

1997-98 SESSION
COMMITTEE HEARING
RECORDS

Committee Name:

Joint Survey Committee
on Retirement Systems
(JSC-RS)

Sample:

- Record of Comm. Proceedings
- 97hrAC-EdR_RCP_pt01a
- 97hrAC-EdR_RCP_pt01b
- 97hrAC-EdR_RCP_pt02

➤ Appointments ... Appt

➤

➤ Clearinghouse Rules ... CRule

➤

➤ Committee Hearings ... CH

➤

➤ Committee Reports ... CR

➤

➤ Executive Sessions ... ES

➤

➤ Hearing Records ... HR

➤

➤ Miscellaneous ... Misc

➤ 97hr_JSC-RS_Misc_pt11e

➤ Record of Comm. Proceedings ... RCP

➤

hearing 2-9-98

STATE OF WISCONSIN

APPENDIX TO 1995 ASSEMBLY BILL 425

REPORT OF JOINT SURVEY COMMITTEE ON RETIREMENT SYSTEMS

(Introduced by Representatives Dobyne, Lehman, Musser, Kreibich, Silbaugh, Kelso, Ott, Gunderson, Grobschmidt, Plombon, Springer, Ziegelbauer, Gronemus and Boyle; cosponsored by Senators Buettnar, C. Potter, Andrea, Jauch, Breske and Schultz.) An Act to amend 40.02 (48)(am) and 40.02 (48)(c); and to create 40.02 (17)(m) and 40.65 (4v) of the statutes; relating to classifying county jailers as protective occupation participants for the purposes of the Wisconsin retirement system.

EXTRACT OF COMMITTEE'S RECOMMENDATION ON THIS BILLPURPOSE OF THE BILL

Public employee participants under the Wisconsin Retirement System (WRS) fall under four classifications: general employees and teachers, protective employees with social security, protective employees without social security, and elected officials and certain state executives. The statutory definition of a protective occupation requires that the principal duties involve law enforcement or fire suppression or prevention, require frequent exposure to a high degree of danger or peril, and also require a high degree of physical conditioning. Public employee participants may fall under that category either by specific designation of that position under 40.02 (48)(am), by employer certification as a protective, or by employee appeal to the board of the Department of Employee Trust Funds (ETF).

The purpose of this bill is to specifically define county jailers in all counties of the state as protective occupation participants under the WRS. Some county jailers have already been designated as protective participants by their employers, and this legislation would classify all other county jailers as protectives who are now classified as general employees. This change would become effective on the January 1 following publication, and the change would not be retroactive for those county jailers newly classified as protective participants under

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this legislation. The bill further amends WRS law to include all county jailers under the s. 40.65 death and disability insurance program for protectives who are injured in the line of duty after the effective date.

ACTUARIAL EFFECT

This bill would have no material effect upon the actuarial goals or balance of the WRS.

PROBABLE COST

This bill would newly classify all county jailers as protective occupation participants under the WRS. As such, this legislation would have no direct effect on the contribution rates that are determined each year by the ETF Board for the various classifications of WRS participants. On the other hand, this change in classification for some county jailers would require employees and employer agencies effected to contribute to the WRS at the protective rate instead of the general employee rate.

Based upon a 1991 survey of counties, this committee report assumes that 400 jailer positions would newly become protective, and that these positions will have an average salary in 1995 of \$30,000 for a total covered payroll for effected positions of \$12 million. The 1995 employer retirement costs will increase by 4.5%, and added employer costs for s. 40.65 death and disability benefits would average about 3.0% of payroll for a total added employer cost of about \$900,000.

Employee retirement costs in 1995 would also increase by 0.3% of payroll, or \$36,000--an amount which is subject to possible employer "pick-up". Hence, the total added costs for mandating these positions as protective in 1995 would be \$936,000, and all of these costs would be allocated to county government.

PUBLIC POLICY

Under present law, protective occupation participants have a higher benefit formula than general employees and an earlier normal retirement than general employees. WRS statutes clearly define the basic requirements for protective designation, and provide that positions may be covered in that classification by specific statutory designation, by employer certification, or by employee appeal to the DETF Board.

The classification status of county jailers has previously been reviewed by the DETF Boards and also the Retirement Research Committee. The DETF carried out a county survey of jailers which reflected differences in county requirements for physical fitness, the degree of contact with inmates, whether or not the

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positions were deputized, and other duties involved. The DETF survey indicated that there was not a uniform job description for county jailers across the state. Appeals to the DETF Board by county jailers have generally been rejected in the past.

The status of county jailers and other groups seeking protective status was also reviewed by an RRC subcommittee working with the s. 40.65 death and disability program. That subcommittee also chose not to make any recommendations for a mandated protective status for county jailers. It should be further noted that employers may certify their county jailers as protective if the employers determine that those positions meet the basic qualification standards for protective status as found under s. 40.02 (48)(a), Stats.

This bill would bypass the employer certification process relative to the determination of protective status under the WRS. Recent changes in normal retirement provisions for general employees and protectives have reduced much of the difference between these groups relative to normal retirement (57/30 years vs. 53/25 years). Accordingly, protective designation primarily provides a higher benefit formula and greater death and disability protection under s. 40.65, Stats.

Legislation/Executive Appointments

Legislation In Committee

Joint survey committee on Retirement Systems

Senate Bill 16

Relating to: creditable military service under the Wisconsin retirement system.

By Senators Decker, Clausing, A. Lasee, Burke, Breske, Plache and Fitzgerald; cosponsored by Representatives Turner, Musser, Gronemus, Otte, Plale, Riley, Springer, Zukowski, Hahn, Black, Boyle, Owens, Kreuser, Murat, Dobyms and Seratti.

Assembly Bill 9

Relating to: protective occupation participant status under the Wisconsin retirement system for state motor vehicle inspectors:

By Representatives Porter, Musser and Boyle; cosponsored by Senators Moen and Jauch.

Assembly Bill 43

Relating to: granting creditable service under the Wisconsin retirement system for service in the federal peace corps or VISTA public service programs or in any national service program under the federal National and Community Service Act of 1990.

By Representatives Schneider, Murat, Turner, Notestein, Boyle, Springer and Baldwin; cosponsored by Senator Shibilski.

Senate Bill 59

Relating to: classifying state probation and parole officers as protective occupation participants for the purposes of the Wisconsin retirement system.

By Senators C. Potter, Schultz, Risser, Welch, Darling, Rosenzweig, Buettner, Drzewiecki and Plache; cosponsored by Representatives Otte, Ziegelbauer, Johnsrud, Goetsch, Freese, Ourada, Linton, Kreibich, Boyle, Murat, Handrick, Ainsworth, Ward, Baldwin, Dobyms, Musser, Kaufert, Albers, Vander Loop, Huber, Springer, Owens, Meyer and Gronemus.

Assembly Bill 190

Relating to: the determination of final average earnings for the purpose of calculating certain benefits under the Wisconsin retirement system.

By Representative Baumgart.

Assembly Bill 196

Relating to: qualified domestic relations orders under the Wisconsin retirement system.

By Representatives Kreuser, Turner, Vander Loop, Grothman and Seratti; cosponsored by Senators Grobschmidt and Buettner.

Assembly Bill 217

Relating to: classifying certain employes of the department of natural resources who exercise police powers and protective occupation participants for the purposes of the Wisconsin retirement system.

By Representatives Brandemuehl, Freese, Musser, Dobyms, Hahn, Hasenohrl, Kreibich and Gronemus; cosponsored by Senator Buettner.

Legislation/Executive Appointments

Legislation In Committee

Joint survey committee on Retirement Systems

Assembly Bill 224

Relating to: classifying state probation and parole officers and certain state employees who are teachers, librarians and social workers as protective occupation participants for the purposes of the Wisconsin retirement system.

By Representatives Ourada, Dobyms, Ainsworth, Meyer, Goetsch, Ziegelbauer, Musser, Vander Loop, Freese, Lorge, Hahn, Baldwin, Boyle, Underheim, Ott, Gunderson, Porter, Huber and Plale; cosponsored by Senators Breske, Panzer and Buettner.

Assembly Bill 269

Relating to: the period of separation from covered employment required under the Wisconsin retirement system for an annuitant under the Wisconsin retirement system.

By Representatives Ziegelbauer, Grothman, Jensen, Ainsworth, Albers, Baumgart, Bock, Brandemuehl, Carpenter, Duff, Freese, Gard, Goetsch, Hahn, Harsdorf, Hoven, Huber, Kedzie, Kelso, Kreibich, Ladwig, La Fave, F. Lasee, J. Lehman, M. Lehman, Linton, Notestein, Olsen, Powers, Reynolds, Schafer, Seratti, Skindrud, Sykora, Urban, Vrakas, Walker, Ward, R. Young and Zukowski; cosponsored by Senators Plache, Buettner, Clausing, Drzewiecki, A. Lasee and Zien.

Assembly Bill 294

Relating to: creditable military service under the Wisconsin retirement system.

By Representatives Musser, Schafer, Gronemus, Freese, Dobyms, Turner, Hahn, Boyle, Green, Huebsch, Brandemuehl, Ryba, Zukowski, Plale, Owens, Hasenohrl, Springer, Seratti, Riley and Lorge; cosponsored by Senators Breske, Fitzgerald, Plache, Zien, Wirch and Welch.

Assembly Bill 331

Relating to: creating a University of Wisconsin optional retirement system and granting rule-making authority.

By Representatives Jensen, Hanson, Kreibich, Ott, Musser, Brandemuehl, Powers, Grothman, Goetsch, Olsen, Freese, Sykora, Plale, Kelso, Duff, Porter, Ziegelbauer, Kedzie, M. Lehman, Riley, Albers, Nass and Underheim; cosponsored by Senators George, Farrow, Huelsman, Schultz, Roessler, Panzer and Plache.

Assembly Bill 362

Relating to: classifying county jailers as protective occupation participants for the purposes of the Wisconsin retirement system.

By Representatives Freese, Dobyms, Sykora, Turner, Schafer, Huber, Kreibich, Springer, Johnsrud, Powers, Gronemus, Brandemuehl, Meyer, Murat, M. Lehman, Boyle, Handrick, Musser, Goetsch and Ott; cosponsored by Senators Moen, Roessler, Breske, Drzewiecki, Risser, Schultz, Panzer and Wineke.

Senate Bill 231

Relating to: creditable military service under the Wisconsin retirement system.

By Senators Welch, Wirch, Fitzgerald, Plache and Zien; cosponsored by Representatives Musser, Turner, Dobyms, Huebsch, Albers, Kreibich, Plale, Ryba, Ott, Schafer, Goetsch, Nass, Springer, Seratti, Plouff, Owens, Boyle, Brandemuehl, Zukowski, Hasenohrl and Green.

Legislation/Executive Appointments

Legislation In Committee

Joint survey committee on Retirement Systems

Senate Bill 245

Relating to: transferring funds in the fixed retirement investment trust of the Wisconsin retirement system and increasing the retirement formula multiplier for certain participating employes in the Wisconsin retirement system for creditable service earned before January 1, 1998.

By Senators C. Potter, Wirch, Schultz, Breske, Rude and Plache; cosponsored by Representatives Dobyys, Musser, Turner, Schafer, Staskunas, Freese, Boyle, Handrick, Plouff and Sykora.

Senate Bill 249

Relating to: classifying county coroners and deputy coroners as protective occupation participants for the purposes of the Wisconsin retirement system.

By Senator Risser; cosponsored by Representatives Black, Musser and Gronemus.

Senate Bill 329

Relating to: presumption concerning employment-connected disease for certain municipal fire fighters.

By Senators Wirch, Rude, Rosenzweig, Wineke, Chvala, Clausing, Burke, Roessler, C. Potter, Risser, Darling, Decker, George, Jauch, Panzer, Plache, Ellis, Moen, Shibilski, Breske and Farrow; cosponsored by Representatives Klusman, Walker, Musser, Krusick, Kreibich, Porter, Handrick, Schneider, Dobyys, R. Potter, Travis, Green, Ryba, Kreuser, Robson, Duff, Steinbrink, Johnsrud, Kedzie, Ladwig, L. Young, Sykora, Lorge, La Fave, Huebsch, Baumgart, J. Lehman, M. Lehman, Harsdorf, Otte, Boyle, Plale, Gunderson, Kaufert, Seratti, Gronemus, Hasenohrl, Underheim, Staskunas, Lazich, Goetsch, Rutkowski, Ott and Plouff.

Assembly Bill 596

Relating to: the amount of a death benefit for participating employes under the Wisconsin retirement system.

By Representative Black.

Assembly Bill 706

Relating to: duty disability benefits for protective occupation participants under the Wisconsin retirement system.

By Representatives Reynolds, R. Young, Ryba, Grothman, Goetsch and Boyle; cosponsored by Senator Weeden.



COUNTY OF MARATHON

COURTHOUSE

500 FOREST STREET

WAUSAU, WISCONSIN 54401-5568

OFFICE OF THE
COUNTY ADMINISTRATOR

(715) 847-5300

Wisconsin Retirement Changes under AB 362

Marathon County employs 57 employees as Jailers/Supervisors. AB 362 would have a serious negative effect on Marathon county's budget, as explained in the following table.

Current Retirement Costs (12.7%)	Proposed Retirement Costs (21.4%)	Increase (59%)
\$200,207	\$337,357	\$137,150

Marathon County is currently planning to open its first Juvenile Facility in July '98. The Detention Facility will be staffed by the Sheriff's Department, with approx. 11 new employees. The Retirement change would significantly affect the costs of that facility. The County is also adding a new wing to the current jail, which will require approx. 9 new employees. That's a total of 20 new employees added to the system, and the tax rate freeze does not allow us to increase our operating budget to accommodate that. The Retirement change would simply add another burden to the already serious increase in costs. \$137,150 simply becomes another unfunded mandate to the county.

In Wisconsin, making all jailers/corrections officers "Protective Service" could also have a negative effect on the state's ability to encourage privatization in jails and prisons for the future.

In Marathon County, our Highway workers are more at risk than our jailers.

In Marathon County, we would prefer to keep our older, experienced jailers longer.

In Marathon County, we have not had any problems with jailers being at higher risk for injury.

In our county, the loss of \$137,150 would have a serious effect on our jail alternative programs and other prevention programs.

AB 362 removes control from local elected officials who have to answer directly to taxpayers.

For all the above reasons Marathon County is opposed to AB 362.

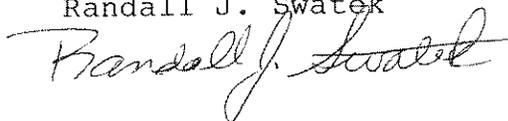
Randall J. Swatek
Walworth County Jail
PO Box 1004
Elkhorn, Wi. 53121
414-741-4520

In many aspects of the work, a police officer and a Correctional officers job run paralell. They are protected. We are not. In every aspect of a state correctional officers job versus a county correctional officers, the work is identical. They are protected. We are not. Corrections is not longer a trade, it is a profession. We are continously educated and professionally trained.

There are 14,955 inmates in the Wisconsin prison system, supervised by state correctional officers working under protective status. But what we cease to remember is that each of these state inmates were once county inmates; supervised by county correctional officers. Yet county correctional officers remain unprotected despite the identical nature of the task at hand.

I have a personal experience that I wish to tell you about. Walworth County is now in a direct supervision Jail. While on duty an unrare indident took place when an inmate decided not to comply with my lawful request. An attempt was made on my life when the inmate tried to stab me in the neck with a pencil. I wish to stress that the threat is there and it is growing.

Thank you,
Respectfully submitted
Randall J. Swatek



County Jailors
Employment Category
Summary Survey Results

County	Employment Category		Deputization Required		Required to Carry Firearm for Any Portion of Job		Physical Fitness Requirements	
	General	Protective	Yes	No	Yes	No	Yes	No
Adams	X		X			X	X	
Ashland	X			X		X		X
Barron								
Bayfield	X			X		X		X
Brown		X	X		X		X	
Buffalo	X			X		X		X
Burnett	X			X		X		X
Calumet	X		X		X			X
Chippewa	X			X		X		X
Clark		X	X			X		X
Columbia								
Crawford		X	X		X			X
Dane		X	X		X		X	
Dodge		X	X			X		X
Door		X	X			X	X	
Douglas	X			X		X	X	
Dunn	X			X				
Eau Claire		X	X		X		X	
Florence								
Fond du Lac	X			X		X		X
Forest		X	X		X		X	
Grant	X			X		X	X	
Green		X	X			X	X	
Green Lake		X		X		X	X	
Iowa	X		X			X	X	
Iron	X		X			X		X

County Jailors
Employment Category
Summary Survey Results

County	Employment Category		Deputization Required		Required to Carry Firearm for Any Portion of Job		Physical Fitness Requirements	
	General	Protective	Yes	No	Yes	No	Yes	No
	Jackson		X	X			X	X
Jefferson		X	X		X		X	
Juneau		X	X		X			
Kenosha	X			X		X	X	
Kewaunee		X	X		X		X	
LaCrosse	X			X		X	X	
Lafayette		X		X		X		
Langlade								
Lincoln		X	X		X		X	
Manitowoc		X	X		X		X	
Marathon	X			X		X	X	
Marinette		X	X		X			
Marquette		X	X			X	X	
Menominee								
Milwaukee								
Monroe		X	X			X	X	
Oconto	X			X		X		
Oneida	X			X		X		
Outagamie	X		X			X	X	
Ozaukee		X	X			X	X	
Pepin		X	X		X		X	
Pierce		X	X			X		
Polk								
Portage		X	X		X		X	
Price		X	X		X		X	
Racine		X	X		X		X	

Employment Category
Summary Survey Results

County	Employment Category		Deputization Required		Required to Carry Firearm for Any Portion of Job		Physical Fitness Requirement	
	General	Protective	Yes	No	Yes	No	Yes	No
Richland	X			X		X		X
Rock		X	X		X			X
Rusk	X		X		X			X
St. Croix	X		X			X	X	
Sauk		X	X		X		X	
Sawyer		X	X			X		X
Shawano								
Sheboygan	X			X		X	X	
Taylor		X	X			X		X
Trempealeau	X			X		X	X	
Vernon		X	X		X			X
Vilas	X			X		X		X
Walworth	X			X		X		X
Washburn								
Washington	X		X			X		X
Waukesha	X			X		X		X
Waupaca	X			X		X	X	
Waushara		X	X			X	X	
Winnebago		X	X			X	X	
Wood		X	X		X			X



Martin Beil
Executive Director

AFSCME Council 24
AFL-CIO
WISCONSIN STATE EMPLOYEES UNION
The Union That Cares

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Gary Lonzo
President

My name is Gary Lonzo, and I am President of the Wisconsin State Employee Union. I also work as a Correctional Officer at the Green Bay Correctional Institution.

The bill before you today is something very important to a lot of my friends, and our members.

I invite each of you to go with one of these folks here today, to actually see what they really do. To investigate violations of law, to enforce state law, confiscate firearms, and take custody and transport offenders, most times in their own vehicles.

Go with them on a home visit, or when they have to revoke someone, with no back up, no police help, or weapons.

Knock on that front door, waiting to see if the person that opens it has a pistol, or a knife in their hand, whether they are high on drugs,



or drunk. Or better yet, knock on that door, not knowing if somebody is going to shoot a shotgun through it - into you.

Go with them to revoke someone, not knowing if their friends, or family will decide to try and stop you.

These are the people who "walk the walk" for the citizens of this state. They put their lives on the line **for us**, each and every day.

When they leave their homes in the morning they have no idea what's in store for them.

They are no different than correctional officers, state troopers, or police officers.

The dangers are the same.

It's only **right** that they should be treated the same.

I urge today, that **you** do what is right.

Move this group, Probation and Parole Officers, into protected service.

It's what's **right**, and what they **deserve**.

RACINE AREA PROJECT OVERVIEW

RAP belongs to everyone. We all have a stake in the success of RAP as we see probation and parole re-tool for the future. Probation and Parole throughout this country is experiencing a shift towards a surveillance-based, control oriented model of supervision with greater emphasis on risk management and expanded use of intermediate sanctions. We are being challenged to prove that what we do really works and therefore we must increasingly rely on data to provide the answers. At the same time there is a national trend to reach out to the community to form partnerships to expand our ability to monitor offenders and secure the resources we need.

RAP is on the cutting edge of where the next decade of correctional programming will lead. Probation and Parole has always been about change. (refer to DCC accomplishments)

The Racine Area Project provides a model of enhanced offender supervision that will use strategies of active supervision and community participation to reduce offender anonymity and increase public safety. This means that DCC staff will be working in the community in close cooperation with local criminal justice representatives, public agencies, treatment providers, community boards and individual citizens all of whom are joint stakeholder in a partnerships with DOC.

Offenders placed on probation will be met in the courtroom and offenders released from jail or DOC institutions will be met at the door to provide up-front contact and reduce absconding. RAP interventions will be based on an expanded risk assessment and evaluation as part of the PSI and/or prison release planning that identifies offender criminogenic needs and the risk they pose to reoffend. Critical success factors of stable employment, AODA Treatment, positive supportive relationships and stable residence will be assessed and resources allocated in direct proportion to these identified needs in order to reduce risk.. The level of supervision will be based on what results the offender accomplishes with a focus on responsibility, accountability and behavior.

This enhanced supervision model will initially be implemented in three distinct geographic areas of the city where community oriented police houses

have already been established. Offenders living in these areas will be supervised by teams of agents. However, the RAP project represents the next generation of DOC programs that ultimately will impact all staff. The immediate benefits of these additional enhanced resources can be seen in the following:

Location of a centralized Intake Unit at Center Street and in the LEC building to provide liaison with the courts, coordinate intake for all Racine offenders and complete all Racine Presentence Investigations.

- Initial case opening requirements for all Racine supervision cases completed by the Intake Unit to include:

an initial offender assessment and evaluation using the CRNMS (Community Risk Needs Management Scale) that measures probability of recidivism), SASSI, AODA evaluation, DOC-179 Social History, 502 and a base polygraphs for some sex offenders.

