Than Expected	$100,000	$120,794	$20,794
5) Scenarios 2, 3, and 4	$100,000	$138,777	$38,777

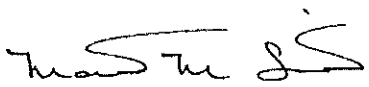
Assumes annuity calculation based on 3% COLA, and 90%/10% male/female mortality blend.

ACTUARY'S CERTIFICATION

The undersigned hereby certifies that:

1. The actuarial cost methods are appropriate for the purposes of this pricing exercise.
2. The actuarial assumptions used are appropriate for the purposes of this pricing exercise.
3. The data on which this draft fiscal note is based are sufficient and reliable for the purposes of this pricing exercise.
4. Use of another set of methods and assumptions may also be reasonable, and might produce different results.
5. This draft fiscal note has been prepared for the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 Board.
6. This draft fiscal note has been prepared, and opinions given, in accordance with Washington State law and accepted actuarial standards of practice as of the date shown on page one of this draft fiscal note.

This draft fiscal note is a preliminary actuarial communication and the results shown may change. While this draft fiscal note is meant to be complete, the undersigned is available to provide extra advice and explanations as needed.



Matthew M. Smith, FCA, EA, MAAA
State Actuary

GLOSSARY OF ACTUARIAL TERMS

Actuarial Accrued Liability: Computed differently under different funding methods, the actuarial accrued liability generally represents the portion of the present value of fully projected benefits attributable to service credit that has been earned (or accrued) as of the valuation date.

Actuarial Present Value: The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of actuarial assumptions (i.e. interest rate, rate of salary increases, mortality, etc.).

Aggregate Funding Method: The Aggregate Funding Method is a standard actuarial funding method. The annual cost of benefits under the Aggregate Method is equal to the normal cost. The method does not produce an unfunded liability. The normal cost is determined for the entire group rather than on an individual basis.

Entry Age Normal Cost Method (EANC): The EANC method is a standard actuarial funding method. The annual cost of benefits under EANC is comprised of two components:

- Normal cost.
- Amortization of the unfunded liability.

The normal cost is determined on an individual basis, from a member's age at plan entry, and is designed to be a level percentage of pay throughout a member's career.

Normal Cost: Computed differently under different funding methods, the normal cost generally represents the portion of the cost of projected benefits allocated to the current plan year.

Projected Unit Credit (PUC) Liability: The portion of the Actuarial Present Value of future benefits attributable to service credit that has been earned to date (past service).

Projected Benefits: Pension benefit amounts which are expected to be paid in the future taking into account such items as the effect of advancement in age as well as past and anticipated future compensation and service credits.

Unfunded PUC Liability: The excess, if any, of the Present Value of Benefits calculated under the PUC cost method over the Valuation Assets. This is the portion of all benefits earned to date that are not covered by plan assets.

Unfunded Actuarial Accrued Liability (UAAL): The excess, if any, of the actuarial accrued liability over the actuarial value of assets. In other words, the present value of benefits earned to date that are not covered by plan assets.

LAW ENFORCEMENT OFFICERS' AND FIRE FIGHTERS' PLAN 2 RETIREMENT BOARD

Law Enforcement Presumption for Duty-Related Illnesses
Preliminary Report

May 28, 2008

1. Issue

Including Law Enforcement Officers in LEOFF Plan 2 under the occupational disease presumption that currently covers Fire Fighters.

2. Staff

Tim Valencia, Senior Research and Policy Manager
(360) 586-2326
tim.valencia@leoff.wa.gov

3. Members Impacted

This issue potentially impacts all of the active Law Enforcement Officers in LEOFF Plan 2. As of September 30, 2006 there were 15,718 active members and 779 retirees and beneficiaries. In 2005, data provided by the Department of Retirement Systems indicated that Law Enforcement Officers accounted for approximately 58% of the active membership in the plan.

4. Current Situation

There is no occupational disease presumption for law enforcement officers in Washington State. Although the occupational disease provisions in the Workers' Compensation statutes apply to law enforcement officers, the burden of proof to qualify for benefits shifts to the member. An occupational disease presumption exists for fire fighters in Washington State.

5. Background Information and Policy Issues

A presumptive occupational disease law is a law that links a particular occupation with a disease or condition that has been shown to be a hazard associated with that occupation. As a result of this linkage, if an individual employed in the occupation covered by the presumption contracts a disease or condition that is specified in the presumptive law, then that disease or condition is presumed to have come from that occupation. In this case, the burden of proof shifts from the employee to the employer to demonstrate that the condition was not in fact associated with the occupation but with another cause.

In the case of public safety officers, particularly for fire fighters, scientific evidence has demonstrated an increased risk for heart disease, lung disease, cancer, and infectious diseases. Many states have an occupational disease presumption law that applies to at least one category of emergency response personnel. However, these presumption laws vary between states in terms of medical conditions/illnesses covered and emergency response personnel covered.

Presumptive Coverage Provisions in Washington

In 1987, the Legislature passed Engrossed Substitute Senate Bill 5801, which created a presumption that certain diseases were occupationally related for industrial insurance purposes for only fire fighters. As originally passed, this bill only included respiratory disease as an occupational disease.

The 2002 Legislature amended the definition of occupational disease to include heart problems that are experienced within seventy-two hours of exposure to smoke, fumes, or toxic substances; certain cancers; and infectious diseases.

The presumption of *cancer* as an occupational disease only applies to a fire fighter, where the cancer develops or manifests itself after the fire fighter has served at least 10 years, and was given a qualifying medical examination upon becoming a fire fighter that showed no evidence of cancer. Time served as a volunteer fire fighter does not count towards the 10 years of service required for presumptive cancer coverage. Under the 2002 legislation, the presumption of cancer only applied to the following specific types of cancer[1]:

[1] The 2002 bill originally listed a broader set of cancers within the presumption than was passed in the final version of the bill. The original bill included the following types of cancer: Breast Cancer, Reproductive System Cancer ,Central Nervous System Cancer, Skin Cancer, Lymphatic System Cancer, Digestive System Cancer, Hematological System Cancer, Urinary System Cancer, Skeletal System Cancer, Oral System Cancer.

