The Aging Workforce:

Implications for Workers Compensation

(Literature Review)

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Research and Data Services

-Information for Informed Decisions-

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Executive Summary: Aging Workforce literature review

As the proportion of older workers increases through demographic changes and an emerging trend among older workers to extend their working lives, changes are occurring in the worker and workplace that effect worker productivity and health. In comparison to younger workers the health of older workers can vary widely, based on the normal effects of aging and occurrence of occupational diseases or workplace injuries. Older workers' incentives to continue working also vary and depend on health condition and health insurance, retirement benefits, workers' compensation, federal insurance programs, dependent family members and personal considerations. Economic incentives are likely to influence claim filing and return to work decisions more strongly when an older worker is in poor health or has a disability.

These demographic and workplace trends are likely to have a significant impact on workers' compensation programs. What are the implications of Washington's aging workforce for its Workers Compensation programs? What are the increased costs likely to be? What are society's responses to older workers needs in future workplaces?

This review focused on workers aged 45 and over and the implications of their increasing labor force participation on workers compensation. Washington's men and women over age 55- particularly those over 65- show current and forecast labor force participation rates greater than their share of the civilian non-institutional population. Washington's expected demographic changes will likely be significant for workers compensation costs, however, even with large shifts, the net effect may be mitigated by a proportional increase in younger workers (Washington Office of Financial Management 2005).

There are three key relationships concerning workers compensation and older workers: the relationship between age and the prevalence of impairments or chronic conditions; the relationship between age and work disability; and the relationship between age and workers' compensation benefits paid (Burton and Spieler 2001).

There are usually direct relationships between age and the prevalence of chronic conditions and injuries, disabilities and financial impacts. Chronic conditions in the over-50 working population, such as cerebrovascular, cardiovascular, diabetes-related, pulmonary and arthritis-related diseases are more prevalent than previously thought. A Center for Disease Control review of the top four actual causes of death in 1990 and 2000, ranked tobacco, poor diet and physical activity, alcohol consumption and microbial agents as accounting for nearly 40% of mortality in the US (Mokdad et al 2004). The CDC emphasized the morbidity risk and financial burden of these mortality causes on older workers because of the cumulative effects of behavior. The interdependence of aging with chronic morbidity factors and work-related injuries has likely consequences for older workers, when compounded by the aging effects of the baby boomer generation.

Workers compensation expenses for older workers are expected to be higher with the higher prevalence of age-related conditions, for example one 2004 study of Washington calculated a constant $36.45 added to the median cost of a claim for every year of a claimant's age (Higdon and Collins 2004).

There are dissenting findings about potential effects of aging on workers' compensation (Pransky et al 2005). For example, in a survey of workers above and below age 55, most age-related outcomes in work-related injuries were quantitatively and qualitatively similar, despite more severe injuries in older workers. Although older workers had more co-morbidity, they reported no age-related differences in physical work limitations or injuries prior to injury. Workplace conditions were a key to the relative advantage of older workers' reported higher satisfaction with the workers' compensation insurer, their pre-injury employment, the medical care they received for their injury, and the provider's return to work recommendations. Older workers were no more likely to be placed on light duty than younger workers once injury severity, problems upon return to work, and physical functional status were accounted for. Gender was largely insignificant.

A random sample of Washington workers compensation claims from 1987-89 found that workers over age 45 were at risk of longer term disability (Cheadle et al 1994). The study concluded that older age is the most important and consistent influence on duration of disability. Another 1993-1994 study of permanent partial disability and workers' earnings losses in Washington found that older workers suffered proportionately more permanently disabling injuries and that their average income losses were greater than for younger workers (Biddle et al 2004).

A wage-loss study among Washington's permanently disabled workers injured from July 1993 to June 1994 found that 27% of ages 35-54 and 39% of ages 55 and older received permanent disability benefits (Biddle et al 2001). The increase in permanent disability was largest in Washington compared with Wisconsin or California, supporting a conclusion that older injured workers were more likely than their younger counterparts to receive benefits for permanent, rather than temporary disability. Wage replacement rates over ten years showed that older workers had less of their long-term wage losses compensated. In Washington, injury-related non-employment ten quarters after injury was significantly longer for workers aged 55 and older. This suggested that a disabling workplace injury may lead older workers to choose to retire earlier than they would have otherwise.

Research and Data Services is studying aging workers, based primarily on the Labor and Industries administrative database. The research team's initial focus is on demographics, chronic conditions, and the expected impacts of aging workers on injuries, disability, costs and re-employment.

The research question is the following: In Washington, what effects does an aging workforce have on the frequency and costs of workplace injuries, initial and re-opened claims and time-loss days?

Introduction – Aging Workforce Study

The aging of the post WWII "baby boom" generation has attracted fairly widespread attention from demographers, economists and other social scientists, government, business and labor, social service agencies, and advocates as they begin to observe the effects on the workforce of changes in the population structure (Galizzi et al 1998; Bogyo and Victor 2000). As the proportion of older workers increases through demographic changes and an emerging trend among older workers to extend their working lives, changes are occurring in the worker and workplace that effect worker productivity and health (Burton and Speiler 2000). In comparison to younger workers the health of older workers can vary widely, based on normal effects of aging and the occurrence of occupational diseases or workplace injuries (Biddle et al 2001; 2003). Older workers' incentives to continue working also vary and depend on health condition and health insurance, retirement benefits, workers' compensation, federal insurance programs, dependent family members and personal considerations (Mitchell 1988; Pransky et al 2005). Economic incentives are likely to influence claim filing and return to work decisions more strongly when an older worker is in poor health or has a disability (Gardner 1989).

These demographic and workplace trends are likely to have a significant impact on workers' compensation programs. What are the implications of Washington's aging workforce for its Workers Compensation programs? What are the increased costs likely to be? What are society's responses to older workers needs in the workplaces of the future?

Consideration of the effects of aging on workers' type, frequency and severity of injuries, medical costs, claims filing, claims management, time-loss payments, pensions, re-opened claims, re-injury and return to work can answer these questions. Chronic conditions, employer (workplace) accommodations of injured workers, vocational rehabilitation, retirement, economic incentives, social factors, the "work ethic," medical provider efficiency, Social Security, and unemployment rates are other factors affecting older workers.

We reviewed aging workforce literature and the existing research in context of the following:

I. Demographics and aging worker cohort projections;
II. Chronic conditions and predicted morbidity factors among disabled or injured worker cohorts, time loss, and recovery;
III. Expected impacts on workers' compensation costs; post-injury employability; and
IV Research plan.

I. Demographics

A snapshot of the United States workforce of workers aged 45 and over by gender shows consensus between the national and Washington state data, and a narrow range of variation in age cohort projections. Tables 1 and 2 show actual and projected U.S. civilian noninstitutional population percents and U.S. civilian labor force participation rates by age cohort, based on the 2000 U.S. Census. The older age groups in the population are an increasing proportion, and those that continue to work are generally increasing at an even greater rate in relation to the overall population.