- Intake Unit staff will complete:
 - Preparoles on targeted offenders
 - an initial job verification and collateral family member contact, determine restitution where feasible
 - day and evening orientation to supervision for offenders and family members, complete PPI's - community re-integration plans for MR releases and offenders on a nine month defer excluding sex offenders.
- Assignment of Cases based on where offender lives using GIS
- Direct entry of assigned agent in CACU/CIPIS
- Direct access to C-CAP to readily secure Probation Court Orders and other court documents
- Immediate entry of critical database information including DOC institution placement

Establishment of a 6 day a week 10 hour a day Day Reporting Center at Center Street offering job counseling, STRIVE Programming, AODA, cognitive, domestic violence and other treatment counseling.

- Intake Unit staff will provide liaison to all POS Programs and will coordinate the day program center, and provide circle of recovery program for African American offenders. (see attached description)
- Establishment of an absconder unit to decrease offender anonymity in the community.

Allocation of additional safety equipment, metal detectors, vehicles, enhanced electronic monitoring, and other resources.

- Acquisition and use of kiosks to assist in offender monitoring and supervision.
- Periodic rotation within Intake Unit and supervision teams to provide additional experiences for all Racine staff.
- Enhanced training to all staff focusing on community based supervision and safety issues.
- Internal Staff Advisory Board composed of staff from each unit
- Discharge of Low Risk Misdemeanor Cases and Conditional Discharge to enhance RAP positions (432 Racine cases identified 5.5 positions)
- Explore use of Mobile Command Posts to expand to other neighborhoods where COP houses are not in place
- 10 Bed County Jail AODA Program with 90 Days of Aftercare
- Access to Community Centers for groups and programming
- Supervised Community Restoration Crews
- Reactivation of Client Services Assistant Positions to expand PA opportunities to gain additional expertise and qualify for agent positions

- RCCCRB to serve as a partner in corrections initiatives in the community i.e. citing of facilities, public awareness and education, access to community services, etc.
- Expanded opportunities for hiring of minority staff with additional positions

RAP represents the opportunity to both test and demonstrate new ways of doing business that will enhance public safety. It is through this process that we have the best chance to garner the resources we need. Today you will have an opportunity to listen and ask questions of RAP Team Leaders about:

- RAP Operational Principles
- RAP Philosophy
- RAP Organizational Structure & Personnel Issues
- Safety
- Walk Through of the Intake A&E Unit
- Walk Through of the Supervision Process
- Review of POS Programming to be provided
- Look at Community Partnerships & Linkages being Developed
- Upcoming Technology
- New Database Information
- Space Planning
- Equipment Purchases
- Staff Training
- Violation & Sanctions Process
- Policy & Procedure Issues

RACINE AREA PROJECT TRAINING TOPICS

TOPIC	TARGET AUDIENCE	TRAINERS	DAYS
1. Orientation/Supervision Philosophy	All RAP Staff	TBD	1 Day
2. Risk Instrument	RAP Agents and Supvs	Canadian Consultant	2 Days
3. Offender Movement & PPI's	RAP Intake Staff	OOB & Parole Commission	½ Day
4. Offender Supervision	RAP Agents and Supvs	TBD	1 Day
5. Active Supervision & Sanctions	All RAP Staff	TBD	1 Day
6. Safety Training, including ACT, 1st Aid, Hostage taking	All RAP Staff	Julie Stark & ACT Trainers	3 Days
7. Comm Organization/ Neighborhood Supv	All RAP Staff	Karl Dresen & Cynthia Sartin	1 Day
8. OATS, Database & Form Scanner	All RAP Staff	BIM & Local Staff	2 Days
9. GIS	Supervisors, PA Supvs, Intake Staff	DOA Staff	1 Day
10. C-CAP, CACU/ CIPIS & Direct Entry	RAP Intake Staff	BIM	1 Day
11. Substance Abuse/ AODA Assessments	RAP Agents	Sandy Reno	2 Days
12. Victims/ Collateral contacts	RAP Agents	Racine VW coordinator, TBD	½ Day
13. Employment/Education/ CSO/Community Restoration	RAP Agents	Cynthia Sartin Marco Tejada Bruce Kittle Providers	1 day

14. Orientation to Day Program	All RAP Staff	Consultant	1 day
15. Team Building	Separate dates for each team (A&E, Field Units, RAP team leaders)	Lutherdale Eagle's Nest	1 Day
16. Training for Trainers	RAP Trainers	Oshkosh Training Center	5 Days
17. Absconder Tracking	Absconder Unit	TBD	½ Day
18. Kiosks	All RAP Staff	Vendor	1 Day
19. Computer	New RAP Agents CSA's & PA's	Gateway	8 Days

Probation

The Times are Changing

The cost and consequences of crime have been a central public policy problem in the United States for most of the past century. Few other concerns surpass crime as an issue that instills fear, destabilizes communities and hinders the development of stable resources needed for improved quality of life in communities throughout the nation.

During the past century-and-a-half two of the central players in the effort to create safer communities have been police and probation agencies. From the beginning the paths of both police and probation agencies have been parallel in practice, but rarely, if ever, collaborative in their pursuit of the goals of identifying, controlling and correcting people who violate the law.

In order to understand how police and probation's traditional roles and contemporary positions have developed, it is essential to review the history of both professions. The evolution of police and probation in the United States can be conveniently divided into three stages: (1) the pre-Twentieth Century; (2) Twentieth Century policy and practice; and (3) the emerging era of effective partnerships.

Pre-Twentieth Century

During the early 1840s the recently established Boston Police Department spent much of its time arresting and bringing people before the court for purchasing alcohol on Sundays and public drunkenness. From the beginning, police in the United States spent a great deal of time responding to social concerns referred to today as order maintenance. Much of what police dealt with in the 1840s involved issues of social order such as public drinking, loitering and vagrancy. Police practices in dealing with the problems surrounding public drunkenness had a significant impact on the start of probation in Boston in 1841 by John Augustus, particularly as a response to this problem of alcohol abuse. In 1852, Augustus wrote, "I was in court one morning...in which the man was charged with being a common drunkard. He told me that if he could be saved from the House of Correction, he never again would taste intoxicating liquors. I bailed him, by permission of the Court."

The Massachusetts Legislature enacted the first probation law in the United States in 1878 (M.G.L. Ch. 198; Acts of 1878). The first probation officer was a member of the Boston Police Department and his duty was to recommend probation for those persons "as may reasonably be expected to be reformed without punishment" (Carter, 1962). Following a two year trial period, the Massachusetts Legislature, in 1880, approved the nation's first statewide hiring of probation officers. In 1890, legislation removed probation officers from the employment of the police department and placed probation under the judiciary. The next twenty years found other states enacting probation statutes.

This was also a period in the United States that saw the nation changing from island communities toward an emergence of large urban centers. It was also a period of dislocation and bewilderment. America by the late 19th Century was a nation of intense partisanship and massive political indifference. The irrelevance of government to most citizens placed a continuous, if elusive, strain upon government operations. Then, as now, it was a period that had great disparities of wealth, poverty, racial and ethnic tensions, a widespread fear of crime, increased urban violence, prison overcrowding, inadequate school systems and unstable working conditions (Wiebe, 1967).

The common roots of both policing and probation are found in dealing with similar societal problems. In addition, both organizations are founded on the belief that

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society will be safer if we can prevent future crimes from occurring and that actions by members of each organization can be effective in preventing those future crimes.

Early Twentieth Century

At the turn of the century there was a major paradigm shift in the role of government in the life of the citizenry. This period, referred to by historians as (the Progressive Era, found probation trying to carry on the humanitarian orientation of Augustus that focused on reformation) an idea consistent with the social policy philosophies of the Progressive Era. But, the new probation officers hired under the enabling legislation were drawn from both reformers with an interest in overcoming the social and substance abuse problems of probationers and others from the law enforcement, military and institutional corrections communities with an emphasis on surveillance and control. Thus, from the beginning of this century, probation and police officers unfortunately found themselves working in an atmosphere of role confusion, philosophical disagreement and inconsistency between policy and practice.

In the period between 1900 and the early 1930s there was an increased wave of immigrants pouring into urban areas, seeking housing and employment. These immigrants, with their different languages and customs, tended to settle next to each other, forming ethnic pockets in the poorer sections of town. Immigrant neighborhoods became characterized by higher crime rates. The Progressive reformers believed that an active government could turn the nation into a "melting pot." They believed that if the immigrants became Americanized they would no longer have any need to engage in criminal activity and crime would be largely eradicated.

The Progressives designed a correctional system that had three key components. The first focus was treatment rather than punishment. The second hallmark of the Progressive criminal justice reform was an insistence on individualized treatment. The third factor, was an implicit trust in the benign power of the state to do good on behalf of all of its citizens (Rothman, 1980). The government would no longer be punishing criminals. Instead, it would be responsible for reforming them into upwardly mobile citizens.

In order to reform criminals and to reduce punishment for all but the hardcore offenders, many legislatures adopted the agenda put forth by the Progressive reformers who fundamentally believed that their philosophy would create active problem solving communities. States such as New Jersey, which passed its probation law in 1900, identified the mission critical elements of a probation officers job to be (1) keepers of accurate records, (2) investigators, and (3) supervisors of offenders in the community. This movement toward the promotion of law-abiding behavior by probationers continues today to define the essential role of a probation officer.

Police during the same period were primarily deployed in a series of walking beats. These beats were often placed contingent to these new immigrant sections of communities. The unwritten message to police was to keep these "different" people away from the "good" people. If crime occurred within these immigrant enclaves, many times police would not even respond or would respond with violence directed against everyone involved: offender, victim and anyone else nearby. As police practices evolved during the Progressive Era, the role of police was to use the

power of arrest to direct the youth of these immigrant communities to public agencies or settlement houses that could teach them "how to be better Americans." At the same time police were developing an attitude that there was nothing additional they could do other than arrest an offender. The idea that "we arrest them and then it is up to the courts" became a rationalization for police involvement after the point of arrest. Since the police could not control the decisions subsequently made by the prosecutor or the judge, they developed an attitude of isolation, separating themselves from other criminal justice agencies. During this period the number of interactions between individual police officers and probation officers were substantially reduced and the strain and distrust

between the two organizations increased. It should be noted that one fairly common interaction between police and probation during this period involved incidents where a police officer arrested an individual on probation for a new crime, a situation that only furthered the belief by many police officers that probation was ineffective.

By the 1930s, Sheldon Glueck of Harvard University had taken an interest in probation's effectiveness. Among his findings, he pointed out that probation had to avoid three pitfalls. First, don't oversell. He warned that every overstatement made in an effort to sell probation to various judges and communities, without good policy and research, would boomerang and weaken belief in the benefits of probation. Secondly, probation needed appropriately educated and trained personnel. Finally, Glueck reminded us that probation was highly dependent for its success on the cooperation of other institutions in society in general and the communities they served in particular (Flanagan, 1996).

All of the values which underlie probation are equally important for effective policing. The need for accurate records, good investigations and supervision or surveillance of offenders in the community are also key tasks and roles for effective police practice. In addition, the need to be open with its citizens, not oversell its programs plus the need for knowledgeable officers and for community support are all essential elements of good police practice.

Despite the obvious need for effective communication and organizational cooperation, both police and probation departments during most of the Twentieth Century focused on procedural and philosophical issues that continued to separate both professions. Both police and probation departments retreated into the pattern of bureaucratic isolation. One of the principal areas of contention grew out of the misperceptions each agency held about the role of the other. Police believed that probation officers were softheaded social workers whose main concern was to keep those individuals police arrested out of jail. Probation officers on the other hand felt that police were overly aggressive, did not care about the offenders they came into contact with and their only concern was to put people in jail. Police were particularly critical of probation because of an unwillingness to share case information; meanwhile, probation officers feared police harassment against probationers.

Clearly, during the early Twentieth Century both police and probation departments, as institutions, moved away from their original intertwined organizational histories. Probation emphasized rehabilitation and reintegration of offenders into community life. Police, on the other hand,

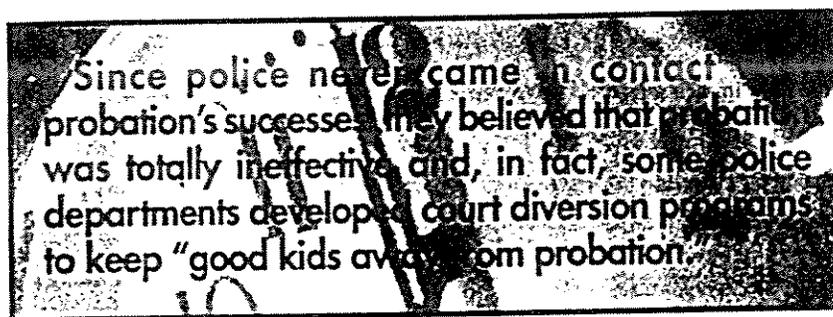
placed its emphasis on surveillance and the removal of offenders from the community. Both probation and police fell into the trap of blaming practices in the other profession for the development of unsafe communities.

The Mid-Twentieth Century

By the 1950s, the American prison system was shaken by a series of riots due to overcrowding, poor management and a general lack of resources. Legislators began to examine alternatives to prison. Among other things, this led to the overselling of probation as the answer to correctional problems. After just having gone through the deprivations brought on by World War II, the citizenry wanted the prison problems to go away and, as was true in prior periods, they were not about to endorse the use of tax money to reduce these problems.

The expansion of probation was again seen as a panacea, not only was it determined to be cheaper than prison, it was seen as being more humane. But, by this time the reality was that probation caseloads were high and actual supervision of offenders leading to assistance or surveillance was minimal at best. In addition, the officers themselves were rarely professionally trained to cope with the multitude of social, psychological and economic problems presented to them by the offender. Even though the debate about probation focused on rehabilitation, the reality was that treatment programs hardly affected daily practice and, at best, rarely went beyond the diagnostic stage found in presentence reports. During this period the police, due in part to their isolation from probation, continued to view probation's attempts at rehabilitation as a failure.

Since police never came in contact with probation's successes, they believed that probation was totally ineffective and, in fact, some police departments developed court diversion programs to keep "good kids away from probation."



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The 1960s proved to be a turbulent decade. There were larger numbers of youngsters in the crime prone age group. America saw an increase in crime rates, especially related to rampant drug usage. Probation was overwhelmed because it lacked appropriate offender supervision strategies for drug offenders. Criminal justice systems in general, and police in particular, came under harsh scrutiny for the sometimes capricious way it dealt with minorities. Both probation and police practices were scrutinized and criticized. Each agency was criticized for failure to become actively involved in the development of community resources. Probation systems came under harsh attacks for hiding behind its claim of large caseloads. Although it was true that large numbers of offenders were under probation supervision, probation departments did not make adequate efforts to improve their record keeping, investigations or supervision practices. It was abundantly clear that probation agencies simply did not have adequate case management and classification systems. The failure to have classification systems in place meant that all offenders received the same inadequate level of probation officer supervision. Probation was clearly not doing much to contribute to the creation of safer communities.

During the 1960s and 1970s, police departments lost touch with the communities they served. Police became the enemy in many communities, being labeled "pigs" and often the source of ridicule and violence. The cause of this social isolation was the role we asked our police offic-

ers to play as supporters of unpopular laws. Around the issues of Vietnam and civil rights, police were a visible force that was viewed as enforcing laws that many people in the society felt were morally wrong. Whether the police were arresting anti-war demonstrators or escorting busses of minority children to previously all white schools, their actions were seen as contrary to the wishes of large segments of their community. This period of alienation from their communities led to a further isolation on the part of the police. Car patrols and radio dispatch systems only created more distance between the police and the communities they served (Kelling and Moore, 1988).

Police and probation departments, like other institutions in America, were generally not prepared for the sudden rush of change that the sixties brought. One of the most significant changes in this decade was in the public and political discussion of crime. It became almost mandatory for political candidates to talk about crime while on the campaign trail. By 1967, the general problems of crime and unrest among the nation's youth were so widespread that President Johnson commissioned a number of Presidential Task Forces (Gaines, 1993).

Although the solution by the federal government was to respond to the Task Force Reports by throwing limited amounts of money at the problem, the bureaucratic isolation and the win/lose games of chasing

after limited fiscal resources continued the pattern of non-cooperative, blame-game management in criminal justice agencies. Despite the negative experiences of the 1960s and early 1970s, the groundwork was being set for the unexpected future collaborations between probation and police.

Emerging Era of Collaboration

Because of the attack on the lack of knowledgeable professionals in most criminal justice agencies, considerable federal money was made available to newly formed schools of criminal justice. The early academic programs were long on analysis and problem identification, the most theoretical of these academic programs suffered from a lack of applied or practical application. Nevertheless, over time there was a movement towards the professionalization of the entire criminal justice community. By the late 1980s, the benefits of a better educated workforce began to emerge. For instance, research on the impact of police education indicates that better educated police officers are less likely to use violence and have fewer complaints made against them (Carter and Sapp, 1989). As more and more criminal justice majors have gone on to graduate studies, they now find themselves in management, line, policy and research positions and are able to influence police and probation practices. They bring fresh insights, construct new paradigms for management and identify many of the new practices that are now evolving within criminal justice agencies. On a national basis the current movement in the criminal justice academic community is toward working more collaboratively with criminal justice practitioners. The federal government has recently seen the benefits of academic and practitioner collaborations and is supporting these collaborative efforts in knowledge transfer. In fact, the National Institute of Justice is presently supporting more than 50 police/academic partnerships.

Although it is true that the entire arena of criminal justice practice has benefited from a more professionalized staff, we do not wish to leave the reader with the impression that the schools of criminal justice were

the primary movers of recent changes in the practice of probation and police work. The changes are multifaceted and occurred primarily at the street level of practice, supported by empowering management, plus fresh involvement of a number of community organizations such as clergy, social service agencies, neighborhood watch programs, as well as the support of informed community leaders. This beginning and fragile effort toward open communication, cooperative practices and proactive efforts by many parties offers a model of collaborative initiatives and effective partnerships to ensure safer communities.

This ability to move toward more collaboration came about because of changes in both probation and police practices during the 1980s. In the same period of time that crime was increasing and probation workload expanding, tax cap legislation became the national trend. With the perceived failure of the "Great Society" to materialize, attention turned away from the concepts of rehabilitation and meeting offenders' needs toward a more dominant emphasis upon protecting citizens from the ravages of crime.

Early in the 1980s, the emphasis in probation shifted toward the goal of risk control. Case management and classification systems were instituted, and management information systems and measurable standards of professional practice were developed in probation. While probation clearly put the proper management tools in place, in many agencies the lack of funding required probation officers to become desk bound in order to get basic work accomplished. Police at the same time, despite making great advancement in information systems, were reduced to being reactive in response to crime and operating from the police cruiser.

By the early 1990s, both probation and police systems, despite being overwhelmed by increased violent crime, were in a position to emphasize professionalism, institute effective management and better manage fiscal resources. Unfortunately, the effective use of resources had not impacted street-level performance in either probation or police work. This problem was recognized at both the management and line level (Kelling and Bratton, 1993). Proactive dialogues at all levels of the probation and police community were encouraged, problems were identified, solutions offered, new programs implemented and research protocols were set in place to test the effectiveness of these new initiatives.

Across the country police departments embraced the idea of community policing (Cardarelli and McDevitt, 1995). At its most basic level, community policing entails an acknowledgment that police cannot solve the problem of crime and fear of crime on their own. Police need the assistance of the public and other governmental agencies if they are to be effective in fighting crime (Police Executive Research Forum, 1996). These new community policing programs sought out new partnerships between the police and previously unconnected governmental agencies such as probation. The key to these new programs was that the police would look for innovative ways to identify neighborhood problems and then partner with other organizations to solve those problems. This was a new philosophy that embraced joint initiatives and, most importantly, set a goal of eliminating a problem so that the strategies employed were regularly reviewed and supplemented, if necessary, until the problem

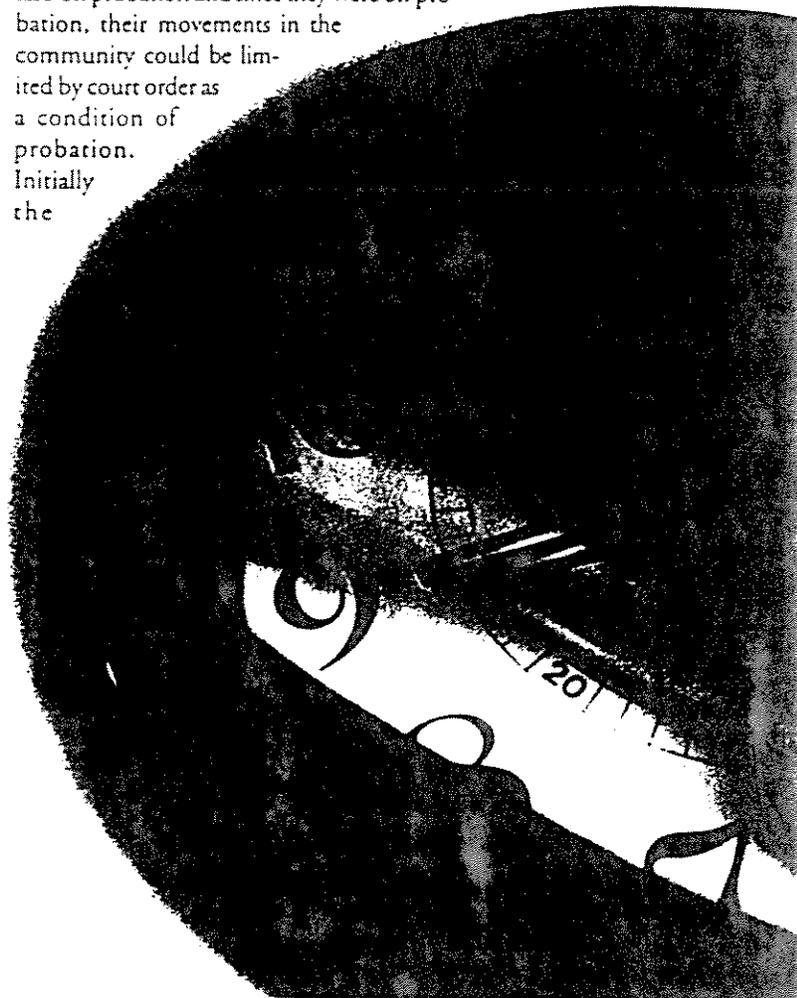
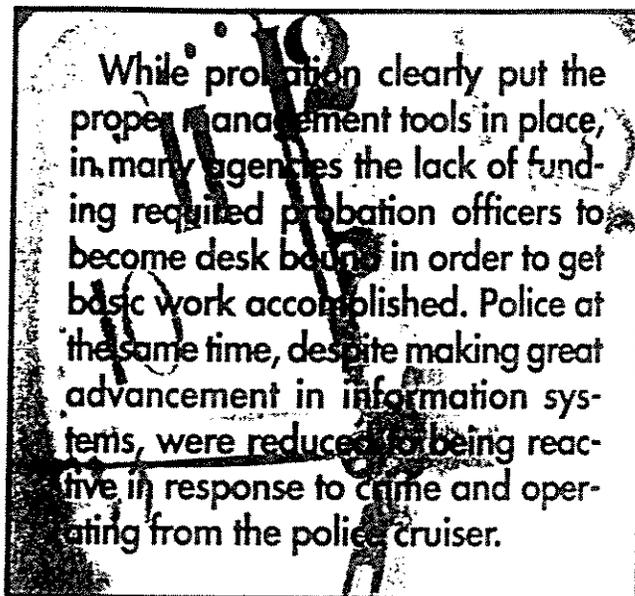
was eliminated.