- Primary Brain Cancer
- Malignant Melanoma
- Leukemia
- Non-Hodgkin's Lymphoma
- Bladder Cancer
- Ureter Cancer
- Kidney Cancer

The presumption of *infectious disease* as an occupational disease only applies to fire fighters who contracted the following:

- Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
- All Strains of Hepatitis
- Meningococcal Meningitis
- Mycobacterium Tuberculosis

The 2007 Legislature further expanded the occupational disease presumption for fire fighters. A presumption of occupational disease was added for heart problems that are experienced within 24 hours of strenuous physical exertion due to firefighting activities. "Firefighting activities" means fire suppression, fire prevention, emergency medical services, rescue operations, hazardous materials response, aircraft rescue, and training and other assigned duties related to emergency response.

Certain cancers were also added to the list of cancers presumed to be occupational diseases. The cancers added included:

- Prostate Cancer, diagnosed prior to the age of 50
- Colorectal cancer
- Multiple Myeloma
- Testicular cancer

The presumption of occupational disease may be rebutted by a preponderance of evidence, including, but not limited to use of tobacco products, physical fitness and weight, lifestyle, hereditary factors, and exposure from other employment or non-employment activities. Since July 1, 2003, the presumption of occupational disease has not applied to a fire fighter who develops a heart or lung condition and who is a regular user of tobacco products or who has a history of tobacco use.

After terminating from service the presumptions are extended such that a member can qualify for benefits for a period of three calendar months for each year of service, out to a maximum of sixty months following the last date of employment. For example, a member who separates from service after a 10-year career will be covered under the presumption for 2 ½ years (30 months) after the date of separation from employment.

The 2007 Legislation also included provisions for the recovery of litigation costs and fees. When a determination involving the presumption of occupational disease for fire fighters is appealed to the Board of Industrial Insurance Appeals or to any court and the final decision allows the claim for benefits, the Board of Industrial Insurance Appeals or the court must order that all reasonable costs of the appeal be paid to the fire fighter or his or her beneficiary.

Presumptive Coverage Provisions in Other Jurisdictions

The presumptions vary from state to state in terms of what occupational diseases are covered for each profession. An initial review of the workers' compensation, pension, and employment statutes of all 50 states shows that most of the states have an explicit occupational disease presumption in statute. At least 38 states (76%) have an explicit occupational disease presumption for fire fighters and 28 states (56%) have an explicit occupational disease presumption for law enforcement. Several states also have included groups such as corrections officers, state police, and volunteer fire fighters.

In the 28 states with a law enforcement presumption, the most commonly occurring presumptions are for heart attack or cardiovascular disease which is covered by 20 states and respiratory or lung disease which is covered by 11 states. A handful of states also have a presumption for hypertension (6), cancer (5), and stroke (3).

Sixteen of the states with a law enforcement presumption include one or more occupational illness caused by infectious disease. In most cases, occupational disease is specifically defined by illness type; however some states use a general definition of occupational disease which broadly includes the specific diseases covered in other states. The most common occupational diseases covered by a presumption for law enforcement include: hepatitis (9), tuberculosis (7), HIV/AIDS (6), meningococcal meningitis (3), and other or generally defined (6).

Table 1: Presumption Coverage for Law Enforcement Officers details the occupation disease coverage by type of occupational disease for each of the 28 states that have an explicit law enforcement presumption in statute.

Table 1: Presumption Coverage for Law Enforcement Officers

State	Heart	Resiratory/Lung	Hypertension	Cancer	Stroke	Hepititis	Tuberculosis	Other or Generally Defined	HIV/AIDS	Meningococcal Meningitis
Arizona		✓		✓						
California	✓			✓		✓	✓	✓		
Colorado						✓				
Florida	✓		✓				✓			
Hawaii	✓	✓								
Illinois	✓	✓		✓	✓		✓			
Indiana	✓	✓		✓			✓	✓	✓	✓
Iowa	✓	✓								
Kansas	✓	✓		✓						
Louisiana						✓				
Maine						✓	✓			✓
Maryland	✓		✓							
Massachusetts	✓		✓							
Michigan	✓	✓						✓		
Minnesota	✓							✓		
Nevada	✓	✓								
New Jersey	✓				✓					
New York						✓	✓		✓	
North Dakota	✓	✓	✓			✓			✓	
Ohio	✓	✓								
Oklahoma								✓		
Pennsylvania	✓				✓	✓				
Rhode Island						✓			✓	
South Carolina	✓									
Tennessee	✓		✓							
Utah						✓		✓	✓	
Vermont	✓									
Virginia	✓	✓	✓			✓	✓		✓	✓
Total by Type	**20**	**11**	**6**	**5**	**3**	**10**	**7**	**6**	**5**	**3**

Presumptive Coverage Provisions at Federal Level – PSOB

The Public Safety Officers' Benefits (PSOB) Act was enacted in 1976 to assist in the recruitment and retention of law enforcement officers and fire fighters. State and local law enforcement officers and fire fighters are covered for line-of-duty deaths occurring on or

after September 29, 1976.[2] As defined by Congress in Public Law 90-351 (Sec. 1217), a public safety officer includes individuals serving a public agency in an official capacity, with or without compensation, as a law enforcement officer or fire fighter.

The PSOB Program provides death benefits in the form of a one-time financial payment to the eligible survivors of public safety officers whose deaths are the direct and proximate result of a traumatic injury sustained in the line of duty. Beneficiaries of the PSOB Death Benefits Program must comply with the PSOB Office's administrative review process by producing sufficient evidence to show that the public safety officer died as the direct and proximate result of a personal injury sustained in the line of duty. The PSOB Act only covers deaths resulting from traumatic injuries sustained in the line of duty. The PSOB Act does not have extensive coverage for occupational diseases, however, heart attack deaths are covered in some instances.

On December 15th, 2003, President Bush signed into law the Hometown Heroes Survivor Benefits Act (S. 459 / H.R. 919), which expanded the PSOB program to cover public safety officers who die of heart attacks or strokes in the line of duty. The death benefit is payable to the survivors of a public safety officer who "has died as the direct and proximate result of a personal injury sustained in the line of duty." See Appendix A: PSOB Statute – Presumption for Heart Attack and Stroke.