Table 1

US civilian noninstitutional population percent by age and sex

	Age	1982	1992	2002	2012
Total	45-54	12.9	14.1	18.3	18.2
	55-64	12.7	10.7	12.1	15.7
	65-74	9.2	9.3	8.3	9.5
	75 and up	5.5	6.3	7.3	7.2
Men	45-54	6.2	6.9	8.9	8.9
	55-64	5.9	5.1	5.8	7.5
	65-74	4	4.1	3.8	4.4
	75 and up	2	2.3	2.8	2.9
Women	45-54	6.7	7.2	9.3	9.3
	55-64	6.8	5.6	6.3	8.1
	65-74	5.2	5.2	4.5	5.1
	75 and up	3.5	4	4.5	4.4

Source: Toossi M., Office of Occupational Statistics and Employment Projections, Bureau of Labor Statistics, 2004.

In Table 2 increased labor force participation of older workers was projected 2002-2012, with the annual growth rate of those aged 55 and older nearly four times that of the overall labor force. As participation rates increase for older age groups the older population's share of the workforce also rises (Toossi 2004, p37). Relative to other age groups the historical labor force participation rate for ages 55 and older generally declined until 1985, but "…is anticipated to grow by more than 10.2 million by 2012, the fastest growth among all age groups" (Toossi 2004, p52). Since 1982 ages 55-64 had labor force participation rates increase from 55.1% in 1982 to 56.2% in 1992, to 61.9% in 2002, and are expected to reach 65.1% by 2012 (Table 2). Similarly, ages 65-74 labor force participation increased from 16.2% in 1982, to 20.4% in 2000, and is expected to reach 23.6% by 2012 (Toossi 2004). Toossi's historical analysis also shows differences by gender, as does comparable Washington state data in Tables 3 and 4. Descriptive data for industry by age cohort are given for Washington later in the report.

Except for men aged 55 and older, labor force participation rates for men have steadily declined since 1982 to 74.1% in 2002, and were expected to decrease to 73.1% in 2012 (Table 2). For men aged 65-74 the labor force participation rate increased by 4.4% from 1992-2002, reversing a trend dating back to 1890 (Toossi 2004, p 45). For all women, labor force participation rates have increased steadily, from 52.6% in 1982 to 59.6% in 2002, and are expected to increase to 61.6% in 2012. Women aged 55-64 will have an annual growth rate of 0.9% in labor force participation rate between 2002 and 2012, and in 2012 are expected participate at 60.6% (Toossi 2004, p 43). From 1992-2002 an almost equal share of men and women (50.8% vs. 49.2%) were in the labor force, and by 2012 the predicted composition will be 52.5% men and 47.5% women. The labor force participation rates of women and men have also been converging, for example the difference between men and women is expected to decrease by 12.5% from 1982-2012 from 24% in 1982 to 11.5% in 2012 (Toossi 2004).

Table 2

US civilian labor force participation rate (percent) by age and sex

	Age	1982	1992	2002	2012
Total	45-54	75.9	81.5	82.1	84.1
	55-64	55.1	56.2	61.9	65.1
	65-74	16.2	16.3	20.4	23.6
	75 and up	4.9	4.5	5.1	5.7
Men	45-54	91.2	90.7	88.5	88.6
	55-64	70.2	67	69.2	69.9
	65-74	22.5	21.1	25.5	29.1
	75 and up	8.5	7.3	7.6	8.2
Women	45-54	61.6	72.6	76	79.8
	55-64	41.8	46.5	55.2	60.6
	65-74	11.3	12.5	16.1	18.9
	75 and up	2.8	2.8	3.5	4.1

Source: Toossi M., Office of Occupational Statistics and Employment Projections, Bureau of Labor Statistics, 2004.

Toossi's analysis of national labor force participation highlights that the greatest expected rate increases are ages 55-64 and 65-74 (Table 2). The median age of the national labor force is increasing from 36.6 in 1992 to 40.0 in 2002, and is expected to be 41.4 years in 2012. The median age was higher for the population than for the labor force because labor force participation rates were lower for older than for younger workers. A projected increase in the median age of the workforce of 1.4 years by 2012 exceeds the increase recorded in 1962, the highest increase ever recorded. Finally, as the age composition increased for those 65 and older the economic dependency ratio (N of persons in total population and not in the labor force per 100 persons who are in the labor force) has also been steadily increasing for those 65 and older (Toossi 2004).

The national population and labor force participation data also suggest that in Washington we can expect equal or greater growth, especially in the increasing tendency of older workers to continue working. Tables 3 and 4 show actual and projected Washington state civilian noninstitutional population percents and civilian labor force participation rates by age group, based on the 2000 U.S. Census. The state and national data are generally similar, especially in the older age groups. Charts 1 and 2 demonstrate the overall trends for Washington state workers aged 65-74, gender differences, and a long range forecast.

Table 3

Washington state civilian noninstitutional population percent by age and sex

	Age	1992	2000	2012	2020
Total	45-54	14.9	19.0	18.0	15.4
	55-64	10.1	11.2	16.3	16.3
	65-74	8.6	7.5	9.4	12.6
	75 and up	6.3	6.9	6.6	7.6
Men	45-54	15.4	19.3	18.4	15.9
	55-64	10.2	11.4	16.3	16.4
	65-74	8.2	7.2	9.2	12.2
	75 and up	5.0	5.5	5.4	6.5
Women	45-54	14.4	18.7	17.7	15.0
	55-64	10.0	11.0	16.3	16.2
	65-74	9.0	7.8	9.6	13.1
	75 and up	7.6	8.2	7.7	8.6

Source: Washington State Office of Financial Management, Forecasting Division, April and September, 2005