Although cooperative efforts between community police and community probation systems are springing up throughout the entire nation, the examples that will be described in the remainder of this article focus on practices within the Commonwealth of Massachusetts.

Partnership Programs

The pivotal program in building probation and police partnerships in Massachusetts grew out of a 1991 specialized unit dubbed the "Youthful Offender Group." The specialized probation unit was organized in the Dorchester section of Boston to deal with high risk individuals (Corbett, Fitzgerald and Jordan, 1996). The changing philosophy toward having probation play a pro-active role in creating safer communities in urban areas focused on late night home visits, as well as visits to schools, job locations and generally, assigned probation officers as a constant presence in high crime neighborhoods.

In 1992, the initiative was expanded to a joint venture between the Boston Police Anti-Gang Unit and a number of probation officers. Initial discussion by individual police officers and probation officers revealed that both groups were concerned about the same individuals. Police as part of Boston's new "Neighborhood Policing Strategy" were made aware by the community of a small number of "troublemakers" who were causing most of the problems in the neighborhood. These street level discussions revealed that many of the "troublemakers" were also on probation and since they were on probation, their movements in the community could be limited by court order as a condition of probation. Initially the

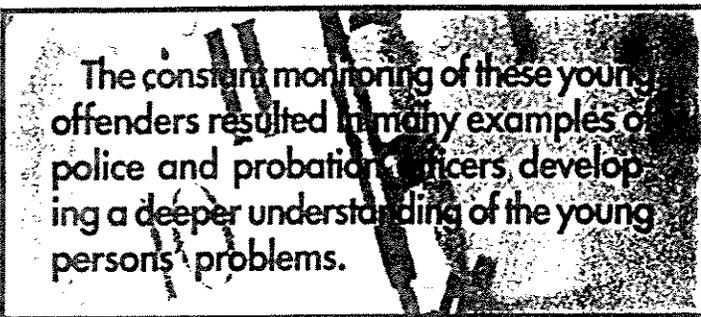


police and probation partnerships began as a way of increasing surveillance over high risk probationers in the community. Strict enforcement of conditions of probation were used in an effort to stem ongoing "gang" problems, drive-by shootings, and a general increase in violent crime in the inner city communities.

As the collaboration between probation, police, prosecutors, clergy, youth workers, school personnel, health-care professionals, parents, youth and other community partners developed, an interesting trend was noticed. Further dialogue and general information sharing started to develop between all of the community partners. Geographic area restrictions and curfews were imposed on probationers by sentencing judges. Police now had information on conditions of probation, and assured that the offender would be held accountable for violating conditions of probation, they started to report violations to probation officers. By combining resources, probation supervision became a 24 hour a day, highly accountable reality.

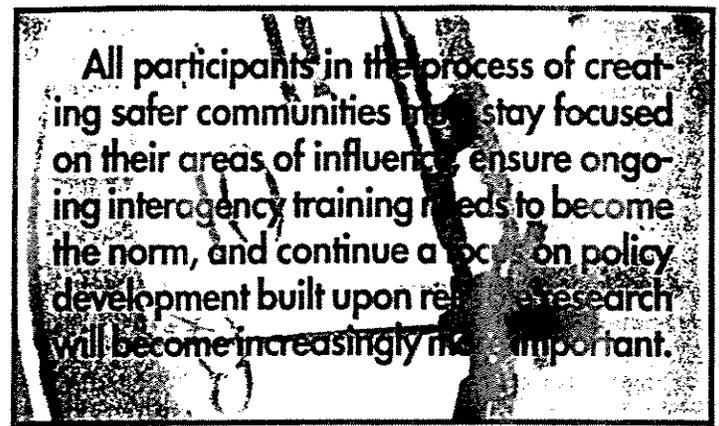
A further change came about as street-level practitioners in both police and probation established the practice of probation and police officers riding together at night. Initially as this program began to expand, skepticism by probation officers who felt it was not their job to be out at night and by police officers who did not want to ride with "social workers" had to be overcome. But, as police realized that the real probability of their coming upon a crime in progress was minimal, it became clear that enforcement of terms of probation was developing into a highly effective crime prevention tool. The reduction in the ability of gangs to harass law abiding citizens, the drop off in drive-by shootings, and the increased support by the community began to dispel the idea that probation had no teeth, or that police could not affect crime patterns at the neighborhood level.

At the same time an interesting trend developed as the program began to be institutionalized. The constant monitoring of these young offenders resulted in many examples of police and probation officers developing a deeper understanding of the young persons' problems. These officers had now met the parents or other caretakers of the probationers and had visited their homes on a number of occasions. The result was a



series of initiatives geared to helping these high risk youth stay out of future trouble. When a police or probation officer associated with Operation Night Light went out and spoke about the program, they stressed this prevention component of the program. Police officers could now use and sometimes add to the employment network already developed by probation to assist high risk youth in obtaining reliable employment.

Probation and police partnership programs have been expanded to other communities in Massachusetts. Policy guidelines have been established at the administrative level to keep these programs focussed on enforcing general conditions of probation, as well as special conditions such as curfews and more frequent home visits by the supervising probation officers. In a further effort to not only ensure that communities were safer, but that resources were being used more effectively, joint



training, strategic planning and university research initiatives have been established to ensure that the effective elements of the programs are expanded and ineffective initiatives are adjusted or eliminated entirely.

Parallel to the police/probation partnerships, an ecumenical group of clergy and lay leaders called the Ten Point Coalition mobilized urban communities around issues affecting youth at risk for violence, drug abuse, and other destructive behavior. Over the past five years the dialogue has been broadened to include gang members, street workers, urban pastors and seminarians. During this period of time, community probation and community police officers have been active participants in working with all of these parties to create partnerships for peace at the community level.

Historically, in Massachusetts the Office of the Commissioner of Probation has been the principal provider of statewide criminal justice information. As computer information technology has become more available and widely used in the criminal justice community, appropriate sharing of information has expanded the Commonwealth's ability to fight crime. Presently, Massachusetts has a statewide database which includes abuse prevention orders, conditions of probation, probation violation and warrant information, as well as an extensive criminal record file containing the adult and juvenile delinquency histories of all offenders.

Other initiatives that have grown out of partnerships established between probation and the police departments have resulted in intensive probation supervision and monitoring of high risk domestic violence cases, plus collaboration with school systems to reduce truancy. Photos of probation absconders are carried in local newspapers and receive priority arrest status by police. In addition, the prosecutors in the Commonwealth have been convening problem solving round table panels that involve human service providers, school systems, probation and police officers, all in an effort to create safer communities.

All of these newly established partnership initiatives are still a work in progress. History has proven that interagency collaboration involving multiple agencies and members of the community is a delicate process. The dialogue has to be open, problems have to be addressed and the individual roles of all of the participants have to be identified, understood and respected. The initial efforts toward the creation of safer communities is presently very positive. There is an open recognition by all parties involved that the institutionalization of this process will have its bumps and detours, but what is most significant and encouraging is the shared commitment to working together to overcome rather than run from problems as they become apparent. The strengths of these programs are seen in the recognition that crime is a complex, multifaceted problem that will not be overcome by simplistic, singularly focused solutions.

The Future

The guide for the ongoing efforts to refine and improve these partnerships will be to heed the warning of Sheldon Glueck from over sixty years ago. The programs should not be oversold or oversimplified. Complex academic/practitioner collaborative research initiatives have to be designed and implemented. Skilled, trained, and committed personnel need to be hired. But, most importantly, programs must remain community involved.

New measures of effectiveness must be developed that reflect the effort of each organization. Activities by a police officer to support a probation officer that do not result in an arrest must be valued, as must actions by a probation officer to assist police. For example, if a probation officer finds a job for a high risk youth identified by the police, even if this young person is not on probation, that action must be valued and ultimately rewarded. These new measures might in some instances result in additional effort by other criminal justice agencies. For example, a policy of increased monitoring, such as Operation Night Light, may result in additional surrender hearings in court and additional commitments to a states correctional facilities.

Information technology as support system tools for the street level practitioners must be enhanced and developed. Accurate records with appropriate safeguards in the sharing of that information will become increasingly important in order to build an effective knowledge-based criminal justice system.

All participants in the process of creating safer communities must stay focused on their areas of influence, ensure ongoing interagency training needs to become the norm, and continue a focus on policy development built upon reliable research will become increasingly more important. In addition, issues including mutual oversight, shared responsibility and accountability must remain a primary focus. Failure to achieve a goal may no longer be labeled as the "fault" of some other agency. Success always has to be understood as a group achievement among the partnering agencies.

It appears that criminal justice organizations are now returning to their roots. Led by partnerships between police and probation, many criminal justice organizations are beginning to deal with problems they encounter by partnering with other criminal justice organizations.

While it is politically and operationally challenging to agency heads, this movement holds incredible promise for solving problems, as evidenced by Operation Night Light in Boston. Effective partnerships and healthy communities are dynamic entities that need constant nurturing. It will be important not to lose sight of the fact that successful initiatives can be undone by breakdowns in communications and the presence of unenlightened police and/or probation managers. Ongoing training and development of probation and police managers will be key components in the creation of safer communities.

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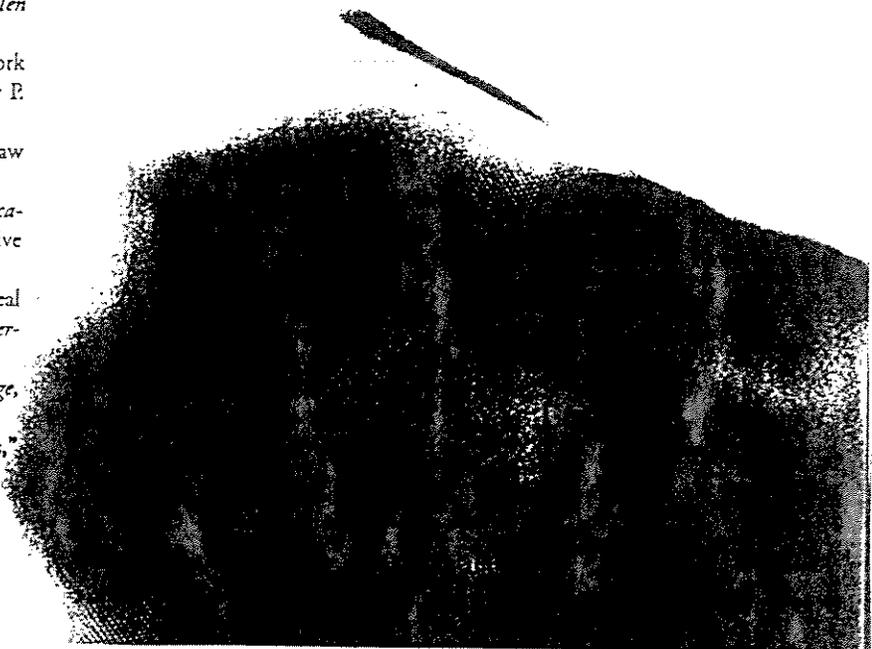
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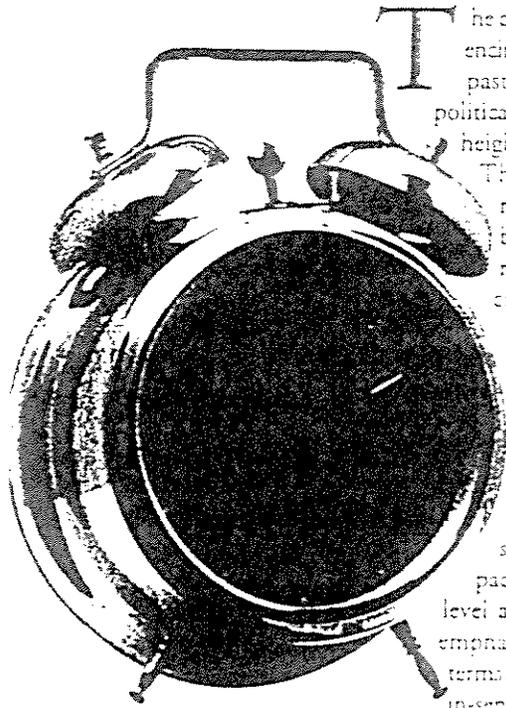
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PROBATION AND PAROLE SUPERVISION: TIME FOR A NEW NARRATIVE



The criminal justice system is experiencing a crisis of legitimacy. For the past several decades public and political discourse have expressed a heightened anxiety about crime. These discourses have been rooted in fear, moralism and a belief in the need to restore retribution as the centerpiece of crime control policy. In response legislative change have been enacted that reflect an increasingly harsh and conservative philosophy in addressing the problem of crime. The most notable of these changes includes a massive expansion of prison capacity at the state and federal level and criminal code revisions emphasizing mandatory minimum terms and a commitment to "truth-in-sentencing." The conclusion has

been drawn by legislators and opinion makers alike that punishment and incapacitation are the only appropriate goals in a system that seems unable to change offenders' criminality (Zimring and Hawkins 1995).

This represents a dramatic turn of events. Until as recently as the early 1970s, the system of criminal justice could finesse its failures; those driving the system could point to a future in which acknowledged shortcomings in dealing with criminal offenders would be overcome and meaningful changes effected. The strategies and practices adopted by professionals within the system for addressing criminal behavior offered a certain amount of reassurance to the public, political leaders and others that something of value was being done to combat criminality. There was a shared conviction on the part of many that—whatever the deficiencies—continued reform of the system would have a positive impact on reducing crime.

The current crisis in criminal justice is fueled by the growing conviction that the system itself no longer represents a credible response to the problem of crime. In a relatively short span of time, the optimism of earlier eras about the rationality and efficacy of the system of criminal sanctioning has now given way to a striking and corrosive skepticism about its very value (Garland 1990). In essence, the practice and dis-

course of criminal justice no longer succeed in providing the public with a convincing narrative of the goals being pursued or how it conducts its business.¹

Though all components of criminal justice have been affected by this development, its impact has been especially noticeable in the area of probation and parole. Despite their importance to public safety the past twenty years have witnessed a marked devaluation of traditional probation and parole supervision. Acknowledging this trend, there has been a concerted effort on the part of many administrators in the field to adopt a set of practices and a discourse that represents a discernible shift toward risk management and surveillance. This shift in the mission and conduct of supervision represents a new narrative, the plausibility of which has yet to be established. What follows addresses these developments within the current crisis of criminal justice.

The Devaluing of Traditional Probation and Parole Supervision²

During the past several decades the prison population has grown more rapidly than at any other period of time since the founding of the penitentiary in the early 1800s (Blumstein 1983). In 1995 the total number of inmates in state and federal prisons exceeded more than 1,000,000 (Bureau of Justice Statistics 1995). The growth continues unabated. The historically unprecedented increases and the problems this has created for prison administrators are well understood. What is not so well understood or even acknowledged is the urgent problem of probation and parole population growth and the public safety issues associated with crowded supervision caseloads.

Reflecting the reality that the criminal justice system is primarily a system of community-based sanctioning, at the end of 1995 approximately 3.8 million offenders were on probation or parole. (Tonry 1996). Despite the commitment to incapacitation as the paramount goal of sentencing, these figures clearly illustrate that the vast majority of offenders are serving their time under supervision in the community. Even though prison population growth has been dramatic, the increase in probation and parole populations has been equally as pronounced. At present, nearly three quarters of all criminal offenders are supervised in some manner by probation and parole officers.

The increased reliance on incarceration fueled by the crisis in criminal justice has been accompanied by ever greater expenditures for institutional corrections. Many states have engaged in massive prison construction programs to deal with the increased numbers of offenders sentenced to a term of confinement. The same is not so for probation and parole. Even though these components have experienced unprecedented growth in the offender populations over which they have jurisdiction,

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probation and parole budgets have not kept pace. In fact, since 1977 spending for probation and parole in proportion to institutional corrections has shown a steady decline (Ringle et al. 1994).

The inadequacy of funding is especially troublesome when it is placed beside the average supervision caseloads for probation and parole officers and the growing seriousness of the offenders they supervise. Numerous reports have long recommended that supervision caseloads be lim-

In essence, the primary focus of supervision has become almost exclusively that of crime control through more contacts, more enforcement, and more sanctioning of noncompliance.

ited to an average of thirty-five cases or less (e.g., the President's Commission on Law Enforcement and Administration of Justice 1967). Petersilia (1995) reports that probation caseloads at the national level reflect a ratio of 150:1, while those in parole equal 80:1. Though research suggests there is no ideal caseload size (Byrne et al. 1989), it is also evident that caseloads this large (and larger) make it difficult to maintain anything but superficial and infrequent contacts with offenders under supervision. Public safety is compromised under such circumstances, a problem compounded by the fact that probationers and parolees seem increasingly to present more serious types of offenses and levels of risk than in years past (Petersilia 1995).

The Shifting Focus in Community Supervision

The gradual devaluing of traditional probation and parole supervision in concert with the crisis of confidence in criminal justice has sparked a profound change in the mission and strategies embraced by probation and parole administrators. In a number of states, especially since the mid-1980s, they have moved toward surveillance-oriented, control-based strategies of supervision. They have adopted a formal system for the classification and management of offender risk. This system self-consciously allocates limited resources to the management of probationers and parolees based on their formal identification and classification as high risk offenders. It places an emphasis on monitoring and enforcing compliance with the rules of probation or parole, and the detection of violations leading to revocation and return to custody. In essence, the primary focus of supervision has become almost exclusively that of crime control through more contacts, more enforcement, and more sanctioning of noncompliance.

The widespread adoption and continued use of formal risk assessment tools by probation and parole agencies represent one indicator of this shift. Other indicators include the rapid movement toward intensive supervision programs, the increasing use of electronic monitoring, home confinement, frequent drug testing of offenders, and the growing reliance on community service. Many of these indicators fall under the category of "intermediate sanctions" (Morris and Tonry 1990; Tonry and Lynch 1996).

The growing prominence of such sanctions in both discourse and practice on the part of probation and parole administrators reflects an effort to market a more credible approach to supervision, one that is viewed as tough-minded and uncompromising in relation to offender

accountability. If success is measured by the number of probationers and parolees who are revoked, it is an approach that has been rather successful. According to a report by the National Council on Crime and Delinquency, in 1987 there were 62,729 prison admissions in California (Austin 1989). Of this number, 31,581 (or 50.3 percent) were parole violators. In 1991 probation and parole violators represented roughly 45 percent of the state prison population. The comparable figure for 1974 was 17 percent (Cohen 1995).

As probation and parole administrators move toward the twenty-first century, they find themselves in the position of having adopted ever more aggressive supervision strategies that focus almost singularly upon the management and control of criminal offenders (Simon 1993). These strategies do not make any assumptions about restoring or reintegrating offenders back into the community. Left on their own, the narratives these administrators have constructed face an intractable dilemma: as the perception of offender risk continues to escalate, politicians and the public alike become ever more convinced that the system of supervision is unable to manage such risk in a credible fashion. For evidence, they point to the very indicators that the surveillance-based, control-oriented model of supervision relies on as a benchmark of success: the swift revocation and return to custody of growing numbers of probation and parole violators.

The "New Penology" and Community Supervision

The current discourse and practice of probation and parole supervision reflect the imprint of what has been referred to recently as the "new penology" (Feeley and Simon 1992; Simon and Feeley 1995). The language of the new penology focuses on risk management, the allocation of resources and the management of internal system processes. Within this perspective, crime is viewed as a systemic phenomenon. Offenders are addressed not as individuals but as aggregate populations. The traditional correctional objectives of rehabilitation and the reduction of offender recidivism give way to the rational and efficient deployment of control strategies for managing (and confining) high risk criminal populations. Though the new penology refers to any agency within the criminal justice system that has the power to punish, the framework it provides has significant analytic value to probation and parole administrators.

The supervision of offenders in the community has shown notable change due to the impact of the Model Probation/Parole Classification and Case Management Project in the 1980s (Burke et al. 1990). The project then and now enabled probation and parole agencies to respond effectively to escalating caseload growth, dwindling resources and the need for greater accountability in the conduct of supervision. However,

To some extent, the movement toward a surveillance-based, control oriented model of supervision represents an extension of traditional probation and parole, albeit with a greater emphasis on risk management, and the expanded use of intermediate sanctions.

This modern day narrative must account for what is now known about how to achieve reductions in offender recidivism by wedding effective correctional programming with sound strategies for supervision.

as noted above, there has been a steady devaluation of traditional probation and parole. Though the systems language of the new penology is clearly expressed in the supervision practices of probation and parole agencies across the country (Burke 1990), traditional supervision strategies do not offer a persuasive narrative for handling criminal offenders in the community.