Prior to the Hometown Heroes Survivor Benefits Act, in almost every incidence of death by heart attack or stroke it had been ruled that the heart attack or stroke was not a direct result of an injury sustained in the line of duty and the families received no benefits even though the deaths were clearly triggered by the rigors of the job. The Hometown Heroes Survivor Benefit Act was intended to correct that deficiency in the law, by ensuring that a public safety officer who suffers a fatal heart attack or stroke while on duty or not later than 24 hours after participating in a physical training exercise or responding to an emergency situation, is presumed to have died in the line of duty for purposes of public safety officer survivor benefits.

Law Enforcement Presumption Research

Senate Resolution and Report. During the 1991 legislative session, Senate Floor Resolution 8674 requested the Department of Labor and Industries to conduct a study of the unique occupational disease hazards encountered by law enforcement officers and fire fighters. The Department of Labor and Industries was specifically asked to address the incidence of cancer and heart disease and the problems of proof associated with occupation disease. The study was completed December 1, 1992. The study was conducted with the assistance of the Department of Health and the University of Washington. An advisory committee was also established with representatives from stakeholder organizations.

[2] Federal, state, and local public rescue squads and ambulance crews are covered for line-of-duty deaths occurring on or after October 15, 1986.

With respect to law enforcement and cancer, the study reported that based on the available epidemiologic evidence that the overall risk of cancer among law enforcement personnel was similar to that of the general population. The study also reported that there had been very few studies specifically designed to examine the risk of cancer among law enforcement officers.

The study reported with respect to law enforcement and circulatory disease that while the stresses associated with law enforcement are thought to increase the risk of ischemic heart disease, most epidemiologic studies found law enforcement to have a risk of death due to circulatory disease similar to , or only slightly above, that of the general population. Despite the available evidence suggesting increased risk of heart disease, there was not enough evidence from which to draw firm conclusions. The study reported that very few studies of this specific nature about law enforcement had been performed and current studies were limited to available death records which lack many specific details.

Recent Research. An updated review of medical literature databases resulted in finding no significant change in the literature about occupational illness and injury for law enforcement. The existing research on cancer and heart disease in law enforcement that has been published contain findings and conclusions similar to those presented in the 1992 Washington presumption report.

Infectious diseases and law enforcement, which were not included in the 1992 study, have continued to be more readily covered in recent research. However, findings still only suggest that law enforcement officers have significantly elevated statistical rates for a number of diseases; despite these statistical findings, they do not necessarily prove causal association.

The research department of the Fraternal Order of Police (FOP) was also contacted regarding research on this topic. FOP research staff concurred that their findings on the available research were similar to those of the LEOFF Plan 2 Retirement Board.

Appendix B contains a sample of citations and abstracts from literature about law enforcement occupational illness.

6. Policy Options

Option 1: Include Law Enforcement Officers in the presumption for infectious diseases. This option would include Law Enforcement Officers in LEOFF Plan 2 under the same presumption for infectious disease that currently covers Fire Fighters including Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome, all Strains of Hepatitis, Meningococcal Meningitis, and Mycobacterium Tuberculosis. This option would provide coverage for the exposure of law enforcement officers, because of their employment, to uncontrolled environments containing various hazardous such as infectious diseases. This option would put Washington on level with a number of states that have presumptions to establish that various infectious diseases are work-related for law enforcement officers under

disability or workers' compensation laws. This option is not mutually exclusive from the other options; rather it could be selected in addition to Option 2 and/or Option 3

Option 2: Create a presumption for heart problems for law enforcement officers.
This option would create a presumption for heart problems similar to the presumption established for Fire Fighters during the 2007 Legislative Session. A presumption would exist if a law enforcement officer covered by LEOFF Plan 2 experienced heart problems within 24 hours of strenuous physical exertion due to law enforcement activities. This option would require "law enforcement activities" to be specifically defined. This could include criteria such as participating in a physical training exercise, responding to an emergency situation, or other assigned duties related to or requiring a law enforcement response. This option would put Washington on level with the Federal Government and 20 other states that have presumptions to establish that heart problems are work-related for law enforcement officers under disability or workers' compensation laws. This option is not mutually exclusive from the other options; rather it could be selected in addition to Option 1 and/or Option 3

Option 3: Create a presumption for cancer.
This option would create a presumption for cancer. This option would require the identification of the specific types of cancers to be covered. This option would put Washington on level with five other states that have a cancer presumption for law enforcement officers. This option is not mutually exclusive from the other options; rather it could be selected in addition to Option 1 and/or Option 2.

7. Supporting Information

- **Appendix A: PSOB Statute – Presumption for Heart Attack and Stroke**
- **Appendix B: Sample of Liturature Regarding Law Enforcement Occupational Illness**

Appendix A: PSOB Statute – Presumption for Heart Attack and Stroke

42 U.S.C. § 3796, Sec. 1201(k) Payment of death benefits

(k) For purposes of this section, if a public safety officer dies as the direct and proximate result of a heart attack or stroke, that officer shall be presumed to have died as the direct and proximate result of a personal injury sustained in the line of duty, if—

(1) that officer, while on duty—

(A) engaged in a situation, and such engagement involved nonroutine stressful or strenuous physical law enforcement, fire suppression, rescue, hazardous material response, emergency medical services, prison security, disaster relief, or other emergency response activity; or

(B) participated in a training exercise, and such participation involved nonroutine stressful or strenuous physical activity;

(2) that officer died as a result of a heart attack or stroke suffered—

(A) while engaging or participating as described under paragraph (1);

(B) while still on that duty after so engaging or participating; or

(C) not later than 24 hours after so engaging or participating; and

(3) such presumption is not overcome by competent medical evidence to the contrary.

Direct and proximate result of a heart attack or stroke –

A death results directly and proximately from a heart attack or stroke if the heart attack or stroke is a substantial factor in bringing it about.

Nonroutine stressful physical activity –

Except as excluded by the Act, at 42 U.S.C. 3796(*l*), nonroutine stressful physical activity means line of duty activity that—

(1) Is not performed as a matter of routine;

(2) Entails non-negligible physical exertion; and

(3) Occurs—

(i) With respect to a situation in which a public safety officer is engaged, under circumstances that objectively and reasonably—

(A) Pose (or appear to pose) significant dangers, threats, or hazards (or reasonably-foreseeable risks thereof), not faced by similarly-situated members of the public in the ordinary course; and

(B) Provoke, cause, or occasion an unusually-high level of alarm, fear, or anxiety; or

(ii) With respect to a training exercise in which a public safety officer participates, under circumstances that objectively and reasonably—

(A) Simulate in realistic fashion situations that pose significant dangers, threats, or hazards; and

(B) Provoke, cause, or occasion an unusually-high level of alarm, fear, or anxiety.