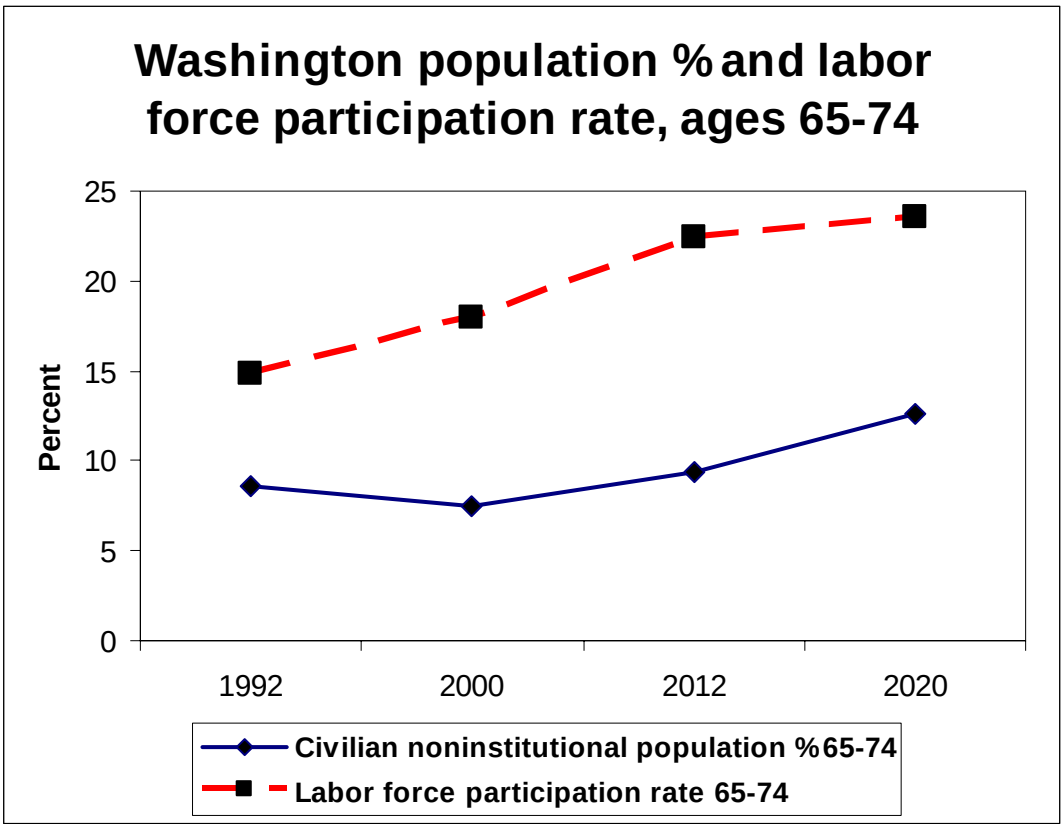
Table 4

Washington state civilian labor force participation rate (percent) by age and sex

	Age	1992	2000	2012	2020
Total	45-54	85.0	83.9	84.5	85.0
	55-64	56.2	60.0	64.8	68.3
	65-74	14.8	18.0	22.4	23.5
	75 and up	4.0	6.1	5.5	5.6
	Total all	69.3	68.4	67.4	65.7
Men	45-54	92.8	90.3	90.2	90.2
	55-64	66.0	67.4	70.6	73.1
	65-74	19.0	22.5	27.3	28.9
	75 and up	6.0	7.8	7.3	7.4
	Total all	77.1	75.5	73.7	71.8
Women	45-54	77.0	77.6	78.8	79.8
	55-64	46.7	52.8	59.2	63.7
	65-74	11.2	14.1	17.9	18.7
	75 and up	2.7	5.0	4.4	4.4
	Total all	61.9	61.7	61.3	59.9

Source: Washington Office of Financial Management, Forecasting Division, April and September, 2005

Chart 1



The labor force participation rate of Washington workers age 65-74 and 55-64 is increasing faster than their share of the total civilian non-institutional population. In Washington this trend is forecasted to continue over the next 15 or more years to around 2020, then levels off and starts a slight decline around 2020-2030, as exemplified by OFM in Chart 3 for men age 65 and over. Chart 2 shows Washington trends by gender for the age 65-74 population and labor force participation that are generally consistent for the genders and with the national data. In Washington one notable gender difference forecasted for age 55-64 women is labor force participation at double the comparable rate for men.

Chart 2

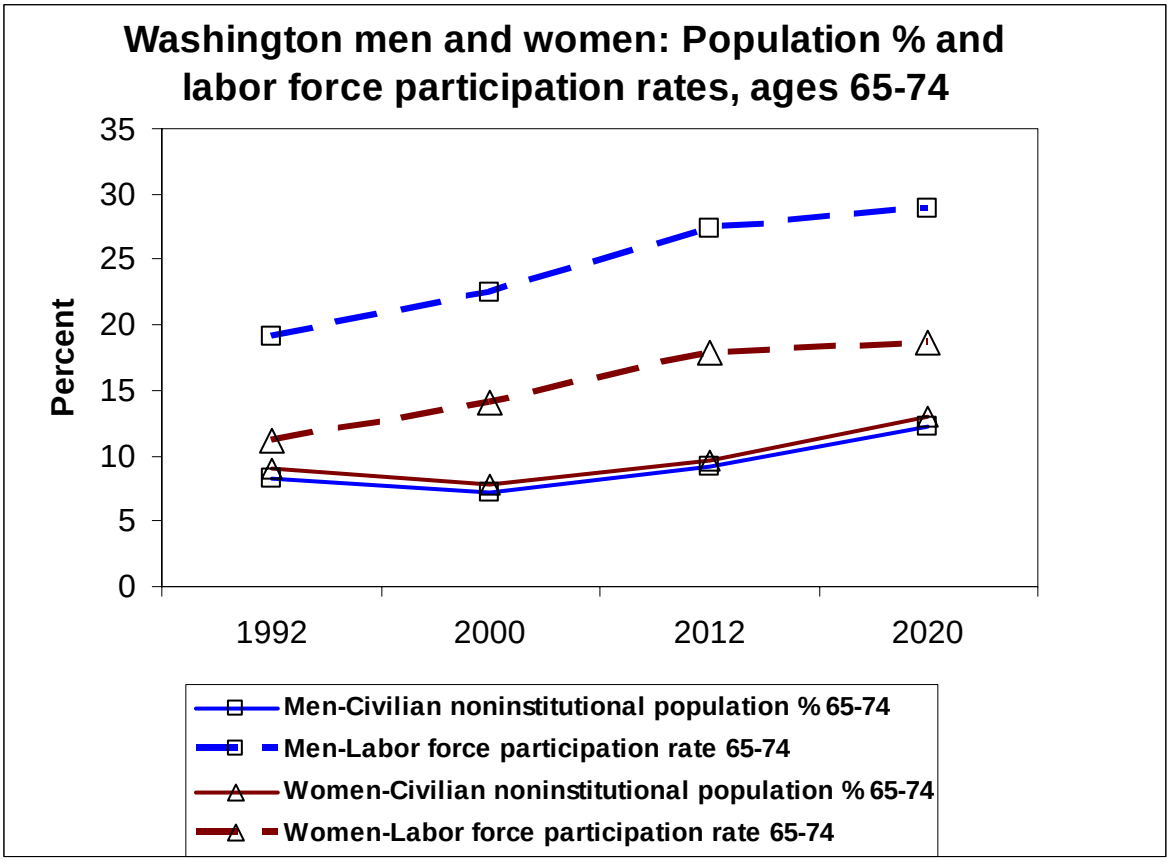
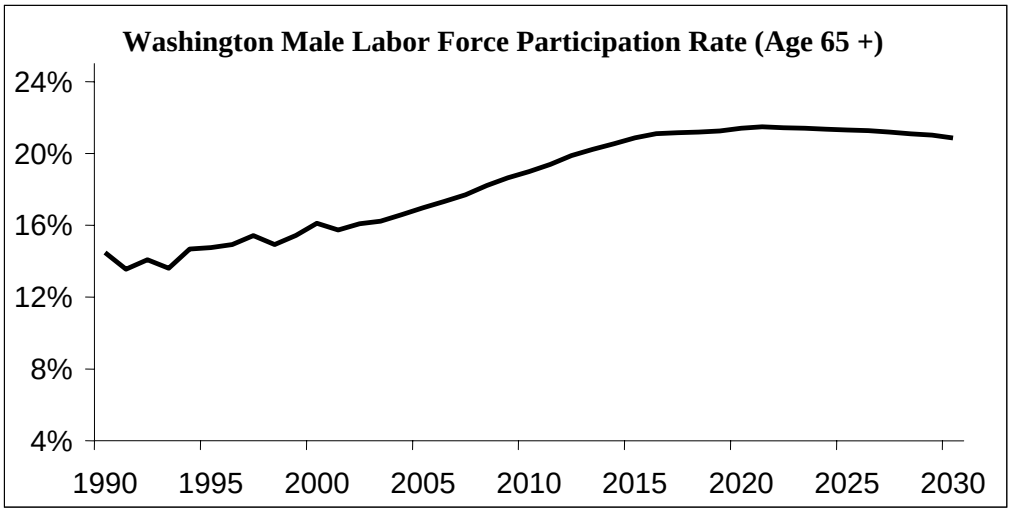


Chart 3



Source: Washington Office of Financial Management, Forecasting Division;
Employment Security Department, Labor Market and Economic Analysis Branch.