To some extent, the movement toward a surveillance-based, control oriented model of supervision represents an extension of traditional probation and parole, albeit with a greater emphasis on risk management, and the expanded use of intermediate sanctions. There is, however, a significant difference. The recent shift in probation and parole strategies is premised on a deep cynicism about the capacity of any model or technique to change offender behavior. The paramount goal is not to curb criminality per se, but to manage its inevitability in the community through systemic coordination of limited resources and policies that selectively target high risk, felony offenders. This goal, firmly embedded within the framework of the new penology, does not (and will not in the future) provide a sufficiently compelling narrative that something meaningful is being done about the problem of crime (Simon and Feeley 1995).

The Need for a New Supervision Narrative

What the above analysis suggests is that the most pressing (and vexing) problem facing probation and parole administrators today is the need to develop a plausible narrative of community-based supervision. This narrative must convey in both discourse and practice how the risk offenders present can be addressed in a credible fashion outside prison walls. According to Simon (1993: 9), for such a narrative to be successful three elements must be addressed in a manner that conveys coherence and plausibility. These elements include the need for a theory of criminogenesis, a measurement of its degree and a set of practices that appear capable of controlling it. A sound narrative in probation and parole must provide a persuasive accounting of the problem of crime, its extent, and what can be done to address it. In addition, it must recognize and be responsive to the "rationality demands" that are placed on the system. That is, it must articulate the legitimate ends or goals that the system is pursuing and defend its practices and strategies as viable means of accomplishing these ends (Simon 1993: 8)¹

The legitimate or overriding goal for probation and parole may be found by revisiting an earlier era. From the Progressive Era of criminal justice in the 1920s-1930s through the 1960s, probation and parole supervision relied on a philosophy and a set of practices designed to restore offenders to the community. Despite the continuous tension between "conscience" and "convenience," there was a commitment to transforming the offender (Rothman 1980). In dramatic contrast to the new penology, the discourse of probation and parole must emphasize a return to the historic commitment of the field to offender reintegration.

This modern day narrative must account for what is now known about how to achieve reductions in offender recidivism by wedding effective correctional programming with sound strategies for supervision.

The new narrative for probation and parole supervision must draw on the current state of knowledge regarding offender criminality, and in so doing, offer a theory of criminogenesis. It must then show how this knowledge may be applied to the reduction of criminal behavior. Fortunately, an extraordinary knowledge base has been accumulating since the early 1980s on offender rehabilitation and the principles that govern effective correctional intervention (Gendreau and Ross 1987; Andrews and Bonta 1994). In meta-analyses extending over hundreds of studies, the research has shown that "something works"; certain types of programs offer a promising vehicle for reducing the level of recidivism for some offenders. Of perhaps greater importance, the research has also identified those principles that drive effective correctional intervention. The evidence indicates that well designed and properly implemented programs incorporating these principles result in significant reductions in recidivism. Those programs that are most successful include a strong behavioral and cognitive skills development component (Porporino 1996; Rhine 1996).

In terms of the strategies adopted for supervision, this research suggests that probation and parole officers should target the criminogenic needs of high risk offenders. It also suggests that supervision should be delivered in an intensive manner and in combination with programming occupy a majority of offenders' everyday activities. The integration of programming with intensive supervision will be most effective if it is demanding on offenders' time and thinking and if it disrupts their criminal network by placing them in situations where prosocial activities predominate. In essence, the supervision of high risk probationers and parolees must be structured, intensive, maintain firm accountability for program participation and connect the offender with prosocial networks and activities.

The above is barely suggestive of what might constitute the beginnings of a new narrative of probation and parole supervision. It does not provide a fully developed narrative inclusive of the elements described by Simon (1993). It acknowledges, however, Simon and Feeley's argument that the discourse and practice of probation and parole does not provide a satisfying account to the public, political leaders and others that significant steps are being taken to effectively address the problem of crime and criminality (1995). The challenge for probation and parole administrators is to develop such a narrative and thereby create strategies and practices that have recognizable public value (Moore 1995).

Endnotes

¹This article draws on the recent writings of Feeley and Simon (1992), Garland (1990; 1995), Simon (1993) and Simon and Feeley (1995). These authors present contrasting arguments regarding the nature and form of modern penal practices.

²Joan Petersilia's 1995 article provides a more in depth analysis of the trends discussed in this section. This section briefly highlights some of the more significant trends addressed in that article.

³Simon's argument is developed in an incisive study of parole supervision. Nonetheless, his analysis may be extended to contemporary probation supervision. □

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RACINE COUNTY COMBINED COMMUNITY CORRECTIONS RELATIONS BOARD (RCCCCR)

PURPOSE: In support of the mission of the Department of Corrections it is established that a combined community corrections board shall be formed to address common issues and concerns of the citizens of Racine County and the state correctional facilities and field services that operate within Racine County with the expressed purpose to:

- Consolidate and limit/reduce the demands placed on criminal justice and community leaders participation in several correctional boards
- Review the impact of the corrections on the community.
- Define corrections involvement in community affairs.
- Develop public awareness and education about the operations and mission of corrections
- Define the availability of community services for corrections.
- Discuss and share other law enforcement and community issues related to corrections.

Board Composition: The Board will be limited to a maximum of 30 members from the executive board, At Large Members and Chairs of the Local Ancillary Boards.

- Twelve (12) Executive Board Members to include the following local officials and criminal justice leaders.
- Eleven (11) At Large Members to include citizens representing specific or vested community interests from:
- Six (6) Chairpersons, representing operational issues one each from:
 - Racine Correctional Institution Community Board
 - Robert E. Ellsworth Correctional Center Community Board
 - Racine Youthful Offender Correctional Facility Community Board
 - Southern Oaks Girls School Community Board
 - Juvenile Corrections Field Services Community Board
 - Community Corrections Field Services Community Board

Standing Committees shall be established to include but not limited to the following and shall be composed of representatives from the community and correctional staff for the purpose of developing information and advising the Executive Board on issues of concern to the community:

(over)

PROPOSED RCCCCRB MEMBERSHIP

William L. McReynolds, Sheriff
Racine County Sheriff's Department
717 Wisconsin Avenue
Racine, WI 53403-1237
(414) 636-3839

Ms. Mary Beth Aldrich
Racine Neighborhood Watch
800 Center Street, Suite 314
Racine, WI 53403
(414) 637-5711

James M. Smith
Mayor, City of Racine
730 Washington Avenue
Racine, WI 53403
(414) 636-9104

Robert S. Flancher
DA, County of Racine
730 Wisconsin Avenue
Racine, WI 53403
(414) 636-3172

Jean M. Jacobson
Co Exec, County of Racine
730 Wisconsin Avenue
Racine, WI 53403
(414) 636-3118

Gerald A. Ptacek
Senior Judge
Racine County Circuit Court, Branch 1
730 Wisconsin Avenue
Racine, WI 53403
(414) 636-3708

Chief Richard Polzin
Racine Police Department
730 Center Street
Racine, WI 53403
(414) 635-7714

Director William Adams
Racine County Human Services Dept.
1717 Taylor Avenue
Racine, WI 53403
(414) 638-6721

Kimberly Plache
State Senator, 21st District
State Capitol, Room 305(H)
P.O. Box 7882
Madison, WI 53707-7882
(608) 266-1832

Robert Turner
State Representative, 61st District
State Capitol, 109 North
Madison, WI 53701
(608) 266-0731

John Lehman
State Representative, 62nd District
State Capitol, 409 North
Madison, WI 53701
(608) 266-0634

Bonnie Ladwig
State Representative, 63rd District
State Capitol, 113 West
Madison, WI 53701
(608) 266-9171

George Stinson, President
NAACP - Racine Branch
1325 16th Street
Racine, WI 53403
(414) 637-9975

LaToria Hickman-Kern, President
Urban League of Racine & Kenosha
718 N. Memorial Drive
Racine, WI 53404
(414) 637-8532

- Community Relations
- Offender Programs & Counseling
- Staff Hiring & Retention
- Offender Residential Placements
- Security & Public Safety
- Public Education
- Offender Employment

Support Staff: The Wardens, Superintendents, and DCC & DJC Chiefs or their designees shall be present at all RCCCCR B Meetings to raise issues, facilitate the process, provide information and respond to questions.

Meeting Frequency: Shall be held quarterly or as needed.

Community Board Chairperson: At the first meeting the CBC will be elected to a 1 year term by the RCCCCR B based on a simple majority vote. RCCCCR B Meetings will be coordinated by DOC staff.



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SUMMARY OF SCIENTIFIC STUDIES ON CANCER RISK AMONG FIRE FIGHTERS

Overall Cancer Risk:

"Fire fighters are exposed to heavy smoke, poisonous gases and carcinogens every day, but data linking cancer as an occupational risk of fire fighting have been conflicting at best," the *Journal of the National Cancer Institute* reported in July, 1991. ¹

The publication was commenting on three studies:

- Researchers at the National Cancer Institute of Canada reported in December, 1990, a lower than expected lung cancer death rate and the same risk of colon cancer as among the general population, based on studies of firefighters in Boston, the Pacific Northwest, Canada and western Australia. (emphasis in this and following cases added) ²
- A Seattle researcher found in 1988 that firefighters under age 40 who served in four cities from 1945 to 1980 were 60% more likely than other Americans to die of cancer. ³
- A researcher at the University of Alberta in Edmonton found that there was "no strong evidence" of increased risk of lung cancer, heart disease or obstructive pulmonary disease among firefighters. and that the death rates of fire fighters from all causes and from heart disease were "close to the expected standardized mortality ratio." ⁴

Also, a 1991 California study on causes of death among San Francisco firefighters found a lower than expected overall death rate among more than 3,000 fire fighters employed between 1940 and 1970 and "fewer cancer deaths than expected." The study did find excess deaths from esophageal cancer, cirrhosis and other liver diseases. ⁵

"These increased risks may have been due to toxic exposure, alcohol consumption, or interaction between alcohol and toxic exposure," the researchers concluded. "...Taken as a whole the studies published to date (including the present study) do not consistently show increased risk for any type of cancer."

A 1994 study of deaths among firefighters in metropolitan Toronto ⁶ found a lower than expected number of deaths from all causes but "some evidence" of an increased risk of death from cancer of the brain, "ill-defined" cancers ("other malignant neoplasms) and aortic aneurysms.

The researchers were unequivocal only in their conclusion about brain cancer.

"Despite conflicting results for various cancer sites from epidemiologic studies, excess brain cancer mortality is consistently related to fire fighting," they said.

¹ Francis X. Mahoney Jr., *JOURNAL OF THE NATIONAL CANCER INSTITUTE*, Vol. 83, No. 13, July 3, 1991

² Geoffrey R. Howe & J. David Burch, *AMERICAN JOURNAL OF EPIDEMIOLOGY*, Vol. 132, No. 6, December 1990

³ citation unavailable

⁴ Tee L. Guidotti, *AMERICAN JOURNAL OF INDUSTRIAL MEDICINE*, Vol. 23, p. 921-940 (1993) (Not yet published in 1991.)

⁵ James J. Beaumont et. al., *AMERICAN JOURNAL OF INDUSTRIAL MEDICINE*, Vol. 19, p. 357-372 (1991)

⁶ Kristan J. Aronson et. al., *AMERICAN JOURNAL OF INDUSTRIAL MEDICINE*, Vol. 26, p. 89-101 (1994)

CANCER RISK STUDY SUMMARY

Page 2

Some other research:

- A 1992 study of more than 4,500 fire fighters in Seattle, Tacoma and Portland found "no excess risk of overall mortality from cancer but excesses of brain tumours...and lymphatic and haematopoietic cancers."⁷
- A 1978 study of Boston fire fighters found "inconsistent evidence for an increased risk of mortality from cardiovascular disease, respiratory disease, cancer and accidents."⁸
- A 1990 study of fire fighters in Denmark found a significant increase in lung cancer in older firefighters and increased non-pulmonary cancer among younger fire fighters.⁹
- A 1987 study of more than 1,800 fire fighters in Buffalo found fewer than expected deaths from all causes but higher than expected incidence of colon and bladder cancer.¹⁰
- A 1986 study of New Jersey fire fighters found an increase in skin cancer and cirrhosis.¹¹
- A 1995 study of Parisian fire fighters found a "far lower overall mortality" than the typical French male, but greater than expected deaths from genito-urinary cancer.¹²
- A 1984 study of fire fighters in western Australia found "no evidence of increased mortality from cardiovascular or respiratory disease, or from any other cause."¹³
- A 1994 study of male firefighters in Seattle and Tacoma, Wash., found cancer risk among firefighters "similar to both the police and the general male population for the common sites."¹⁴
- A 1994 study of fire fighters in Stockholm found "cancer incidence...equal to the expected."¹⁵

Howe and Burch, *op. cit.*, reviewed six of the studies cited above, and concluded that overall there were 68 fewer cancer deaths than expected among the 15,800 fire fighters tracked in the six studies. From those studies and others they found "substantial evidence ... that no association exists between the occupation of fire fighter and risk of overall cancer mortality."¹⁶

Risk for Specific Cancers:

1997 Senate Bill 329 would create a presumption that various types of cancer contracted by fire fighters were caused by his or her employment. Cancers cited in the bill:

Skin Cancer: "Although there is some evidence of a statistical association between fire fighting and increased risk of malignant melanoma, there is little evidence to support the causality of the association," Canadian researchers found.¹⁷

Bone Cancer: "Overall, the conclusion must be very tentative because of limited numbers, but there appears to be some evidence of a positive association for multiple myeloma," the same researchers concluded.¹⁸

⁷ P.A. Demers et. al., BRITISH JOURNAL OF INDUSTRIAL MEDICINE, September 1992, p. 664-670.

⁸ A.W. Musk, et. al., BRITISH JOURNAL OF INDUSTRIAL MEDICINE, May 1978, p. 104-108.

⁹ E.S. Hansen, BRITISH JOURNAL OF INDUSTRIAL MEDICINE, December 1990, p. 805-809.

¹⁰ J.E. Vena, R.C. Fiedler, AMERICAN JOURNAL OF INDUSTRIAL MEDICINE, Vol. 11, p. 671-684.

¹¹ E. Feuer, K. Rosenman, AMERICAN JOURNAL OF INDUSTRIAL MEDICINE, Vol. 9, p. 517-527.

¹² S. Deschamps, et. al., EUROPEAN JOURNAL OF EPIDEMIOLOGY, December, 1995, p. 643-646.

¹³ E. Eliopoulos, et. al., BRITISH JOURNAL OF INDUSTRIAL MEDICINE, May 1984, p. 183-187.

¹⁴ P.A. Demers, et. al., CANCER CAUSES CONTROL, March 1994, p. 129-135.

¹⁵ Goran Tornling, et. al., AMERICAN JOURNAL OF INDUSTRIAL MEDICINE, February, 1994, p. 219-228.

¹⁶ Howe & Burch, *op. cit.*, p. 1043.

¹⁷ *Ibid*, p. 1047.

¹⁸ *Ibid*, p 1047.

CANCER RISK STUDY SUMMARY

Page 3

Digestive System Cancer

a. **Colon Cancer:** Only the Buffalo study uncovered any evidence of a link between colon cancer and fire fighting, the Canadian researchers reported. "It therefore appears that the weight of evidence favors the lack of any association," they wrote.¹⁹

b. **Rectal Cancer:** Of nine studies, three found fewer than expected cases among fire fighters, and just two found more than a 50-50 chance that a case of rectal cancer was job-related.²⁰ Another researcher found three studies in which deaths from rectal cancer occurred at twice the expected rate, but a more recent study found **rectal cancer incidence was no different** among fire fighters, police and the general population.²¹ Findings like these prompted Dr. Tee L. Guidotti to conclude that there was "no defensible general presumption of risk."²²

c. **Pancreatic Cancer:** "In general, epidemiological data suggest that firefighting is not associated with cancer of the pancreas," researchers at Mt. Sinai School of Medicine concluded. One study found a "large but nonsignificant" elevation of pancreatic cancers compared with police officers; four reported risk equal to the general population.²³

d. **Liver Cancer:** Liver cancer is a rare disease. Researchers at Mt. Sinai School of Medicine analyzed studies ranging from the San Francisco study that found a twofold excess of liver cancer mortality among firefighters to the Stockholm study, which found lower than expected incidence of liver cancer. **Three studies showed no association between fire fighting and liver cancer,** they reported.²⁴

e. **Stomach and Esophageal Cancer:** Seven studies that the Mt. Sinai team analyzed found a positive association between stomach cancer and fire fighting, but none of the numbers were statistically significant. Three studies found a positive association for esophageal cancer, and three found a negative association.²⁵ A California study concluded that **increased risks of esophageal cancer "may have been due to firefighter exposures, alcohol consumption, or interaction between alcohol and exposures."**²⁶

Lymphatic and Hematopoietic Cancer: "There is some evidence for both an association and a general presumption or risk," Canadian scientists reported in 1995. "**However, the aggregation is medically meaningless.**" We therefore recommend a case by case approach.²⁷

Other cancers cited in SB 329: The evidence on other cancers enumerated in the bill is cited in the attached studies but for space reasons is not summarized here.

¹⁹ *Ibid*, p. 1044.

²⁰ Guidotti, AMERICAN JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE, December, 1995, p. 1352.

²¹ Ann L. Golden, et. al., OCCUPATIONAL MEDICINE, Vol. 10, No. 4, December, 1995.

²² Guidotti, *op. cit.*, p. 1351

²³ Golden, , *op. cit.*, p 814.

²⁴ *Ibid*.

²⁵ *Ibid*.

²⁶ Beaumont, *op cit*, p 357.

²⁷ Guidotti, *op cit*, p. 1348.



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CANCER PRESUMPTION RESOLUTION

WHEREAS 1997 Senate Bill 329 would create a legal presumption in any proceeding involving death or disability benefits for a 10-year veteran municipal firefighter who suffers from a wide variety of cancers that those cancers were caused by his or her job; and

WHEREAS elected officials and citizens of Wisconsin Alliance of Cities member cities and communities across the state have a vital interest in providing generous benefits to firefighters who often risk their lives in the line of duty, comparable to the benefits provided other public employees; and

WHEREAS studies involving firefighters worldwide disagree on whether there is a link between the incidence of specific types of cancer and the occupation of firefighter; and

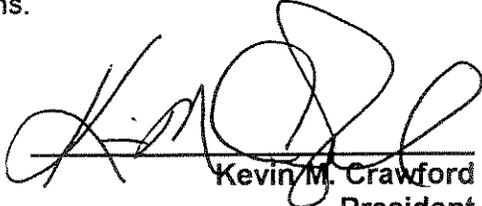
WHEREAS epidemiologists reviewing these studies have found "substantial evidence . . . that no association exists between the occupation of firefighter and risk of overall cancer mortality," and

WHEREAS public policy should be guided by scientific findings, and benefits should not be granted one category of public employees over any other public employees,

NOW THEREFORE BE IT RESOLVED that the Wisconsin Alliance of Cities opposes SB 329 on the basis that it provides a disparate level of benefits for firefighters in the absence of a scientifically demonstrated relationship between fire fighting duties and specific cancers enumerated in the bill.

FURTHER BE IT RESOLVED that copies of this resolution be forwarded to legislative leaders and members of the Joint Survey Committee on Retirement Systems.

APPROVED this 16 day of January, 1998.


Kevin M. Crawford
President



(Footnote 1)

Studies Conflict on Fire Fighters' Risk of Cancer

Fire fighters are exposed to heavy smoke, poisonous gases, and carcinogens every day, but data linking cancer as an occupational risk of fire fighting have been conflicting at best.

Most recently, a major North American review of cancer mortality among firemen by two Canadian researchers has revealed that fire fighters are at no greater risk of dying from cancer, particularly lung and colon cancer, than the general population.

But the study indicated that risk of fire fighters dying from brain cancer, melanoma, or multiple myeloma appears higher.

In their review, published in the December 1990 issue of the *American Journal of Epidemiology*, Geoffrey R. Howe, Ph.D, and J. David Burch, of the National Cancer Institute of Canada, said, "There is essentially no evidence of increase in risk of lung cancer associated with fire fighting . . . [and] no increased risk of cancer mortality overall."

Largely Anecdotal

Howe, the son of a fire fighter himself, said that when he first began his review several months ago, "I frankly did not know what I would find." Previous information about fire fighters dying prematurely of cancer appeared "largely anecdotal." Many fire fighters assumed that they might be at increased risk for lung cancer because of exposure to smoke.

But after reviewing five major cohort studies and four mortality studies, Howe and Burch found the number of lung cancer deaths in the cohort studies was actually lower than expected (173

deaths versus 187 deaths in the general population).

The cohort studies were done in Buffalo, Boston, the northwestern United States, Canada, and western Australia. Only in California, where a mortality study was undertaken, did the researchers find a higher number of cancer deaths due to lung cancer (44 versus the expected 27).

The two researchers also said that presently no data exist on the smoking habits of fire fighters, "so even an observed association with lung cancer would be hard to interpret causally," Howe said.

Colon Cancer

The researchers also concluded that a fire fighter's relative risk for colon cancer was the same as the general population's.

Yet when the two scientists looked at mortality studies they found that fire fighters faced 1.5 times the risk of the general population for brain cancer and multiple myeloma, and almost 2 times the risk of the general population for melanoma.

The Howe and Burch results conflict with those of other studies. In 1988, the Los Angeles Fire Department released data gleaned from 1,559 state death certificates of active and retired fire fighters who died between 1950 and 1980, which showed a 30-year fire fighter faces a one-in-three chance of dying from cancer.

Battalion Fire Chief Johnny Sampson told a city commission that the death rate from cancer among Los Angeles city fire fighters doubled from 17% to 34% between 1950 and 1980,

and that the death rate from brain cancer was 129% higher and for prostate cancer 117% higher than the general population.

The Seattle Study

Linda Rosenstock, M.D., Harborview Medical Center in Seattle, and her colleagues found in 1988 that fire fighters under age 40 were 60% more likely than other Americans to die of cancer, particularly cancers of the lymph tissue and brain.

Rosenstock tracked 4,450 firemen from Seattle, Tacoma, Kent, and Portland who served in community fire departments from 1945 to 1980.

Now a third study by Canadian researcher Tee L. Guidotti, M.D., of the University of Alberta in Edmonton, whose data have not yet been published, finds that Canadian fire fighters were at 3 to 4 times the risk for urogenital cancers, including bladder cancer, "and there was a modest elevation of

lung cancer and some suggestion of colon cancer as well among Edmonton and Calgary fire fighters."