Competent medical evidence to the contrary –
The presumption raised by the Act, at 42 U.S.C. 3796(k), is overcome by competent medical evidence to the contrary, when evidence indicates to a degree of medical probability that circumstances other than any engagement or participation described in the Act, at 42 U.S.C. 3796(k)(1), considered in combination (as one circumstance) or alone, were a substantial factor in bringing the heart attack or stroke about.

Appendix B: Sample of Literature Regarding Law Enforcement Occupational Illness

1. **Potential work-related exposures to blood borne pathogens by industry and occupation in the United States Part II: A telephone interview study.**
   Chen GX, Jenkins EL. American Journal of Industrial Medicine. 50(4):285-92. April 2007

   BACKGROUND: The companion surveillance portion of this study [Chen and Jenkins, 2007] reported the frequency and rate of potential work-related exposures to bloodborne pathogens (BBP) treated in emergency departments (EDs) by industry and occupation, but it lacks details on the circumstances of the exposure and other relevant issues such as BBP safety training, use of personal protective equipment (PPE) or safety needles, or reasons for seeking treatment in a hospital ED.

   METHODS: Telephone interviews were conducted with workers who had been treated in EDs for potential work-related exposures to BBP in 2000-2002. Respondents were drawn from the National Electronic Injury Surveillance System.

   RESULTS: Of the 593 interviews, 382 were from hospitals, 51 were from emergency medical service/firefighting (EMS/FF), 86 were from non-hospital healthcare settings (e.g., nursing homes, doctors' offices, home healthcare providers, etc.), 22 were from law enforcement (including police and correctional facilities), and 52 were from other non-healthcare settings (i.e., schools, hotels, and restaurants). Needlestick/sharps injuries were the primary source of exposure in hospitals and non-hospital healthcare settings. Skin and mucous membrane was the primary route of exposure in EMS/FF. Human bites accounted for a significant portion of the exposures in law enforcement and other non-healthcare settings. In general, workers from non-hospital settings were less likely to use PPE, to have BBP safety training, to be aware of the BBP standards and exposure treatment procedures, and to report or seek treatment for a work-related exposure compared to hospital workers.

   CONCLUSIONS: This study suggests that each industry group has unique needs that should be addressed.

2. **Cardiovascular disease risk factors and the perception of general health among male law enforcement officers: encouraging behavioral change.**
   Ramey SL. American Association of Occupational Health Nurses Journal. 51(5):219-26. May 2003.

   The relationship among cardiovascular disease (CVD) morbidity, risk factors (including stress), and the perception of health among male law enforcement officers (LEOs) compared to men in the general population were examined in this study. Self reported prevalence of CVD and CVD risk factors among currently employed male LEOs from nine states (n = 2,818) were compared to those of other men in the same states (n = 9,650 for CVD risk factors, n = 3,147 for CVD prevalence). Perceived stress in LEOs was assessed to determine if it affected the relationship between CVD prevalence and CVD risk factors. Cross tabulated simple percentages showed CVD was less prevalent in the LEO group than among the

general population. The best predictor variables for CVD were perceived stress, time in the profession, and hypertension. The LEO group had greater prevalence of hypercholesterolemia, overweight, and tobacco use than the general population. However, a greater percentage of LEOs perceived their health as "good to excellent" compared to men in the general population. Using multivariate analysis of variance (MANOVA) it was determined that perceived stress was associated with CVD in the LEO group and three CVD risk factors (i.e., cholesterol, hypertension, physical activity) were significantly affected by perceived stress. Among susceptible officers, stress may contribute to CVD development as well as potentiate several CVD risk factors. However, an apparent lack of association exists between perception of general health and CVD risk in LEOs.

3. **The risk of acquiring hepatitis B or C among public safety workers: a systematic review.**
Rischitelli G, Harris J, McCauley L, Gershon R, Guidotti T. American Journal of Preventative Medicine. 20(4):299-306; May 2001.

CONTEXT: Determination of the occupational risk of hepatitis B and C to public safety workers is important in identifying prevention opportunities and has significant legal and policy implications.

OBJECTIVES: Characterize the risk of occupationally acquired infection: (1) risk of exposure to blood and body fluids, (2) seroprevalence of hepatitis B and C in the source population, and (3) risk of infection after exposure.

DATA SOURCES: Electronic search of MEDLINE (1991-1999), HealthStar (1982-1999), and CINAHL (1975-1999) supplemented by selected reference citations and correspondence with authors of relevant articles.

STUDY SELECTION: Peer-reviewed journal articles (N=702) that addressed the transmission of hepatitis B and C in law enforcement, correctional, fire, emergency medical services, and healthcare personnel were identified. One hundred five (15.0%) articles were selected for full-text retrieval; 72 (68.6%) were selected for inclusion.

DATA ABSTRACTION: Articles selected for inclusion were abstracted by two reviewers and checked by a third reviewer, using a standard reporting form. Evidence tables were constructed, using the standardized abstracts. The tables were designed to summarize data for the key elements of the risk analysis.

CONCLUSIONS: Data suggest that emergency medical service (EMS) providers are at increased risk of contracting hepatitis B, but data have failed to show an increased prevalence of hepatitis C. EMS providers have exposure risks similar to those of hospital-based healthcare workers. Other public safety workers appear to have lower rates of exposure. Urban areas have much higher prevalence of disease, and public safety workers in those areas are likely to experience a higher incidence of exposure events.

4. **Occupational needlestick injuries in a metropolitan police force.**
Lorentz J, Hill L, Samimi B. American Journal of Preventative Medicine. 18(2):146-50; February 2000.

OBJECTIVES: Police officers are at risk of bloodborne diseases through needlestick injuries but few studies have addressed this problem. The purpose of this study was to assess the risk of needlestick injuries in law enforcement officers and to determine predictors of injuries and reporting rates.

