From John Burton's Workers' Compensation Resources

Workers' Compensation Policy Review

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Featured Topics

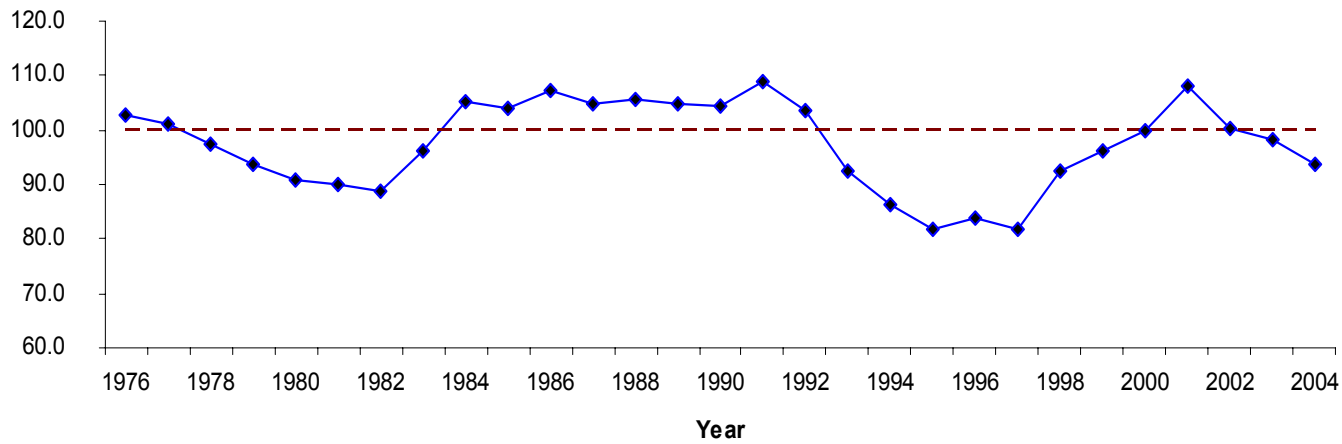
Summary of the Contents

Underwriting results for the workers' compensation insurance industry improved for the third year in a row, as discussed by Elizabeth Yates and John Burton. As shown in Figure A, the overall operating ratio, which is the most comprehensive measure of underwriting experience because it considers investment income, was 93.7 in 2004. This is a clear improvement from the overall operating ratios of 100.3 in 2002 and 98.4 in 2003.

When the overall operating ratio is greater than 100, carriers lose money even when investment income is considered. Conversely, an overall operating ratio of less than 100 means the industry is profitable when investment income is included. While the results for 2004 represent a significant improvement for the industry, the level of profitability of the mid-1990s has not been achieved.

The Institute for Work & Health (IWH), located in Toronto, conducts and shares research that promotes, protects, and improves the health of working people. Sandra Sinclair provides a report on the research and knowledge transfer activities of the IWH, which are far-ranging. Among the topics of ongoing interest to the IWH are the behavioral consequences for workers and employers of insurance and regulation; the measurement of work disability; the prevention of neck and back pain; and the effectiveness of return-to-work interventions.

Figure A
Overall Operating Ratio as a Percent of Premiums, 1976-2004



Note: The Overall Operating Ratio is the total of all underwriting expenses and income from investments as a percentage of premiums.

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(Membership on the Advisory Board does not constitute an endorsement of the contents of the *Workers' Compensation Policy Review.*)

Workers' Compensation Insurance Industry Increases Profitability in 2004

by Elizabeth Yates and John F. Burton, Jr.

The underwriting results for the workers' compensation insurance industry improved in 2004, according to results recently released by A.M. Best. The overall operating ratio, which is the most comprehensive measure of underwriting experience for insurance carriers, dropped from 98.4 in 2003 to 93.7 in 2004, as shown in Figure A and Table 1 (column (8)).

The overall operating ratio is calculated as (1) the total of all carrier expenditures (2) minus investment income (3) as a percentage of premiums.[1] When the overall operating ratio is greater than 100, carriers lose money even when investment income is considered. Conversely, an operating ratio of less than 100 indicates that the industry is profitable when investment income is included. The underwriting results mean the workers' compensation insurance industry improved from marginally profitable in 2003 to profitable in 2004.

Underwriting Results Vary Over Time

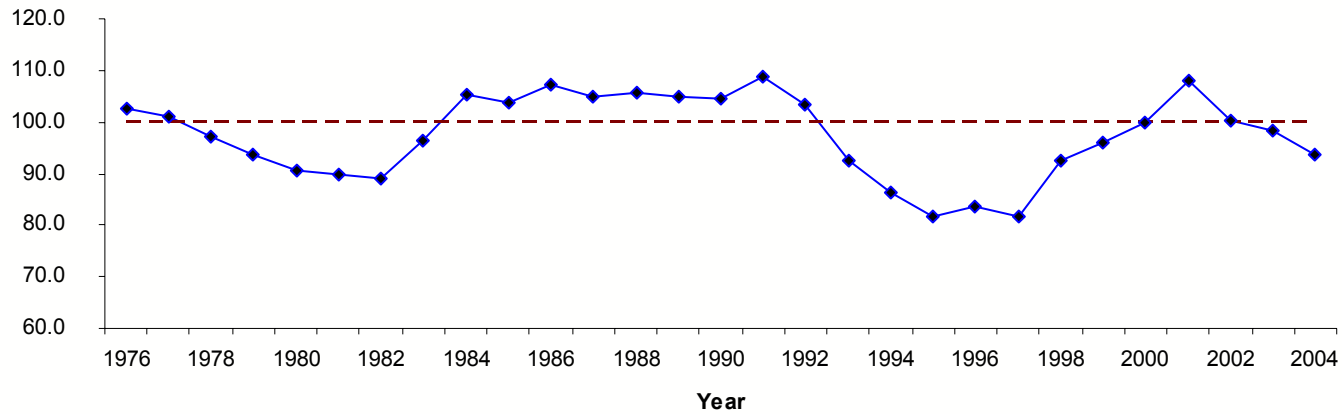
The overall operating ratio for the workers' compensation industry for 1976 to 2004 is shown in Figure A and Table 1, and the cyclical nature of profitability in the industry is evident. Two years of losses in 1976-1977 were followed by six years of profits through 1983. For example, the operating ratio was below 90 in 1981 and 1982, indicating that carriers had profits that exceeded $10 for every $100 of premiums in those years.

The workers' compensation insurance industry was then unprofitable in every year from 1984 to 1992. During this nine-year stretch of unfavorable results, carriers' losses ranged from $3.40 to $8.70 for every $100 of workers' compensation premiums. One result of this unfavorable experience is that the workers' compensation industry took the lead in "reform" efforts that reduced benefits and tightened eligibility standards in many states.[2] Also, because insurance regulators refused to allow insurance rates to increase as rapidly as losses in many jurisdictions, which resulted in underwriting losses in these states, workers' compensation carriers pursued and achieved deregulation of the workers' compensation insurance markets in most states.[3]

The results of deregulation and the various other reforms of workers' compensation in the early to mid-1990s are evident in the underwriting results for 1993 to 2000, when the overall operating ratio was less than 100 in every year. This was the longest string of profitable years for the workers' compensation insurance industry in the last half-century (and probably in the history of workers' compensation). The best years were 1995 to 1997, when on average carriers had profits of more than $17.00 per $100 of premium.

The underwriting experience of workers' compensation carriers deteriorated for several years after 1997. Indeed, between 1997 and 2001, the overall operating

Figure A
Overall Operating Ratio as a Percent of Premiums, 1976-2004



Note: The Overall Operating Ratio is the total of all underwriting expenses and income from investments as a percentage of premiums.

Table 1
Workers' Compensation Insurance Underwriting Experience, 1973-2004

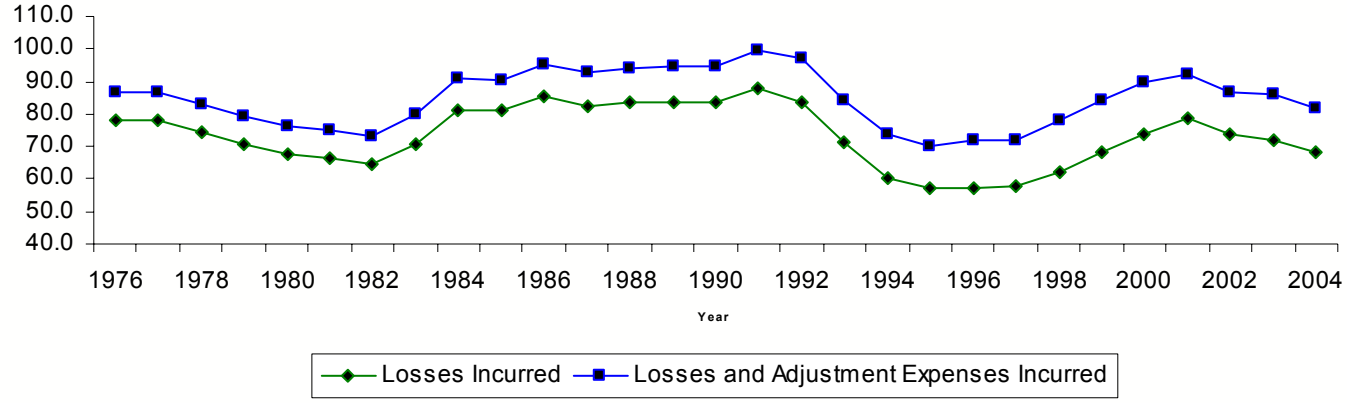
Year	Losses Incurred* (1)	Loss Adjustment Expenses* (2)	Losses and Adjustment Expenses Incurred* (3)	Underwriting Expenses Incurred** (4)	Dividends to Policyholders* (5)	Combined Ratio After Dividends (6)	Net Inv. Gain/Loss and Other Income* (7)	Overall Operating Ratio (8)
1973	68.5	8.5	77.0	19.8				
1974	71.6	8.7	80.3	19.6				
1975	74.0	8.2	82.2	18.9	6.3	107.4		
1976	78.2	8.4	86.6	17.6	5.4	109.6	6.9	102.6
1977	78.0	8.9	86.9	16.7	5.1	108.6	7.4	101.2
1978	74.4	8.7	83.0	16.4	5.6	105.0	7.8	97.2
1979	70.4	9.2	79.6	16.8	6.5	103.0	9.2	93.7
1980	67.6	8.4	76.1	17.4	8.0	101.4	10.8	90.7
1981	66.1	9.0	75.1	19.0	8.7	102.8	13.0	89.8
1982	64.3	9.1	73.4	20.6	9.9	103.9	15.0	88.9
1983	70.6	9.2	79.9	22.0	10.6	112.5	16.2	96.3
1984	81.0	9.8	90.8	21.2	9.9	121.9	16.7	105.2
1985	81.0	9.5	90.5	19.0	9.3	118.8	15.0	103.8
1986	85.4	10.2	95.5	18.0	7.6	121.1	13.7	107.4
1987	82.2	10.9	93.1	18.0	6.4	117.6	12.8	104.8
1988	83.4	10.8	94.2	17.8	6.4	118.4	12.7	105.7
1989	83.3	11.4	94.7	17.4	6.1	118.2	13.4	104.8
1990	83.8	10.7	94.6	17.6	5.1	117.4	13.0	104.4
1991	87.8	11.5	99.3	18.5	4.9	122.6	14.0	108.7
1992	83.9	13.2	97.1	19.8	4.6	121.5	18.1	103.4
1993	71.6	12.4	84.0	20.4	4.7	109.1	16.7	92.4
1994	60.5	13.1	73.6	21.0	7.0	101.6	15.1	86.4
1995	57.0	12.8	69.8	22.7	6.9	99.5	17.7	81.8
1996	57.5	14.5	72.1	24.9	5.4	102.4	18.6	83.8
1997	57.8	14.2	72.1	25.6	6.0	103.7	21.9	81.8
1998	62.0	16.2	78.2	26.3	6.6	111.2	18.6	92.6
1999	68.0	16.2	84.2	27.5	6.7	118.5	22.4	96.1
2000	73.5	16.0	89.5	25.8	5.4	120.7	20.9	99.8
2001	78.9	13.6	92.4	25.0	3.5	120.9	12.8	108.1
2002	73.8	13.1	86.9	22.5	2.6	112.1	11.7	100.3
2003	72.0	14.1	86.1	21.0	1.4	108.5	10.1	98.4
2004	68.4	13.5	81.9	21.5	1.4	104.9	11.2	93.7

Source:
Best's Aggregate & Averages Property/Casualty, 2005 and prior Editions, © A.M. Best Company - used with permission. Data for years 1994 - 2004 updated to reflect values from 2005 Edition.

Notes:
Losses Incurred (also termed the pure loss ratio) (1) plus Loss Adjustment Expenses (2) equals Losses and Adjustment Expenses Incurred (3). Losses and Adjustment Expenses Incurred (3) plus Total Underwriting Expenses Incurred (4) plus Dividends to Policy Holders (5) equals Combined Ratio after Dividends (6). Combined Ratio after Dividends (6) minus Net Investment Gain/Loss and Other Income (7) equals Overall Operating Ratio (8). As of 1992, the methodology for allocating investment income changed slightly; as a result, 1992-2001 numbers in the last two columns are not directly comparable to those for earlier years.

* Percentage of net premiums earned ** Percentage of net premiums written

Figure B
Losses Incurred and Losses and Adjustment Expenses Incurred as Percent of Premiums, 1976-2004



ratio jumped 26 points, which is the most rapid rate of deterioration during the period covered by the data in Figure A (namely 1976 to 2004). Moreover, the overall operating ratio of 108.1 in 2001 indicates the underwriting losses in that year were worse than in any other year for which data are available. The reduction in the overall operating ratio from 108.1 in 2001 to 100.3 in 2002 brought the industry to essentially a break-even point in that year. A further decline in that ratio in 2003 to 98.4 returned the industry to a profitable position for the first time since 2000. The overall operating ratio of 93.7 for 2004 is the lowest, and most profitable, since 1998, as carriers had profits of $6.30 per $100 of premium last year.