Lt. Walter Malone, of the New York City Fire Department Safety Division, and his colleagues believe fire fighters have a greater risk of cancer and other diseases.

The cancer incidence appears to be greater in veteran firemen who became fire fighters more than 25 years ago, who fought chemical fires before oxygen masks and special clothing to protect themselves against toxic and cancer-causing chemicals were worn, Malone said.

Masks Not 'Macho'

When Malone became a fire fighter 31 years ago, he responded to 30 to 48 fire calls a night, "and in those days we didn't wear an oxygen mask," he said. Even when oxygen equipment became mandatory in 1973, many New York fire fighters simply refused to wear them

because it wasn't considered very "macho or manly," fire fighters said.

Deputy New York Fire Chief Thomas Neville added that "after an oil burner [oil fire], you'd cough up thick black soot from your lungs for days, and even after numerous washings, your clothes and skin still smelled of smoke."

"With the advent of lethal chemical and plastic fires and deadly PCB's, you can bet we wear our oxygen masks now," Malone said.

The New York City Fire Department's Chief Medical Officer Cyril Jones, M.D., said, "I am not aware of a single epidemiologic study on New York City fire fighters and cancer, nor have I seen an increased incidence of cancer among our fire fighters."

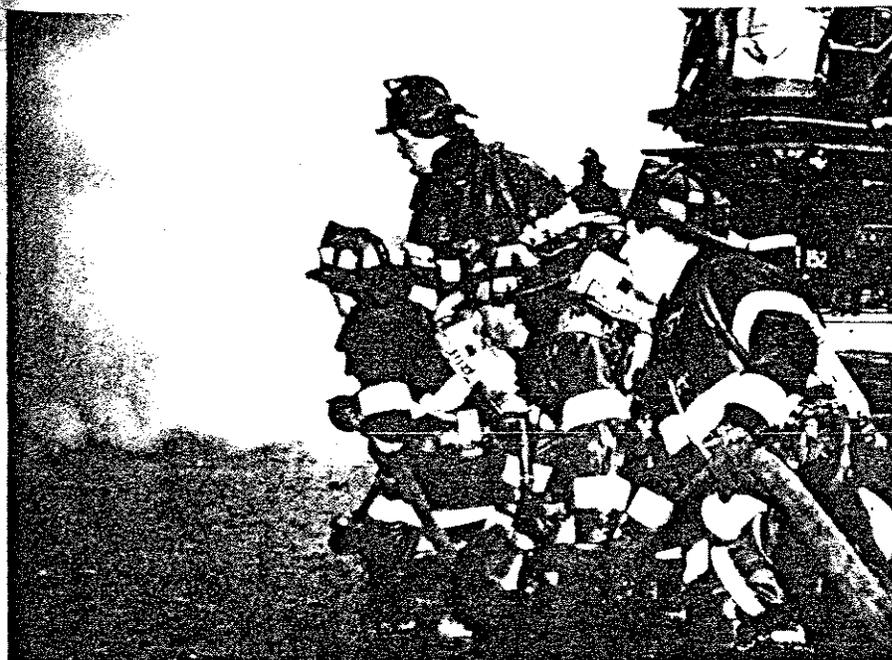
New York City firemen have sought unsuccessfully for years to receive disability compensation for cancer if they get the disease while on the job. In Massachusetts, Minnesota, and California as well as some cities in Illinois, laws have already been passed making cancer a presumed job-related disability for firemen.

Last year, Massachusetts enacted a law enabling fire fighters to collect disability if they have cancer.

When the Downey, Calif., City Council in 1985 unanimously approved a regulation that would prohibit smokers from being hired as fire fighters, the state's largest fire fighters union, the Federated Fire Fighters of California, complained, mostly because of a required lie-detector test that would be given to the applicants.

"We think that's a violation of privacy," the union said. But Downey fire fighters agreed to it anyway.

In California, the cities of Monrovia, Downey, Laguna Beach, and San Mateo all require new fire fighters to be non-smokers.



New York City fire fighters "on the line." Photo courtesy of Lt. Anthony Guerriero, NYC Fire Dept. Forensic Unit.

— By Francis X. Mahaney, Jr.

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FIRE FIGHTERS AND RISK OF CANCER: AN ASSESSMENT AND OVERVIEW OF THE EPIDEMIOLOGIC EVIDENCE

GEOFFREY R. HOWE AND J. DAVID BURCH

In the course of their work, fire fighters are regularly exposed to a number of chemicals, some of which have been shown to be carcinogenic in animals and others in man (1-3). The primary source of these carcinogens is the pyrolysis of building materials, particularly plastics. The increasing use of such products in building materials has raised a concern over possible increased risk of various types of cancer among fire fighters exposed to such potential carcinogens.

Data on exposure of fire fighters to such chemicals, in combination with data from animal studies, of themselves are not adequate to address the issue of a measurable increase in cancer risk. This is due both to the problem of extrapolating from animal data to humans and to the lack of appropriate human dose-response data for the potential carcinogens involved. Epidemiologic data are critical to establishing any possible increased risk in cancer experienced by fire fighters. A number of epidemiologic studies of fire fighters have been conducted in which the primary focus has been on cardiovascular disease and cancer. This paper evaluates these studies using uniform criteria and assesses the overall evidence for the existence of any association between fire fighting and increased risk of a number of cancers. Where such an association exists, standard criteria are ap-

plied to assess the likelihood that the association is causal.

The present analysis focuses on all cancers combined and on those specific cancers which individual studies have reported to show an association with the occupation of fire fighter. The cancers in question are lung cancer, colon cancer, brain tumors, malignant melanoma, and multiple myeloma. It must be emphasized that these cancers were selected empirically rather than from a priori considerations of biologic plausibility. The studies which have identified possible associations with these cancers are presented below.

MATERIALS AND METHODS

Relevant epidemiologic studies of fire fighters were identified by standard means including computerized literature searches and utilization of bibliographies in identified papers. The validity of each identified study was then assessed, and any obvious or potential biases were identified. Studies with any demonstrable major bias were then excluded from further consideration. The subset of studies remaining was then examined using the procedures described below, which are somewhat modified from the classic criteria of causality originally proposed by Bradford-Hill (4).

Assessment of the existence of a statistical association

This assessment involved two steps. First, an overall estimate of relative risk was calculated by summing the observed number of deaths for each particular type of cancer reported by each study, by summing the corresponding expected number of deaths, and by using their ratio as an

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estimate of a pooled standardized mortality ratio. Since the comparison groups in all studies are generally large, this procedure provides the maximum likelihood estimate of the relative risk, under the assumption that the relative risk is constant across all studies. In practice, this assumption is unlikely to hold since studies have been carried out at different time periods and in different geographic areas, and any true underlying relative risk seems almost certain to vary by these factors. Nevertheless, this procedure gives a useful measure of the overall strength of association by providing a weighted average of the individual relative risks. Confidence intervals were estimated by treating the total number of observed deaths as a Poisson variable in order to assess the likely contribution of chance to any observed association. The second step in the process was to examine the consistency of the association among studies. A formal test of heterogeneity of standardized mortality ratios was computed (5), but because of the likely variation in the true relative risk among studies, this procedure should be treated with a good deal of caution and may not be appropriate for this type of assessment. An alternative, which is given more credence in the present analysis, is to assess the number of individual studies which have yielded a positive association and to use this as the preferred criterion for consistency. It should be noted that consistency of effect is normally included as a causality criterion, but we feel that it is more relevant to assessment of the existence of a statistical association.

Evidence for causality

The following criteria adapted from those given by Bradford-Hill (4) have been applied to any observed statistical associations in the data.

Availability of information on any important potential confounding variable. If a particular cancer is known to be associated with a particular risk factor and if no data

are available on the distribution of this factor in fire fighters as a whole, compared with the general population, this inevitably raises the possibility that any observed association could be due to confounding.

Strength of association. This is measured by the pooled relative risk estimated as above. The larger the relative risk, the less likely the association is to be due to confounding. This applies both to potential confounders which have been identified as being associated with disease as in the preceding section and also to any totally unsuspected confounders.

Dose-response. In the present context, the only data available to measure "dose" for all studies examined are years of service as a fire fighter. The presence of a dose-response relation, i.e., increasing risk with increasing years of service, strengthens the believability of the causality of any observed association.

Analogy. In the present context, if a particular cancer is known to be associated with exposure to chemical carcinogens, in particular in an occupational context, this somewhat strengthens the argument for the causality of any association seen in fire fighter studies. In addition to the above criteria, Bradford-Hill (4) proposed several others. The criterion of temporality is not generally applicable to the present data since nearly all fire fighters are first employed in this occupation in their early 20s. Since death from cancer is rare until at least the 30s, any necessary minimal latent period almost certainly will have passed before any cancer deaths are observed. The criterion of specificity again is not readily applicable since no studies appear to contain data on the actual fire fighting experience or exposure of individuals within the cohorts. The criterion of biologic plausibility is again of little use in assessing any observed association since it is clear that fire fighters as a group are exposed to a large number of chemicals, many of which have been demonstrated to be carcinogenic in animals. Thus, it is likely that any observed association with a specific cancer

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could be supported by a corresponding chemical exposure.

RESULTS

A number of epidemiologic studies of fire fighters were identified. These could be classified into three groups. The first consisted of standard cohort studies in which the vital status of members was established at the time of loss to follow-up or at the end of the study, and date and cause of death could be identified for study members who died. Seven such studies were identified, and these are summarized in table 1 (6-13) (Howe and Lindsay, University of Toronto, personal communication, 1989). The Los Angeles study (13) has a major potential bias. Death certificates of fire fighters were searched to identify any mention of cancer, and if this was found, the death was coded to that cancer. The comparison data were derived from US national rates, and since these rates are based on underlying cause of death as recorded on the death certificate, the cohort and the comparison groups are not comparable. The magnitude of this bias could be substantial and would be expected to inflate cancer rates in the cohort. In practice, the data from this study do not reflect such an excess, but because of the unknown magnitude of this potential bias, the results from this study are not considered further. Of the other studies in table 1, those in Boston and Toronto relate primarily to fire fighting service before World War II, and therefore may be less relevant since the nature of any exposure may have changed substantially since that time. The extent to which the data from Western Australia are comparable with those from North America is not clear since respective exposures may again differ.

The second group of studies identified were those using proportionate mortality analysis. The relevant ones are summarized in table 2 (14-17) (Milham, Washington State Department of Social and Health Services, personal communication, 1989). The study from New Jersey analyzed death

certificates identified in a cohort of fire fighters. This study differed from the other three, which are based on analysis of occupation as recorded on the death certificate. It is likely that the quality of such data was less than that utilized by the New Jersey study and was more subject to misclassification. Several other studies based on occupation as recorded on death certificates have been reported, but these were felt to be too small to contribute usefully to the present analysis.

The third group of studies consisted of those in which numerators for death rates were obtained by using occupation as recorded on death certificates, and denominators were derived from census data in the same geographic area using occupation as recorded by the census. Two classic examples of this type of study are those based on deaths in the United States in 1950 (18) and those in the United Kingdom (19). Such data can yield noncomparable numerators and denominators. In the context of fire fighters, for example, many retire at a relatively early age and seek other employment. However, since death certificates normally record usual occupation, there is a tendency for this occupation in the numerator data to be inflated compared with the corresponding denominator. A classic example of this is shown by the US data, for which Enterline and McKiever (20) have reported that the standardized mortality ratio for lung cancer for fire fighters is 1.90, whereas the proportionate mortality ratio, which is not subject to the same bias, is 1.21. Because of this problem, the data from census-based studies are not included in the present analysis. It is of interest to note, however, that the United Kingdom data do not appear to be subject to this bias to the same extent as do the US data. For example, the standardized mortality ratio for lung cancer for the United Kingdom data for fire fighters is 0.96. This may reflect the possibility that fire fighters in the United Kingdom do not seek employment after retirement to the same extent as do their counterparts in the United States.

TABLE 1
Studies of fire fighters and observed and expected numbers of deaths from all cancers, cohort studies

Study (reference)	No. of fire fighters	Years of service	Years of follow-up	All cancer deaths			95% confidence interval
				Observed	Expected	SMR*	
Northwest US (6, 7)	4,540	1945-1979	1950-1984	195	208	0.94	0.81-1.08
Buffalo (8)	1,867	1950-1979	1950-1979	102	94.0	1.09	0.88-1.32
Boston† (9)	5,655	1915-1976	1915-1976	367	427.3	0.86	0.77-0.95
Toronto‡ (10)	1,832	1918-1953	1921-1953	26	27	0.96	0.63-1.41
Canada (11)	1,006	1965-1969§	1965-1979	12	16.2	0.74	0.38-1.29
Western Australia (12)	990	1938-1978	1938-1978	30	27.5	1.09	0.74-1.56
Los Angeles (13)	6,722	--	1940-1980	350			
Total				732	800	0.92	0.85-0.98

p (heterogeneity) = 0.30

* SMR, standardized mortality ratio.

† Expected from Massachusetts rates.

‡ Expected from Toronto city rates.

§ In service at least one year during this period.

|| Unavailable from present report.

TABLE 2
Studies of fire fighters and observed and expected numbers of deaths from all cancers, proportionate mortality studies

Study (reference)	No. of years for which death data are available	All cancer deaths			95% confidence interval
		Observed	Expected	PMR*	
New Jersey† (14)	1974-1980	67	66.9	1.00	0.78-1.27
Washington State (15)	1950-1985	399	381	1.05	0.95-1.16
	1959-1961	114	96	1.19	0.98-1.43

TABLE 2
 Studies of fire fighters and observed and expected numbers of deaths from all cancers, proportionate mortality studies

Study (reference)	No. of years for which death data are available	All cancer deaths			
		Observed	Expected	PMR*	95% confidence interval
New Jersey† (14)	1974-1980	67	66.9	1.00	0.78-1.27
Washington State (15)	1950-1985	399	381	1.05	0.95-1.16
California (16)	1959-1961	114	96	1.19	0.98-1.43
British Columbia (17)	1950-1984	197	171.3	1.15	1.00-1.32
Total		777	715.2	1.09	1.01-1.17

p (heterogeneity) = 0.47

* PMR, proportionate mortality ratio.

† Expected from New Jersey rates.

The studies listed in tables 1 and 2 are now utilized to assess any association between fire fighting and risk of all cancers combined, and a number of individual cancers.

All cancers

Tables 1 and 2 show observed and expected numbers of deaths from all cancers combined from the cohort and proportionate mortality studies, respectively. An overall estimate of the standardized mortality ratio or proportionate mortality ratio is also shown. For some studies, expected numbers had to be derived from the standardized mortality ratio estimate and observed number of deaths, and errors due to rounding may lead to slight discrepancies from the original publication. There is no evidence in any of the individual cohort studies shown in table 1 of an excess in risk of deaths from all cancers. The pooled estimate of 0.92 is very consistent with that usually observed in a healthy working population (21), and a formal test of heterogeneity yields a value of $\chi^2_5 = 6.09$, $p = 0.3$. The data from the proportionate mortality ratio studies (table 2) tend to yield slightly higher estimates of the relative risk, with the British Columbia study being significantly elevated above 1.0. However, the overall estimate of 1.09, although again statistically significantly elevated, is entirely consistent with the healthy worker effect. Since cancer rates are less affected by the healthy worker effect than are rates for other causes of death, there inevitably is an elevation in the proportionate mortality ratio for cancer. Thus, there is substantial evidence from the present combined analysis that no association exists between the occupation of fire fighter and risk of overall cancer mortality.

Lung cancer

Some studies have reported results in terms of all respiratory cancer, but since the great majority of these will be for lung cancer, they are included as such. Observed and expected numbers of deaths from lung

cancer are shown in table 3. None of the cohort studies display any evidence of a positive association, and the pooled estimate of 0.92 is again very consistent with that expected from a healthy working population. Of the proportionate mortality ratio studies (table 3), the California study has a significantly elevated proportionate mortality ratio of 1.63. However, none of the other studies have significantly elevated proportionate mortality ratios, and the pooled estimate of 1.08 is again very consistent with that to be expected from the healthy worker effect. Applying the criterion of consistency, there is essentially no evidence of any general increase in risk of lung cancer associated with fire fighting. Because of the results of the California study, the formal test of heterogeneity for the proportionate mortality ratio studies yields a *p* value of 0.03. However, it is still quite possible that this discrepancy is due to chance in view of the multiple comparisons in terms of the number of types of cancers considered. It is also worth noting that no data on the smoking habits of fire

fighters appear to be available, so even an observed association with lung cancer would be hard to interpret causally.

Colon cancer

The results with respect to colon cancer are shown in table 4. Studies which have reported results for cancers of all digestive organs combined could not be utilized in view of the potential differing etiologies for these cancers. The only cohort study which displays any evidence of a positive association is that from Buffalo, New York, in which the standardized mortality ratio is estimated to be 1.84, which is significantly different from 1.0 and leads to a *p* value for heterogeneity of 0.04. However, the pooled estimate of 1.12 from the cohort studies is very similar to that from the proportionate mortality ratio studies (1.06), and again, none of the latter studies show evidence of any meaningful positive association. It therefore appears that the weight of evidence favors the lack of any association with colon cancer, and the Buffalo study must be regarded as a potential outlier,

TABLE 3
Observed and expected deaths for lung cancer

Study (location)	Observed	Expected	SMR/PMR*	95% confidence interval
Cohort studies				
Northwest US	62	64.0	0.97	0.74-1.24
Buffalo†	28	29.8	0.94	0.62-1.36
Boston†‡	70	79.6	0.88	0.69-1.11
Canada	6	5.4	1.11	0.41-2.42
Western Australia†	7	8.3	0.84	0.34-1.74
Total	173	187.1	0.92	0.79-1.07
<i>p</i> (heterogeneity) = 0.97				
Proportionate mortality studies				
New Jersey+§	23	25.1	0.92	0.58-1.37
Washington State+	117	116	1.01	0.83-1.21
California†	44	27	1.63	1.18-2.19
British Columbia	50	48.1	1.04	0.77-1.37
Total	234	216.2	1.08	0.95-1.23
<i>p</i> (heterogeneity) = 0.03				

* SMR/PMR, standardized mortality ratio/proportionate mortality ratio.

† All respiratory cancers.

‡ Expected from Massachusetts rates.

§ Expected from New Jersey rates.

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Buffalo
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Proportionate mortality studies
Washington State
California
British Columbia
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SMR/PMR, standardized mortality ratio/proportionate mortality ratio

which again could be the multiple view of this, could not be warranted. That the Buffalo study has small numbers. Evidence of a standardized mortality ratio of 1.43, and 4.7 for 10 or more years respectively. It is data on a major cause of any colon cancer is lacking with among fire fighters.

The data reported shown in table 4 also include the study system, but the study is included in the study to be brain tumor risk from the elevated and to that for the studies. Comparison leads to a significant of 1.44 (95% CI 1.07-1.89). For numbers of cases

TABLE 4
Observed and expected deaths for colon cancer

Study (location)	Observed	Expected	SMR/PMR*	95% confidence interval
Cohort studies				
Northwest US	15	19.5	0.77	0.43-1.27
Buffalo	16	8.7	1.84	1.05-2.99
Canada	2	1.3	1.54	0.19-5.56
Total	33	29.5	1.12	0.77-1.57
<i>p</i> (heterogeneity) = 0.04				
Proportionate mortality studies				
Washington State	31	34	0.91	0.62-1.29
California	9	8	1.12	0.51-2.14
British Columbia	20	14.6	1.37	0.84-2.12
Total	60	56.6	1.06	0.81-1.36
<i>p</i> (heterogeneity) = 0.36				

*SMR/PMR, standardized mortality ratio/proportionate mortality ratio.

which again could be due to chance in view of the multiple comparisons problem. In view of this, consideration of causality is not warranted. However, it is worth noting that the Buffalo data, within the limits of small numbers, do appear to show some evidence of a dose-response relation, with standardized mortality ratios of 1.25, 0.87, 1.43, and 4.7 for 10-19, 20-29, 30-39, and 40 or more years experience as a fire fighter, respectively. It is also worth noting that data on a major potential confounder of any colon cancer association, i.e., diet (22), is lacking with respect to its distribution among fire fighters.

Brain tumors

The data relating to brain tumors are shown in table 5. Generally, these results also include tumors of the central nervous system, but the majority of cancers included in the observed numbers are likely to be brain tumors. The summary relative risk from the combined cohort studies is elevated and is very similar in magnitude to that for the proportionate mortality studies. Combining both types of studies leads to a significantly elevated relative risk of 1.44 (95 percent confidence interval of 1.07-1.89). For those studies with adequate numbers of observations, there is a fairly

consistent pattern of positive association, in particular for the studies from the northwest United States, Buffalo, and Washington State. The other studies generally have small numbers, although the Boston results are based on eight deaths and have no indication of increased risk.

In terms of the criteria of causality, the strength of association as indicated by the summary relative risk is not great. Although this raises the possibility of confounding, there is no obvious candidate for such a confounder. There is no evidence of a dose-response relation from either of the studies for which these data are available. From the northwest US study, the standardized mortality ratios are 2.82, 2.52, 0.52, and 1.89 for 1-9, 10-19, 20-29, and 30 or more years of experience, respectively. Corresponding data for the Buffalo study are 3.33, 3.33, and 3.75 for 1-9, 10-19, and 20-29 years of experience, respectively. Apparently, there were no observed deaths for those with 30 or more years of experience. In terms of the analogy criterion, increased risk of brain tumors has been reported from a number of occupational exposures including the rubber industry and vinyl chloride monomer. It thus appears that apart from the lack of a dose-response relation, there is some support for the possible causality

TABLE 5

Observed and expected deaths for malignant tumors of the brain and other central nervous system tumors

Study (location)	Observed	Expected	SMR/PMR*	95% confidence interval
Cohort studies				
Northwest US	11	6.5	1.69	0.84-3.03
Buffalo	6	2.6	2.35	0.86-5.12
Boston	8	7.8	1.03	0.44-2.02
Canada	0	0.6	† 0.00	0.00-6.25
Total	25	17.4	1.43	0.93-2.12
<i>p</i> (heterogeneity) = 0.31				
Proportionate mortality studies				
Washington State	18	10.0	1.80	1.07-2.84
California	2	3.0	0.67	0.08-2.41
British Columbia	6	5.0	1.21	0.44-2.63
Total	26	18.0	1.45	0.95-2.12
<i>p</i> (heterogeneity) = 0.31				

* SMR/PMR, standardized mortality ratio/proportionate mortality ratio.

of the observed association between fire fighting and risk of brain tumors. In this context, it is also of interest that the Boston study, which failed to observe this association, is based primarily on experience before World War II, when chemical exposures of fire fighters are likely to have been considerably less than in more recent times.