DESIGN: An anonymous, voluntary questionnaire was distributed to 1738 active-duty, metropolitan police officers. The survey included the number of needlestick injuries ever experienced, how often these were reported, activities at the time of injury and attitudes toward injuries.

RESULTS: Of the 803 respondents (46.2% of survey population), 29.7% had at least one needlestick injury, and 27.7% of this group had two or more. Risk factors included evening shifts, pat-down searches, patrol duties, male gender and less experience. Only 39.2% sought medical attention for these injuries.

CONCLUSIONS: Needlestick injuries occur with considerable frequency in this group of law enforcement personnel, suggesting an increased risk of becoming infected with bloodborne pathogens, including hepatitis B, hepatitis C and HIV.

5. **Coronary heart disease risk factors in employees of Iowa's Department of Public Safety compared to a cohort of the general population.**
Franke WD, Cox DF, Schultz DP, Anderson DF. American Journal of Industrial Medicine. 31(6):733-7; June 1997.

The prevalence of coronary heart disease (CHD) risk factors in law enforcement personnel compared to that in the general population was studied by determining the predicted 10-year risk for developing CHD (CHD10, expressed as %) in subjects from the Iowa Department of Public Safety and comparing it to the average CHD10 for similarly aged subjects in the Framingham Heart Study cohort. The Iowa data included measures on 388 men from 30 to 64 years old, 246 of whom were measured in 1980-1981 and again in 1992-1993. The CHD10 came from an algorithm developed using the Framingham data; it included measures of age, gender, cholesterol, HDL-C, systolic blood pressure, smoking habit, glucose level, and left ventricular hypertrophy (ECG criteria). For this group, average CHD10 was reported by age in five-year increments [Circulation 83:356, 1991]. The Iowa subjects (n = 388) did not show a statistically significant difference in CHD10 from the reference population (8.9% versus 7.9%). The change with age was very similar in the two groups: for Iowa (n = 388) the estimate was CHD10 = -16.5 + .59 (age); for Framingham it was CHD10 = -17.5 + .60 (age). The change in individual risk factors with time was also similar in both groups; the per year change in CHD10 in the Iowa subjects, which was measured twice (n = 246, 0.63%), did not differ statistically from the 0.60% change predicted by the Framingham model. These results suggest that, for the risk factors considered here, the 10-year probability of developing CHD

among Iowa law enforcement personnel is similar to that found in the Framingham population.

6. **Epidemiological studies of work-related injuries among law enforcement personnel.**
   Sullivan CS, Shimizu KT. J Soc Occup Med. 1988 Spring-Summer;38(1-2):33-40.

7. **Career risk of hepatitis C virus infection among U.S. emergency medical and public safety workers.**
   Rischitelli G, Lasarev M, McCauley L.Journal of Occupational & Environmental Medicine. 2005 47(11):1174-1181. Erratum in: J Occup Environ Med. 2006 Mar;48(3):234-5.

   OBJECTIVE: A probabilistic model was used to analyze the cumulative risk of occupational hepatitis C virus (HCV) infection among U.S. public safety workers.
   METHODS: A model for the career risk of HCV was developed using the frequency of parenteral exposures to blood, the population seroprevalence of HCV, and the risk of seroconversion after exposure. Estimates of key input variables were obtained from published studies.

   RESULTS: Calculated estimates of the 30-year risk of infection ranged from <0.1% for police, firefighters, and corrections officers to 1.9% among paramedics and emergency department personnel in high-risk communities. Infrequent exposure to high-risk blood seems to present a greater risk of infection than more frequent contact to low-risk populations.

   CONCLUSIONS: Use of a probabilistic risk assessment model using published data can assist in policy decisions designed to protect the health and safety of workers. Further efforts to document the frequency of occupationally acquired HCV are needed.

8. **Cost-effectiveness of hepatitis A-B vaccine versus hepatitis B vaccine for healthcare and public safety workers in the western United States.**
   Jacobs RJ, Gibson GA, Meyerhoff AS. Infection Control and Hospital Epidemiology. 2004 Jul;25(7):563-9.

   OBJECTIVE: To determine the cost-effectiveness of substituting hepatitis A-B vaccine for hepatitis B vaccine when healthcare and public safety workers in the western United States are immunized to protect against occupational exposures to hepatitis B.

   PARTICIPANTS: A cohort of 100,000 hypothetical healthcare and public safety workers from 11 western states with hepatitis A rates twice the national average.
   DESIGN: A Markov model of hepatitis A was developed using estimates from U.S. government databases, published literature, and an expert panel. Added costs of hepatitis A-B vaccine were compared with savings from reduced hepatitis A treatment and work loss. Cost-effectiveness was expressed as the ratio of net costs to quality-adjusted life-years (QALYs) gained.

RESULTS: Substituting hepatitis A-B vaccine would prevent 29,796 work-loss-days, 222 hospitalizations, 6 premature deaths, and the loss of 214 QALYs. Added vaccination costs of $5.4 million would be more than offset by $1.9 million and $6.1 million reductions in hepatitis A treatment and work loss costs, respectively. Cost-effectiveness improves as the time horizon is extended, from $232,600 per QALY after 1 year to less than $0 per QALY within 11 years. Estimates are most sensitive to community-wide hepatitis A rates and the degree to which childhood vaccination may reduce future rates.

CONCLUSION: For healthcare and public safety workers in western states, substituting hepatitis A-B vaccine for hepatitis B vaccine would reduce morbidity, mortality, and costs.

9. Occupational exposures and risk of hepatitis B virus infection among public safety workers.
Averhoff FM, Moyer LA, Woodruff BA, Deladisma AM, Nunnery J, Alter MJ, Margolis HS. Journal of Occupational & Environmental Medicine. June 2002; 44(6):591-6.

We conducted a questionnaire and seroprevalence survey to determine the frequency and type of occupational exposures (OEs) and the risk of hepatitis B virus (HBV) infection experienced by public safety workers (PSWs). Of the 2910 PSWs who completed the survey, 6.8% reported at least one OE in the previous 6 months, including needlestick (1.0%), being cut with a contaminated object (2.8%), mucous membrance exposure to blood (0.9%), and being bitten by a human (3.5%). The rate of OE varied by occupation with 2.7% of firefighters, 3.2% of sheriff officers, 6.6% of corrections officers, and 7.4% of police officers reporting > or = 1 OE ($P < 0.001$). The HBV infection prevalence was 8.6%, and after adjustment for age and race, it was comparable to the overall US prevalence and did not vary by occupation. By multivariate analysis, HBV infection was not associated with any OEs, but it was associated with older age, being nonwhite, and a previous history of a sexually transmitted disease. This study demonstrated that although OEs are not uncommon among PSWs, HBV infection was more likely to be associated with nonoccupational risk factors. Administration of hepatitis B vaccine to PSWs early in their careers will prevent HBV infection associated with occupational and non-OEs.