Older workers' decisions about retirement age, physical health, disability status and demographic factors seem to interact in fairly complex ways. Among a sample of early retirees aged 62-64 most did not have a serious health condition, but almost half report some type of health problem and about 25% were estimated to have health problems that substantially impaired their ability to work (Leonesio et al 2003). About 12% met Social Security Disability Income (SSDI) or Supplemental Security Income (SSI) eligibility requirements, but many did not have sufficient work histories for SSDI or meet income and asset tests for SSI. About as many 62-64 year olds classified as severely disabled received early retirement benefits as received disability benefits from SSDI or SSI. "The evidence suggests that Social Security early retirement benefits serve as a substantial, unofficial disability program for some early retirees" (Leonesio et al 2003, p 1).

Compared with those in good health, early retirees with more severe disabilities are more likely to be Black or Hispanic, to be formerly married, to live alone, and to have less than a high school education (Leonesio et al 2003, p 4). Women are 60% of all Old Age and Survivors Insurance (OASI) beneficiaries receiving reduced benefits, 63% of those with a severe disability, and an estimated 79 % of these meeting Social Security Disability (SSD) criteria. A different work experience is part of the reason early beneficiaries meeting SSDI criteria are disproportionately female. Of all early retirees estimated to meet SSDI eligibility, 51% had not worked in the last 13 years, and their median lifetime earnings were about one fourth of those without severe disabilities. Women are generally less likely to be insured for disability benefits through other means. In 1990 for 62-64 year olds, disability-insured rates were 50% for women and 80 % for men, and in 2002 were 64% for women and 81% for men (1991 and 2002 Social Security Administration (SSA) data referenced by Leonesio et al 2003).

For healthy and impaired early beneficiaries, past occupations differed for early OASI beneficiaries who had worked in the past 13 years. Those with health problems were less likely to be white-collar (e.g. managerial, professional, technical, sales, administrative) and more likely to be blue-collar workers (e.g. service, production, craft, repair, operators, fabricators, laborers (Leonesio et al 2003, p 5). The income and financial status of early retirees receiving half or more of their family income from SSA account for 32% of those in good health and 58% of the modeled "simulated SSD early retirees" (Leonesio et al 2003, p 5). Consistent with their greater reliance on SSA, the more severely disabled are much less likely to have other types of income. Median total family income of early retirees with severe disabilities is about half that of healthy early retirees (Leonesio et al 2003, p 5). The implications for workers compensation are that those more prone to injury because of their occupational status are also more likely to have more serious health problems that may result in disability or an early exit from the workforce.

Variation in the poverty rate across health categories reflects a strong relationship between health and family income. For a substantial minority of early beneficiaries, impaired health is associated with precarious finances. Those with no health problems have assets roughly four times the median of those with severe disabilities and 40 times the median of those estimated to meet the SSDI test of disability. About one in eight healthy early retirees is uninsured, while about one in four with the most severe health problems is uninsured. Leonesio and co-authors conclude that these retirees limited assets may reflect the cumulative long-term effects of impairments on work and asset accumulation (Leonesio et al 2003, p 5-6). Of early

OASI beneficiaries 25% have health problems that substantially impair their ability to work. If this group comprises those potentially eligible for SSDI or SSI benefits, the eligibility process would probably exclude about 17%. The authors state that "…without changes in eligibility criteria the disability programs will not serve as a safety net for many early beneficiaries with a significant work limitation if the early entitlement age is raised," motivating shifts to unofficial disability or retirement status in state or federal programs (Leonesio et al 2003, p 5-7).

A gender analysis by the Workers Compensation Research Institute in a survey of workers injured in Wisconsin reported that in comparison with the general population's 54% men and 48% women, surveyed workers with lost time due to low-back injuries constituted 71% men and 29% women (Galizzi et al 1998). In Washington we could expect more men than women claimants to have low back injury histories due to a relationship with industry. It is unclear how this pattern would hold up in the older age cohorts.

II. Recovery and Chronic conditions

Conditions normal to aging, chronic or "pre-existing conditions" in the over-50 working population, such as cerebrovascular, cardiovascular, diabetes-related, pulmonary and arthritis-related diseases are more prevalent than previously thought (Higdon and Collins 2004). Workers compensation expenses for older workers are expected to be higher with the higher prevalence of age-related conditions. Analysis of 85,000 indemnity claims closed 1/1/99 to 3/31/03 ranging from $100-$100,000 from 10 states including Washington showed the incremental financial impact for each year of age to be added to the median cost of a claim. The results demonstrate a consistent positive association between age and workers' compensation costs.

"For every year a person is old, the impact of the claim is "N" dollars" (Higdon and Collins 2004, p 64). The impact in Washington and Pennsylvania was the highest of 10 states surveyed- a constant $36.45 added to the median cost of a claim for every year of age, so that the age-related cost for an age 50 Washington worker is $1,822.50. The cost difference between 30-50 years or 50-70 years is the same at $729. The impact of age on indemnity cost depends on the age distribution of the employer's work force, prevalence of claims from various age groups, industry, and the impacts of other variables on claim resources (Higdon and Collins 2004).

In an Ohio study of worker injuries and effects of aging, older workers had higher cost rank orders of rotator cuff sprain, tear of medial meniscus, shoulder tendonitis and carpal tunnel syndrome injuries (Jewell and Dunning 2005). The identified effects of aging on physical abilities were visual acuity, hearing, reaction time, body position, balance, memory, intellectual functioning, respiratory, cardiovascular, reduced flexibility/bond density, and longer recovery time. Older workers had more degenerative or age-related injuries than younger workers and greater severity measured by the percentage of claims with increased lost-work days. Injured older workers had higher average costs per claim than younger workers. The authors suggested that …"focusing on the types of injuries and facilitating return to work may be the most effective strategies to assist employers and workers compensation and disability insurers in controlling costs" (Jewell and Dunning 2005 p 64).

Three important relationships about workers compensation and older workers are the following: "the relationship between age and the prevalence of impairments or chronic conditions; the relationship between age and work disability; and the relationship between age and workers' compensation benefits paid (Burton and Speiler 2001, p 2)." The severity of worker injuries tends to increase with age, such that injured workers ages 45-64 averaged 34.6 days in bed, compared with 24.5 days for ages 25-44. Restricted activity resulting from work injuries lasted about 20 weeks for older and 14 ½ weeks for younger persons. (Burton and Speiler 2001, data based on the National Health Survey, 1996, r.e. Adams et al 1999). Chronic conditions per 1000 persons were much higher for ages 45-64 than for younger persons for intervertebral disc disorders, orthopedic impairments of the back, hearing impairment, heart disease, and high blood pressure.