A full explanation of the deterioration in the underwriting experience between 1997 and 2001 is beyond the scope of this article.[4] However, there is one fundamental difference between the adverse experience of the late 1980s and early 1990s and the deteriorating profitability between 1997 and 2001. In the earlier period, benefits paid to workers were increasing rapidly, while this was not true from 1997 to 2001. In 1984, benefits paid to workers were 1.21 percent of payroll and continued to climb until 1992, when they peaked at 1.68 percent of payroll. Then benefits as a percent of payroll decreased every year through 2000, when they were 1.04 percent of payroll, before increasing slightly to 1.07 percent of payroll in 2001.[5]

The rapid improvement in underwriting experience between 2001 (when the overall operating ratio was 108.1) and 2004 (when the ratio was 93.7) is also beyond the scope of this article. The data provide further

Figure C
Underwriting Expenses Incurred as a Percent of Premiums, 1976-2004

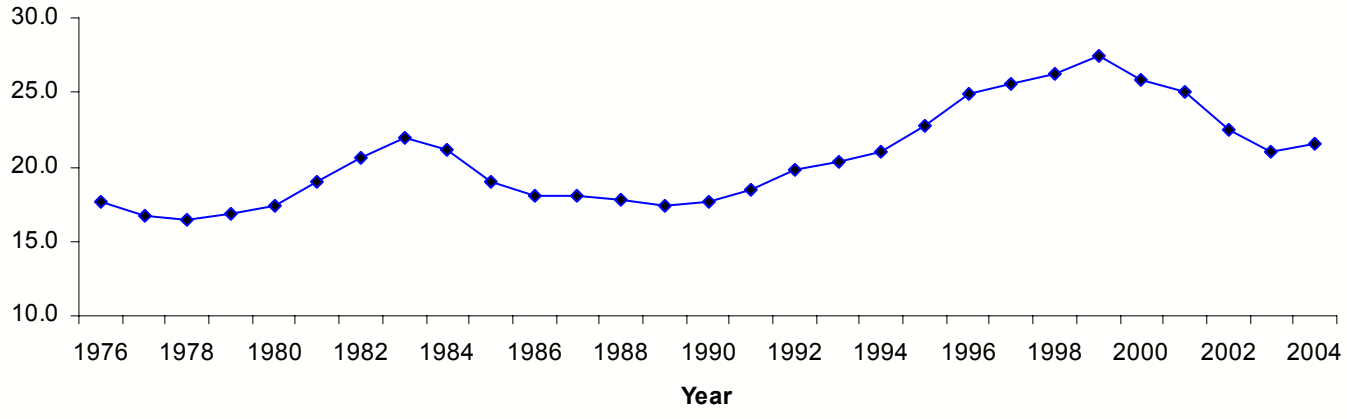
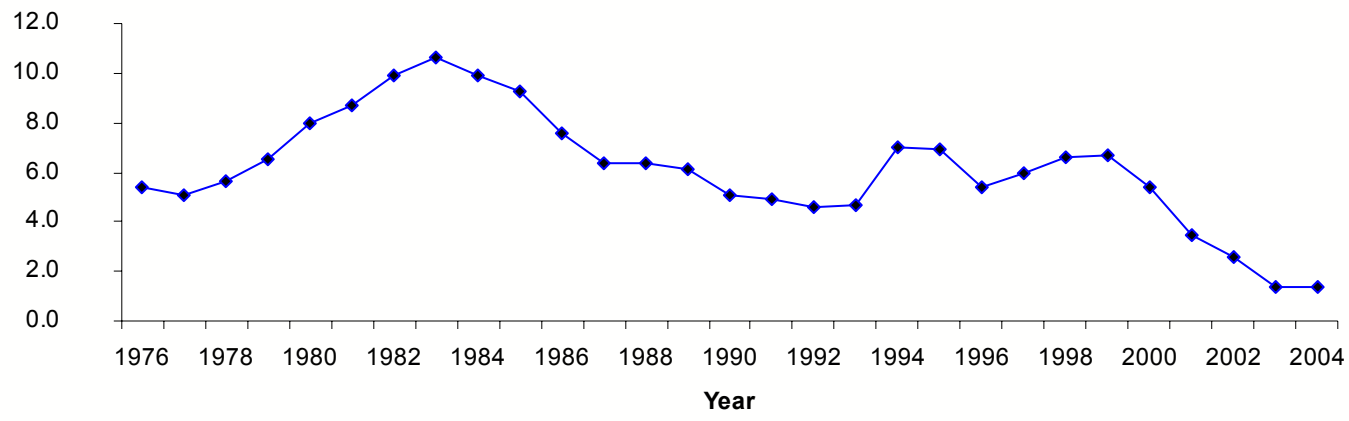


Figure D
Dividends to Policyholders as Percent of Premiums, 1976-2004



evidence of the lack of correspondence between underwriting results and benefits paid, which increased from 1.07 percent of payroll in 2001 to 1.16 percent of payroll in 2003 (Sengupta, Reno, and Burton 2005, Table 12).

Components of the Overall Operating Ratio

The loss ratio is incurred losses as a percentage of premiums.[6] When premiums drop more rapidly than losses (or when premiums increase less rapidly than losses), the loss ratio will increase. As shown in Figure B and Table 1 (column 1), the loss ratio increased rapidly from 57.8 percent in 1997 to 78.9 percent in 2001, and then plummeted to 68.4 percent in 2004.

The total of incurred losses and incurred loss adjustment expenses is also shown in Figure B and in Table 1 (column 3). The difference between the two lines in Figure B is incurred loss adjustment expenses, which are also shown in Table 1 (column 2). Loss adjustment expenses include the cost of processing claims. From 1973 to 1985, loss adjustment expenses were always less than 10 percent of premium, but they have been at least 13 percent in every year but two since 1992. Loss adjustment expenses were 16 percent or higher in 1998 to 2000, before declining to 13.6 percent in 2001 and 13.1 percent in 2002. Loss adjustment expenses then crept back up to 14.1 percent in 2003 and back down to 13.5 percent in 2004. The higher loss adjustment expenses since the early 1990s compared to earlier years reflect in part the more intensive efforts to manage health care costs for disabled workers.

Figure E
Combined Ratio After Dividends as Percent of Premiums, 1976-2004

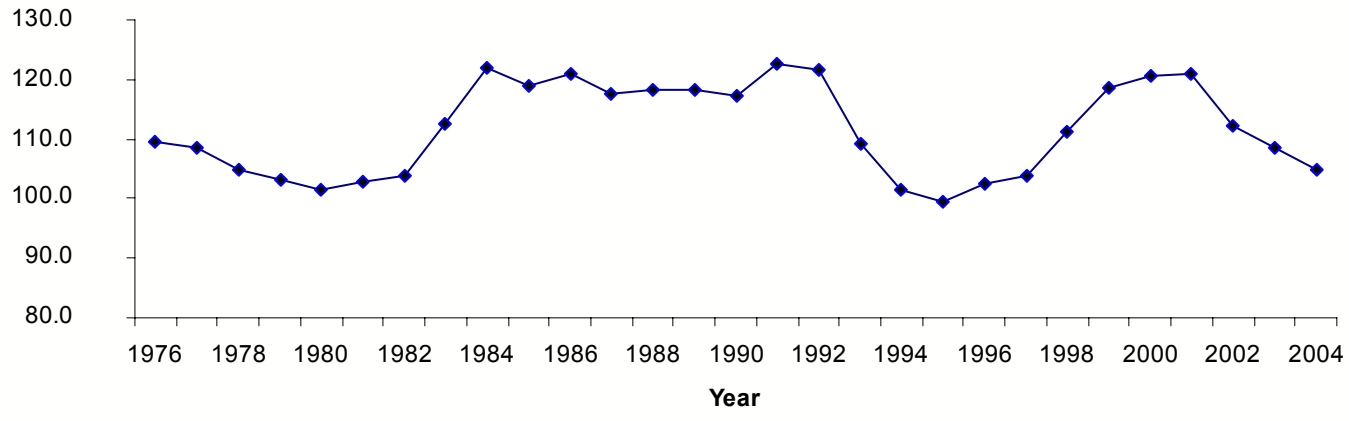
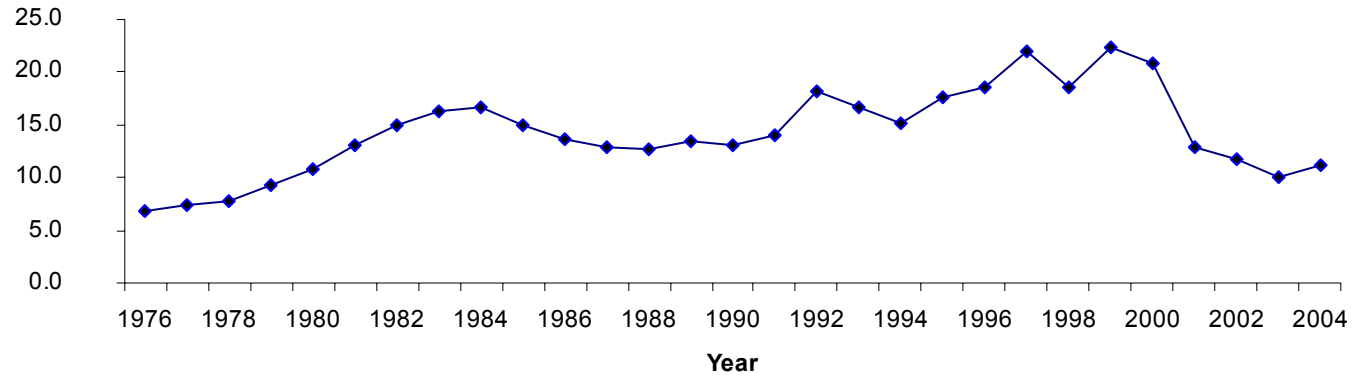


Figure F
Net Investment Gain/Loss and Other Income as Percent of Premiums, 1976-2004

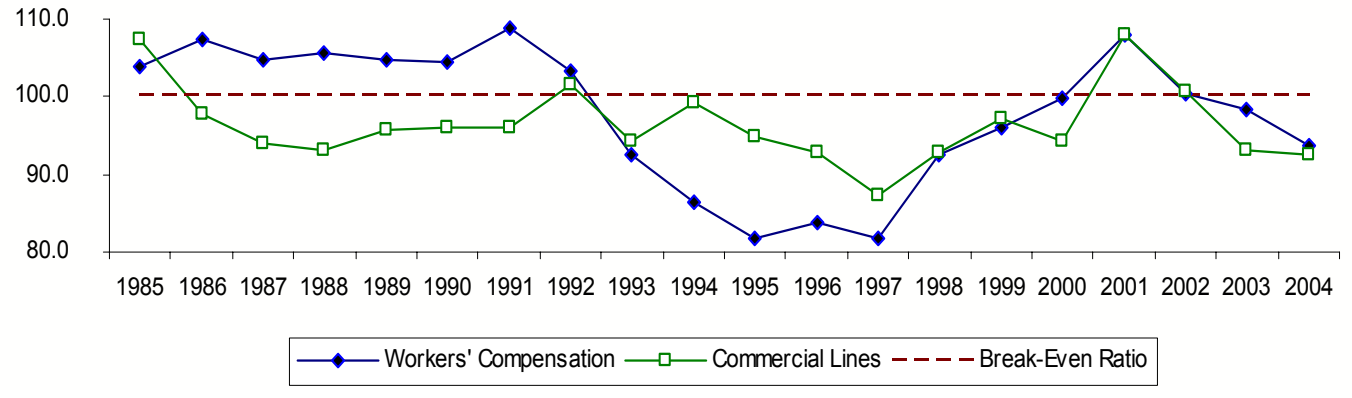


Underwriting expenses incurred as a percent of premiums are shown in Figure C and Table 1 (column 4). These expenses, which include commissions and broker fees, have also generally increased over time. Between 1973 and 1992, underwriting expenses were greater than 20 percent of premium only thrice; since 1993, underwriting expenses have been 20 percent or greater in every year. However, after averaging 27 percent of premium in 1998 to 2001, underwriting expenses dropped to 22.5 percent of premium in 2002 and further to 21.0 percent of premium in 2003, before creeping back up to 21.5 in 2004.

Dividends as a percent of premiums are presented in Figure D and Table 1 (column 5). Prior to deregulation of the workers' compensation insurance markets in recent decades, carriers were limited in their ability to compete by lowering insurance rates at the beginning of the policy period. However, both mutual and stock companies could compete by offering policies that paid dividends to policyholders after the policy period. In the early 1980s, dividends ranged from 8.0 to 10.6 percent of premiums. Since 1990, dividends have never exceeded 7.0 percent of premiums. Dividends averaged less than four percent of premiums in 2000 to 2003, reaching their lowest point in 2003 for the then 29 years of available data at a mere 1.4 percent of premiums, and remained at this minimal level in 2004.

The combined ratio after dividends is presented in Figure E and Table 1 (column 6). The combined ratio is the sum of the loss ratio (column 1), loss adjustment expenses (column 2), underwriting expenses (column 3), and dividends (column 4). When the combined ratio

Figure G
Overall Operating Ratio as Percent of Premiums, Workers' Compenstion and Commercial Lines, 1985-2004



exceeds 100 percent, insurers lose money on their underwriting experience because premiums are not adequate to cover losses and expenses. As shown in Figure E, the combined ratio exceeded 100 percent in every year between 1975 and 1994, and was greater than 110 percent in every year from 1983 to 1992. The combined ratio then dropped sharply after 1992 until reaching a low of 99.5 in 1995. The combined ratio deteriorated (increased) in every year between 1995 and 2001, reaching 120.9 percent in 2001 and averaging nearly 118 percent in 1998 to 2001. Restated, for every $100 of premium received by workers' compensation carriers in 1998 to 2001, there was an average of almost $118 of losses, loss adjustment expenses, underwriting expenses, and dividends. The combined ratio then dropped sharply to 112.2 in 2002 and again to 108.5 in 2003. A further improvement to 104.9 in 2004 made this the best result since 1997.