Malignant melanoma

Only a limited number of studies have reported data for death from malignant melanoma. The combined data from cohort and proportionate mortality ratio studies are shown in table 6. Observed and expected numbers of deaths are combined for both types of study. This, of course, involves an approximation, particularly in view of the healthy worker effect, but again it is a reasonable approach to forming some overall estimate of the strength of association. The pooled estimate of 1.73 is significantly different from 1.0, though this is driven to a large extent by the data from Washington State. The formal test of heterogeneity is consistent with a homogeneous risk across studies, but it must be pointed out that this test lacks power due to limited numbers. It would thus appear to be reasonable to conclude that there is

some evidence of a statistical association between fire fighting and risk of death from malignant melanoma.

In terms of the causal criteria, one very obvious potential confounder is exposure to sunlight. It appears that the maximal risk of malignant melanoma associated with such exposure occurs in those who are frequently exposed to the sun, but do not routinely have such exposure in terms of their occupation (23). The strength of the association is not great, and thus the possibility of confounding, either by sunlight exposure (for which no data are available in general for fire fighters) or by some other unsuspected confounder, is certainly a serious possibility. Very limited data on dose-response relations have been provided from the New Jersey study, and although this yields values for the proportionate mortality ratio of 0.0, 1.82, and 3.88, for less than 20, 20-24, and 25 or more years of experience, respectively, this analysis is almost meaningless, in view of the very small numbers of observed deaths (4). The other relevant criterion, that of analogy, also fails to support the causality of the observed association: Malignant melanoma is not generally associated with chemical carcinogenesis, and the only occupational asso-

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TABLE 6

Observed and expected deaths for malignant melanoma cohort studies and proportionate mortality studies

Study (location)	Observed	Expected	SMR/PMR*	95% confidence interval
Northwest US	5	4.1	1.22	0.40-2.85
Canada	0	0.2	0.00	0.00-18.44
New Jersey†	4	2.10	1.90	0.52-4.88
Washington State	8	3	2.67	1.15-5.25
California	1	1	1.00	† 0.03-5.57
Total	18	10.4	1.73	1.03-2.74

p (heterogeneity) = 0.59

* SMR/PMR, standardized mortality ratio/proportionate mortality ratio.

† Expected from New Jersey rates.

ciation appears to be by virtue of sunlight exposure. In summary, although there is some evidence of a statistical association between fire fighting and increased risk of malignant melanoma, there is little evidence to support the causality of the association.

Multiple myeloma

The data for multiple myeloma are shown in table 7, again combining results of cohort and proportionate mortality ratio studies in view of the small number of such studies reporting data for this cancer. Studies which reported their results in terms of total cancers of the lymphatic and hematopoietic system are not included, since the etiologies of cancers within this rubric may well differ. The results of the northwest US study were reported in terms of "other cancers" of this system, but since four of the five deaths were from multiple myeloma, they are included in table 7. There is an overall elevated summary standardized mortality ratio/proportionate mortality ratio of 1.51, which, because of small numbers, does not significantly differ from 1.0. However, the pattern of association appears reasonably consistent with the formal test of heterogeneity, yielding a *p* value of 0.29. In particular, the Canadian result of two deaths observed compared with 0.2 expected is of particular interest. It would thus appear that there is some evidence of

a statistical association for this cancer, and this warrants the investigation of the criteria of causality.

Other than exposure to chemicals and possibly radiation, essentially no risk factors for multiple myeloma have been identified. The strength of association again is not large (standardized mortality ratio/proportionate mortality ratio = 1.51), and although this raises the possibility of confounding by some unmeasured variable, there is no obvious candidate for such a confounder. Data on dose-response relations have been presented for the northwest US study, giving standardized mortality ratios of 0.00 and 2.49 for up to 29 and for 30 or more years of service, respectively. The fact that the excess of deaths from multiple myeloma in the northwest US study occurred primarily in one decade, as reported by the authors (6), is not easily interpretable, since this type of observation could easily arise within the multiple comparisons made. The argument of analogy is somewhat supportive of the existence of a causal relation, since various studies have implicated exposure to chemicals as being associated with increased risk of multiple myeloma (24-26). Overall, the conclusion must be very tentative because of limited numbers, but there appears to be some evidence of a positive association for multiple myeloma, and if such an association exists, the criteria of causality do not pre-

TABLE 7
Observed and expected deaths for multiple myeloma cohort and proportionate mortality studies

Study (location)	Observed	Expected	SMR/OMR*	95% confidence interval
Northwest US†	5	2.9	1.72	0.56-4.02
Canada	2	0.2	10.00	1.21-36.1
Washington State	8	6	1.33	0.58-2.63
California	2	1	2.00	0.24-7.22
British Columbia	2	2.5	0.80	0.10-2.89
Total	19	12.6	1.51	0.91-2.35

p (heterogeneity) = 0.29

* SMR/PMR, standardized mortality ratio/proportionate mortality ratio.

† Neoplasms of lymphatic and hematopoietic tissues excluding lymphosarcoma, reticulosarcoma, Hodgkin's disease, leukemia, and aleukemia.

clude the possibility that this could reflect some element of causality.

DISCUSSION

The present analysis provides strong evidence of the lack of an association between the occupation of fire fighting and increased risk of cancer mortality overall. Similarly, adequate numbers of observed deaths are available to indicate that there appears to be no association with increased risk of lung cancer. Numbers are smaller for colon cancer, but with the exception of one study, there appears to be no association, and the absence of data on a major potential confounder, i.e., diet, would preclude any meaningful interpretation of causality even if an association existed. For three other cancers—brain tumors, malignant melanoma, and multiple myeloma—there is some evidence that a statistical association exists, with reasonably consistent results, given the limitation of small numbers. Three reasonably sized studies have found an increased risk of brain tumors among fire fighters, namely those in the northwest United States, Buffalo, and Washington State. The absence of a dose-response relation tends to diminish the plausibility that this association is causal, but this is a tumor which is associated with various occupational exposures, and the possibility of a causal relation cannot be ruled out.

There is little evidence to support the causality of the melanoma association, in view of the absence of data on sunlight exposure among fire fighters, either occupationally or recreationally, and the general lack of evidence supporting the importance of chemical carcinogenesis for this cancer. The strength of the multiple myeloma association, which is similar to that for malignant melanoma, does again raise the possibility of confounding by some unmeasured variable, but there is no obvious candidate for such a confounder. The argument of analogy, i.e., that this cancer may be associated with chemical exposure, is somewhat supportive of a possible causal relation for this cancer, but such an interpretation requires considerable caution.

Some limitations of the epidemiologic data in the present context need to be considered. The healthy worker effect, as discussed, is less important for cancer than for other causes of death, and in addition, this effect tends to fall off with time since employment (21). Since the epidemiologic studies generally cover long periods of follow-up, it is unlikely that any positive association will be masked by the healthy worker effect. All studies considered have utilized mortality as opposed to incidence data. It is theoretically possible that an occupation can be associated with differential survival as opposed to risk of developing cancer, but this is unlikely to con-

tribute any near context. The fact been identified fr raise the possibil out this will not risk unless the m ferent for fire fi general populati ently unlikely. A cern is the lack among fire fight a subset of the c a particular expo ably diluted in ers as a whole. might have ha tained, but the causal associati reduced because

In summary, from a number fire fighters and evidence of any in general or of particular. Ther associations with melanoma, and evidence in favo what greater for myeloma than For substantiat associations, fu is needed. Stu rather than mo cancers of low and specific ex fighting should substantiating t such studies co identifying spe which might be risk among fire

1. Coleman DL. 1976;115:300-9
2. Dyer RF. Esch fires. JAMA 19
3. Schenker MP. carcinogen? J
4. Bradford-Hill

tribute any meaningful bias in the present context. The fact that causes of death have been identified from death certificates does raise the possibility of misclassification, but this will not bias estimates of relative risk unless the misclassification rate is different for fire fighters compared with the general population, and this seems inherently unlikely. A final methodological concern is the lack of specific exposure data among fire fighters: If risk is restricted to a subset of the cohort, i.e., those who have a particular exposure, such an effect is inevitably diluted in cohort studies of fire fighters as a whole. The extent to which this might have happened cannot be ascertained, but the magnitude of any positive causal association might be substantially reduced because of this problem.

In summary, combined analyses of data from a number of epidemiologic studies of fire fighters and cancer have provided no evidence of any increase in risk of cancers in general or of lung and colon cancer in particular. There appear to be positive associations with brain tumors, malignant melanoma, and multiple myeloma, with the evidence in favor of causality being somewhat greater for brain tumors and multiple myeloma than for malignant melanoma. For substantiation of the validity of these associations, further study of fire fighters is needed. Studies of cancer incidence, rather than mortality, would be helpful for cancers of low or moderate fatality rates, and specific exposures or patterns of fire fighting should be examined. In addition to substantiating these possible associations, such studies could be of direct value in identifying specific practices or exposures which might be associated with increased risk among fire fighters.

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Mortality of Urban Firefighters in Alberta, 1927-1987

Tee L. Guidotti, MD, MPH

The mortality experience of firefighters has been an active topic of investigation. Collateral toxicological evidence suggests that certain causes of death are likely to be associated with firefighting: lung cancer, heart disease, and obstructive pulmonary disease. To date there has not been a clear and consistent demonstration of excess risk due to occupational exposure for these outcomes, but certain other cancers, including genitourinary, colon and rectum, and leukemias, lymphomas, and myeloma, appear to be consistently elevated. A major unproven hypothesis is that risk increased following the introduction, in the 1950s, of combustible plastic furnishing and building materials known to generate toxic combustion products. Mortality by cause of death was examined for two cohorts totalling 3,328 firefighters active from 1927 to 1987 in Edmonton and Calgary, the two major urban centers in the province of Alberta, Canada, examining associations with cohort (before and after the 1950s) and years of service weighted by exposure opportunity. The study attained 96% follow-up of vital status and over 64,983 person-years of observation, yielding 370 deaths. Mortality from all causes was close to the expected standardized mortality ratio (96; 95% confidence limits (CL) 87, 107) as was that for heart disease (110; 95% CL 92, 131), and neither was statistically significant at the $p < 0.05$ level (N.S.). Excesses were observed for all malignant neoplasms (127; 95% CL 102, 155, $p < 0.05$) and for cancer of lung (142; 95% CL 91, 211, N.S.), bladder (315; 95% CL 86, 808, N.S.), kidney and ureter (414; 95% CL 166, 853, $p < 0.05$), colon and rectum (161; 95% CL 88, 271, N.S.), pancreas (155; 95% CL 50, 362, N.S.) and leukemia, lymphoma, and myeloma (127; 95% CL 61, 233, N.S.); obstructive pulmonary diseases (157; 95% CL 79, 281, N.S.). Fire-related causes showed a marked excess (486; 95% CL 233, 895, $p < 0.01$), but external causes overall showed a significant deficit (66; 95% CL 49, 87, $p < 0.05$). The lung cancer excess was confined to Edmonton; there was no consistent association with duration of employment, exposure opportunity, or cohort of entry (before or after the 1950s) except that the highest risk was observed among Edmonton firefighters with over 35 weighted years. The excess of cancers of the urinary tract was observed mostly among firefighters entering service after 1950, appeared to increase with length of service and exposure opportunity, and was observed in both cities. An occupational association with heart disease and chronic pulmonary disease is not supported in this study on this population. An effect on lung cancer is not obvious, but may be present in the highest exposure group: a weak effect for lung cancer confounded by stronger effects cannot be ruled out. Associations of firefighting with cancers at genitourinary sites and with fire-related injury are strongly suggested in this population. © 1993 Wiley-Liss, Inc.

Key words: occupational hazards, SMRs, firefighting risks, genitourinary cancer, weighted exposure index

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INTRODUCTION

Firefighting is an important and ubiquitous occupation in modern society. It is one of the few remaining public service occupations in which such high risks of personal injury are voluntarily assumed [Heineman et al., 1989]. Few modern occupations combine the potential for exposure to as many chemical and physical hazards with a relatively accessible and well-documented population of workers. We have recently reviewed the literature on occupational hazards and the health experience of firefighters and present overviews of the topic elsewhere [Guidotti, 1992; Guidotti and Clough, 1992].

There remain many unresolved issues related to the health risks of firefighting. These unresolved issues include the associations between firefighting and three relatively common causes of death for which collateral toxicological evidence would suggest that an association with toxic combustion products is likely: lung cancer, heart disease, and obstructive pulmonary disease. Recent cohort studies of mortality have been equivocal or inconsistent in suggesting an association with these three chronic health outcomes [Eliopoulos, 1984; Feuer and Rosenman, 1986; Calif. Dept. of Health Services, 1987; Venn and Fiedler, 1987; Hansen, 1990; Heyer et al., 1990; Rosenshock et al., 1990; Tornling et al., 1990; Beaumont et al., 1991; Demers et al., 1992; L'Abbe and Tomlinson, 1992]. In the case of heart disease, the question of an occupational association with lung cancer or heart disease [Thomas, 1971] is a feature of law or workers' compensation policy in many jurisdictions [Gerace, 1990]. Lung cancer among firefighters is widely presumed to be associated with inhaled combustion products, particularly those resulting from burning plastics and other synthetic materials [Polakoff, 1984; Brandt-Rauf et al., 1988]. Respiratory disorders have also been considered likely to be associated with these inhalation exposures [Thomas, 1971; Brandt-Rauf et al., 1988] and, indeed, evidence does exist for short-term effects [Sheppard et al., 1986]. Rosenshock et al. [1990] reported a significant excess of respiratory disease for a cohort of firefighters compared to a cohort of police. Acute mortality from respiratory failure is conclusively associated with inhalation of combustion products of synthetic materials. Morbidity studies, although more suggestive for long-term impairment from respiratory disorders, have not been persuasive in the weight of evidence [Guidotti et al., 1987]. Rarer outcomes are more consistently demonstrated, particularly malignancies, including genitourinary, colon and rectal, and, as a group, leukemias, lymphomas, and myeloma [Guidotti and Clough, 1992].

Three technical issues are commonly discussed among investigators with reference to the health of firefighters.

1. The need for an exposure index that better reflects personal exposure than years of employment [Heyer et al., 1990]. We considered that because firefighters move among stations and duties during the course of a career, this exposure opportunities in a given job should tend to become similar over time. An exposure index could therefore be based on job level and intensity of firefighting activity, with some assurance that individual variations will average out over time.
2. Presumed toxic and carcinogenic effects of oxidation products from the combustion of synthetic materials, which were introduced in quantity in North American

furnishings and building materials in the late 1950s and 1960s [Sumi and Tsuchiya, 1971; Yuill, 1972]. If there were a strong effect resulting in an increased risk for any of the three outcomes of principal concern as a result of changes in chemical exposure, it should be apparent in the cohort of firefighters entering the occupation in the 1950s and 1960s but not before or after. There is a suggestion of such an effect in data reported from Washington State but not in other population surveillance data [Guidotti et al., 1987].

3. Effectiveness of personal protection, such as self-contained breathing apparatus, in reducing exposure. Personal protection was undervalued generally and not consistently used according to best practices in many fire departments until the 1980s [Carter, 1988; Ransom, 1989]. The protective effect of personal protection equipment for chronic disorders cannot be assessed using currently available data. Regular use of personal protective equipment, such as self-contained breathing apparatus, remains difficult under extreme weather conditions, as experienced in Alberta and Alaska [Carter, 1988; Snell, 1989; Stenn, 1989]. We therefore limited our attention to issues 1 and 2.

This report presents the experience of firefighters in two cities in the province of Alberta in Canada: Edmonton in the central area of the province, and Calgary in the south. The populations of the two cities have been very similar over the period in question and currently stand at about 700,000 each. We structured the analysis of this study to address two of the three technical issues noted above, and we emphasize the three health outcomes of particular concern.

MATERIALS AND METHODS

Cohort

All firefighters employed between 1927 and 1987 by either of the fire departments of Edmonton or Calgary were included in this study. A considerable portion of the first year in the training of firefighters involves significant exposure to smoke and the use of apparatus [Atlas et al., 1985; Norman, 1988]. For this reason, firefighters who did not remain in the service beyond 1 year were included in the analysis. Essential demographic and employment information was recorded from personnel files of the fire departments of each city. During this period, the number of females employed as firefighters or in firefighting-related jobs in either department was negligible. Clerical employees were considered city administrative staff rather than members of either fire department.

Vital Status and Cause of Death

Vital status as of December 1987 was determined for 96% of the total cohort. Initially, this was done by tracing methods, beginning with the identification and exclusion of current workers known to be alive, followed by identification of current (and therefore living) enrollees in the Alberta Health Care Insurance Plan by linking our file of separated employees with the provincial data base of registrants. In Canada, registration for provincial health plan coverage is universal for all residents regardless of age or employment status; lack of registration therefore implies that the former resident has either left the province or died. Those remaining subjects who could not be identified as currently registered were then searched for in the death

certification files of Alberta Vital Statistics, from which copies of the death certificates were obtained. For those still untraced, data linkage with the Canadian Mortality Data Base was performed with the assistance of the Vital Statistics and Disease Registries Section of the Health Division of Statistics Canada (Smith and Newcombe, 1982). This facility receives all death certificates from all jurisdictions in Canada.

Individual death certificates were obtained from the province or country of death. (Deaths were also reported from the United States and the United Kingdom and the original death certificate was requested when deaths were recorded as having occurred out of Canada.) Underlying (secondary) cause of death was obtained from the death certificates for each deceased case and is the basis of this analysis. Deaths were recorded into the most recent ICD-9 code by a nosologist using a set of conversion tables constructed to interconvert coding systems used in the province over the period [Jhangri et al., 1990].

Cross-tabulations were constructed to identify the demographic characteristics of subjects lost to follow-up.

Statistical Analysis

The mortality patterns were analyzed using the Occupational Cohort Mortality Analysis Package (OC/MAP) developed by the Department of Biostatistics of the University of Pittsburgh Graduate School of Public Health [Marsh and Prentinger, 1980]. The confidence intervals and the standardized mortality ratios were calculated in the usual manner and supplemented by calculations of the statistical significance of the estimate compared to unity by the Mantel-Haenszel chi-square test, with one degree of freedom [Mantel et al., 1959]. Correction for multiple comparisons was not made, following the suggestion of Rothman [1990]. We also conducted a latency analysis, but report here only results of interest in the context of overall or suggestively elevated risks. Although it is not customary to report SMRs on the basis of single observed deaths, we have done so in this instance so that the degree of inflation of overall risk estimates arising from these and other small cells can be appreciated. We also present data for 5-year intervals in some analyses in order to demonstrate more precisely the onset of certain trends or the consistency of certain patterns that would be otherwise obscured by aggregation.

Firefighters lost to follow-up were assumed to be lost at the date of their termination of employment with the fire service [Manson, 1990]. It should be noted that because the Canadian Mortality Data Base is a complete national death registration, this is a highly conservative assumption, because subjects lost to follow-up are much more likely to be alive than dead if their death is not registered anywhere in Canada.

Expected mortality was derived from the corresponding age- and time-specific mortality rates for male residents of the province of Alberta. Because these data were not fully compiled in machine-accessible format at the time of our study, this involved our directly compiling mortality statistics by cause of death and population figures for each year during the 61-year interval from the records of Alberta Vital Statistics. Comparisons were made over 5-year periods. At the conclusion of this exercise, the general population mortality experience, both male and female, was summarized in a data set designated the Alberta Mortality Data Base, which has been published separately [Jhangri et al., 1990]. Conversion of the coding systems of the day to ICD-9 codes was accomplished by construction of a "dictionary" of equiv-

TABLE I. Distribution of Deaths for All Causes, and Person-Years of Observation, by Decade of Death and by Decade of Entry Into Occupation: Firefighters in Edmonton and Calgary, Alberta

Decade	Observations		Observations	
	Current in that Decade	Among Firefighters Entering that Decade	Observed Deaths	Person-Years
<1920	0*	—	107	3,917.8
1920-29	0*	417.9	35	1,477.9
1930-39	8	1,740.0	26	2,277.2
1940-49	13	2,863.7	75	8,032.7
1950-59	51	7,130.4	75	19,539.7
1960-69	74	12,210.4	28	15,445.6
1970-79	104	19,069.9	22	11,345.9
1980-87	120	21,524.0	2	2,946.5
Total	370	64,983.3	370	64,983.3

*Deaths occurred from 1927 to 1929.

alent codes; since cause of death rubrics were collapsed into broader categories in the analysis, small differences in diagnostic or nosologic criteria would be unlikely to affect the findings in our study.

Exposure Opportunity

A fundamental problem in studies of chronic disease among firefighters is assessing presumed exposure to fire smoke and combustion products. In order to assess the fit of mortality trends to a presumed exposure profile more refined than simply years of service, we repeated the analysis using a weighted employment history. Each year of a firefighter's service was weighted by an exposure opportunity index term reflecting estimates of relative time spent in close proximity to fires by each job classification. These estimates were derived from interviews with active firefighters in Edmonton and reflect their collective judgement. There was substantial agreement on scaling the relative weights. The weights were as follows: firefighter lieutenant and captain = 1.0; safety or training officer = 0.2; district chief or volunteer firefighter = 0.1; desk job and other designations not involving active firefighting = 0.0. We could not empirically validate this scaling, but because the number of positions associated with intermediate exposure (weighted 0.2 or 0.1) is much smaller than those in the extremes (1.0 or 0.0), and because chiefs and volunteers are known to go to only a small subset of fires, the scaling is likely to be very robust and insensitive to inaccuracies in middle weightings.