Burton and Speiler (2001) reported that prevalence of work disability rises with age. Disabilities that limited the kind or amount of work were about 6% for ages 25-34 and about 22% for ages 55-64. Severe disabilities, precluding work were about 4% for ages 25-34 and 16% for ages 55-64 (authors' compilation from US Census, 1999 Current Population Survey). They comment that "…the exact nature of the relationship between age and workers' compensation is inconclusive," although age was a factor in determining the award and payment of benefits. Conditions substantially aggravated by work may also be more prevalent among older workers (Burton and Speiler 2001).

The Center for Disease Control's (CDC) practical approach to morbidity was based on the leading actual causes of death, resulting in estimates of each morbidity factor to eventual mortality (Mokdad et al 2004; McGinnis and Foege 1993). The actual causes of death describe chronic medical conditions among living workers in all age cohorts, particularly for older workers. In 1990 and 2000 the ranks of the top four actual causes of death were unchanged, with slight changes occurred as follows: Tobacco, (18.1%, decreased slightly), poor diet and physical activity (15.2%, increased 1.2%), Alcohol consumption (3.5%, decreased 1.5%), Microbial agents (3.1%, decreased slightly) (Mokdad et al 2004). *

The four top actual causes of death and five lesser causes accounted for 50% of U.S. mortality in 1990 and 47% mortality in 2000. Other causes were unknown pollutants, low education levels, and poverty. The former two are related to work-related illness and the ability to return to work after a time-loss injury. Mokdad states: "low education levels and income were associated with increased risk of cardiovascular disease, cancer, diabetes and injury," that suggest work-related contributors to time-loss accidents or illnesses (Mokdad et al 2004, p 242).

* *Note*: There was a media splash in 2004-05 challenging the "obesity epidemic" included in CDC's, "poor diet and physical activity" actual cause of death factor. The 15.2% mortality figure above is Mokdad's corrected data, obtained directly from the author (Mokdad et al 2005; Mokdad, personal communication). The controversy continues over how to validly measure obesity. Expect the proportion of this actual cause of death to change slightly, as it did in the correction (-1.4%). Of practical importance, its rank as the second actual leading cause of death in the U.S. is much less likely to change. The consistent discussion in the original article and correction is valuable to the study of aging workers' chronic conditions because it emphasizes risky personal health choices, demographic factors, and the cumulative nature of health problems on the aging process of workers.

The authors discuss the strong association between mortality causes and the total disease burden, for example years of lost life, diminished productivity, high rates of disability, and decreased quality of life (Mokdad et al 2004). They emphasize the cumulative nature of illness and how it affects older people including older workers: "With the current shift in the age distribution of the population, more adults are in the age group at highest risk because of the *cumulative effects* (emphasis added) of their behavior." The authors recommended age cohort analysis: …"*if the effect of the risk factor is age-dependent*, (emphasis added) then age- and sex-specific estimates are preferable" (Mokdad et al 2004, p 1243). The interdependence of aging with chronic morbidity factors and work-related injuries has likely consequences for older workers: "The burden of chronic diseases (smoking, poor diet and physical inactivity, rapid increase in prevalence of overweight) *is compounded by the aging effects* (emphasis added) of the baby boomer generation" (Mokdad et al 2004, p 1243).

The Harvard Study of Adult Development corroborates the CDC's morbidity factors with findings about "predictor values at age 50 of successful aging" for two prospective samples of men ages 65-70 and 75-80. The factors predicting healthy aging: "no heavy smoking, no alcohol abuse, stable marriage, some exercise, not overweight, mature (psychological) defenses, and years of education" (Valliant 2002, p 209). Tobacco, alcohol, lack of exercise and overweight are important chronic conditions to be avoided in successful aging, with clear applications to aging workers. Dr. Valliant comments that the factors "allow us to predict health *thirty years* in the future" (Valliant 2002, p 210).

Washington's Labor and Industries (LNI) administrative database doesn't provide systematic chronic morbidity information to estimate aging workers' pre-existing conditions. The 40% cumulative risk for CDC's top four morbidity factors could be used to predict that four in 10 workers will be affected by one or more significant morbidity factors that would interact with the risks of worksite injury. Alternatively, we could assume a weight of 47% in a risk model for workers some of whom will have more than one morbidity factor from among CDC's nine actual leading causes of death. The authors do not analyze interactions among leading causes, although they and the associated reviewers' comment on increased risk due to interactions.

The CDC data emphasize compounding aging effects, suggesting additional weighting for higher risk older age groups. The Harvard Study also values the absence of several of the same morbidity factors. Assuming that time-loss and associated costs will be incrementally greater for each successive injury, and will accumulate for an aging worker, the longer that worker keeps working the greater the likelihood that another illness or injury will be related to previous morbidity or injuries resulting in accumulating time-loss, workers compensation costs, and other consequences for the worker and employer. This differs from the "straight line" age-based cost increment calculated by Higdon and Collins. After age 50 or 55 if one or more chronic morbidity factors are present, things are starting to "add up" for older workers because it's getting harder to do the job and the risks of injury may be increasing. Eventually some disabled workers will have to leave the workforce because they can't physically work anymore, or they will have to move to easier or part-time work. Others in good health will voluntarily retire. For Washington workers, there is probably a connection between chronic morbidity and

subsequent time loss and it would be challenging to cumulatively weight the risk for older cohorts. Pre-existing (chronic) morbidities are likely a strong contributing factor to older workers' injury and claims events, and their eventual decision to leave the workforce.

III. Expected impacts on Workers' Compensation costs:

There are dissenting opinions about the potential effects of aging on workers' compensation systems. Some researchers find that older workers are more likely than younger workers to have increased rates of claim filing and increased claim duration because of differences in benefits, even when disability isn't a factor such as in retirement decisions. Economic incentives are likely to influence claim filings and return to work decisions more strongly when an older worker is in poor health or has a disability (Gardner 1989, p 52).

In sharp contrast to the findings above about age-related outcomes in work-related injuries, Pransky and co-authors found that most outcomes were quantitatively and qualitatively similar in a survey of workers above and below age 55, despite more severe injuries in older workers. This New Hampshire study of workers who were injured no more than eight weeks prior to the survey hypothesized "that outcomes would be different for these two age groups, and that a variety of factors (some associated with aging) would account for these differences (Pransky et al 2005, p105)." The self-reported survey was designed to closely associate first reported injury with a matched pairs analysis of young and older workers, injury severity rankings, and workers experiences with functional job outcomes.