10. Hepatitis C in urban and rural public safety workers.
Rischitelli G, McCauley L, Lambert WE, Lasarev M, Mahoney E. Journal of Occupational & Environmental Medicine. 2002 Jun;44(6):568 -73.

A sample of 719 Oregon public safety personnel (police officers, firefighters, and corrections officers) was tested for hepatitis C virus (HCV) antibody after completing a risk questionnaire. Seven of nine positive enzyme immunoassay tests (78%) were confirmed with recombinant immunoblot assay, yielding confirmed prevalence estimates of 1.2% (95% confidence interval, 0.4 to 2.8%) among the 406 firefighters and emergency medical technicians, and 0.7% (95% confidence interval, 0.1 to 2.6%) in 274 corrections personnel. No cases were observed in the 29 participating police officers. Self-reports of the number of workplace exposures to blood were not associated with HCV positivity, and the number of years of public safety employment seemed to be slightly less for HCV-positive subjects. Two

of the seven (28.6%) HCV-positive individuals reported having at least one nonoccupational risk factor (odds ratio, 4.3; 95% confidence interval, 0.4 to 27.1), suggesting the greater relative importance of nonoccupational exposures.

11. Hepatitis C screening and prevalence among urban public safety workers.
Upfal MJ, Naylor P, Mutchnick MM. Journal of Occupational & Environmental Medicine. 2001 Apr;43(4):402-11.

This study examines the prevalence of anti-hepatitis C virus by using an enzyme-linked immunoassay test (EIA-2) in 2447 volunteers (including 1560 police, 678 fire, and 209 emergency medical service personnel) and a self-reported questionnaire on potential occupational and non-occupational risk factors. Subjects consisted of 76% men, 54.8% blacks, and 40.3% whites. Twenty-eight individuals (1.1%) tested positive, with prevalence rates of 1.1% and 1.3%, respectively, among blacks and whites. Although firefighters and emergency medical service workers had a higher prevalence (2.3% and 2.8%) than police (0.6%), the overall prevalence was lower than that typical of urban populations. In a multivariate analysis, the most important risk factors were behavioral, with no significant occupational exposure risk observed. Previously reported racial differences were not detected in this study, most likely because the subjects were of similar socioeconomic status.

12. Potential work-related exposures to bloodborne pathogens by industry and occupation in the United States Part II: A telephone interview study.
Chen GX, Jenkins EL. American Journal of Industrial Medicine. 2007 Apr;50(4):285-92.

BACKGROUND: The companion surveillance portion of this study [Chen and Jenkins, 2007] reported the frequency and rate of potential work-related exposures to bloodborne pathogens (BBP) treated in emergency departments (EDs) by industry and occupation, but it lacks details on the circumstances of the exposure and other relevant issues such as BBP safety training, use of personal protective equipment (PPE) or safety needles, or reasons for seeking treatment in a hospital ED.

METHODS: Telephone interviews were conducted with workers who had been treated in EDs for potential work-related exposures to BBP in 2000-2002. Respondents were drawn from the National Electronic Injury Surveillance System.

RESULTS: Of the 593 interviews, 382 were from hospitals, 51 were from emergency medical service/firefighting (EMS/FF), 86 were from non-hospital healthcare settings (e.g., nursing homes, doctors' offices, home healthcare providers, etc.), 22 were from law enforcement (including police and correctional facilities), and 52 were from other non-healthcare settings (i.e., schools, hotels, and restaurants). Needlestick/sharps injuries were the primary source of exposure in hospitals and non-hospital healthcare settings. Skin and mucous membrane was the primary route of exposure in EMS/FF. Human bites accounted for a significant portion of the exposures in law enforcement and other non-healthcare settings. In general, workers from non-hospital settings were less likely to use PPE, to have

BBP safety training, to be aware of the BBP standards and exposure treatment procedures, and to report or seek treatment for a work-related exposure compared to hospital workers.

CONCLUSIONS: This study suggests that each industry group has unique needs that should be addressed.

13. Relationship Between Cardiovascular Disease Morbidity, Risk Factors, and Stress in a Law Enforcement Cohort.
Franke, Warren D. PhD; Ramey, Sandra L. PHD; Shelley, MackC. II, PhD. Journal of Occupational & Environmental Medicine. 44(12); 1182-1189, December 2002.

It is unclear to what extent law enforcement officers (LEOs) experience increased prevalence of cardiovascular disease (CVD; defined as coronary heart disease, myocardial infarction, angina, or stroke) and, if so, whether perceived stress affects this relationship. First, self-reported CVD risk factors among currently employed male LEOs from 9 states (n = 2818) were compared to CVD risk factors among similarly-aged males with similar incomes in the same states (n = 8046). Second, CVD prevalence was compared among LEOs (n = 1791) and similarly-aged males with similar incomes (n = 2575) from four of these states. Finally, among the LEOs only, the possible effect of perceived stress on the relationship between CVD prevalence and CVD risk factors was assessed. LEOs reported higher prevalence of hypertension, hypercholesterolemia, tobacco use, and elevated body mass index. CVD prevalence did not differ significantly between the LEO group and the general population (2.3% +/- 15% versus 3.1% +/- 17%;P = 0.095). In the LEO-only group, the best predictors of CVD were: time in the profession (OR = 1.07; 95% CI = 1.03-1.11), perceived stress (OR = 1.05; 95% CI = 1.00-1.10), and hypertension (OR = 0.33; 95% CI = 0.18-0.62). In the LEO-only group, perceived stress was associated with CVD (P = 0.008), and three CVD risk factors were significantly affected by perceived stress: cholesterol, hypertension, and physical activity. Perceived stress was affected by duration of time in the profession (P = 0.004), independent of an age effect (P = 0.353). Among susceptible officers, perceived stress may contribute to CVD directly and through potentiating several CVD risk factors.