RESULTS

Table I presents the distribution of observed deaths for all causes, the person-years of observation by year of death, and the distribution of person-years of observation and observed deaths from all causes by cohort (year beginning employment as a firefighter). A total of 3,328 firefighters were followed for 64,983.3 person-years and vital status was determined for 3193, or 96%, yielding 370 known deaths (all males), all of which were matched with death certificates. The population includes 8

TABLE II. Distribution of Deaths From All Causes and Person-Years of Observation by Age Interval Among Alberta Firefighters

Age in Years	Observed Deaths	Person-Years
<20	0	38.0
20-29	18	15,280.7
30-39	28	22,315.3
40-49	52	14,457.2
50-59	84	8,387.5
60-69	83	3,116.5
70-79	62	1,075.2
80+	43	342.1
Total	370	64,983.3

firefighters who joined their department before 1910. Only 135 firefighters were lost to follow up.

Table II presents the distribution of observed deaths for all causes and person-years of observation by age of the firefighter. The person-years of experience were concentrated in the third, fourth, and fifth decades (78%) reflecting hiring practices that favor recruitment of firefighters in their late twenties and thirties.

Table III presents the mortality experience of the firefighters, both as combined populations and by city. There are few major differences between the mortality experiences observed in the two cities; most of these involve malignant neoplasms. Mortality by cause of death is discussed below. Overall, mortality was close to that expected for the general male population (SMR = 96.2).

Table IV presents the mortality experience in summary form for each cohort by decade of entry into the fire service. Mortality from all causes varied around that expected for the general male population (SMR range 72.9-119.7). Patterns by cause of death are discussed below.

Table V presents the analysis of latency for deaths by age and exposure opportunity for malignant neoplasms, respiratory and cardiovascular causes. The risk of death from malignancies for all exposure groups together increased with increasing latency, as expected, but mortality from respiratory and cardiovascular causes did not follow a clear trend. For those workers classified as 0 by the exposure index, there was no apparent monotonic trend for any cause, although there was a suggestion of increasing risk after 20 years of latency for malignancies, and there were consistently elevated risks across latency intervals for respiratory and cardiovascular causes.

Table VI presents the distribution of deaths from lung cancer, cardiovascular disease, obstructive pulmonary disease, and genitourinary cancers, by both surrogate measures of exposure, by the duration of employment and by the exposure opportunity index. The findings are discussed below.

Malignancies

Examined by cause of death, without reference to prior hypotheses, significant, or suggestive excesses in mortality were observed for malignant neoplasms (SMR = 127, $p < 0.05$), including colon and rectum (SMR = 161, N.S.), pancreas (SMR = 155, N.S.), lung (SMR = 142, N.S.), bladder (SMR = 316, N.S.), kidney and ureter (SMR = 414, $p < 0.01$), and leukemias, lymphomas, and myeloma (SMR =

TABLE III. Summary of Mortality Experience of Alberta Municipal Firefighters (ICD-9 codes)*

Cause of Death	Observed		Both Cities		Confidence Intervals, 95%	
	Calgary	Edmonton	Expected	SMR	Lower	Upper
All causes (001-999)	188	182	384.7	96.2	86.6	106.5
Infectious, parasitic disorders (001-139)	1	1	6.0	33.3	4.0	120.2
Malignant neoplasms (140-208)	40	52	72.7	126.6 ^a	102.0	155.2
oral (140-149)	0	2	1.8	113.6	13.7	410.4
stomach (151)	3	3	7.4	80.9	29.7	176.0
colon and rectum (152-154)	9	5	8.7	161.4	88.3	270.9
pancreas (157)	3	2	3.22	155.1	50.4	362.0
lung (162)	7	17	16.9	142.0	91.0	211.4
skin (172)	0	0	1.1	0.0	0.0	331.2
prostate (185)	2	2	5.5	146.1	63.1	287.9
bladder (188)	1	3	1.3	315.7	86.0	808.3
kidney and ureter (189)	3	4	1.7	414.0 ^a	166.4	853.1
leukemia, lymphoma, myeloma (200-208)	3	0	2.1	146.6	30.3	428.5
Eukaryotic disorders (240-279)	6	4	7.9	126.5	60.6	232.5
Blood disorders (280-289)	2	1	6.4	46.9	9.7	137.0
Mental disorders (290-319)	13	6	4.2	455.4 ^a	274.2	711.1
Nervous system disorders (320-389)	79	2	5.4	73.5	29.0	188.3
Cerebrovascular disorders (390-439)	66	64	152.3	103.1	87.6	120.6
Heart ^b	53	56	117.8	110.4	92.2	131.1
ischemic heart (410-414)	6	3	102.9	105.9	86.9	127.7
coronary (410-414)	6	3	23.3	38.6 ^a	17.7	73.3
arteriosclerosis (440-448)	4	8	8.0	140.7	77.3	261.5
Respiratory disorders (460-519)	11	10	22.3	94.9	58.8	145.1
COPD (490-496)	5	6	7.0	157.3	78.5	281.4
Digestive system disorders (520-579)	6	3	19.2	46.9 ^a	21.4	89.0
Genitourinary system disorders (580-629)	4	4	6.1	132.0	57.0	260.1
External causes (800-999)	28	21	74.7	65.6 ^a	48.5	86.7
motor vehicle (810-825)	10	6	23.7	67.5	38.6	109.6
accidental falls (880-888)	2	1	5.25	57.1	11.8	166.9
fire-related (890-899)	7	3	2.1	486.4 ^d	233.2	894.5
suicide (950-959)	3	4	18.2	38.5 ^a	15.5	79.2
homicide (960-969)	0	0	2.3	0.0	0.0	162.0
Other and unknown ^c	1	3	12.8	31.2 ^a	8.5	80.0

*To estimate the expected mortality for either city, take half of the expected figure for both.
^a $p < 0.05$.
^b(990-998, 402, 404, 410-416, 420-429).
^cChronic obstructive pulmonary diseases includes emphysema, asthma, and chronic bronchitis.
^d $p < 0.01$.
 (209-239, 630-739, 780-799.)

127, N.S.). The 95% confidence intervals surrounding each estimate of relative risk are presented in Table III. The risk of death from malignant neoplasms overall was not consistently elevated after the 1950s compared to the 1940s and before. Of these sites, only lung (ICD 162) was specified in an a priori hypothesis, and detailed evaluation of lung cancer was an objective of the study. The peak latency for

TABLE IV. Summary of Mortality Experience for Selected Causes of Death by Entry Cohort: Urban Firefighters in Edmonton and Calgary, Alberta^a

Causes of Death	<1920	1920s ^b	1930s	1940s	1950s	1960s	1970s
All causes ^c	94.7 (107)	115.2 (35)	90.2 (26)	119.7 (75)	87.2 (75)	72.9 (28)	105.2 (22)
Malignant neoplasms	161.5 (30)	91.0 (5)	74.8 (5)	146.3 (22)	117.0 (1)	155.4 (9)	42.6 (1)
colon and rectum	149.2 (4)	—	265.1 (2)	122.5 (2)	149.4 (3)	339.6 (2)	—
lung	222.7 (6)	95.0 (1)	—	154.9 (7)	117.5 (6)	168.6 (2)	260.7 (1)
bladder	710.0*(3)	—	—	344.2 (1)	—	—	—
kidney and ureter	1728.3 (4)	—	—	—	333.6 (2)	516.0 (1)	—
leukemia, lymphoma, myeloma	226.9 (3)	—	322.8 (2)	133.2 (2)	42.9 (1)	185.3 (2)	—
Circulatory disorders	89.3 (53)	148.8 (23)	98.9 (13)	113.0 (29)	105.5 (29)	86.5 (7)	108.3 (3)
heart disease	102.2 (43)	141.5 (16)	105.9 (11)	126.8 (27)	98.1 (23)	104.5 (7)	133.1 (3)
Chronic obstructive pulmonary disease	151.0 (3)	321.2 (2)	93.1 (1)	245.1 (4)	82.5 (1)	—	—
Mental disorders	225.4 (1)	—	440.2 (1)	826.4** (6)	540.2 (8)	403.8 (3)	—
External, suicide	—	223.5 (1)	—	—	57.2 (3)	23.5 (1)	57.4 (2)
External, fire-related	512.2 (1)	—	1137.3 (1)	354.6 (1)	157.4 (1)	211.6 (1)	1910.0** (5)

^aSummary mortality experience expressed as SMR (observed number of deaths 0).

^b1920s = 1920-29, etc.

^cCells with only one death are shown for completeness but should not be interpreted as an excess unless part of a consistent trend.

* $p < 0.05$.

** $p < 0.01$.

all exposure groups was < 20 years, as it was for those with exposure indices of 0. For groups with increasing exposure opportunity, however, the peak latency appeared to shift progressively to later latency intervals, although none achieved statistical significance given the small numbers involved. The excess mortality in recent years began among workers who began their employment in the decade 1940-49 (7 observed, SMR = 155, N.S.) and persisted above 100 in subsequent decades with great instability because of small numbers of observed and expected cases. In no individual decade did the elevation achieve statistical significance at the 95% level, nor did the excess achieve statistical significance over the period as a whole. Following the 1940s, the risk did appear to increase in magnitude but the largest SMRs were observed in years with single cases. Although the decade-specific SMRs increased after the 1980s, they were not significantly different statistically from the experience in the 1940s. Many more cases were observed in Edmonton (17) than in Calgary (7); the power for identifying an excess in Calgary alone is < 40%, however. The rate in Edmonton alone did achieve statistical significance (SMR 187.3; 95% confidence limits 109.1, 299.9). As expected, lung cancer cases did not appear until the age group 30-34 and did not peak until after age 75, but in no age group did an excess, where present, achieve statistical significance. The youngest lung cancer case was 34 years old at the time of his death and had experienced 6.5 years of exposure beginning in 1980. There were no other cases under the age of 40. Analysis by latency period showed a peak risk at or over 50 years after entry into the workforce (3 cases, SMR 174.6; 36.0, 510.4). Analysis by duration of employment showed a peak risk (SMR 283; 2 cases, N.S.) among firefighters employed for less than 1 year (entirely due to cases from Edmonton) and a generally declining risk thereafter until 40+ (SMR 202; 2 cases, N.S.). Application of the exposure opportunity index demonstrated that the risk was greatest in less heavily exposed firefighters and in workers with no firefighting experience (again due to the cases in Edmonton) until 35+ weighted years; the large excess in that category is almost entirely due to a marked excess in that group in Edmonton, consisting of three cases (SMR 1711; 353, 5000, $p < 0.0001$). Colon and rectal cancers (ICD 152-154) peaked at age 40-44 with 3 individual cases (0.43 expected, SMR 697.6, $p < 0.05$) but showed no clear correlation with entry cohort, although deaths from this cause were elevated, without achieving statistical significance, in each decade except the 1920s and 1970s. The latency analysis suggested a peak after 20-29 years among the exposed groups, significantly for those with an exposure index of 1 to 9 (SMR 1146.3, $p < 0.01$).

Pancreatic cancer (ICD 157) was not observed before age 60 and peaked after age 80, with two individual cases (0.13 expected, SMR 1444, N.S.). None appeared in members of cohorts entering after 1949. The peak risk (3 cases, SMR 716, $p < 0.01$) came more than 50 years after entry into the workforce.

In contrast, bladder cancer (ICD 188), did not appear among firefighters prior to age 60, showing a peak latency of 40 years, but was significantly elevated ($p < 0.05$) in age groups 60-64 (2 cases; 0.20 expected), 70-74 (1; 0.14), and 75-79 (1; 0.18); the cases did not concentrate in any particular decade and appeared in men entering before 1950. The peak risk (3 cases, SMR 1392.8; 287.4, 4070.3, $p < 0.01$) was observed 40-49 years after entry. Bladder cancer was not observed in firefighters with less than 20 years of service or 25 weighted years of service but increased in frequency and magnitude of risk thereafter, although never achieving statistical significance.

TABLE V. Latency Analysis for Selected Causes of Death Among Alberta Firefighters

	Latency (Yrs)																	
	<20			20-29			30-39			40-49			50+			TOTAL		
	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR
All Subjects																		
All causes	77	107.76	71.5*	75	75.50	99.3	91	81.02	112.3	75	59.94	126.0	52	60.85	85.5	170	384.66	96.2
Malignant neoplasms:	13	13.25	98.1	17	16.16	105.2	25	20.55	121.6	23	13.04	176.3*	14	9.70	144.4	92	72.69	126.6*
Intestine and rectum	2	1.35	148.0	5	1.87	267.9	3	2.41	124.3	2	1.67	119.5	2	1.37	146.4	14	8.67	161.4
Pancreas	0	0.44	—	1	0.89	112.9	1	1.03	96.7	0	0.44	—	3	0.42	716.4*	5	3.22	155.1
Trachea, bronchus, lung	4	2.08	192.5	4	4.21	95.1	10	5.79	172.8	3	3.11	96.6	3	1.72	147.6	24	16.90	142.0
Prostate	0	0.14	—	1	0.39	258.5	2	1.21	164.8	2	1.67	120.0	3	2.06	145.3	8	5.47	146.1
Bladder	0	0.09	—	0	0.25	—	1	0.36	277.5	3	0.22	1392.8*	0	0.35	—	4	1.27	315.7
Kidney and ureter	1	0.25	407.9	2	0.51	392.0	0	0.59	—	4	0.19	2129.4*	0	0.15	—	7	1.69	414.0*
Disease of circulatory system:	18	20.55	87.6	36	28.55	126.1	38	36.75	103.4	36	31.73	113.5	29	34.69	83.6	157	152.27	103.1
Disease of heart	18	16.87	106.7	30	24.10	124.5	30	30.27	99.1	31	23.35	132.7	21	23.16	90.7	130	117.76	110.4
Disease of respiratory system:	4	3.24	123.4	3	3.22	93.2	6	4.17	143.7	2	4.42	45.3	6	7.07	84.9	21	22.12	94.9
COPD (inc. asthma, bronch., emphysema)	2	0.54	367.6	1	0.96	103.8	4	1.72	232.2	1	1.66	60.3	3	2.11	142.4	11	7.00	157.3
EXPOSURE INDEX: 0																		
All causes	11	10.75	102.3	14	3.76	372.5*	2	2.78	72.0	3	1.42	211.0	1	0.91	109.6	31	19.62	158.0*
Malignant neoplasms:	2	2.05	97.7	3	0.89	336.6	1	0.76	131.5	1	0.33	305.2	0	0.17	—	7	4.19	166.9
Intestine and rectum	0	0.22	—	0	0.10	—	0	0.08	—	0	0.03	—	0	0.02	—	0	0.46	—
Pancreas	0	0.10	—	0	0.05	—	0	0.04	—	0	0.02	—	0	0.01	—	0	0.21	—
Trachea, bronchus, lung	2	0.53	377.4	0	0.26	—	0	0.23	—	0	0.08	—	0	0.04	—	2	1.14	176.0
Prostate	0	0.07	—	0	0.05	—	0	0.05	—	0	0.04	—	0	0.04	—	0	0.24	—
Bladder	0	0.03	—	0	0.01	—	0	0.01	—	0	0.01	—	0	0.01	—	0	0.07	—
Kidney and ureter	0	0.06	—	1	0.03	3997.4	0	0.02	—	0	0.01	—	0	0.00	—	1	0.11	889.6
Disease of circulatory system:	5	3.32	150.5	4	1.56	253.9	0	1.21	—	1	0.68	147.6	1	0.47	213.2	11	7.25	151.8
Disease of heart	5	2.79	179.0	2	1.29	155.2	0	1.00	—	1	0.49	203.6	1	0.32	308.9	9	5.89	152.7
Disease of respiratory system:	1	0.40	252.3	1	0.19	524.4	1	0.17	597.7	1	0.12	776.9	0	0.12	—	4	1.01	397.2*
COPD (inc. asthma, bronch., emphysema)	1	0.14	729.2	0	0.08	—	1	0.08	1215.6	1	0.05	1988.3	0	0.06	—	3	0.40	741.8*
EXPOSURE INDEX: >0, <1																		
All causes	21	19.90	105.5	16	6.99	228.9*	12	5.53	217.1*	3	1.82	164.8	1	0.91	109.6	53	35.15	150.8*
Malignant neoplasms:	4	2.84	140.6	4	1.61	248.3	4	1.54	259.2	1	0.45	220.2	0	0.17	—	13	6.62	196.4*
Intestine and rectum	0	0.29	—	1	0.18	548.2	1	0.17	595.4	0	0.05	—	0	0.02	—	2	0.71	282.6
Pancreas	0	0.12	—	0	0.09	—	0	0.08	—	0	0.02	—	0	0.01	—	0	0.32	—
Trachea, bronchus, lung	2	0.62	321.8	0	0.46	—	1	0.48	206.5	0	0.12	—	0	0.04	—	3	1.73	173.6
Prostate	0	0.07	—	0	0.06	—	0	0.09	—	0	0.05	—	0	0.04	—	0	0.31	—
Bladder	0	0.03	—	0	0.02	—	0	0.03	—	0	0.01	—	0	0.01	—	0	0.10	—
Kidney and ureter	0	0.07	—	1	0.05	2055.5	0	0.05	—	0	0.01	—	0	0.00	—	1	0.18	566.8
Disease of circulatory system:	7	4.40	159.0	4	2.80	142.9	4	2.36	169.6	1	0.85	117.8	1	0.47	213.2	17	10.88	156.3
Disease of heart	7	3.66	191.4	2	2.34	85.5	3	1.97	152.5	1	0.63	158.6	1	0.32	308.9	14	8.92	156.9
Disease of respiratory system:	1	0.60	166.3	1	0.31	323.7	2	0.31	655.5	1	0.16	623.8	0	0.12	—	5	1.50	333.4*
COPD (inc. asthma, bronch., emphysema)	1	0.16	612.6	0	0.12	—	2	0.15	1321.0*	1	0.07	1993.9	0	0.06	—	4	0.56	710.2*
EXPOSURE INDEX: 1-9																		

(continued)

TABLE V. Latency Analysis for Selected Causes of Death Among Alberta Firefighters (continued)

	All Subjects																	
	Latency (Yrs)																	
	<20			20-29			30-39			40-49			50+			TOTAL		
OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR	
All causes	33	47.35	69.7*	19	10.38	183.1*	18	9.74	184.9*	8	5.22	153.2	5	7.97	62.7	83	80.66	102.9
Malignant neoplasms:	3	4.45	67.4	5	2.24	223.1	5	2.63	190.0	2	1.31	152.8	2	1.21	164.9	17	11.84	143.5
Intestine and rectum	1	0.43	230.5	3	0.26	1146.3*	1	0.29	350.1	0	0.16	—	1	0.17	579.5	6	1.31	458.1*
Pancreas	0	0.09	—	1	0.12	837.1	0	0.16	—	0	0.06	—	0	0.05	—	1	0.47	211.8
Trachea, bronchus, lung	1	0.45	224.6	1	0.62	162.5	3	0.82	365.5	0	0.35	—	0	0.19	—	5	2.43	205.8
Prostate	0	0.02	—	0	0.05	—	0	0.14	—	0	0.14	—	1	0.27	371.3	1	0.62	162.3
Bladder	0	0.01	—	1	0.03	—	0	0.05	—	0	0.03	—	0	0.04	—	0	0.16	—
Kidney and ureter	0	0.05	—	0	0.07	—	0	0.09	—	0	0.03	—	0	0.02	—	0	0.25	—
Disease of circulatory system:	7	6.07	115.3	10	3.96	252.4*	4	4.18	95.8	6	2.61	230.1	2	4.54	44.0	29	21.36	135.8
Disease of heart	7	4.81	145.6	9	3.36	267.6*	3	3.52	85.3	5	2.01	249.3	2	3.01	66.5	26	16.70	155.7*
Disease of respiratory system:	2	1.19	168.4	1	0.40	252.5	2	0.51	395.7	0	0.36	—	1	0.96	104.3	6	3.41	175.9
COPD (inc. asthma, bronch., emphysema)	1	0.15	647.9	1	0.13	747.1	1	0.24	421.5	0	0.17	—	0	0.28	—	3	0.98	306.6
EXPOSURE INDEX: ≥10																		
All causes	23	40.51	56.8*	40	58.13	68.8*	61	65.75	92.8	64	52.49	121.9	46	51.96	88.5	234	268.85	87.0*
Malignant neoplasms:	6	5.95	100.8	8	12.30	65.0	16	16.38	97.7	20	11.28	177.3*	12	8.32	144.3	62	54.23	114.3
Intestine and rectum	1	0.63	159.3	1	1.42	70.3	1	1.96	51.0	2	1.47	135.9	1	1.17	85.2	6	6.65	90.2
Pancreas	0	0.24	—	0	0.68	—	1	0.79	126.1	0	0.36	—	3	0.36	835.0	4	2.43	164.8
Trachea, bronchus, lung	1	1.01	98.9	3	3.13	96.0	6	4.48	133.8	3	2.63	113.9	3	1.48	202.1	16	12.74	125.6
Prostate	0	0.05	—	1	0.27	365.7	2	0.98	203.5	2	1.48	135.5	2	1.76	113.7	7	4.54	154.0
Bladder	0	0.05	—	1	0.20	—	1	0.28	353.5	3	0.18	1704.5*	0	0.30	—	4	1.01	395.2*
Kidney and ureter	1	0.13	758.3	1	0.39	254.0	0	0.46	—	4	0.15	2654.2*	0	0.13	—	6	1.27	474.2*
Disease of circulatory system:	4	10.08	39.7	22	21.79	100.9	30	30.22	99.3	29	28.27	102.6	26	29.68	87.6	111	120.04	92.5
Disease of heart	4	8.41	47.6	19	18.40	103.3	24	24.78	96.8	25	20.72	120.7	18	19.83	90.8	90	92.14	97.7
Disease of respiratory system:	1	1.45	68.9	1	2.51	39.8	2	3.36	59.5	1	3.90	25.7	5	5.99	83.5	10	17.21	58.1
COPD (inc. asthma, bronch., emphysema)	0	0.23	—	0	0.71	—	1	1.33	75.0	0	1.41	—	3	1.77	169.7	4	5.45	73.3

*p < 0.01.