The authors state "for the vast majority of workers who return to their jobs, there does not appear to be any age-related difference in functioning," including ability to do the job compared with before injury, current injury-related pain, use of pain medications for the injury, concerns about future job capacity or job retention following injury (Pransky et al 2005, p108). Age, gender and level of job physical activity were controlled. "In multivariate models age was unrelated or inversely related to poor outcomes. Injury severity, physical functioning, and problems upon return to work were associated with adverse work injury outcomes (Pransky et al 2005, p104)." In the multivariate model, age was inversely related to only one outcome, injury-related financial difficulties, where being older was related to reduced financial difficulties. "These findings are remarkable, as older workers reported more frequent pre-existing illnesses, and had more severe injuries (Pransky et al 2005, p109-110)." Although older workers had more co-morbidity, they reported no age-related differences in physical work limitations or injuries prior to the index injury, suggesting similar pre-injury work-related health status in both age groups (Pransky et al 2005, p110).

Workplace conditions were a key to the relative advantage of older workers' reported higher satisfaction with the workers' compensation insurer, their pre-injury employment, the medical care they received for their injury, and the provider's return to work recommendations. In contrast, younger workers reported lower pre-injury job satisfaction, less positive responses from employers, less satisfaction with the post-injury response of the workers' compensation insurer, and more problems on returning to work. The only outcome model where pre-injury job

satisfaction was significant was return to work (Pransky et al 2005, p 110). Older workers were no more likely to be placed on light duty than younger workers once injury severity, problems upon return to work, and physical functional status were taken into account, (Pransky et al 2005, p 111). Gender was largely insignificant in multivariate models, with the exception of change in quality of work life, where men were more likely to report a negative change (Pransky et al 2005, p 109).

Pransky et al emphasize studying the effect of age on work outcomes in the context of other factors because of the lack of an age-related difference in functioning. Older workers appeared more content and suffered fewer residual symptoms than younger workers. "Factors in adverse outcomes of work injuries for any age group, and the nature of the contribution of age to these outcomes, such as job satisfaction, severity of injury, and post-injury employer response- factors, where those over age 55 who are still working have an advantage- are the most important determinants of outcome, more so than age itself (Pransky et al 2005, p 111)."

In contrast, a study of a pooled sample of claims in the Detail Claim Information database compiled by the National Council on Compensation Insurance April 1979- December 1983 found that age was a prime determinant of the duration of a non-work period (Worrall et al 1988, unpublished). Duration of workers' compensation insurance was a function of number of weeks, weekly wage at time of injury, weekly workers compensation insurance benefit, if the worker was employed at the time of claim filing, age at time of injury, if the worker was married with spouse present, number of hospital days, and if an attorney is involved in the claim.

A random sample of Washington workers compensation claims from 1987-89 found that workers over age 45 were at risk of longer term disability. Based on a survival analysis the conditional probability was 0.67 of returning to work relative to a reference group (Cheadle et al 1994). The study concluded that older age is the *most important and consistent influence on duration of disability*, stating, "the age effect is due both to the reduced ability of older workers to recover from injuries and to the reduced likelihood of finding employment once they have recovered" (Cheadle et al 1994 p 194).

A review of predictors of chronic disability in injured workers also found that age was the most consistent finding in older workers' poorer outcomes (Turner et al 2005). However older workers may not always have had significantly different recovery times or outcomes. The authors suggested the following variables for analysis: worker injury severity, functional status, history of prior injury and disability, psychological distress, expectations of recovery, and analysis of the interactions of sex and wage, and age and type of injury (Turner et al 2005).

A study of permanent partial disability (PPD) and workers' earnings losses in states including Washington found that older workers suffered proportionately more permanently disabling injuries and that their income losses averaged greater than for younger workers (Biddle et al 2001). Injury-related non-employment was higher among older workers and they appeared to recover a smaller proportion of their earnings losses from workers' compensation than did other injured workers (Biddle et al 2001, p 264). * (see Footnote on following page)

The share of Washington's claims with PPD benefits averaged 23.4%. By age, PPD claims were 17% for age 35 and under, 27% for ages 35-54, and 39% for ages over 55. In 1984 dollars, based on pre-injury quarterly earnings of $5,601 the estimated earnings loss and replacement rates placed the average losses from an injury in Washington at $15,358 for 3.5 years, and projected to $32,427 for 10 years. Based on total average income benefits in Washington of $14,975, the replacement rate of 10-year losses was 0.462 (or 46.2%). Washington's replacement rate was the same as Wisconsin's and above California's (0.377) (Biddle et al 2001, p 276).

In 1994 dollars, earnings increased with age for PPD claims and were consistently highest for those over age 55 in Washington and Wisconsin. When compared with pre-injury earnings in Washington the youngest disabled workers experienced the largest earnings losses relative to pre-injury earnings in contrast to Wisconsin, where older disabled workers experienced more post-injury time out of work than younger workers. Washington workers under age 35 experienced over nine months of lost pre-injury earnings while workers over 55 experienced less than 7 months of losses (Biddle et al 2001, p 278). Over 10 years, income losses in Wisconsin showed that older disabled workers experienced considerably larger absolute losses or months of lost earnings, while in Washington months of lost earnings was similar among age groups. In both states the replacement rate of 10-year losses was considerably lower for workers over age 55 than for younger age groups. For the two age groups below age 55, the replacement rate was about 50% but for injured workers age 55 and over, both states' replacement rates were 28%. "The results suggest that the adequacy of replacement rates is lowest for the oldest injured workers (Biddle et al 2001, p 278-9)."

Compared with non-disabled workers in Washington and Wisconsin, workers over age 55 with permanently disabling injuries were increasingly likely to be out of work as time from the injury increases. "This suggests that a disabling workplace injury may lead older workers to choose to retire earlier than they would have otherwise" (Biddle et al 2001, p 282). In Table 6 the duration of non-employment varied directly with age for PPD cases in two states.

Footnote- *from previous page*: Washington and Wisconsin earnings regressions were estimated with longitudinal data on real quarterly earnings for a pooled sample of injured workers and controls. Regression coefficients projected probable earnings of the injured worker in the quarters of injury and post-injury using that worker's estimated fixed effect. Estimated earnings loss for each post-injury quarter was set equal to the earnings projection minus the actual earnings of the injured worker. Sampled Washington claims were compensated injuries from July 1993 - June 1994 including 8,769 medical-only cases and 34,618 workers receiving total temporary disability (TTD) and PPD income benefits. Washington claims data were linked to 21 quarterly reports on employer-reported earnings from the Washington Employment Security Department so that earnings were available from 6 quarters before to 14 quarters after the injury (Biddle et al 2001, p 269).

Table 6

Injury-Related Non-Employment Rates by Quarters from Injury and by Age Group, PPD Cases in Wisconsin and Washington (%)

	Quarters		
Sample	3	5	10
Wisconsin			
Age <35	11	10	9
Age 35-54	8	11	12
Age 55+	12	17	27
Washington			
Age <35	13	11	7
Age 35-54	12	12	10
Age 55+	13	15	18

(from Biddle et al 2001, p283)

The first few years after injury older workers seemed to recover a smaller proportion of their wage losses from workers' compensation than other injured workers, "raising concerns about the extent to which the uncompensated burden of work-related disabilities of older workers falls on the workers and their families or is absorbed by other public and private insurance systems" (Biddle et al 2001, p 285). The authors raised questions for aging workers research in the complex area of cost shifting from state to federal and private programs. Probable effects of demography, occupation and employer accommodations for older workers were noted.