The combined ratio after dividends provides an incomplete report on the underwriting experience in the workers' compensation insurance market, however, because no account is taken on investment gains (or losses) and other income received by workers' compensation carriers. Net investment gains (or losses) and other income as a percent of premium ("net investment income") are shown in Figure F and Table 1 (column 7). From 1981 to 2001, net investment income was at least l2 percent of premium in every year. Net investment income dropped below 12 percent in 2002 to 11.7 percent and then dropped further to the lowest rate since 1979 at 10.1 percent in 2003. Net investment income recovered slightly to 11.2 in 2004. The rapid decline of net investment income from an average of 22 percent in 1999 and 2000 reflects the low interest rates and dismal stock market performance in recent years.

Table 2
Underwriting Experience, Workers' Compensation and Commercial Lines, 1991-2004

Year	Overall Operating Ratio-Workers' Compensation	Overall Operating Ratio-Commercial Lines
1976	102.6	
1977	101.2	
1978	97.2	
1979	93.7	
1980	90.7	
1981	89.8	
1982	88.9	
1983	96.3	
1984	105.2	
1985	103.8	107.5
1986	107.4	97.7
1987	104.8	93.9
1988	105.7	93.2
1989	104.8	95.7
1990	104.4	95.9
1991	108.7	96.0
1992	103.4	101.5
1993	92.4	94.2
1994	86.4	99.2
1995	81.8	95.0
1996	83.8	92.7
1997	81.8	87.2
1998	92.6	92.8
1999	96.1	97.2
2000	99.8	94.3
2001	108.1	108.0
2002	100.3	100.6
2003	98.4	93.2
2004	93.7	92.6

Source:
Best's Aggregate & Averages Property/Casualty, 2005 and prior Editions, © A.M. Best Company - used with permission. Data for years 1994 - 2004 updated to reflect values from 2005 Edition.

Notes:
The Overall Operating Ratio is the total of all underwriting expenses and income from investments as a percentage of premiums.
"Commercial Lines" includes all insurance lines except passenger auto and homeowner multiples peril insurance.

Comparison to Other Insurance Lines

The overall operating ratio of workers' compensation is compared to all commercial lines of insurance for 1985 to 2004 in Figure G and Table 2. The comparison reinforces the impression of the volatility of the underwriting results in the workers' compensation insurance industry. The workers' compensation industry had smaller losses (a lower operating ratio) than other commercial lines in 1985; workers' compensation had losses (overall operating ratios were in excess of 100) while other commercial lines were profitable (overall operating ratios were less than 100) from 1986 until 1991; workers' compensation had greater losses than other commercial lines in 1992; workers' compensation was more profitable (a lower overall operating ratio) than other lines from 1993 to 1999; workers' compensation was profitable but less so than other lines in 2000; workers' compensation had losses that slightly exceeded those in other commercial lines in 2001; and workers' compensation had losses that were slightly lower than the losses in other commercial lines in 2002. Both workers' compensation and other commercial lines of insurance returned to a profitable overall operating ratio in 2003, but workers' compensation was less profitable than the other lines. Profitability continued to improve in 2004 for workers' compensation and other lines of commercial insurance, with workers' compensation still slightly less profitable than these other lines.

Analysis

The deterioration in the underwriting results in workers' compensation insurance between 1997 and 2001 was reversed in 2002, although the industry was still unprofitable. The efforts to improve underwriting results were rewarded in 2003, when the workers' compensation insurance industry achieved profitability for the first time since 2000. This trend continued for 2004. Losses decreased in 2004 as did loss adjustment expenses, with the sum of losses and adjustment expenses being at their lowest level since 1999. Underwriting expenses relative to premiums and dividends were also down in 2004, and net investment gains improved slightly. The combined effects of these developments resulted in the 6.3 percent profit experienced by workers' compensation insurers in 2004. This level of profitability may still mean that the workers' compensation insurance industry is relatively unprofitable compared to other lines of insurance, but at least workers' compensation carriers can take comfort in the overall trend of profitability. The improved underwriting results should also reduce the underlying pressures on carriers to increase insurance rates and to support regressive legislative changes.

ENDNOTES

1. More complete definitions of the overall operating ratio are provided subsequently in the text and the notes to Table 1.

2. The reform efforts are examined in Spieler and Burton (1998).

3. The deregulation of the workers' compensation insurance market is examined in Thomason, Schmidle, and Burton (2001a: 39-43).

4. One possible explanation of the adverse underwriting results in the last five years is that the high profitability of the industry in the mid- and late- 1990s attracted more capital to the workers' compensation industry, which in turn led to increasing competition. As a result of deregulation, the competition was less constrained than in the period of administered pricing, which facilitated vigorous price competition in recent years. Thomason, Schmidle, and Burton (2001b: 5) report that the most comprehensive form of deregulation – lost cost systems that do not require prior approval by regulators of rates promulgated by carriers – is, on average, associated with about an 11 percent reduction in the employers' costs of workers' compensation insurance.

5. The 1984 result for benefits paid to workers as a percent of payroll is from Thomason, Schmidle, and Burton (2001a: Table A.1). The 1992, 2000, and 2001 results are from Sengupta, Reno, and Burton (2005: Table 12).

6. Incurred losses include paid losses plus reserves for future losses for injuries or diseases that have already occurred. An extended discussion of insurance terminology is included in Thomason, Schmidle, and Burton (2001a, Appendix B).

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The Institute for Work & Health: A Report on Research Activities

by Sandra Sinclair

I. INTRODUCTION

A. Brief History

The Institute for Work & Health, which is located in Toronto, Ontario, Canada, is an independent not-for-profit organization whose mission is to conduct and share research with workers, labour, employers and policymakers to promote, protect and improve the health of working people. It is a unique transdisciplinary research and knowledge transfer and exchange organization, well integrated into Canadian research and practitioner communities and recognized internationally for its contribution to the fields of occupational health and work-related population health research.

In the late 1980s the need for an independent research organization in the area of workplace health and disability was recognized by the senior leadership of the of the provincial workers' compensation agency, the Ontario Workers' Compensation Board (WCB). The result was the Ontario Workers' Compensation Institute (OCWI) created in 1990. Its mandate was to conduct healthcare research into the management of workers with injury and disease, to contribute new knowledge to the training of medical rehabilitation professionals, and to monitor the quality of the WCB's community-based rehabilitation services through an accreditation process. Over the years the scope of the Institute's research has broadened to include the study of factors underlying the incidence of workplace injury and disability and the relationship between work and health. In 1994 it was renamed the Institute for Work and Health to reflect these developments.

About the Author

Sandra Sinclair is Director of Operations and Associate Scientist at the Institute for Work and Health in Toronto and is also an Assistant Professor (part-time) at the School of Rehabilitation Sciences at McMaster University. Sandra holds a Master of Science Degree in Design, Measurement, and Evaluation (DME) from McMaster University and a diploma in Physical and Occupational Therapy from the University of Toronto. She also received her undergraduate degree from the University of Toronto.

After working as a clinician for several years, Sinclair gained experience in policy research and program evaluation at the Ontario Workplace Safety & Insurance Board. There she developed both an in-depth knowledge of the workers' compensation system and a particular interest in work-related health and disability issues.

In recent years, Sandra and I have served on the International Steering Committee for the International Congress on Work Injuries: Prevention, Rehabilitation, and Compensation, which most recently met in Rome in 2004. She is a member of the Workers' Compensation Research Group and of the Advisory Board for the *Workers' Compensation Policy Review*.

Her research interests are in evidence-based practice, the effectiveness of rehabilitation and other factors influencing return to work, and the measurement of non-economic losses resulting from workplace injuries. I was pleased to serve as a co-author with Sandra of a chapter published in 1995 on the "Development of a Schedule for Compensation of Non-Economic Loss: Quality-of-Life Values vs. Clinical Impairment Ratings," which was included in Terry Thomason and Richard Chaykowski, eds., *Research in Canadian Workers' Compensation* (Queen's University Press).

I appreciate the time and effort Sandra devoted to the preparation of this article describing the activities of the Institute for Work and Health, which I regard as the premier research organization on workplace safety and health in North America. (In the interest of full disclosure, I must report that I am a member of the Scientific Advisory Committee for the IWH.)

John Burton

B. Research

More specifically, the Institute's research involves a transdisciplinary approach to a range of occupational health and safety matters, particularly the prevention of injury and disability, the effectiveness of treatment modalities, and factors influencing the safety, timeliness, and permanence of return to work. Institute scientists have a special interest in work-related musculoskeletal conditions (which constitute approximately 70 percent of disability compensation claims involving time lost from injury) and have acquired considerable expertise in this field. There is also emerging interest in the areas of mental health and stress in the workplace. They also investigate broader matters such as labour market experiences and their population health consequences, and conduct research on the design of disability compensation schemes and their behavioural consequences. Since 1990 the Institute has provided research and other evidence-based products to inform and assist clinicians, policymakers, employers, labour, and other researchers. It also provides evidence to support the policy development processes of federal and provincial institutions and other organizations in Canada. Although not a degree granting institution it provides training and mentorship for the next generation of work and health researchers by sponsoring Masters and PhD students and Post-doctoral fellows.

C. Knowledge Transfer & Exchange

In 1998, knowledge transfer and exchange was established at the Institute as a core business alongside research. An evidence-based research transfer strategy was developed and implemented in early 2000. The goal of the Institute's Knowledge Transfer and Exchange (KTE) activity is to place research knowledge in the hands of key decision makers in a timely, accessible, and useful manner using a wide range of strategies and collaborations with partners in the prevention system. The Institute considers Knowledge Transfer & Exchange to be a process by which relevant research information is made available and accessible for practice, planning, and policy-making through interactive engagement with stakeholders. Stakeholders are frequently involved early in the research process to provide researchers with audience intelligence to help shape the research questions and provide information about the context in which research results are likely to be used. Stakeholders may also be involved while the research is under way and at the message extraction stage when the research has been completed. The target audiences for the Institute include policymakers (e.g., federal and provincial governments), third party payers (such as the workers' compensation agency, the Workplace Safety & Insurance Board -- WSIB), workplace parties (labour and employers), and clinicians.

The KTE process is supported by user-friendly materials and a corporate communications strategy that enhances both the Institute's ability to communicate effectively with its stakeholders and its ability to receive their messages about content, timeliness and applicability. The communication tools include corporate newsletters, the IWH website, media relations, special events and the promotion of specific products such as booklets and workshops. In addition KTE actively builds its audiences' capacity to understand and use research evidence in their own programming, planning, and decision-making.

D. Governance

The Institute for Work & Health is an incorporated not-for-profit organization. Created through a master agreement with the workers' compensation agency (WSIB), the Institute is governed by an independent 12 person Board of Directors that provides policy guidance on strategic issues to the President and oversees financial affairs. The Board membership is composed of senior business, labour, and academic leaders. (http://www.iwh.on.ca/about/bod.php)

Oversight of the Institute's research program is delegated to the Scientific Advisory Committee (SAC), a subcommittee of the Institute's Board. The SAC is a panel of up to 12 senior national and international scientists which meets annually to advise on the direction, scope, and focus of the Institute's research and to champion the Institute's commitment to the investigation of the broad determinants of health in working populations. (http://www.iwh.on.ca/about/sac.php)

E. Funding

The Workplace Safety and Insurance Board remains the Institute's primary funder and has maintained this relationship through its master agreement over the past 15 years. In addition, IWH researchers attract numerous grants and research contracts each year. As the Institute has grown, so has its success in achieving peer review funding from national and international agencies including the Canadian Institutes for Health Research, the US National Institute of Occupational Safety and Health, and the Swedish Academy for Technology Assessment. Of a $7.4 M budget in 2005, $2.4 M is peer reviewed and contract research funding. Approximately 80 percent of funding is devoted to research, 15 percent to Knowledge Transfer and Exchange, and the remainder to administration.

Programs	Themes
Population/Workforce Studies	Behavioural consequences of insurance and regulation Labour market experiences and health
Workplace Studies	(The thematic structure of this Program is under review)
Health Services Research	Measurement of health and function Epidemiology of disability Evidence-based practice Prevention of work disability
Data and Information Systems	Statistical methods and data tools

F. Staffing

The Institute staff complement has also grown significant growth from an initial cadre of 6 in 1990 to over 90 full- and part-time employees in 2005. This includes close to 20 scientists in a wide range of disciplines (e.g. epidemiology, medicine and allied health professions, sociology, economics, occupational health, psychology, anthropology, and ergonomics), research associates, graduate students, knowledge transfer specialists, plus corporate and administrative support staff. (http://www.iwh.on.ca/about/leadership.php, http://www.iwh.on.ca/about/staff_bios.php)

G. Adjunct Scientists

In addition to the scientific staff employed there, the Institute also has a special adjunct appointment relationship with over 20 local and international scientists. The adjunct designation is conferred on a collaborating researcher who is making a sustained contribution to the success of an Institute program. (http://www.iwh.on.ca/about/adjunct.php)

H. External Relations and Collaboration

Through its scientists, affiliates, and at the institutional level, there is a rich network of national and international collaboration with universities and other research organizations as well as social insurance agencies. These include, for example, EMGO, HVBG, NIOSH, and Cochrane Collaboration. Scientists and policymakers from around the world continue to visit the Institute to consult and study. Locally, the Institute has affiliation agreements with the University of Toronto, University of Waterloo, McMaster University, and York University. These agreements facilitate the sharing of information and ideas, databases, and access to research personnel between the Institute and each of the four universities.