14. Cardiovascular Disease Morbidity in an Iowa Law Enforcement Cohor, Compared with the General Iowa Population.
Franke, Warren D. PhD; Collins, Shannon A. MS; Hinz, Paul N. PhD. Journal of Occupational & Environmental Medicine. 40(5); 441-444, May 1998.

It remains uncertain if law enforcement officers experience an elevated cardiovascular disease morbidity and, if so, whether their profession contributes to this incidence. Consequently, the self-reported incidence of cardiovascular disease (CVD) (coronary heart disease, myocardial infarction, stroke, coronary artery bypass graft surgery, angioplasty) and CVD risk factors (age, diabetes, elevated body mass index (>= 27.8 kg [middle dot] m-2), hypercholesterolemia, hypertension, tobacco use) in 232 male retirees, >= 55 years of age, from the Iowa Department of Public Safety were compared with 817 male Iowans of similar age. CVD incidence was higher in the law enforcement officers than the general population (31.5% vs 18.4%, P < 0.001). Using multiple logistic regression, factors found to be

associated with CVD included the law enforcement profession (odds ratio [OR]= 2.34; 95% confidence interval [95% CI] = 1.5-3.6), hypercholesterolemia (OR= 2.37; 95% CI = 1.7-3.3); diabetes (OR = 2.22; 95% CI = 1.4-3.6), hypertension (OR = 1.79; 95% CI = 1.3-2.5), tobacco use (OR = 1.67; 95% CI = 1.07-2.6), and age (OR = 1.06; 95% CI = 1.03-1.08). These results suggest that employment as a law enforcement officer is associated with an increased cardiovascular disease morbidity and this relationship persists after considering several conventional risk factors.

15. Ischemic Heart Disease Mortality and Occupation Among 16- to 60-Year-Old Males.
Calvert, Geoffrey M. MD, MPH; Merling, Jeffrey W. MD; Burnett, Carol A. MS.Journal of Occupational & Environmental Medicine. 41(11):960-966, November 1999.

Cardiovascular disease is the leading cause of death, and the role of occupation continues to generate interest. Using the National Occupational Mortality Surveillance system, proportionate mortality ratio (PMR) analyses were used to examine the association between occupation and ischemic heart disease among 16- to 60-year-old males. We used data from 1982-1992 from 27 states. Separate analyses were conducted for blue-collar and white-collar occupations. Among the blue-collar occupations with the highest PMRs for ischemic heart disease mortality were sheriffs, correctional institution officers, policemen, firefighters, and machine operators. Physicians (blacks only) and clergy (both races) were among the white-collar occupations with the highest PMRs for ischemic heart disease. Although more study is needed, consideration should be made for targeting high-PMR occupations, with improvement in work organization to reduce occupational stress and promotion of healthy lifestyles through cardiovascular disease prevention programs.

16. Occupational Exposures and Risk of Hepatitis B Virus Infection Among Public Safety Workers.
Averhoff, Francisco M. MD, MPH; Moyer, Linda A. RN; Woodruff, Bradley A. MD, MPH; Deladisma, Adeline M. MPH; Nunnery, Joni MPH; Alter, Miriam J. PhD; Margolis, Harold S. MD.Journal of Occupational & Environmental Medicine. 44(6):591-596, June 2002.

We conducted a questionnaire and seroprevalence survey to determine the frequency and type of occupational exposures (OEs) and the risk of hepatitis B virus (HBV) infection experienced by public safety workers (PSWs). Of the 2910 PSWs who completed the survey, 6.8% reported at least one OE in the previous 6 months, including needlestick (1.0%), being cut with a contaminated object (2.8%), mucous membrane exposure to blood (0.9%), and being bitten by a human (3.5%). The rate of OE varied by occupation with 2.7% of firefighters, 3.2% of sheriff officers, 6.6% of corrections officers, and 7.4% of police officers reporting >=1 OE ($P < 0.001$). The HBV infection prevalence was 8.6%, and after adjustment for age and race, it was comparable to the overall US prevalence and did not vary by occupation. This study demonstrated that although OEs are not uncommon among PSWs, HBV infection was more likely to be associated with nonoccupational risk factors. Administration of hepatitis B vaccine to PSWs early in their careers will prevent HBV infection associated with occupational and non-OEs.

17. Cancer incidence among Ontario police officers

Murray M. Finkelstein, PhD, MDCM; American Journal of Industrial Medicine Volume 34, Issue 2 , Pages 157 – 162; Published Online: 6 Dec 1998

The National Institute for Occupational Safety and Health (NIOSH) published a report in 1995 suggesting the possibility of increased incidence of testicular cancer, leukemia, and cancers of the brain, eye, and skin among police officers working with traffic radar. NIOSH recommended epidemiologic study of the issue. This report presents the results of a retrospective cohort cancer incidence study among 22,197 officers employed by 83 Ontario police departments. The standardized incidence ratio (SIR) for all tumor sites was 0.90 (95% confidence interval [CI] = 0.83-0.98). There was an increased incidence of testicular cancer (SIR = 1.3, 90%CI = 0.9-1.8) and melanoma skin cancer (SIR = 1.45, 90%CI = 1.1-1.9). These anatomical sites might absorb energy from radar units, but at this time the author has no information about individual exposures to radar emissions, and it is not possible to draw etiologic conclusions.

18. Dying from the Job: The Mortality Risk for Police Officers

John M. Violanti, Phd., Law Enforcement Wellness Association
http://cophealth.com/articles/articles_dying_a.html, viewed 3/3/08.

There are an estimated 623,000 sworn police officers employed in the United States, yet few studies of long term health risks have been conducted. It has been argued that police officers are at increased risk for mortality as a result of their occupation. The average age of death for police officer in our 40-year study was 66 years of age.