Biddle and co-authors concluded that "Wisconsin's system appears to lead to better targeting of benefits to losses, *while Washington's impairment-based PPD schedule leads to losses unrelated to benefits paid"* (Biddle et al 2001, p 283, emphasis added). Workplace injuries and illnesses were important sources of disability throughout the working life, particularly for older workers. When injured, older workers appeared to suffer more permanently disabling injuries, and those with permanent disabilities experienced more injury-related non-employment. Older injured workers in the two states recovered a smaller proportion of their losses from workers' compensation than younger workers. *"Current evidence on the relationship of age and losses is ambiguous"* (Biddle et al 2001, p284, emphasis added).

The Upjohn Institute also studied functional income replacement for older workers in the Washington State Work Search Incentives Study 1986-87 (O'Leary et al 2001). Unemployment insurance's function for older workers from career job to bridge job(s) in working retirement transitions was such that unemployment insurance use patterns differed for those over ages 55 and 65, compared with younger workers.

Another report on wage-loss among Washington's permanently disabled workers injured from July 1993 to June 1994 found that the proportion of injured workers receiving permanent disability benefits rose from 27% of ages 35-54 to 39% of ages 55 and older (Biddle et al 2003). The increase in permanent disability for older workers was largest in Washington compared with Wisconsin or California, supporting the hypothesis that "…older injured workers are more likely than their younger counterparts to receive benefits for permanent, as opposed to only temporary disability" (Biddle et al 2003, p 1).

Older workers with permanent disabilities faced greater wage losses from workplace injury. In Washington three years' lost wages averaged $18,228 for injured workers aged 35-54 and $21,229 for ages 55 and older, a significantly smaller age-related difference than in Wisconsin (Biddle et al 2003). The pattern persisted when losses were projected to 10 years after injury. Washington workers' average loss over ten years for older workers was $57,763, about 40% larger than the $37,332 earnings loss for ages 35-54 (Biddle et al 2003). Ten year total wage replacement rates showed that older workers had less of their long-term wage losses compensated by workers' compensation. Washington's and Wisconsin's injured workers age 55 and older received benefits that replaced 28 % of their lost pre-tax earnings over ten years, while workers 35-54 received about 50% of their lost earnings, although after taxes replacement rates would be somewhat higher for both age groups (Biddle et al 2003).

Compared with non-disabled workers, those age 55 and older with permanent disabilities were increasingly likely to have been out of work as time increased following the injury (Biddle et al 2003, p 3). In Washington, injury-related non-employment at ten quarters after injury for workers aged 55 and older was 18% and for workers aged 35-54 was 10%, a pattern "suggesting that a disabling workplace injury (as with the onset of other health conditions) may lead older workers to choose to retire earlier than they would have otherwise" (Biddle et al 2003, p 3).

Another study of age and workplace injuries using data from the 1980 US Census and workers' compensation programs for nine states - Colorado, Montana, Idaho, New York, North Carolina, Arkansas, Iowa, Wisconsin and Delaware - found age positively and significantly correlated with some forms of workplace risk (Mitchell 1988). Job-related temporary disabilities had not varied with age, but employees age 65 and over were more likely to suffer permanent disabilities and fatalities on the job. Age effects were not simply the result of job differences between older and younger workers, because findings were robust for inclusion of controls for industry, occupation and state (Mitchell 1988).

Occupational variables were more powerful than industry variables in Mitchell's analysis of permanent disability. The variance attributed to age, industry and occupation explained that occupational patterns were most important for the least severe job risks (temporary disabilities), accounting for about 80% of the explained variance. Occupation appeared to be three to four times more important than industry as a determinant of temporary disability. In contrast, age, and not occupation or industry best explained fatalities (Mitchell 1988, p 10). The more severe the injury incident, however, the more similar was the explanatory influence of occupation and industry.

Compared to younger workers, older workers appeared to suffer significantly more serious job-related risks, as explained by multivariate regression. Permanent disabilities were 1.1% higher and fatalities 1.6% higher for workers age 65 and older than the sampled average (Mitchell 1988, p 10). Age coefficients indicated that the very young and those over 65 suffered more job-related health problems and were less productive than all other age groups, even when other factors were held constant (Mitchell 1988, p 11). Occupation was significant in all "extent of disability risk" models. Service workers, craft workers, operatives, transportation operators and handlers and laborers suffered significantly more total incidence of health and safety problems in rate models. The "blue-collar" effect was significant and positive even when

controlled for age, industry and state, which indicated increased risk of disability (Mitchell 1988, p 11). The significance of the industry variables indicated that industry did not contribute to explaining fatality rates or permanent and temporary disability rates, confirming that job risk varied more by occupation than by industry, other things being equal (Mitchell 1988, p 12).

In Mitchell's study workers below age 25 were twice as frequent in the group receiving TTD benefits for 8-10 days. Mitchell concluded that prime-age workers and older workers had not had different patterns of job-related temporary disabilities. Workers age 55 and over were more often in PPD benefit and compromised-case groups confirming that young workers were hurt more often, but not as seriously as older workers, and that older workers were more likely to be involved in PPD cases (Mitchell 1988). Those age 65 and older appeared more likely to suffer work-related permanent disabilities and fatalities (Mitchell 1988, p 12). Age effects were robust for industry and occupation, implying that they are not simply reflecting life-cycle differences in workers' jobs. *Occupation was more important than industry* in explaining job-risk patterns for craft workers, transportation operators, operatives and handlers, laborers, and durable manufacturing industries (emphasis added). Differences in job-risk persisted even if age, industry, and occupational dispersion in jobs were controlled, a result not previously noted (Mitchell 1988).

A WCRI study in Wisconsin reported that workers with intermittent pre-injury employment tended to be out of work much longer after an injury, and 56% of workers at least age 55 at time of injury stopped working after an initial return to work. Of those changing employment following injury, 3% were age 55 and older, and less than 1% were age 60 and older (Galizzi et al 1998, p 61). The proportion of older workers was 9% in the PPD and compromised case groups (Galizzi et al 1998, p 89). The intensity of workers' treatment at time of injury and physical limitations 5-6 years after the injury were strongly associated. Of people who had not returned to work following injury, 27% were age 55 and older, and 12% were age 60 and older. Return to the pre-injury employer and age or pre-injury training were not significantly associated. Employer help in finding a job with another employer and pre-injury job tenure were significantly associated, as were training for a new occupation and age, pre-injury tenure and pre-injury wages (Galizzi et al 1998).

When older workers were displaced by injuries, their injuries, recovery experiences and return to work behaviors differed by age group, taking more lost-time days and considerably more expense. When job displacement was due to causes other than workplace injury older workers were less likely to find work and more often found it at lower wages relative to younger age cohorts (Reno and Eichner 2000). Workers 55-64 were 44% more likely to be displaced and 20% less likely to have found other jobs than younger workers. "Displaced" was defined as 'employer closed or moved, positions abolished, or employer did not have enough work,' with no relationship to injury. When they found work, displaced workers aged 55-64 were more likely than younger workers to suffer large earnings losses, such that 40% of older workers had a drop in earnings of =>20%. (Reno and Eichner 2000, source: BLS, 2000). Prevalence of a disability that qualified for SSA benefits rose with age from less than 1% for workers aged 25-29, to about 15% for workers aged 60-64, and SSA actuaries have projected a disability rate of about 17% for workers aged 60-64 by 2009. (Reno and Eichner 2000, source: SSA, 2000). A shift in worker demand on employer-based health and disability programs or to SSI was thought

likely if workers lacked health insurance coverage, so that claiming workers' compensation may have been their only way to get medical treatment.