†p < 0.05.

TABLE VI. Mortality by Duration of Employment and by Exposure Opportunity in Study of Alberta Firefighters

Duration of Employment (yr.):	Lung Cancer		Cardiovascular Disease		Obstructive Pulmonary Disease		Cancer of Kidney and Ureter	
	Obs	SMR	Obs	SMR	Obs	SMR	Obs	SMR
<1	2	283	5	118	1	529	0	—
1-9	4	197	27	175	4	623	0	—
10-19	3	149	17	103	0	—	1	430
20-29	6	131	36	102	3	208	1	184
30-39	7	107	58	91	3	92	2	338
40+	2	202	14	82	0	—	2	3,612*
Exposure Opportunity (yr. × weight):								
0	2	176	11	152	3	742 ^b	1	890
>0, <1	1	169	6	165	1	630	0	—
1-4	1	114	9	121	2	542	0	—
5-9	4	258	20	144	1	164	0	—
10-14	2	190	9	180	0	—	0	854
15-19	2	159	11	85	0	—	1	654
20-24	1	32	27	108	2	147	0	—
25-29	4	111	21	75	0	—	2	522
30-35	3	121	26	92	1	88	0	—
35+	4	408 ^b	17	190	1	161	2	3,542*

* $p < 0.01$.
^b $p < 0.05$.

Kidney and ureter cancers (ICD 189) did not appear in firefighters below the age of 40 but occurred in age groups 40-44 (1 observed; 0.10 expected), 50-54 (1; 0.26), 55-59 (1; 0.38), 65-69 (3; 0.17, $p < 0.01$), and above 70 (1; 0.26). All cases were seen in men entering the fire service before 1915 or after 1950: 2 in 1950-59 (0.60 expected) and 1 in 1960-69 (0.19 expected). There was a similar excess observed in both cities. Although the earliest case appeared 18 years after entry, the peak risk was observed 40-49 years after entry, as for bladder (4 cases, SMR 2129.4; 580.3, 5452.4; $p < 0.01$). The frequency appeared to increase with increasing duration of employment and exposure opportunity, as shown in Table VI, although one case was observed in a worker without firefighting experience. The highest risk of all was observed in firefighters with more than 35 weighted years (SMR 3542, $p < 0.01$) and in the highest exposure opportunity category in the latency analysis (≥ 10 weighted years) at 40-49 years of latency (SMR 2654.2, $p < 0.01$).

Leukemias, lymphomas, and myeloma (ICD 200-208) did not concentrate in any age group, latency period, or entry cohort. Stomach cancer (ICD 151) was significantly elevated in the age group 70-74 in Edmonton (3 cases, SMR 718.0; 148.2, 2098.3, $p < 0.01$). A latency analysis is not reported for this heterogeneous group.

Nonmalignant Outcomes

There were few statistically significant elevations among nonmalignant causes of death, but several were elevated without achieving significance. Two nonmalignant causes of death were considered of interest a priori, heart disease and chronic

lung diseases. In both cases, application of the exposure opportunity index did not appreciably change the interpretation because the risk showed no relationship with duration or duration and intensity of exposure.

Diseases of the circulatory system (ICD 390-439) and each of its subcategories of diseases of the heart (ICD 390-398, 402, 404, 420-429), ischemic heart disease (ICD 410-414), and arteriosclerosis (ICD 440-448) showed elevations (SMRs 103, 110, 105, 150, respectively), none of which, individually or in the aggregate, attained statistical significance. The peak latency overall was observed to be 20-29 years, driven by a peak in that interval for the subjects with an exposure index of 1-9 weighted years (SMR 252.4, $p < 0.05$), but this risk level was not reflected in the next higher group and was less than that of the unexposed group (exposure index = 0). Risks for heart disease as coded were similar between the two cities; there was a reciprocal variation in excess risk of cerebrovascular disease and arteriosclerosis. Application of the exposure opportunity index did not appreciably change the distribution of cases by (weighted) years of service. No consistent change in pattern was apparent after the 1950s.

Chronic obstructive pulmonary disease (COPD, ICD 490-496), incorporating asthma, bronchitis, and emphysema, was elevated (SMR 157, 79, 281), again without attaining statistical significance. The findings were consistent between the two cities. Except for one case below the age of 45, mortality from COPD did not appear before age 55 and did not peak (3 cases SMR 391; 81, 1144) until age 75-79. Elevations were apparent in subcohorts from the 1920s (SMR 321) and 1940s (SMR 245) but not the 1950s, 1960s, or 1970s. The risk did not increase consistently with time in service. Application of the exposure opportunity index revealed a group of cases with no firefighting experience or with less than four (weighted) years of exposure; no subsequent exposure-response relationship was apparent, however. The peak latency overall was observed at 30-39 years (SMR 232.2, N.S.), driven by a peak in that interval observed among firefighters with less than 1 but more than zero weighted years of exposure. Within most latency intervals, there was a trend toward reduced risk with increasing exposure index.

Among causes of death not considered among the a priori hypotheses, mental disorders (ICD 290-319) shared a marked elevation (SMR 455, $p < 0.01$) but suicide (ICD 950-959) showed a marked deficit (SMR 39, $p < 0.01$); when combined, the SMR would be 117 and nonsignificant. An elevation in genitourinary disorders (ICD 580-629) was observed (SMR 132; 57, 260); the majority were seen in firefighters over the age of 65. Injuries by fire (ICD 890-899) were significantly elevated (SMR 486; 233, 894 $p < 0.01$). These findings were consistent in both cities. Although fire-related injuries contributed a disproportionate share of cases to overall external causes (20% of the observed external injuries compared to 3% of those expected), external causes generally showed a marked deficit (SMR 66; 49, 87, $p < 0.05$).

Significant deficits in mortality were observed for cerebrovascular disease, diseases of the digestive system, and all diseases not specifically coded. Again, these findings were observed in data from both cities.

Lost to Follow-Up

Among the 135 firefighters lost to follow-up, 64% separated from their fire services before 1970 and 59% were from Edmonton. At the time that they were lost 68% were younger than 30 years of age; 61 (45%) were under 35 and were lost in or

since 1960, and an additional 40 (30%) were under 30 when they were lost in 1950-59. It therefore seems unlikely that many of these subjects are deceased. Because the Canadian Mortality Data Base collects death certificates from all jurisdictions in the country, a subject lost to follow-up is more likely to be alive than to be deceased but untraceable.

DISCUSSION

The three cardinal causes of death suspected of an association with exposures encountered during firefighting activity are lung cancer, ischemic heart disease, and chronic obstructive pulmonary disease. We find no strong evidence for an association with any of these outcomes in our population; the findings for lung cancer are not inconsistent with a weak effect, however. In contrast, there is a strong suggestion of an excess from genitourinary cancers in this population of firefighters.

Study Characteristics

A strength of our study is the inclusion of data from two cities, providing an internal comparison allowing us to examine consistency in findings between the two cities. The long period of observation allows the opportunity to examine mortality before and after the period in which the toxicological characteristics of firefighting exposures are known to have changed.

Our application of an exposure index to adjust for the likelihood of inhaling fire smoke, representing the best judgement of active firefighters, is also an innovation of some utility in this study. Although the weights given to firefighters on duty in various job categories is derived from firefighters' own impressions, the scaling represents a subjective judgement that should be validated by appropriate exposure monitoring if the weights are to be treated rigorously as part of an exposure assessment in future studies. Few fire service employees fell into the intermediate exposure categories compared to the much larger number of active firefighters and the smaller group of unexposed personnel. Thus, the lack of empirical validation of the scaling is unlikely to introduce serious misclassification bias in this study. For the purposes of the present study, it is sufficient that the weights fall between unity and zero and reasonable that they should be closer to zero than unity when firefighters are not assigned to be at the fire scene routinely. We attempted a further adjustment based on fire hall activity, measured by real alarms adjusted by the proportion of alarms representing fires. Insufficient data on job assignment by hall were available to construct a meaningful profile based on activity levels, however.

Misclassification of firefighters by the index is possible as a result of misperception of the opportunity to inhale fire smoke in a given job classification, but this is most likely to occur in unusual or specialized fire department positions such as trainers, safety officers, and arson investigators, who collectively made up only a tiny fraction of the cohort, and all of whom were likely to have fallen into the 1-9 group or higher because of the experience and seniority required to attain these positions. Since they would almost never fall into the index groupings involving 0 or >0 but <1 weighted years, misclassification within these groups is highly unlikely to distort the analysis as a whole.

The major limitation of the present study is lack of power to demonstrate lower relative risks for all outcomes and to demonstrate excesses of rarer outcomes in the

trend analyses at conventional levels of statistical significance ($p < 0.05$). This is a common drawback of occupational cohort studies and, in this study, mainly limits the analysis of secular trends in Table IV and mortality by duration of employment in Table VI. The power of this study is well over 80% for all three cardinal health outcomes in the aggregate (at an effect level of SMR 150), and for cardiovascular disease in each of the trend analyses. The problem therefore lies in interpreting negative results—the absence of an effect—in the smaller subgroups and cells. The statistical power of individual cells in the analyses in Tables IV-VI is unavoidably quite low in many cases, and caution should be used in examining any one cell in isolation. In assessing trends, however, the size and statistical significance of individual cells is not the major factor in making an interpretation but the suggestion of a direction. In the present study, such trends are presented to test particular hypotheses and interpretation does not depend on the power of individual cells. Limitations on power are, by definition, a concern when no effect is observed. This concern does not apply when one is interpreting positive findings in the sample.

The overall SMR in our group of firefighters is 96.2, close to that expected on the basis of the general male population. Thus, we have not observed the strong healthy worker effect for this population that others have observed among firefighters [Rosenstock et al., 1990]. The healthy worker effect is usually much stronger for nonmalignant disorders than for cancer [Munson, 1990]. The SMR for cardiovascular disease in our study (103.1) shows no healthy worker effect, however. The SMR for nonmalignant respiratory diseases (94.9) shows minimal evidence for a healthy worker effect in this population. In studies that have compared firefighters to a comparably employed population, some suggestion of an excess mortality from non-malignant respiratory disease [Rosenstock et al., 1990] and cancer [Hansen, 1990] has been noted.

One interpretation of the observation that our overall SMR comes close to that of the general population is that the absence of a healthy worker effect suggests a hidden elevation in risk and is an indication of excess risk compared to other employed groups. There are several other possible explanations: One is that we have followed nearly to extinction the cohorts that entered firefighting in the early decades of the century, so that our mortality experience for these cohorts is nearly complete. SMRs are comparisons based on rates, so that complete ascertainment of cases does not necessarily result in the SMR approaching 100, but nearly complete ascertainment will approach a maximum SMR for the population under study. The complete national coverage of the Canadian Mortality Data Base makes it likely that we have achieved full reporting of deaths in our population and have not missed substantial numbers in our subjects lost to follow-up.

Another factor influencing the overall SMR in our study may be that the mortality experience of the general population of Alberta is generally favorable compared to other jurisdictions. It is likely that the "base" healthy worker effect might be reduced proportionately when comparisons are made with an unusually healthy general population. The majority of population centers in Alberta are significantly below Canadian averages for mortality among males from all causes, from cardiovascular diseases, and from malignant neoplasms [Bureau of Epidemiology, 1980]. Some of these differences are quite substantial: between 1950 and 1984, male mortality in Alberta from obstructive pulmonary disease in the age group 60-65 averaged only 51% that of Canada as a whole, which in turn was comparable to that of the U.S.

[Jhangri et al., 1989; Manfreda, 1989; Thom, 1989]. Other indices of health status also suggested that the health status of male residents of Alberta is unusually high; male residents of Alberta reported a lower prevalence of cardiovascular risk factors compared to other jurisdictions in North America, particularly in urban areas where the population is concentrated [Alberta Heart Health Survey, 1991].

Lung Cancer

There are many reasons to suspect an association between occupation as a firefighter and lung cancer. The potential for exposure to carcinogenic substances in firefighting is well known [Brand-Rauf et al., 1988] and an excess would be anticipated. Lung cancer rates are indeed elevated relative to the general population in many similar studies, although not necessarily at a level achieving statistical significance [California Dept. of Health Services, 1987; Hansen, 1990; Demers, et al., 1992]. However, other cohort studies have not shown an excess among firefighters [Vena and Fiedler, 1987; Torning et al., 1990; Beaumont et al., 1991; L'Abbé and Tomlinson, 1992]. Many of these studies are extensively reviewed elsewhere and by others [Howe and Burch, 1990; Guidotti and Clough, 1992], as are studies based on population surveillance methods [Guidotti et al., 1987; Howe and Burch, 1990]. In this study, a significant excess was observed among firefighters in Edmonton with over 35 weighted years of firefighting, suggesting that an excess due to occupational exposure risk may be confined to the highest exposure groups. Given the absence of a parallel finding in Calgary, the observation of a relatively low and stable risk estimate in the cohort entering firefighting in the 1950s, and the relatively high risks observed in Edmonton alone for workers in nonfirefighting assignments (SMR 495; 60, 1789, 2 cases) and with less than one year of exposure opportunity (1 case, nominal SMR 284), the null hypothesis that there is no true excess due primarily to occupational exposures cannot be rejected by the findings of this study. Each consideration, as stated, is relatively weak statistically, however, based on close scrutiny of cells in the small numbers and relatively low power. The possibility that lung cancer is heavily confounded by smoking is also raised by the observation that cohort members who had no or less than one year of firefighting experience showed excesses of both lung cancer and chronic obstructive lung disease, both smoking-related outcomes.

Attribution of risk to occupational exposure, compared to cigarette smoking, is a perennial problem in evaluating mortality from lung cancer. This study alone cannot rule out a relatively weak occupational effect superimposed on a smoking effect. Attempts to adjust for smoking have suggested that this may be the case but the evidence is not very strong as yet [Calif. Dept. Health Services, 1987]. However, there are data to suggest that the prevalence of smoking among firefighters is lower than that of other municipal and blue collar occupations. [Gerace, 1990]

Cardiovascular Diseases

The cardiovascular classification of cause of death is, of course, driven by heart disease, particularly ischemic coronary artery disease. Heart disease demonstrates no noteworthy excess and is not associated in this population with duration of exposure or era of entry. These findings are consistent with those of most other recent cohort studies [Elhopoulos, 1984; Feuer and Roseman, 1986; Calif. Dept. of Health Services, 1987; Hansen, 1990; Vena and Fiedler, 1987; Heyer et al., 1990; Rosenstock

et al., 1990; Torning et al., 1990; Beaumont et al., 1991; L'Abbé and Tomlinson, 1992; Demers et al., 1992]. At least part of the deficit in cerebrovascular disease might be due to misclassification of unobserved strokes as cardiac events or misclassification as arteriosclerosis. Another explanation may be a healthy worker effect that is particularly strong for risk factors for stroke.

Lung Disease

There is a nonsignificant excess in chronic obstructive pulmonary disease (COPD) that appears to be driven by a marked excess in one subgroup, those who did not remain in the firefighting occupation beyond one year, with the suggestion that a lesser excess might persist for firefighters who leave after less than 10 years. This is consistent with early migration out of the occupation of workers who are experiencing breathing difficulties but who are not considered established, career firefighters. Our discussions with fire service personnel confirm that firefighters are subject to an intensive if informal selection process that results in effective removal of firefighters who are at risk for chronic respiratory disorders from active firefighting duty, as suggested by Rosenstock et al. [1990]. Many of these firefighters appear to remain in service in other job assignments and to remain on the roster rather than leaving the fire service entirely [Musk et al., 1977]. A related study of sickness absence among firefighters reaching mandatory retirement age, performed on the Calgary population, did not show exceptional or increasing absence from cardiopulmonary disorders, suggesting that those who remain in the fire service for an entire career are not at high risk [Guidotti, 1992].

It may be that some firefighters have developed respiratory symptoms, such as a cough, as a result of their employment, possibly because they are unusually susceptible, and leave the fire service rather than enter a protected job assignment. It seems unlikely that workers with less than 1 year service would leave for reasons of respiratory illness, however. Alternatively, firefighters who did not remain in the force beyond probation may constitute a selected group with a risk profile different from firefighters as a whole, related to their inability to finish probation or maintain strenuous employment. On the whole, we believe that this second explanation is more likely because firefighters with an exposure index of 0, meaning that they are unexposed, are at highest risk of all subgroups.

Other Malignancies

Of greatest interest among the positive findings in this study is the excess of cancer for bladder, kidney, and ureter. This combination suggests the possible influence of an excreted, urine-borne carcinogenic activity compatible with inhaled constituents of smoke, particularly polycyclic aromatic hydrocarbons. The timing of the excess of kidney and ureter cancer, especially, are suggestive of a cohort effect and a concentration of the risk among those sustaining the heaviest exposure and surviving to the longest latency periods observed. This observation is consistent with findings in other recent studies. [Vena and Fiedler, 1987; Sama et al., 1990] and suggests a risk additional to that of cigarette smoking [Sama et al., 1990].

The excesses we observed for cancer of the colon and rectum and for cancer of the bladder are not statistically significant, unlike those reported by Vena and Fiedler [1987]; likewise our findings for leukemia, lymphoma and myeloma are more modest than those reported by Heyer et al. [1990]. The actual SMRs we observed for these

sites were very similar to those they reported; however, 161 compared to their 183 for colon and rectum and 316 compared to their 286 for bladder. They did not report a significant excess for cancer of kidney and ureter; other recent studies have noted such an excess, however [L'Abbé and Tomlinson, 1992].

CONCLUSIONS

We conclude that the evidence from our cohort does not support a consistent causal association in modern times (since 1950) in our two urban populations between exposures resulting from employment as a firefighter and mortality from heart disease, and chronic obstructive pulmonary disease, despite the obvious and well-documented exposures to hazardous substances inherent in the occupation. There is a suggestion of an occupational effect for lung cancer among firefighters with more than 35 weighted years of exposure opportunity. The findings do not rule out a weak effect for lung cancer against the background risk of smoking but do not suggest a ureter do appear to be plausibly associated to occupational exposures, and our findings lend limited support to the reports of others of an excess in bladder and colon and rectal cancers. [Vena and Fiedler, 1987; Sama et al., 1990; Torling et al., 1990; Beaumont et al., 1991; L'Abbé and Tomlinson, 1992; Demers et al., 1992].

The results from this one study must be interpreted in the light of other, similar contemporary studies cited. We cannot rule out or confirm an occupational effect increasing the risk for lung cancer in the presence of a strong confounding effect from smoking. However, the predominant evidence from the studies cited appears to us to suggest a weak occupational effect against a strong background effect, as would be expected from the toxicology of inhaled combustion products [Guidotti and Clough, 1992].

We are more strongly persuaded that COPD is not a substantial occupational risk, probably because the inhalation effect associated with lung cancer is even more vital, generally unusual firefighting situations that individual firefighters in individual abnormalities following acute injury [Bergström et al., 1988; Guidotti and Clough, 1992]. Cardiovascular mortality does not appear to be substantially elevated in any major study or consistently elevated across studies including ours.

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An Epidemiologic Study of Cancer and Other Causes of Mortality in San Francisco Firefighters

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To test the hypothesis that firefighter exposures may increase cancer risk, mortality rates were calculated for 3,066 San Francisco Fire Department firefighters employed between 1940 and 1970. Vital status was ascertained through 1982, and observed and expected rates, rate ratios (RR), and 95% confidence intervals (CI) were computed using United States death rates for comparison. The total number deceased (1,186) was less than expected and there were fewer cancer deaths than expected. However, there were significant excess numbers of deaths from esophageal cancer (12 observed, 6 expected), cirrhosis and other liver diseases (59 observed, 26 expected), and accidental falls (21 observed, 11 expected). There were 24 line-of-duty deaths, which were primarily due to vehicular injury, falls, and asphyxiation. Heart disease and respiratory disease deaths occurred significantly less often than expected. It was concluded that the increased risks of death from esophageal cancer and cirrhosis and other liver diseases may have been due to firefighter exposures, alcohol consumption, or interaction between alcohol and exposures. Because this was an older cohort and firefighter exposures have changed due to the increasing use of synthetic materials, it is recommended that the effects of modern-day exposures be further studied.

Key words: combustion products, occupation, esophageal cancer, cirrhosis of liver, alcohol use, heart disease

INTRODUCTION

Firefighters are exposed to a variety of potential carcinogens, including polycyclic aromatic hydrocarbons (PAHs) in soots and tars, arsenic in wood preservatives, benzene and formaldehyde in wood smoke, asbestos in building insulation, and

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Mortality Among Fire Fighters in Metropolitan Toronto

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Fire fighters are exposed to substances which are recognized or suspected causal agents in cancer or heart disease. The purpose of this study was to determine whether or not fire fighters experience increased risk for any specific cause of death. A retrospective cohort study was conducted, with 5,995 subjects recruited from all six fire departments within Metropolitan Toronto. The mortality experience of the cohort was ascertained through computerized record linkage and compared to that of the male Ontario population specific to cause, age, and calendar period from 1950 through 1989. Average duration of follow-up was 21 years, and there were 777 deaths among the 5,414 males included in the analysis, giving an all-cause standardized mortality ratio of 95 (95% confidence interval: 88-102). Three specific causes of death exhibit statistically significant excesses (brain tumors, "other" malignant neoplasms, and aortic aneurysms). There are also slight increases in risk for some other sites of cancer, and for various diseases of the respiratory, circulatory, and digestive systems. This study is consistent with others in demonstrating that fire fighters experience increased risk of death from cancer of the brain, and in suggesting increased risk for various other causes of death.

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Key words: epidemiology, occupational risks, cohort, fire fighters, brain cancer, heart disease, record linkage

INTRODUCTION

Fire fighters are concerned about the potential health effects of exposures encountered in their profession. Although documentation of the prevalence of exposures which fire fighters experience is limited, existing information points to the potential for exposure to known and suspected carcinogens, and to situations and substances which may cause respiratory or cardiovascular reactions. Recognized or probable carcinogens to which fire fighters can be exposed include asbestos, benzene, diesel engine exhaust, ethylene oxide, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, among others [International Agency for Research on Cancer (IARC),

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