Although it is not possible to change the dangers inherent in police work, it is possible to change aspects which affect the long term health of officers. The present findings suggest that police officers are at significantly elevated risks for a number of diseases and appropriate interventions should be instituted. Elevated mortality risk of colon cancer and other digestive cancers , for example, indicates a need for earlier detection with stool tests or frequent medical examinations. Such medical examinations are lacking as part of work benefits in most police agencies. Elevated risk for cirrhosis, arteriosclerotic heart disease, and all malignant neoplasms combined are also diseases of concern. Prevention should emphasize management programs which include health education, physical exercise , smoking abatement, and dangers of alcohol use. The elevated risk of suicide among police officers in present study indicates the effect of a high stress work environment and perhaps the officer's inability to adequately cope with stress. In addition to stress management and suicide awareness education, police officers should have confidential psychological services available to help them deal with such difficulties. Only one of five police agencies presently have such programs. Shift work is another possible factor related to long term health problems. Departments should consider arranging work shifts to optimally benefit officers in terms of proper sleep. Shifts, for example, should not be changed for at least 4-6 weeks at a time, as rapid shift changes exacerbate strain on the body.

Lastly, there is need for police departments to consider alternatives to police organizational structure which can produce much of the stress experienced by police officers. Officers report that approximately 90% of stress in their work is a result of a highly structured, unresponsive, uncaring administration. Changes should include allowing officers the opportunity to participate in decisions affecting their work, and a greater organizational awareness of problems at the street level.

No simple answers exist for prevention of disease in police work. The present study may help to understand correlates of the long term health effects of this occupation and provide a basis for future work.

19. Work Stress in Aging Police Officers.
Journal of Occupational & Environmental Medicine. 44(2):160-167, February 2002.
Gershon, Robyn R. M. MHS, DrPH; Lin, Susan MPH; Li, Xianbin MHS, PhD

Data are sparse regarding the impact of psychosocial work stress on the health and well-being of aging workers, even for employees working in high-stress occupations, such as law enforcement. To improve our understanding of this issue in older workers, we assessed and characterized work stress, coping strategies, and stress-related health outcomes in a sample of police officers aged 50 years and older (n = 105). The most important risk factors associated with officers' perceived work stress were maladaptive coping behaviors (eg, excessive drinking or problem gambling) (odds ratio [OR], 4.95; 95% confidence interval [CI], 2.11 to 11.6) and exposure to critical incidents (eg, shootings) (OR, 3.84; 95% CI, 1.71 to 8.65). In turn, perceived work stress was significantly associated with anxiety (OR, 6.84; 95% CI, 2.81 to 16.65), depression (OR, 9.27; 95% CI, 3.81 to 22.54), somatization (OR, 5.74; 95% CI, 2.47 to 13.33), posttraumatic stress symptoms (OR, 2.89; 95% CI, 1.29 to 6.47), symptoms of "burnout" (OR, 5.93; 95% CI, 2.54 to 13.86), chronic back pain (OR, = 3.55; 95% CI, 1.57 to 8.06), alcohol abuse (OR, 3.24; 95% CI, 1.45 to 7.22), and inappropriately aggressive behavior (OR, 4.00; 95% CI, 1.34 to 11.88). These data suggest that older workers in high-stress jobs may be at increased risk for work stress-related health problems, especially if they rely on risky health behaviors to cope with stress. Given the size of the rapidly aging US workforce and the likelihood that many are employed in high-stress jobs, interventions are urgently needed to address this emerging public health issue.

20. A Prospective Study of Occupation and Prostate Cancer Risk.
Journal of Occupational & Environmental Medicine. 46(3):271-279, March 2004. Zeegers, Maurice P. A. PhD; Friesema, Ingrid H. M. MSc; Goldbohm, R. Alexandra PhD; van den Brandt, Piet A. PhD

A wide variety of occupations has been associated with prostate cancer in previous retrospective studies. Most attention has been paid to farming, metal working, and the rubber industry. Today, these results cannot be affirmed with confidence, because many associations could be influenced by recall bias, have been inconsistent, or have not been confirmed satisfactory in subsequent studies. This study was conducted to investigate and confirm these important associations in a large prospective cohort study. The authors conducted a

prospective cohort study among 58,279 men. In September 1986, the cohort members (55-69 years) completed a self-administered questionnaire on potential cancer risk factors, including job history. Related job codes were clustered in professional groups. These predefined clusters were investigated in 3 time windows: 1) profession ever performed, 2) longest profession ever held, and 3) last profession held at baseline. Follow up for incident prostate cancer was established by linkage to cancer registries until December 1993. A case-cohort approach was used based on 830 cases and 1525 subcohort members. To minimize false-positive results, 99% confidence intervals (99% CI) were calculated. Although moderately decreased prostate cancer risks were found for electricians, farmers, firefighters, woodworkers, textile workers, butchers, salesmen, teachers, and clerical workers, none of the relative risks (RR) were found to be statistically significant. For road transporters, metal workers, and managers, no association with prostate cancer risk was found. Although the RR for railway workers, mechanics, welders, chemists, painters, and cooks was moderately increased, these estimates were not statistically significant. For men who reported to have ever worked in the rubber industry, we found a substantially increased prostate cancer risk, but not statistically significant (RR, 4.18; 99% CI = 0.22-80.45). **For policemen, we found a substantial and marginally statistically significant increased prostate cancer risk, especially for those who reported working as a policeman for most of their occupational life (RR, 3.91; 99% CI = 1.14-13.42) or as the last profession held at baseline (RR, 4.00; 99% CI = 1.19-13.37).** Most of the previously investigated associations between occupation and prostate cancer risk could not be confirmed with confidence in this prospective study. The lack of statistical significance for rubber workers could be caused by the scarcity of rubber workers in this cohort and subsequent lack of power. The results for policemen were substantial and statistically significant, although a conservative value for significance level was used.

21. **Hyperinsulinemia and the Risk of Stroke in Healthy Middle-Aged Men: The 22-Year follow-Up Results of the Helsinki Policemen Study.**
Stroke. 29(9):1860-1866, September 1998. *Pyorala, Marja MD; Miettinen, Heikki MD; Laakso, Markku MD; Pyorala, Kalevi MD*

Background and Purpose: Several studies have shown that hyperinsulinemia is associated with the risk of coronary heart disease, but information on the association of hyperinsulinemia with the risk of stroke is limited. We investigated the association of hyperinsulinemia with the risk of stroke during a 22-year follow-up of the Helsinki Policemen Study population. Conclusions: Hyperinsulinemia was associated with the risk of stroke in Helsinki policemen during the 22-year follow-up, but not independently of other risk factors, particularly upper body obesity. (Stroke. 1998;29:1860-1866.)