Coverage gaps can occur through job loss, illness, or because no national system ensures health coverage to unemployed workers (Reno and Eichner 2000). Workers' compensation may continue paying for medical care for a particular injury, but not for coverage of the workers' family or for other health needs of the worker. With a career-ending disability, workers can receive SSI disability after a five-month wait. For the injured worker there is another 24 month gap until Medicare coverage begins covering the worker but no family members who lost coverage when the worker lost his/her job. The workers' dilemma of lost health coverage and workers' compensation's exposure to shifting health insurance expenses are likely to increase as the aging worker becomes a larger proportion of the active workforce (Reno and Eichner 2000).

Analysis of worker displacement due to injury and health insurance outcomes was based on the March 1999 Supplement to the Current Population Survey (CPS) for health insurance types, socioeconomic and demographic characteristics (Swartz and Stevenson 2001). Family income, educational attainment and health status had the greatest effects on each type of insurance coverage, consistent with the authors' concept that near-retirees consisted of two distinct groups, "fortunate and unfortunate." The "fortunate" group worked until at least age 65, were more likely to have higher education and income, better health, and employer-sponsored insurance. The "unfortunate" group had developed health conditions or other difficulty to continued work, and had less financial resources, including employer-sponsored insurance before they reached age 65 (Swartz and Stevenson 2001). Analogous distinctions were used in a broader life context for describing the successful aging process in the Harvard Study of Adult Development as noted above (Valliant 2002).

A study of almost 3400 workers in Ontario, Canada found that about 15% did not return to work following injury, and that on average they were older, less likely to be union members, and had low educational attainment. Nearly 80% of the workers who had not returned to work had less than a high school education, and 40% sought re-employment with their time-of-injury employer but were rejected (Butler et al 1995, p 458). Aging and low educational attainment significantly reduced the probability of returning to work in this sample, and gender did not significantly affect the probability of returning to work. The probability of returning to work declined as the ratio of workers' compensation benefits to wages increased, confirming results of other studies showing that disability benefits produce some work disincentives (Butler et al 1995).

Controversy with WCRI findings

Bogyo and Victor (2002) questioned a Workers' Compensation Research Institute (WCRI) conclusion (Tattrie et al 2000) that demographic changes expected over the next 10-25 years would have little impact on workers' compensation costs. The WCRI conclusion was based on data for eight selected states. Among the eight states the projected percent population increases in the groups age 65 and over ranged from 19-70% (Tattrie et al 2000).

For Washington, not one of the eight selected states, the projected population increase for those age 65 and over was 75% by year 2025, and seven additional states were higher than Washington! Bogyo and Victor point out that the selected eight states' demographics are reasonably typical of large states, but that smaller states had much higher growth rates in the elderly population with potentially significant consequences for workers' compensation costs.

Washington's "outlier" position in projected aging population growth signals potentially significant impacts on workers' compensation costs. WCRI's controversial conclusion noted that the national impact is equivalent to a two-percent surcharge to premium for the next 20 years. Bogyo and Victor discussed that "segmentation effects" could mean a particular employer, provider, industry or insurer could have differed significantly from an aggregate impact based on only eight states. National impact would have been small in some industries such as construction but with a probably large impact in Washington. As workers' life expectancy extends into their 80's, they would be driven by basic needs for food, shelter and self-actualization to continue working, and the demand for older workers would also increase as representation of younger workers in the population decreased.

In Washington "the relatively large demographic changes will likely have significant consequences for workers compensation costs," however, "even in states with large shifts, the net effect on average age may be mitigated by a proportional increase in younger workers" (Bogyo and Victor 2002, p 23). Relatively dramatic demographic shifts in individual states such as Georgia (70%) and Colorado (101%) could be "lost" in WCRI calculations of average growth rates/shifts in cohorts age 65 and over vs. age 18-24 and age 25-64. The authors suggested using national rates only as a guide to analyzing state-specific data, and to look at states that also had high projections for age 65 and over. The authors concluded that the WCRI study is significant, that its authors did not overstate their findings, but that the casual reader may miss important implications in the data (Bogyo and Victor 2002). For Washington, comparison of age groups by expected population increases, with working adults and workers' compensation claims would show current and expected trends of older workers' labor force participation.

Note: This literature search was conducted from 8 November 2004 to 6 May 2005 with help from Washington State Library staff to search EBSCO Host-Business Source Corporate, Academic Search Premier, Web of Knowledge (formerly Current Contents) and OCLC- catalog of monographs. The search words used were aging, aged, elderly, old, older, worker, employee, job and related synonyms. The additional institutional sites searched include Harvard World Health News, U.S. Government Printing Office, Workers Compensation Research Institute, Workers Compensation Board of B.C., National Academy of Social Insurance, Occupational Hazards, John Burton's Workers' Compensation Resources, Workers' Compensation Insurance.com, Social Science Research Network, Onmidex-The Corporate Database Search Engine, Kaiser Network.org, Social Security Online, W.E. Upjohn Institute for Employment Research, U.S. Census Bureau, Pub Med-National Library of Medicine, Oregon Workers Compensation Division, and European Foundation for the Improvement of Living and Working Conditions.

IV. Research Agenda

Research and Data Services is studying aging workers based primarily on information in the Labor and Industries administrative database. A research team has been formed to begin empirical work, with initial focus on demographics, chronic conditions, and the expected impacts of aging workers on injuries, disability, costs and re-employment. Initial analysis will focus on age, gender, industry and occupation by the following: time loss days, chronic conditions, re-injury, disability, and "severity." Although numerous other areas such as wage replacement, worksite accommodations, vocational rehabilitation or retirement decisions are important parts of the aging workforce question, the study will initially be limited to the topics noted.

Following the Aging Workforce Symposium (22 June 2005) held at Labor and Industries, the areas in this review in common with presenters' findings should also be investigated. In order to determine the impacts in Washington basic research on the size of older population cohorts, the size of the working population and projected rates of change is needed. The rate of claims and time loss days for each age cohort, with sensitivity to industry would begin to describe time loss compensation, claim costs, claim frequency, and injury severity for older workers

Research Question:

In Washington, what effects does an aging workforce have on the frequency and costs of workplace injuries, initial and re-opened claims and time-loss days?

Null Hypothesis:
Aging workers' claims activity will not increase demands on workers' compensation, medical care, vocational rehabilitation and pensions, as compared with the claims activity of other age cohorts of workers.

General Hypothesis:
Claims for older workers will be more frequent and will increase costs to workers' compensation, medical treatment, vocational rehabilitation and pension programs, as compared with other age cohorts of workers.

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