II. RESEARCH THEMES AND PROJECTS

The Institute's Research Department is organized in four Programs: the Population/Workforce Program, the Workplace Studies Program, the Health Services Research Program, and the Data and Information Systems Program. These programs exist primarily for internal organizational purposes. Each comprises a set of projects organized into cross cutting themes. These themes bring together research topics and methods that have substantial elements in common.

To provide a more detailed view of the work on the Institute we give a brief description of each of the eight themes followed by a summary of a couple of projects highlighted from each theme. The list of other projects in each theme and a web address for further information are also included at the end of each section.

A. Behavioural Consequences of Insurance and Regulation

Over the last two decades, workers' compensation jurisdictions across North America have experienced substantial declines in injury claim rates, yet in many of these jurisdictions, the costs of workers' compensation and other disability insurance programs have steadily increased. The goal of this research theme is to identify factors driving these trends, and to understand the relative impact of prevention incentives offered to workplaces in the design of insurance programs and by occupational health and safety regulation. These are important policy questions that warrant critical research attention to support evidence-based policy development.

Providing adequate and equitable benefits to workers who experience a work-related injury, while simultaneously providing affordable insurance to employers, is a fundamental social objective of the historic compro-

mise that gave rise to workers' compensation insurance. Fulfilling this objective is a complex and challenging task. Researchers and policymakers have much to learn about designing programs that provide incentives for employers, workers, and other stakeholders to give appropriate attention to prevention, effective and optimal care, and timely and safe return-to-work. Responding to this policy challenge, Institute scientists have established a comprehensive research program on the behavioural consequences of insurance and regulation.

A.1. WSIB Lost-time Injuries and Income Sources Post-injury

Overview: The first phase of the project examines the adequacy and equity of income benefits under two different permanent disability workers' compensation benefit programs in Ontario. It will also examine changes in family and individual income and family formation/dissolution patterns after injury. Currently, we have completed the analysis of the data on adequacy and equity in the Ontario programs and have initiated additional analyses to examine post-accident income sources and amounts at the family level, and family formation/dissolution patterns. In the second phase we will investigate the post-accident earnings experiences of individuals sustaining a temporary work disability arising from a work-related accident. In the third phase we will investigate cross-jurisdictional differences in program adequacy and equity for a similar population using data from British Columbia and possibly several U.S. jurisdictions.

Results: The results to date relate to the adequacy and equity of two long term disability income loss programs in Ontario, one in existence prior to 1990, based on degree of permanent impairment sustained by the worker (Permanent Disability - PD), and the other which came into effect after 1990, based on future loss of earnings capacity (future economic loss/non-economic loss - FEL/NEL).

We found that the pre-1990 impairment-based system was neither as adequate nor as equitable as the post-1990 dual awards program. Specifically, the FEL/NEL program was closer to reaching the target of restoring 90 percent of pre-accident earnings overall, and provided higher levels of replacement rates for older individuals (individuals older than 35 in the accident year). However, this older age group had lower replacement rates in both the PD and FEL/NEL programs. This was partly due to the fact that they had higher pre-accident earnings than the younger group but received lower levels of benefits. It is not possible to determine why this was the case from the data, since benefit determination is based on earnings capacity, whereas what we observe is actual earnings.

In summary, the study showed that when 90 percent wage replacement (after taxes) is used as a measure of adequacy, benefits were less than adequate for the pre-1990 claimants over 35 years of age. Wage replacement rates were between 57 percent and 75 percent of pre-accident earnings. For workers who sustained permanent disability after 1990, the program benefits were closer to the 90 percent replacement target (71 percent to 85 percent) but were still less than fully adequate for claimants over 35.

Although the PD program would have been less costly to operate in the post-1990 period in terms of core benefits, it is generally agreed that these benefits were inadequate and inequitable, and hence required supplemental benefits. The costs of remedying the short-falls of core benefits through supplementary benefits under the PD program will be significantly higher than the costs of the FEL/NEL program, and would still potentially be less adequate according to our analysis of claimants from the two programs. Overall, no aspect of the PD program reviewed in this study (i.e., earnings recovery, benefits adequacy and equity, and program cost) out-performed the FEL/NEL program.

Impact: The findings from all of these initiatives will be of interest to representatives of workers, representatives of employers and to benefits policy staff in provincial and federal social protection programs. The comparison of benefit adequacy and equity will be of interest to disability insurance providers across Canada and internationally. The importance of this type of analysis is underscored by a recent award of a three year grant to Institute researchers from the U.S. National Institute for Occupational Safety and Health and by the invitation to participate in work to evaluate the changes in the benefits policy including permanent disability benefits in the British Columbia workers' compensation system.

Publications:

Tompa E, Mustard CA, Sinclair S, Trevithick S, Vidmar M. (2003) Post-accident earnings and benefits adequacy and equity of Ontario workers sustaining a permanent impairment from workplace accidents. (IWH Working Paper #210)

Tompa E, Mustard CA, Sinclair S, Trevithick S, Vidmar M. (2003) Post-accident earnings and benefits adequacy and equity: an evaluation of the pre-1990 Ontario permanent disability program. (IWH Working Paper #210A)

Tompa E, Mustard CA, Sinclair S, Trevithick S, Vidmar M. (2003) Post-accident earnings and benefits

adequacy and equity: an evaluation of the post-1990 Ontario permanent disability program. (IWH Working Paper #210B)

A.2. Systematic Review of the Literature on Workers' Compensation System and Occupational Health and Safety Features and their Consequences for Work-related Injury Experiences

Overview: In late 2003 we completed a systematic literature review of the empirical research on workers' compensation system design features and their consequences for injury experiences. The review focused on initiatives directed at employer behaviour such as experience rating, insurance options, and occupational health and safety regulation enforcement. The results were shared with the WSIB, Ontario Ministry of Labour and other policymakers during this past year. A second phase, in 2005, will disseminate results to workers' compensation boards across Canada and the United States and ministries/departments of labour in the USA and internationally.

Results: This review summarized more that 50 quality studies and yielded "moderate" evidence that the degree of experience rating reduces the frequency and/or severity of injuries. There was no evidence of general and specific deterrence of thorough inspections or general deterrence of citations/penalties. However, there was strong evidence that actual citations and penalties reduce frequency and /or severity of injuries.

Impact: In 2004 several Canadian provincial ministries of labour indicated that they were finding this report of value in policy/program development. The Ontario Ministry of Labour which was coincidentally undertaking a policy review of the inspectorate function in this province subsequently announced a significant increase in the number of inspectors (200) who audit workplaces for compliance with occupational health and safety standards. The review found limited evidence that inspections without penalty or enforcement resulted in the frequency or severity of workplace injuries. However, there was strong evidence in the international literature that the imposition of orders, citations, or fines following inspections did result in a reduction in both frequency and/or severity of injuries.

This literature synthesis is the first in this field to date. It is expected to be of particular interest to policymakers in workers' compensation boards, others working with disability compensation programs and employment-income replacement programs, health services researchers and program administrators, and researchers interested in methodological issues related to investigating program design effects. The broader dissemination of these findings planned for 2005 lays the ground work for future research and knowledge exchange as part of the Institute's ongoing interest in the consequences of policy and regulation.

Publications:

Tompa E, Trevithick S, McLeod C. (2003) A systematic review of the prevention incentives of insurance and regulatory mechanism for occupational health and safety. Submitted: Journal of Human Resources (IWH Working Paper #213) The Working Paper can be found at: http://www.iwh.on.ca/products/wp_order.php

A.3. Other projects on Behavioural consequences of Insurance & Regulation

Understanding Disability Insurance in Canada: Issues and Research Opportunities - http://www.iwh.on.ca/research/BCIR-projects.php#reforming

The Impact of Experience Rating and Occupational Health and Safety on Claims Experiences in Ontario - http://www.iwh.on.ca/research/BCIR-projects.php#impact

B. Labour Market Experiences and Health

Two broad dimensions of labour market activity characterize this theme: work availability and the nature of work. Availability includes such phenomena as employment and unemployment, working time, and job security. The nature of work relates to the actual work done: such elements as job characteristics, position in firm or occupational hierarchy, and other organizational characteristics. Global economic integration and rapid technological change have brought about many changes in labour markets, including changes in these two broad dimensions, as employers adopt arrangements like "flexible staffing" and/or vary the size/ number of task-related demands on workers.

B.1 Work Injuries and Teens /Prevalence and Determinants of Work-related Injuries Among Young Workers in Ontario & British Columbia

Overview: A growing body of research suggests that both the incidence rates and the types of occupational injuries in young workers (i.e., workers 12 to 19 years of age) are different from those in adults. A number of environmental and individual factors may account for this. Young workers occupy a particular niche in the North American labour market that is characterized by part-time, temporary work, and concentration in particular jobs and industries. In addition, developmental factors may play a prominent role in young workers'

risk. The Institute has several research projects underway on work injuries and youth. The long-term goal of this research program is to facilitate Canada's ability to formulate evidence-based policies for the prevention of work injuries among adolescents and young adults.

Results: From our analysis of the Ontario and British Columbia workers' compensation claims data we found that lost-time claim rates decline as length of job tenure increases for all ages. For example, workers in the first month on the job were more than five times as likely to have a lost time claim as workers who have been in their current job for more than one year. With regard to time trends, we found that the rate of decline in lost-time claim rates for young workers as their tenure on the job increased generally paralleled that of their adult counterparts over 1990-2003, though gender differences were observed.

From our analysis to date on national data our examination of correlates of work and non-work injuries among youth shows that geographic regions with high work injury rates also have higher non-work injury rates even after accounting for other determinants. These findings highlight potentially important contextual factors for unintended injuries.

Impact: The results of these projects will be of interest to policymakers and administrative/managerial audiences. There is a great deal of interest among large private and public sector employers in protecting youth at work and preventing work-related injury.

Publications:

Breslin FC, Smith P. Baptism of fire: The relationship between job tenure and lost-time claim rates among adolescent, young adult, and adult workers. (IWH Working paper #216) Accepted: *Occupational and Environmental Medicine*.

Breslin FC, Amick BC. (2003) Work injuries and youth: an application of the labour market and health framework. (IWH Working Paper #217)

Breslin FC, Adlai E. (2003) Part-time work and adolescents: The moderating effecting of school SES on alcohol use. (IWH Working Paper #188)

Breslin FC, Koehoorn M, Smith P, Manno M. Age-related differences in work injuries and permanent impairment: A comparison of workers' compensation claims among adolescents, young adults, and adults. Accepted: *Occupational and Environmental Medicine*.

Breslin FC, Smith P. Age-related differences in work injuries: A multivariate, population-based study. (IWH Working Paper #227) Submitted: *American Journal of Industrial Medicine*.

Breslin FC, Smith P. Youth and work injuries: How do provinces compare? (IWH Working Paper #260) Submitted: *Canadian Medical Association Journal*.

B.2. Underemployment and Contingent Work

Overview: The key question in this multi-year study concerns the health consequences of precarious employment experiences. In the first phase of this research initiative, we developed a detailed conceptual model and applied it to short-term exposures of non-standard work, proxies for the dimensions of precariousness, and measures of under-employment. In the continuation of our research, the principal hypothesis is that individuals are more likely to experience adverse health outcomes in response to more frequent or chronic exposure to contingent work arrangements than persons not experiencing chronic exposure, even after controlling for prior health levels. Additionally, chronic exposure to precarious employment experiences is expected to result in health consequences for individuals in specific social locations (specifically women, older individuals, single parents, visible minorities, and individuals with little formal education) than for their counterparts (men, younger individuals, parents living with their spouse, non-visible minorities, and individuals with higher levels of education).

Overall, non-standard work is not a significant predictor of low health level or transitions to worse health.

Results: Phase One - Labour Market Trends. The prevalence of non-standard work in the Canadian labour market is rising for both men and women, particularly among youth (17 to 24) and the older (55 to 64) age groups, with women and youth having the longest durations of exposure to non-standard work. The increase in non-standard work is driven by rising rates of part-time work, own account self-employment, and multiple job holding. In contrast, rates of short tenure work have remained fairly stable over time. Overall, non-standard work is not a significant predictor of low health level or transitions to worse health. Our analyses found a general pattern of marginal/weak health effects arising from short-term exposure but no statistically significant relationship between within-year duration of exposure to non-standard work and any of the health outcome measures.

Several proxies of work related precariousness show significant associations with health outcomes, although the pattern of these findings varies according to age and gender. For example, working a substantial number of unpaid overtime hours, experiencing no increase in earnings, and having low labour-market earnings, all significantly affected health across gender-age groups for two or more of the outcome measures. These results emphasize the detrimental health effects of lack of control over work processes and inadequate income and benefits. Several other proxies had a similar impact on health (manual occupation, low job status, no pension), but were significant for only some gender-age groups. Some proxies had no significant impact (e.g., short-tenure work, irregular schedule, low family income). Additionally, we found that some proxies (e.g., no union coverage, small firm) were associated with better health.

Impact: The knowledge from this research will be relevant for policymakers at workers' compensation boards, provincial ministries of labour, and Human Resources Development Canada in relation to: the provision of employment insurance benefits; the provision of health and pension related work benefits; work related disability policy; employment standards; and the relative mix between private and public disability insurance coverage. A comprehensive research transfer strategy has been planned with the assistance of our Knowledge Transfer & Exchange department. Part of the strategy will include developing key messages targeted to stakeholder audiences. There are a number of publications arising from this work to date noted below.

Publications:

Dolinschi R, Trevithick S, Scott HK, Bhattacharyya S. Non-standard work forms and arrangements and work-related precariousness: Canadian trends, 1976-2002. (IWH Working Paper #281)

Scott H, Tompa E, Trevithick S. The health consequences of under-employment. (IWH Working Paper #274) Submitted: *Social Science and Medicine*

Tompa E, Trevithick S, Scott H, Dolinschi R, Bhattacharyya S. Precarious employment experiences and their health consequences: Towards a theoretical framework. (IWH Working Paper #232) Submitted: *Work and Stress*

Tompa E, Scott H, Trevithick S. (2004) Precarious employment and people with disabilities. (IWH Working Paper # 240) In: L.F. Vosko (Ed) *Precarious Employment in the Canadian Labour Market*.

Dolinschi R, Tompa E, Bhattacharyya S. (2004) Precarious employment experiences and functional health. (IWH Working Paper #273)

Scott H, Tompa E, Trevithik S. (2004) Underemployment in the Canadian labour market: Examining the consequences for workers' health. (IWH Working Paper #274)

Tompa E, Scott H, Dolinschi R, Trevithick S, Bhattacharyya S. (2004) The health consequences of precarious employment experiences. (IWH Working Paper #268)

B.3. Other Projects on Labour Market Experiences & Health

Work Injuries and Teens - http://www.iwh.on.ca/research/labourmkt-projects.php#teens

Prevalence and Determinants of Work-related Injuries Among Young Workers in Ontario & British Columbia - http://www.iwh.on.ca/research/labourmkt-projects.php#prevalence

Work and Work-related Injuries Among High School Students in British Columbia - http://www.iwh.on.ca/research/labourmkt-projects.php

Early Childhood Determinants of Success in the Transition to Adult Social Roles in a Cohort of Canadian Children - http://www.iwh.on.ca/research/labourmkt-projects.php#early

Underemployment and Contingent Work - http://www.iwh.on.ca/research/labourmkt-projects.php#underemployment

Precarious Employment and People with Disabilities - http://www.iwh.on.ca/research/labourmkt-projects.php#precarious

Ten-year Mortality Follow-up for Occupations in the 1991 Canadian Census - http://www.iwh.on.ca/research/labourmkt-projects.php#ten

Health and Labour Market Trajectories - http://www.iwh.on.ca/research/labourmkt-projects.php

Analytic Methods for Population-based Health and Health Care Resource Allocation - http://www.iwh.on.ca/research/labourmkt-projects.php#analytic

Social Inequalities in Mental Illnesses in the Canadian Community Health Survey Cycle 1.2 - http://www.iwh.on.ca/research/labourmkt-projects.php#social

C. Workplace Studies

The range of research topics included in the theme is very broad and the teams that work on them frequently include members beyond the Institute. The character of the work within the new theme may be described in the following way. Some projects are directed essentially at understanding processes that have impact on health and safety in the workplace (e.g., the way in which informal interests of managers interact with the legal and policy environment in 'new economy' workplaces, the impact of transformational leadership on musculoskeletal disorders and injuries, and the behaviour of non-profit organizations in respect of occupational health and safety). Several projects focus on the evaluation of the effectiveness of particular workplace interventions including preventing RSI in the newspaper industry, a project which is highlighted in this report. Other evaluation projects include cost-effectiveness of overhead patient lifting devices in hospitals, effectiveness of participatory ergonomics systems, and effectiveness of systems of inspection in preventing musculoskeletal disorders. Others are systematic reviews of entire literatures (e.g., again, participatory ergonomics, occupational health and safety management systems). This includes the majority of the work which will be undertaken through the auspices of the four year pilot funding provided by WSIB for the Institute to focus on systematic reviews of the workplace prevention literature. Yet other projects focus on methodology (e.g., development of appropriate methods of economic evaluation of workplace interventions); and one project concerns the implementability and evaluation of an entire organizational approach to health and safety at work – the 'safety climate' and its rolling out from individuals forms/plants to entire industries.

The main audiences for the research reported here are workplace parties such as consultants and ergonomists working for health & safety associations, management and labour, and ergonomists and kinesiologists in general. By combining research evidence with the experience of labour and management, we hope to maximize the relevance, timeliness and implementability of the research.

C.1. WMSD: Evaluating Interventions among Office Workers. (Star-SONG Evaluating Interventions)

Overview: Workplace parties have expressed considerable interest in evidence of effectiveness of workplace programs designed to prevent and limit work-related musculoskeletal disorders of the neck and upper limb (WMSD). In 1995 IWH researchers were invited by the workplace parties in a large Toronto newspaper to undertake research to assist them in addressing an increasing incidence of repetitive strain injuries and workers' compensation claims. In conducting this research we sought to capture both the breadth of change occurring at the newspaper and to focus on certain aspects of work with particular observational, methodological and analytical tools. We employed a mixed methods longitudinal evaluation design to improve the strength and validity of our findings. Each component of the evaluation included methods and measures to capture both intermediate and longer term outcomes associated with the strategies developed by the workplace parties to control WMSD.

The final phase of this multi-year collaborative project with the Star-SONG workplace partners aims to assess the impact of this joint labour-management directed program on primary, secondary and tertiary prevention of WMSD among Star office workers.

Results: An important aim was to document the interventions undertaken by workplace parties. Through participation in RSI Committee meetings we observed the development of an innovative Ergonomic Policy with combined primary and secondary prevention components and hypothesized that implementation might result in reduction in WMSD risk factors and improvement of symptoms. Over five years, 1,091 Ergonomic Reports/Workstation Assessments were completed by over 40 trained assessors, proactively reaching 881 employees as part of an active hazard and symptom surveillance program. The latter included 138 employees that were not reached in any of our survey activity, although 56 percent (459) of Q4 2001 survey respondents did report workstation assessments. The surveillance system met a number of the important criteria for such systems, including utility through a wide range of improvements either directly made, planned or improved as a result of these assessments.

From administrative data, we noted substantial increases in healthcare utilization, particularly physiotherapy services promoted by the RSI Program. Over time, these physiotherapy services were reaching employees with WMSD earlier than had been the norm prior to their introduction. MSK-related drug utilization and particularly costs of NSAIDs also increased through the intervention period, though we had hoped to demonstrate reductions in costs over time. This hoped-for reduction was observed in workers' compensation claim-related absence (to zero new lost-time claims in 2001) but nowhere else due to a combination of meeting previously unmet needs for physiotherapy and escalating costs associated with changing drug availability and prescribing patterns.

Interviews and survey data gave us a clear sense of considerable changes in awareness, knowledge, and attitudes towards RSI/WMSD during the period of research. Ninety percent of Q4 2001 survey respondents felt that The Toronto Star RSI Program had completely to moderately ensured that all employees were informed about RSIs. Compared to our earlier 1996 survey we observed important changes in knowledge on RSI/WMSD. Further, 85 percent of Q4 respondents completely to moderately agreed that the RSI Program "promoted continuous improvement in the technology and management practices to control exposure to workplace risk factors that can cause RSI" and 74 percent agreed or strongly agreed (vs. 64 percent in 1996) that Toronto Star management were supportive in dealing with RSI. Nevertheless, the proportion of workers who indicated that their immediate supervisor was aware and concerned about RSI and the proportion of respondents who disagreed that "I can take breaks when I want to" was unchanged from 1997 to 2001 (28 percent). The interviews helped provide explanations where little change occurred.

This theme recurred in our assessment of changes in physical and psychological risk factors for WMSD and WMSD symptoms among employees who underwent a move and reorganization process into teams. Among a small group of predominantly advertising employees undergoing direct measures, we noted reduced extreme mouse positions (horizontal and vertical), fewer monitors to the side with less head rotation, and fewer extreme head tilts, the last despite monitor heights being generally higher. Among the psychosocial factors, fewer task variables changed than expected, though increases in keyboard time and post-reorganization mousing time were positively associated with changes in employee pain. Informal information collected while contacting workers during the intensive exposure and formal interviews with those in teams and not in teams suggested that, in practice, employees' jobs had changed little except for increased use of computers through introduction of new software.

The RSI Program was associated with some positive changes in self-reported exposures to physical and psychological risk factors for WMSD and a concomitant reduction in the self-reported period severity but not prevalence of WMSD-related symptoms. Overall the proportion reporting equipment inside a preferred location increased between 1996 and 2001 from 56 percent to 72 percent for the keyboard and 17 percent to 61 percent for the mouse.

Among a cohort that participated in the 1996 and 2001 surveys more got better than worse, even though those who remained in the cohort were worse at baseline than those that did not continue. They had fewer wrist/hand (- 6 percent), more shoulder (+7 percent), and more neck (+12 percent) pain. In 2001, the majority reported that their pain was aggravated by work (yes, 57 percent; to some extent, 34 percent).

In path analyses on the cohort, RSI training and job task changes were both associated with significant ($p<0.1$) increases in decision latitude and reductions in disability, after taking account of demographic confounders (gender and age). Perhaps training gave employees some support to adjust their workload or work rhythm, taking breaks as needed and assuming more control over the process of their work.

Of additional interest is that men were more likely than women to report decreases in decision latitude but increases in management support for RSI and persistence in use of poorer types of telephones (e.g., hand held rather than receiver head phone). Nevertheless, it remains hard to interpret such change over time in causal terms, with post-hoc explanations taking root to understand the relationships. At least, in the way we carried out modeling, different kinds of variables along the path are not conflated, nor can confounding by the usual demographic variables be a big problem. Such difficulty teasing out both intervention effects and directions in causality is unfortunately related to the complexity of relationships and practices in the workplace.

Impact: In our discussion of these results with labour and management of the company, they clearly articulated the different workplace pressures. During the period, the business thrived despite competitive pressures, and major technological and organizational change occurred. In many ways, the fact that RSI/WMSD got marginally better and not worse is a testament to the commitment of the workplace parties, the extent to which they did implement the Ergonomic Policy, and their understanding that dealing with RSI/WMSD is a long-term proposition. Some RSI Committee members see the need to not only maintain their activities but also push upstream into influencing technology change and job design.

Publications:

Polanyi MF, Cole DC, Ferrier S, Facey M, and the Worksite Upper Extremity Research Group. (2005) Paddling upstream: a contextual analysis of a worksite intervention to reduce upper limb musculoskeletal disorders. (IWH Working Paper #192) *Applied Ergonomics* 2005; 36: 231-239.

Beech-Hawley L, Wells R, Cole DC, and the Worksite Upper Extremity Group. (2003) A multi-method ap-

proach to deadlines, workload and WMSD risk in newspaper workers. Work (in press).

Polanyi MF, Cole DC. (2003) Towards research-informed multi-stakeholder action on complex workplace health issues: Reflections on two WMSD interventions. In: T.J. Sullivan & J.W. Frank (Eds) *Preventing Work-Related Disability*: New Views. London, England: Taylor & Francis, pp 125-142.

Swift M, Cole DC, Hogg-Johnson S. (2003) Development of an ergonomic assessment workplace monitoring program. (IWH Working Paper #245)

Cole DC, Wells RP, and the Worksite Upper Extremity Research Group. Interventions for musculoskeletal disorders in computer-intense office work: a framework for evaluation. *Work & Stress* 2002; 16 (2):95-106.

Cole DC, Manno M, Beaton DE, Swift M. Transitions in self-reported musculoskeletal pain and interference with activities among newspaper workers. *Journal of Occupational Rehabilitation* 2002; 12(3)

C.2. Systematic Reviews of Effectiveness of Prevention Interventions

The Institute has also been actively building relationships with Prevention System agencies and organizations in Ontario over the past couple of years. Through these partnerships, we often hear that potential research users want more evidence about the effectiveness of interventions for protecting workers' health and that, even when adequate research evidence exists, it is often hard to access, difficult to understand and is not always presented in language and formats suited to non-scientific audiences.

In response, IWH has established a group dedicated to performing systematic reviews of relevant evidence from research studies in the area of workplace injury and illness prevention. This initiative has four years of pilot funding support from the Workplace Safety and Insurance Board (WSIB). The Institute will be consulting regularly with workplace parties to identify priority topics in workplace health protection that might be suitable for review. Our systematic review team also monitors developments in the international research literature on workplace health protection looking for further timely and relevant topics for review. A specialist team of researchers then identifies all the potentially relevant literature, assesses its quality and empirical reliability, and synthesizes and summarizes the evidence in ways that make it accessible to non-scientific readerships and audiences. Two recently completed reviews are highlighted below.

C.3. Occupational Health & Safety Management Systems Systematic Review

Overview: Occupational health and safety management systems (OHSMSs) have developed considerably over the last 20 years and are now quite prevalent. There is, however, no common understanding in the literature of what is meant by an "OHSMS" and little is known about the effectiveness of these systems on employee health and safety and on relevant economic outcomes. A systematic review of the literature was undertaken to see what existing research had found about the effectiveness of OHSMSs.

For the purposes of this review the team developed the following definition of an OHSMS:

An OHSMS is the integrated set of organizational elements involved in the continuous cycle of planning, implementation, evaluation, and continual improvement, directed toward the abatement of occupational hazards in the workplace. Such elements include, but are not limited to, organizations' OHS-relevant policies, goals and objectives, decision-making structures and practices, technical resources, accountability structures and practices, communication practices, hazard identification practices, training practices, hazard controls, quality assurance practices, evaluation practices, and organizational learning practices.

The review team set out to investigate three key questions:

- the relative effectiveness of mandatory and voluntary OHSMSs on employee health and safety and on associated economic outcomes;
- the facilitators and barriers to the adoption and the effectiveness of OHSMSs;
- the evidence on the cost-effectiveness of OHSMSs.

Results: The review focused on the published, peer-reviewed literature in order to concentrate on high-quality studies. Of the 4,807 titles and abstracts reviewed only nine met the pre-established relevance and study quality criteria. Moreover, these proved to be of only a “moderate" quality. There were also reasons to suspect that publication bias might account for the consistently positive findings in these studies.

Effectiveness. Voluntary OHSMSs.

Four quality studies involving voluntary OHSMS interventions reported positive findings. While the outcomes measured varied among the studies, the findings included increased implementation over time, better safety climates, increased hazard reporting by em-

ployees, more organizational action taken on occupational and health issues, and decreased workers' compensation premiums. It is likely that the size of the observed declines in premium rates (23 and 52 percent) would be considered as significant by stakeholders.

Mandatory OHSMSs

All five studies involving mandatory OHSMSs reported positive findings. Some found increased OHSMS implementation over time. Others found that an OHSMS improved how workers perceived their physical and psychosocial working environments. It also appeared to increase workers' participation in health and safety activities, and led to reduced rates of lost-time injury and increases in productivity. It is likely that the size of the observed changes in OHSMS implementation and injury rate would be considered as significant by stakeholders.

Barriers/Facilitators & Cost Effectiveness

No studies were found comparing voluntary and mandatory OHSMS interventions directly. No good quality studies were found looking at facilitators of and barriers to OHSMS implementation or effectiveness, nor did we find studies estimating the cost of implementing OHSMSs.

Impact: Many countries, including Canada, are in the process of developing management standards for occupational health and safety, so a better understanding of the impact of these systems is timely. The review identified a number of gaps in the research. The most important was the lack of research whose explicit purpose was to study the effectiveness of voluntary and mandatory OHSMSs on employee health and safety and economic outcomes. The research designs used in the selected studies were not rigorous enough to produce great confidence in the findings. This lack of high-quality studies may reflect, at least in part, how difficult it is to carry out applied research in workplaces.

Publications:

Robson LS, Clarke J, Cullen K, Bielecky A, Severin C, Bigelow P, Irvin E, Culyer AJ, Mahood Q. *The effectiveness of occupational health and safety management systems: A systematic review*. Toronto: Institute for Work & Health; 2004.

Summary Report can be found at: http://www.iwh.on.ca/products/images/IWH_OHSMS.pdf

C.4. Participatory Ergonomics Effectiveness Systematic Review Participatory Ergonomics Effectiveness Systematic Review (950) 2

Overview: Work-related musculoskeletal disorders (MSD) are a major source of illness and disability throughout the industrialized world. Even though many of these conditions may be preventable, they continue to have widespread negative effects on workers, employers, and insurers. There is evidence that inappropriate design of workplaces and work processes contributes significantly to the development and chronicity of common MSDs. By improving ergonomic aspects of work and workplaces, it may be possible to prevent or reduce these disorders and increase productivity. Since the early 1990s, workplace participatory ergonomics (PE) interventions have received a lot of attention and there have been an increasing number of studies in the scientific literature that examine PE approaches. While the prerequisites and benefits of PE programs have previously been extensively described, a synthesis of the evidence of the effectiveness of these interventions, particularly with respect to health outcomes, had not been attempted.

Our objectives in conducting this systematic review were:

- to provide a comprehensive summary of the effectiveness of workplace-based PE interventions in improving health outcomes by reviewing the quantitative literature; and
- to assess the methodological strengths and weakness of the existing quantitative studies, and provide recommendations to guide future research initiatives.

Results: Despite research methods and reporting that differed widely across the studies, the review team assigned a level of "partial evidence" in favour of PE interventions as a way to improve health outcomes. There was partial evidence that:

- PE interventions had a small, positive impact on musculoskeletal symptoms.
- PE interventions had a positive impact in reducing injuries and workers' compensation claims. (The size of this impact varied and should be characterized more clearly in future research.)
- PE interventions had a positive impact on lost days from work or sickness absence. (Again, the size of this effect requires more precise definition).

A number of key facilitators and barriers to the participatory ergonomic process were noted:

Facilitators included: active participation and acceptance of the team members by workers, senior and

middle management, and union representatives (where applicable); the availability of an ergonomic expert, as either an active team member or an external advisor; access to adequate resources;

Barriers included: lack of acceptance and resources; instability within the workplace or negative economic conditions (such as recession) affecting the specific industry sector.

Impact: The generally positive findings which emerged from this review support the use of PE interventions. Given the evidence linking workplace exposures to the burden of MSD in working populations, we should continue to practice methods proven to reduce the burden. We accordingly recommend that PE interventions be implemented in workplaces as one means of reducing the burden of work-related MSDs among Canadian workers.

Publications:

Cole DC, Rivilis I, Van Eerd D, Cullen K, Irvin E, Kramer D. *Effectiveness of participatory ergonomic interventions, a systematic review*. Toronto: Institute for Work & Health; 2004.

Summary Report can be found at: http://www.iwh.on.ca/products/images/IWH_partergo_sum_web.pdf

C.5. Other Workplace Studies Projects

Preventing Occupational Injury, Illness and Disability: What Works and How Do We Know? – A Prevention Discussion Paper for Ontario's Occupational Health and Safety Stakeholders. PDF version can be downloaded at http://www.iwh.on.ca/products/other_pap.php

Methodologies for the Economic Evaluation of Workplace Interventions - http://www.iwh.on.ca/research/WI-projects.php#conceptual

Healthy Workplace Scorecard for Hospitals - http://www.iwh.on.ca/research/workstudies-projects.php#scorecard

Prospective Nursing Care Model - http://www.iwh.on.ca/research/workstudies-projects.php#prospective

The Impact of Multiple Roles on Health and Health Behaviours in Parents of Young Children - http://www.iwh.on.ca/research/workorg-projects.php#impact

D. Measurement of Health and Function

Studying the etiology, burden, likely course, and treatment of a musculoskeletal disorder presents substantial challenges of measurement. The pathology of a musculoskeletal disorder, whether a structural lesion or an inflammatory mechanism, is frequently difficult to diagnose. Conceptual frameworks for the classification of the disorder lack consistency. Finally, the measurement of pain and functional limitation arising from these disorders requires imaginative and innovative approaches to assessment. Over the past 15 years the Institute for Work & Health has continued to make original contributions to both the conceptualization of musculoskeletal disorders and the measurement of functional deficit.

In 2004, IWH researchers participated in an international invitational symposium at the Prevention of Work-related Musculoskeletal Disorders Conference (PREMUS) on classification systems for musculoskeletal disorders. The symposium led to the establishment of an international collaboration, including IWH researchers, who will be developing a database of all current MSK classifications systems starting with upper extremity disorders. The ultimate goal of this initiative is for researchers and clinicians to come to agreement on a single classification system which would facilitate more accurate communication on the prevalence on different MSK disorders and on appropriate and effective treatment interventions.

Work to develop and test a shorter version of the internationally accepted measurement tool the DASH (developed by IWH researchers in collaborations with the American Academy of Orthopedic Surgeons) resulted in dissemination in 2004 of the QuickDASH, an 11 item version of the questionnaire. The DASH is now available in more than 14 languages/dialects with additional translations underway. The QuickDASH promises to be equally useful to clinicians and clinical researchers as indicated by the recent decision of the WSIB Program of Care for Upper Extremity Conditions to include the QuickDASH as the standard assessment instrument for this new evidenced based clinical program for injured workers.

One new development in this theme is the emergence of a series of linked research initiatives which are aimed at improving our ability to measure the impact of an injury or illness on work productivity through self reported instruments. Building on research already underway in a WSIB funded upper extremity clinic IWH scientists have recently received funding support through the Canadian Arthritis Network to investigate a series of measures of work disability. Their research on

measuring the impact of health status limitation has caught the attention of international researchers interested in measuring important constructs in clinical trials. A number of local research dissemination initiatives to the clinical community planned for 2005. The developments in measuring the impact of injury and illness are highlighted in this report.

D.1. The Measurement of Work Disability/ Disability at Work

The cornerstone of managing the burden of a disease is an understanding of its impact on people's lives and of its course over time. An abundance of research has shown how arthritis affects people's employability and it is also clear that people with arthritis are more likely to leave their jobs than those without arthritis. However, this is only part of the picture. A less recognized, yet increasingly important burden of arthritis arises from the disability people experience at work. This can take the form of difficulties with workplace tasks and activities, having to alter career aspirations or change jobs, difficulties with co-workers, and having to make decisions whether to disclose one's condition and uncertainty about the future.

This project includes five elements described below, all of which are aimed at improving our ability to measure the impact of limitations of health status on work productivity. The measures identify the impact of an injury or illness on work activities through self-reported limitations in job tasks. These may be markers for changes in productivity and/or precursors to disability resulting in work absence, and they may also serve as indicators of productivity-related costs in an economic appraisal. In this set of projects we will identify new measurement properties, factors associated with work disability, and also create links between clinical, community and workplace populations and between different local, national and international networks of researchers interested in the measurement of work disability. Our objectives are to understand the development and measurement properties of extant measures of work disability and work productivity and to conduct a comparison of different measures of at-work disability. We will make recommendations about the role of self-report measures of work disability in workplace studies at IWH and in the broader community.

1) Injured Workers Study: 130 injured workers attending a WSIB specialty clinic for shoulder and/or elbow disorders were recruited to compare four different measures of work disability. Measurement properties were tested and the workers' preferences sought on the measures.

2) Arthritis Study: Bombardier and Beaton secured funding through the Canadian Arthritis Network (CAN) to compare measures of work-disability. Concurrently they will compare touch-screen versus pencil and paper data collection in a clinical setting, and the effect on measurement properties. The extended study will include a longitudinal follow up of these workers to six months. Data collection will be at two centres in Toronto and one in Vancouver (Dr. D. Lacaille).

3) Outcome Measures in Rheumatology (OMERACT) Initiative: Focusing on findings from 1 and 2 above, Bombardier and Beaton will present issues in the measurement of work disability at OMERACT 2005. This is an international group researching the measurement of important constructs in clinical trials in arthritis.

4) CAN-IWH. This service-oriented funding program is designed to facilitate research dissemination to the CAN community. In 2005 two initiatives will be undertaken: a workshop co-sponsored by CAN and IWH focusing on the measurement of work productivity; and sharing of information with CAN investigators on factors influencing successful return to work.

5) Community versus clinical work disability in arthritis. We propose to look at the longitudinal measurement properties and the best way to use these outcomes in a longitudinal manner (change scores, trajectories), the usual course of work disability in persons with arthritis, and predictors of current work disability, and shifts in work disability over a one-year period.

Impact: A thorough understanding of work disability and the level of production lost from injured/ill workers in the workplace, including the optimal measurement of this construct, will be of particular interest to researchers, employers, employees, insurers, the pharmaceutical industry, disability managers, and clinicians. This set of projects brings together researchers with expertise in the impact of arthritis on employment and in the measurement of outcomes. They are also affiliated with international initiatives on the measurement of work productivity (i.e. OMERACT 8 Work Productivity Working Group) and as such have established avenues to translate their research findings to the Canadian and international audiences.

D.2. Other Projects in Measurement of Health & Function Theme

Measurement Methodology Studies - http://www.iwh.on.ca/research/measure-projects.php#measurement

Development and Testing of the DASH - http://www.iwh.on.ca/research/measure-projects.php#dash

How Are You Now? Testing a Model of Recovery from the Patient's Perspective One Year After a Traumatic Fracture of an Extremity - http://www.iwh.on.ca/research/measure-projects.php#how

Validation of a Classification System for Work-Related Disorders of the Shoulder and Elbow - http://www.iwh.on.ca/research/measure-projects.php#valid

E. Epidemiology of Disability

Understanding the etiology of disability resulting from musculoskeletal disorders, the largest single cause of work disability in Canada, is a challenging research frontier, requiring the collaborative insights of epidemiology and clinical sciences. To understand the prospects for restoration of function, it is necessary to understand the impact of clinical management on musculoskeletal disorder – both at the level of the effectiveness of therapeutic innovations and at the level of the organization and delivery of health services.

E.1. Development of a Prospective Cohort Study of Individuals with Musculoskeletal Conditions / The Relationship Between Impairment, Activity Limitations, Participation Restrictions and Markers of Recovery in Individuals with MSK Disorders: A Validation Study of Two Conceptual Frameworks

Overview: Musculoskeletal disorders are a leading cause of disability and healthcare utilization in Canada. For most individuals the course of musculoskeletal disorders is episodic, but a significant proportion of this population suffers from recurrent episodes of chronic disability. Despite improvements in our understanding of musculoskeletal disorders, defining and measuring "recovery" from these disorders remains problematic.

Our objective with an initial set of analyses was to describe the incidence and course of musculoskeletal pain in the populations, advancing our understanding of the etiology and prognosis of musculoskeletal pain and the impact of back and neck pain on the health-related quality of life. In a second set of analyses we were interested in determining whether the construct of "resolution of the disorder" mediates the relationship between impairments, activity limitations, participation restrictions and self-assessment of recovery and to determine whether the indirect relationship between impairments, activity limitations, participation restrictions and self-assessment of recovery is mediated by the construct of "readjustment/redefinition" among subjects who do not experience a resolution of their disorder. The available data sources include the Saskatchewan Health and Back Pain Survey, A Study of Outcomes Assessment of Treatment and Rehabilitation after Traffic Injuries in Saskatchewan, and the Arizona State University Healthy Back Study.

Results: *Etiology and Prognosis.* The age and gender standardized annual incidence of neck pain is 14.6 percent (95 percent confidence interval: 11.3, 17.9). Each year, 0.6 percent (95 percent confidence interval: 0.0-1.1) of the population develops disabling neck pain. The annual rate of resolution of neck pain is 36.6 percent (95 percent confidence interval: 32.7, 40.5) and another 32.7 percent (95 percent confidence interval: 25.5, 39.9) report improvement. Among subjects with prevalent neck pain at baseline, 37.3 percent (95 percent confidence interval: 33.4, 41.2) report persistent problems and 9.9 percent (95 percent confidence interval: 7.4, 12.5) experience an aggravation during follow-up. Finally, 22.8 percent (95 percent confidence interval: 16.4, 29.3) of those with prevalent neck pain at baseline report a recurrent episode. Women are more likely than men to develop neck pain (Incidence Rate Ratio=1.67, 95 percent confidence interval 1.08-2.60); more likely to suffer from persistent neck problems (Incidence Rate Ratio=1.19, 95 percent confidence interval 1.03-1.38) and less likely to experience resolution (Incidence Rate Ratio=0.75, 95 percent confidence interval 0.63-0.88).

The cumulative incidence of low back pain was 18.6 percent, (95 percent confidence interval 14.2-23.0). Most LBP episodes were mild. Only 1.0 percent (95 percent confidence interval 0.0-2.2) developed intense and 0.4 percent (95 percent confidence interval 0.0-1.0) developed disabling LBP. Resolution occurred in 26.8 percent (95 percent confidence interval 23.7-30.0), and 40.2 percent (95 percent confidence interval 36.7-43.8) of episodes persisted. The severity of LBP increased for 14.2 percent (95 percent confidence interval 11.5-16.8) and improved for 36.1 percent (95 percent confidence interval 29.7-42.2). Of those that recovered, 28.7 percent (95 percent confidence interval 21.2-36.2) had a recurrence within six months, and 82.4 percent of it was mild LBP. Younger subjects were less likely to have persistent LBP (incidence rate ratio 0.88, 95 percent confidence interval 0.80-0.97) and more likely to have resolution (incidence rate ratio 1.26, 95 percent confidence interval 1.02-1.56).

Data from the Arizona State University Study suggest four basic patterns of return to work: (1) no work absence; (2) single absence, return and stay; (3) multiple spells of absence; (4) not yet return to work. There is considerable movement among patterns even within the group of apparently low-severity injuries: Among

workers who report no work absence at one month, there is an 18 percent transition probability to spells of work absence by six months. Among those who report no work absence at one and six months, there is a 17 percent transition probability to absence spells by one year. Conversely, we observe efforts to return to work even among those with apparently high-severity injuries: Among those who have not returned at one month, only 29 percent have not returned at one year, but among those who have not returned at six months 69 percent have not returned at one year. The vast majority of injured workers (97 percent) make some attempt to return to work. IMPLICATIONS: A return to work is a poor indicator of the resolution of occupational back pain, but a work absence extending six months after onset is a strong indicator of permanent work disability. The evidence suggests that researchers and clinicians must look beyond the first return to work in designing strategies to minimize the disability burden associated with occupational back pain.

Recovery. One model used resolution of impairment (n=1,244) as a mediator and the other used resolution of activity limitations (n=1,209). Results suggest that the effects of impairment and depression are mediated by resolution of impairment, resolution of activity limitations, and passive, but not active, coping. In the first model (Fit: CFI=0.91; TLI=0.89), the standardized coefficient for the indirect effect of impairment through resolution and coping was -0.16 ($p<0.01$) and -0.07 ($p<0.05$) for activity limitations. The effect of depression (standardized coefficient = -0.15; $p<0.01$) was mediated through passive coping. The standardized coefficient for the direct effect of resolution of impairment on recovery was 0.34 ($p<0.001$) while the indirect effect through passive coping was 0.14. Results were similar for the second model. In conclusion, resolution and coping mediate the relationship between impairment, depression, and activity limitations and self-reported recovery.

Impact: These results have provided back ground information which has assisted in the development of a multi-year multi-centered proposal for a longitudinal cohort study to further examine the course, determinants, recovery and consequences of MSK in the Canadian population.

Publications:

Cassidy JD, Côté P, Carroll LJ, Kristman V. The Incidence and Course of Low Back Pain in the General Population: A Population-based Cohort Study. *Spine* 2005; (Accepted).

Mercado AC, Carroll L, Cassidy JD, Côté P. Passive coping as a risk factor for disabling neck or low back pain. 2005 (Accepted: *Pain*).

Côté P, Baldwin ML, Johnson WG. Early patterns of care for occupational back pain. *Spine* 2005; 30:581-587.

Côté P, Cassidy JD, Carroll LJ, Kristman V, The annual incidence and course of neck pain in the general population: a population-based cohort study. *Pain* 2004; 112: 267-273 (Project #825)

Carroll LJ, Cassidy JD, Côté P. Depression is common after whiplash injury: The incidence, timing and course of depression after whiplash. Submitted: Spine (Project #825, IWH Working Paper #272)

Carroll L, Cassidy JD, Côté P. Depression as a risk factor for onset of troublesome neck and low back pain. *Pain*. 2004; 107: 134-139.

Carroll L, Cassidy JD, Côté P. Factors associated with onset of an episode of depressive symptoms in the general population. *J Clin Epi* 2003; 56:651-658.

Cassidy JD, Carroll L, Côté P, Berglund A, Nygren, Ä. Population-based, inception cohort study of traffic injuries in Saskatchewan: an analysis of post-traumatic low back pain. *Spine* 2003; 28:1002-1009.

Côté P, Cassidy JD, Carroll L. The epidemiology of neck pain in Saskatchewan: What have we learned in the past five years? *Journal of the Canadian Chiropractic Association*.2003; 47:284-290.

Côté P, Cassidy JD, Carroll L Kristman V. (2003) The course of neck pain in the general population. Submitted: Arthritis and Rheumatism (IWH Working Paper #225)

E.2. Description of WSIB Lost Time Claims for Occupational Neck Pain

Much attention has been given to occupational back pain (ONP) and upper extremity conditions. Oftentimes, neck complaints are grouped with either back complaints or upper extremity complaints. In this project, we will focus on neck complaints as a separate entity. We designed a cohort study of Ontario injured workers who made a claim to the Ontario Workplace Safety & Insurance Board between 1997 and 1998. WSIB claims and healthcare billings data will be obtained for a period from one-year prior and two years after the date of injury. The WSIB data will be linked to the Ontario Ministry of Health (OHIP) data for the same period.

Our objectives are to:

- develop a methodology to define and identify ONP claims from the WSIB databases;
- determine the prevalence and incidence of ONP claims in Ontario;
- determine the administrative course of ONP claims and identify the predictors of duration of wage replacement benefits in a cohort of injured workers who made a claim to the Ontario WSIB in 1997-1998;
- describe the healthcare utilization of claimants with ONP as they transit through the acute, subacute and chronic phases of their injury;
- determine whether the implementation of the Workplace Safety and Insurance Act (Bill 99, 1998) was associated with a change in the administrative course and healthcare utilization for ONP claims in Ontario.

This study will provide us with a broad description of the problem of ONP in Ontario and the information needed to develop secondary prevention strategies that may help reduce the burden of disability related to neck injuries.

E.3. Studying the Health of Health Care Workers

Overview: This is a retrospective (1991-2000) database linkage study of healthcare workers in the British Columbia acute care sector. We have created an integrated database to facilitate a better understanding of the health of healthcare workers and to encourage changes to promote worker health. The first involved the construction of the comprehensive database linking data from medical services, hospitalization, workers' compensation, and extended health benefits/long-term disability data sources via agreements with data stewards. Additional data on hospital-level indicators of workload available through the Ministry of Health were linked by hospital of employment codes.

Results: Findings indicate six unique trajectories for musculoskeletal health over time and five unique trajectories for mental health over time, illustrating unique variability in the trajectory shapes. Some individuals never experience any musculoskeletal or mental health outcomes (as measured by the various health databases), while others have episodes of symptoms with either a decline or an increase in healthcare contacts for their symptoms over time. Also present are individuals who continue to show high levels of musculoskeletal and mental health outcomes (as evidenced by contacts with various healthcare providers or systems) with no resolution over the entire follow-up period. Future analysis will investigate the factors associated with group membership to begin to understand and predict differences in health trajectories. Preliminary multi-level modeling results indicate that musculoskeletal outcomes among healthcare workers varied by hospital of employment, peer-group (similar groupings of hospitals based on size, service and geography) and health authority after controlling for age, gender, union membership, income and working (part-time/full time) status. Mental health outcomes varied by hospital of employment and peer-group controlling for age, gender, union membership, income, working status, and health region. Work will continue to investigate which hospital level variables account for this difference in MSK and mental health outcomes.

Impact: The construction of the database will provide the opportunity for a series of studies to be conducted on the health of healthcare workers, and will be of interest to researchers in the field of occupational epidemiology and health services planning. Findings related to musculoskeletal and mental disorders will be relevant to policymakers within hospitals and health authorities, the healthcare sector, compensation systems and the provincial ministries of health.

Publications:

O'Brien-Pallas L, Shamian J, Thomson D, Alksnis C, Koehoorn M., Kerr MS, Bruce S. Work-related disability in Canadian nurses. *J Nurs Scholarsh* 2004; 36 (4): 352-357. (Project #810)

Koehoorn M, Cole DC, Hertzman C, Lee H. (2003) Patterns of general healthcare utilization among hospital worker compensation claimants with a work-related musculoskeletal disorder. (IWH Working Paper#221)

Koehoorn M, Mozel M, Cole DC, Hertzman C, Ostry A, Ibrahim S. The health of healthcare workers: a profile of extended health benefits utilization. Abstract appears in *La Medicina del Lavoro: The Italian Journal of Occupational Health and Industrial Hygiene*, 93(5) 445-446.

Koehoorn M, Cole DC, Hertzman C, Lee H. (2002) How much or when? Work exposures and the risk of musculoskeletal injury among healthcare workers. Aug 2002: Vancouver, BC: International Society of Exposure Analysis (ISEA): Linking Exposures and Health. Abstract: *Am J Epi*.

E.4. Other Projects on the Epidemiology of Disability

The Arizona State University Healthy Back Study: A Study of the Cost Effectiveness of Chiropractic vs. Medical Care in Returning Injured Workers with Occupational Low Back Pain to Work - http://www.iwh.on.ca/research/EOD-projects.php#arizona

The Bone and Joint Decade 2000-2010 Task Force on Neck Pain and its Associated Disorders - http://www.iwh.on.ca/research/EOD-projects.php#bone

Investigating the Consequences of Work-related Injuries Among Young Workers in British Columbia - http://www.iwh.on.ca/research/EOD-projects.php#investigating

F. Evidence-Based Practice

Injured workers, healthcare providers, payers and the public are increasingly asking for system-wide processes to improve the quality of care provided and to measure the success of care delivery. High-quality care implies practices that are consistent with the best evidence of efficacy and effectiveness (from randomized trials or observational studies) as well as systematic assessment of actual health outcomes. The Institute for Work & Health has made major contributions towards evidence-based practice (EBP) for the most burdensome musculoskeletal conditions: low-back pain, neck pain, upper extremity conditions, and chronic back pain. The Institute was created just prior to the release of the Acute Low-back Pain Guidelines from the U.S. Agency for Health Care Policy and Research (AHCPR) in 1994. Consequently, the Institute's initial focus in EBP was on low-back pain and the diffusion of these guidelines to our relevant stakeholders in Ontario. In 2004, the Institute was approached by the Ontario Medical Association and the Ontario Ministry of Health to participate in a clinical guideline development process for primary care, on the basis of this earlier work. In conjunction with the Ministry of Health's Guideline Advisory Committee (GAC) the College of Physicians and Surgeons, the Ontario College of Family Physicians, the University of Toronto, and other colleagues, IWH staff are engaged in a process of disseminating these guidelines and evaluating the dissemination approach.

Much of the current work of the EBP theme is related the Institute's role as an international Cochrane Collaboration Review site – The Back Review Group (BRG). During 2004, The Back Review Group released a number of new evidence based reviews on the effectiveness of interventions for low back pain.

F.1. Cochrane Collaboration Back Review Group: Systematic Reviews of the Scientific Literature on Spinal Disorders /Systematic Review Workshops

Overview: The scope of the Back Review Group is to conduct reviews of randomized controlled trials and controlled clinical trials on primary and secondary prevention of neck and back pain and other spinal disorders, excluding inflammatory diseases and fractures. As the editorial and central coordinating centre for the BRG we are responsible for preparing, maintaining, and disseminating systematic reviews of the scientific literature on spinal disorders; maintaining a specialized database of trials on spinal disorders as a resource for those conducting literature searches; and assisting in identification of gaps in the literature for areas of further study. We have also contributed to the development of standardized methods of randomized controlled trials in low-back pain research. As a result of the expertise gained as a Cochrane Collaborating Centre, and our broader interests in enhancing the methodology of systematic reviews within clinical research and other disciplines a number of Institute staff have developed significant capacity in the methods of systematic reviewing.

Results: *Back Review Group.* Through the BRG we have managed 30 reviews (10 of which have been updated as of 2004) and 11 protocols, all of which are registered in *The Cochrane Library*, Issue 4, 2004. There are also 1,532 references in the Specialized Trials Registry.

Systematic Reviews. Our capacity in systematic review methods has led to many requests for the Institute to share its expertise and to contribute to the education and training of educators, clinicians, and future researchers. In response, since March 2001 the Institute has been conducting two-day Systematic Review Workshops that teach participants to plan, conduct, and communicate the results of systematic reviews.

Impact: Updated systematic reviews of the literature provide the most current information on the effectiveness of treatment modalities and therapies, thereby assisting evidence-based treatment and payment decisions by patients, healthcare professionals, policymakers, and payers. The Systematic Review Workshops are of particular interest to healthcare professional students, educators, clinicians, researchers, insurers, and policymakers.

F.2. Other Evidence Based Practice Projects

Development of a Framework to Identify Clinically Useful Predictive Factors for Low Back Pain - http://www.iwh.on.ca/research/student-projects.php#frame

Adherence to Clinical Guidelines for Plain Film Radiography in Acute Low Back Pain Among Chiropractic Trainees - http://www.iwh.on.ca/research/student-projects.php#clinguide

G. Prevention of Work Disability

The Institute's traditional focus has been on musculoskeletal disorders, the dominant cause of disability from work-related causes in Ontario. More recently, the Institute's scientific staff have been reflecting on how we might contribute understanding of effective methods of reducing work disability arising from mental disorders. Untreated or under-treated mental health needs may adversely affect the health and recovery of workers disabled by a musculoskeletal injury. Representatives of employers and of workers in Ontario are increasingly advocating enhanced detection, treatment, and return-to-work strategies arising from mental health disorders. In 2004, the Institute's Scientific Advisory Committee endorsed a recommendation from IWH scientific staff to develop research into the prevention of work disability arising from these causes. The Institute has consolidated long-standing interests in the prevention of disability from musculoskeletal injury with a new focus on the prevention of disability from mental health disorders. Jointly these projects will form a program to be known as the Prevention of Work Disability.

G.1. Workplace-Based Return-to-Work (RTW) Interventions: A Review of the Literature

Introduction: The literature review included both quantitative and qualitative studies. The former included studies examining workplace-based RTW interventions. The latter included studies examining workers' experience of the return-to-work trajectory, as well as the perceptions and/or experiences of various other players such as employers, labour representatives, insurers, and rehabilitation professionals We included studies reporting the effectiveness of clinical RTW interventions only if care was delivered by healthcare professionals linked specifically with the workplace. Effectiveness was examined in terms of what impact the interventions had on 1) duration of work disability, 2) associated compensation and healthcare costs, and 3) workers' quality-of-life. To focus the review, we limited our scope to studies of workers with pain-related conditions.

Seven databases were searched for relevant studies published in English and French between January 1990 and December 2003 and peer reviewed reports published by major research centres were also included. From the total of 4,124 papers identified in the search, 35 quantitative studies and 15 qualitative studies met our study relevance selection criteria. Of these 50 studies, only 24 studies - 11 quantitative and 13 qualitative - met our quality appraisal criteria and were included in the final evidence synthesis.

For quantitative studies, we relied on the best evidence synthesis approach developed which involves combining three aspects of the research literature: the number of studies identified; their methodological quality; and the consistency of the results across different studies. For qualitative studies, we used a meta-ethnographic approach which involves identifying "key concepts" across the selected studies and then re-interpreting the findings.

Results: *From the Quantitative Studies.* Our best evidence synthesis finds that RTW interventions are effective in reducing the duration of work disability. They also reduce associated wage replacement and healthcare costs. The evidence that such interventions improve quality-of-life for workers is weaker.

Here are some key findings and recommendations:

There is moderate evidence that three components - early contact with the worker by the workplace; a work accommodation offer; and contact between healthcare providers and the workplace - significantly reduce work disability duration and associated costs. Therefore we recommend that workplace-based RTW interventions include these three core disability management strategies.

There is moderate evidence that two other RTW components - ergonomic worksite visits and the involvement of an individual with responsibility for RTW coordination - also reduce work disability duration and associated costs. In the studies reviewed, ergonomic visits were conducted by third party specialists such as physiotherapists, ergonomists, and occupational therapists. The intensity and timing of these visits varied across studies. Therefore we recommend that workplace-based RTW interventions include a strong ergonomic component, as facilitated by ergonomic worksite visits. We also recommend that such interventions include RTW coordination.

There is moderate evidence that educating supervisors and managers leads to reductions in work disability duration. In the studies we reviewed, this consisted primarily of education about participatory ergonomics and safety training. Therefore we recommend that RTW interventions contain an educational component for supervisors and managers.

There is moderate evidence that labour-management cooperation is associated with shorter work disability duration. There is limited evidence that both people-oriented culture and safety-committed culture are associated with shorter work disability duration. We recommend that increased attention be given to

labour-management relations and consideration be given to workplace culture.

From the Qualitative Studies. Developing good relationships among unions, management and healthcare providers is important for successful RTW interventions. When it comes to return to work, unions and labour representatives may sometimes face competing responsibilities. For example, an employee seniority agreement which protects one group of workers can conflict with the process of work accommodation. The research, which is supported by the quantitative literature, suggests that when unions and labour representatives are committed to and participate fully in the RTW process, their involvement is very beneficial. We recommend employing strategies to encourage a "shared understanding" of RTW - for example, processes that bring together workers, unions, employers, insurers, and healthcare providers.

The RTW process is laden with potential for miscommunication and misunderstanding. Successful return to work after injury or illness is not a straightforward process. The qualitative studies highlight the many difficulties workers face in meeting their "duty to cooperate" with employers and workers' compensation boards. Their navigation through that system is often arduous, marked by a lack of information about process and procedures at a time when they feel vulnerable and less than self-reliant. Workers are usually not familiar with rules about workers' compensation or the specialized language used by healthcare and insurance professionals. We recommend that employers, insurers, and healthcare providers provide adequate and consistent information when communicating with ill or injured workers about return to work. It is important to simplify procedures and language around RTW processes and requirements, and to ensure that workers have been fully informed of their rights and obligations.

Return to work requires careful coordination and consideration of the needs of the various players. The needs and experiences of workers, co-workers, supervisors, managers, and healthcare providers will affect the success of RTW. For instance, supervisors who must maintain competitive production levels may find that this conflicts with their ability to fully accommodate the needs of an injured worker. In this case, organizational restructuring may modify supervisor performance requirements so that RTW needs do not compete with production targets. We recommend that at each step, the parties consider the feasibility of RTW plans and the ability of workers to successfully negotiate the process. We also emphasize the importance of engaging with top management to ensure their consideration of and support for the resources needed for a successful RTW process.

Supervisors can play an important role in the RTW process. They were identified as important to the success of RTW due to their proximity to the worker, their ability to manage the immediate RTW work environment, and their organizational position, which provides a link between the worker and senior workplace decision-makers. These findings are reinforced by moderate evidence from the quantitative literature that educating supervisors and managers leads to reductions in work disability duration. To support their role in successful return to work, we recommend that supervisors be included in RTW planning and offered related training.

Rehabilitation and occupational health professionals can be key to RTW success because they are a bridge between the workplace and the healthcare system. These professionals are able to communicate with health specialists, to visit worksites to assess RTW conditions, and to offer tailored advice that is sensitive to the workers' immediate work environment. The review findings show that the involvement of rehabilitation and occupational healthcare providers in the RTW process is important. The systematic review has identified which workplace-based actions have been found to enhance RTW and reduce worker disability and associated costs.

Impact: Our systematic review represents the most comprehensive review to date of the literature about workplace-based RTW interventions and processes. It provides background knowledge and guidelines for WSIB, employers, employee assistance programs, and unions regarding RTW strategies.

Publications:

Franche R-L, Cullen K, Clarke J, MacEachen E, Frank JW, Sinclair S and the Workplace-based RTW Intervention Systematic Review group. Workplace-based return-to-work interventions: A systematic review of the quantitative and qualitative literature. 2004 Report: WSIB.

Summary Report can be found at www.iwh.on.ca/products/images/IWH_rtw.pdf

G.2. Other Projects on the Prevention of Disability

The Readiness For Return To Work Cohort - http://www.iwh.on.ca/research/prevention-projects.php#readiness

Return to Work in Small Workplaces: Worker and Employer Perspectives - http://www.iwh.on.ca/research/prevention-projects.php#rtwsm

Effects of Return-to-Work on Health-Related Quality of Life in HIV/AIDS - http://www.iwh.on.ca/research/prevention-projects.php#effects

H. Statistical Methods and Data Tools

This section describes the work of an important Institute program that underpins virtually every project in every theme within the Institute's research portfolio. Since the Institute is primarily occupied with applied research, using empirical methods of analysis, both qualitative and quantitative, we attach great importance to the availability of appropriate programming, bibliographical, information retrieval, statistical, econometric, and other empirical skills, with experts capable of supporting a very diverse set of projects in terms of their substantive topic content, their empirical method, and their scientific discipline. The Institute sees the function of this program as serving the entire corpus of our work and the staff are accordingly to be found amongst the listed participants in all themes. Their involvement is typically from early conceptualization of the research to be done, through its implementation to its publication. One project which demonstrates the applied nature of this work is described below.

H.1. WSIB Denominators

Overview: Workplace injury and disease surveillance in Ontario and in Canada is deficient relative to leading international standards. Workplace injury surveillance conducted by provincial workers' compensation authorities in Canada has a number of limitations. While time-loss injury claims recorded by worker's compensation authorities in Canada contain information on the age and gender of the injured worker, the nature and cause of injury as well as the size of the firm and the industrial sector in which the firm is engaged, there is a lack of denominator information available from compensation system sources at similar levels of stratification. To examine alternate sources of labour force denominator information, this project obtained detailed labour force counts from the Canadian Labour Force Survey and the Canadian Census. These were adjusted for the coverage rates of the Ontario Workplace Safety and Insurance Board. The labour force counts, stratified by age, gender, and industry, have been tabulated for each of the two dominant occupational classification systems in use in Canada in the 1990s (SOC1980 and SOC1991). We anticipate the use of the time series of labour force denominators developed in earlier phases of this project in applications to enhance the surveillance and monitoring of occupational injury and disease in Ontario and eventually to conduct cross-provincial comparisons. In the interim this alternate source of labour force counts has subsequently been applied in a wide range of research applications at the Institute.

Results: The alternate denominator series based on Statistics Canada data sources has been applied in range of IWH surveillance reports. Most recently, this method has been applied in projects examining youth injury risk, where the alternate denominator series has provided adjustment for person-time work exposure in estimating differences in injury risk between young workers and older workers. Younger workers have fewer average work hours.

Impact: This project was originally focused on the internal capacity of the Institute to provide accurate and timely descriptive statistics of the rates of time-loss injury in the Ontario labour force. However, at the annual Association of Workers' Compensation Boards of Canada (AWCBC) meeting in August 2004, the Chief Financial Officers of the Canadian Workers' Compensation Agencies directed the staff of the Quebec and Ontario compensation agencies to conduct an assessment of the feasibility of implementing the IWH alternate denominator series as a means of improving indicators of cross-provincial compensation system performance. This directive to the workers' compensation agencies indicates policy interest in the development of these methods. IWH believes the work arising from this project will be of increasing interest to a wide range of stakeholders.

Publications:

Smith PM, Mustard CA. Examining the association between physical work demands and work injury rates between men and women in Ontario. 1990-2000. (IWH Working Paper #215) *Occup Environ Med* 2004; 61 (9):750-756.

Smith P, Mustard CA, Payne JI. A methodology for estimating the labour force insured by the Ontario WSIB 1990-2000. (IWH Working Paper #196) *Chronic Dis Can* 2004; 25(3/4): 127-137.

H.2. Other Projects in Statistical Methods & Tools Theme

Cohort Methods - http://www.iwh.on.ca/research/stats-projects.php#cohort

A Book of Possible Interest to Subscribers

Workplace Injuries and Diseases: Prevention and Compensation: Essays in Honor of Terry Thomason has been published by the W.E. Upjohn Institute for Employment Research. The volume, edited by Karen Roberts, John F. Burton, Jr., and Matthew M. Bodah, is based on a conference held at the University of Rhode Island in honor of Terry Thomason, who was a distinguished scholar of workers' compensation, workplace safety, and collective bargaining before his untimely death in 2002.

The book contains 11 chapters, including "Economic Incentives and Workplace Safety" by Terry Thomason, which is an insightful review of the literature on topics such as the effect of experience rating in workers' compensation on safety. "The Adequacy of Workers' Compensation Cash Benefits" by Leslie I. Boden, Robert T. Reville, and Jeff Biddle documents the inadequacy of permanent partial disability benefits in California, New Mexico, Oregon, Washington, and Wisconsin. "Health Care and Workers Compensation" by Cameron Mustard and Sandra Sinclair examines the relatively low cost of health care for injured workers in Canada compared to the U.S. Peter Barth, in "Revisiting Black Lung: Can the Feds Deliver Workers' Compensation for Occupational Disease?", examines the role of the Federal Government in providing benefits to workers who arguably have not been well served by state workers' compensation programs. Karen Roberts explores "The Structure of and Incentives from Workers' Compensation Pricing" in her chapter. John Burton, in "Permanent Partial Disability Benefits," proposes five criteria for evaluating PPD benefits, including delivery system efficiency and affordability.

301 Pages. $20.00 paper. ISBN 0-88099-324-3. Published July 2005. Available from the W. E. Upjohn Institute for Employment Research, 300 S. Westnedge Avenue, Kalamazoo, MI 49007-4686. Phone: 888-227-8569. Fax: 269-343-7310. Online: http://www.upjohninstitute.org/publications/titles/wid.html

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WORKERS' COMPENSATION COMPENDIUM 2005-06
VOLUME ONE

The **Workers' Compensation Compendium 2005-06** is the first edition of an annual publication designed to serve several audiences:

(1) *workers' compensation practitioners*, such as state and federal administrators and adjudications, employers, union officials, insurers, attorneys, who need current information about the benefit levels, coverage provisions, costs, and other aspects of workers' compensation programs in various states;

(2) *workers' compensation policymakers* who want analyses of significant issues, such as the policies that may control workers' compensation medical costs and the challenges to the exclusive remedy provision, which limits the right of injured workers' to bring tort suits against their employers; and

(3) *researchers* who need information about recent studies and program developments in order to improve their own analyses.

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Part I also includes significant articles, chapters, and reports that were originally published elsewhere but that warrant reprinting in the *2005-06 Compendium*. These articles originally appeared in the *Monthly Labor Review*, *The Millbank Quarterly*, the *Journal of the American Medical Association*, the *Journal of Occupational and Environmental Medicine*, and the *IAIABC Journal*. The chapters and reports originally appeared in the *International Encyclopedia of Business & Management* and in publications of the Workers Compensation Research Institute, the Labor and Employment Relations Association (formerly the Industrial Relations Research Association), the RAND Institute for Civil Justice and Health, and the California Commission on Health and Safety and Workers' Compensation.

Part II contains a detailed Subject Index plus a Jurisdiction Index to the articles, chapters, and reports contained in Part I.

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