

The Effect of Arthritis on Working Life Expectancy

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ABSTRACT. Objective. To measure the effect of arthritis and musculoskeletal conditions on working life expectancy.

Methods. Cross sectional data from the 1994 Canadian National Population Health Survey (NPHS) were used to calculate and compare the working life expectancy of individuals who reported "arthritis or rheumatism" with that of the general population. Age and sex-specific workforce participation rates were calculated for the population reporting arthritis or rheumatism as a chronic condition, excluding back pain, and for the entire population surveyed. Age and sex-specific population figures and mortality data were obtained from annual estimates produced by Statistics Canada. Working life expectancy was estimated by constructing multiple-decrement life tables for the total and for the arthritis and rheumatism populations.

Results. The NPHS surveyed 22,000 households, yielding a sample size of 58,439 individuals. The percentage of the population aged 15 to 65 yrs who reported having arthritis or rheumatism was 8.9%. The percentage of persons employed for each group was reduced compared to the total population, by 3 to 23%. Working life expectancy of individuals with arthritis or rheumatism was reduced by 4.19 ± 0.02 yrs (mean \pm SE) for men and 3.12 ± 0.01 yrs for women at age 15 ($p < 0.001$ for both), with a persistent reduction through all age groups. Working life expectancy of men at age 15 was 37.42 ± 0.01 yrs for the population with arthritis or rheumatism compared to 41.62 ± 0.01 yrs for the total population; for women it was 31.06 ± 0.01 and 34.19 ± 0.001 yrs for both groups, respectively.

Conclusion. The working life expectancy of people with arthritis and musculoskeletal conditions is significantly reduced compared to the general Canadian population. (J Rheumatol 2001;28:2315-9)

Key Indexing Terms:

ARTHRITIS

WORKING LIFE EXPECTANCY

MUSCULOSKELETAL CONDITIONS

WORK DISABILITY

WORK

Most forms of arthritis are chronic and lead to progressive impairment in physical function. Individuals are often affected during the prime of their working life, when they would still be expected to be active labor force participants for many years. Work loss from arthritis and musculoskeletal disorders has a major impact on the quality of life of patients and their families, as well as economically for both patients and society. Arthritis and musculoskeletal disorders are the leading cause of work disability in Canada¹ and in the US². The cost is estimated at 1% of the gross national product annually in the US². Using 1999 Canadian gross national product figures, this translates into a cost of \$8.9 billion per year for Canada.

Further, the prevalence of arthritis is expected to rise sharply in the near future, due to the aging of the Canadian population, as the "baby boom" generation enters the age group over 45, when arthritis is most prevalent. In a study using data from the 1994 National Population Health Survey, Badley, *et al* estimated that 2.9 million Canadians aged 15 and older reported arthritis or rheumatism in 1991, and forecast that this number would rise to 5.7 million by the year 2021, and 6.5 million by the year 2031. Half of that increase will be in the working age population³. As the prevalence of arthritis and musculoskeletal conditions increases, and as the workforce ages along with the population, one can expect that these diseases will have an even greater effect on society and the labor force.

Few data are available to characterize the problem of work loss from arthritis and musculoskeletal disorders and evaluate its magnitude on a population scale⁴⁻⁸. Yelin, *et al* described the importance of arthritis as a cause of days lost from work in the US⁴⁻⁶. Badley, *et al* have shown the importance of arthritis as a cause of premature departure from the workforce in Canada, by reporting that 50% of Canadians of working age who report having disability from arthritis are not in the labor force^{7,8}. None of these studies quantify the amount of work loss, from premature departure from the workforce, at an individual level. Evaluating working life expectancy allows one to measure the effect of arthritis and musculoskeletal conditions on the number of years individuals spend in the workforce

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over their lifetime. This has not been studied previously. Defining the problem has important implications for policy-makers who need to allocate scarce resources, and provides direction for further research, especially intervention studies.

We investigated the extent to which the working life expectancy of individuals with arthritis and musculoskeletal conditions is reduced compared to that of the general population in Canada.

MATERIALS AND METHODS

Study design. Data from the 1994 Canadian National Population Health Survey (NPHS)⁹ were used to calculate and compare the working life expectancy of individuals who reported "arthritis or rheumatism" with that of the general population. The NPHS is a longitudinal survey performed by Statistics Canada. Results from the first survey, conducted in 1994, were used for this analysis. The target population consisted of household residents in all provinces, with the exclusion of a few remote areas in Quebec and Ontario, Indian Reserves, and Canadian Forces bases. The sample design used was a multistage stratified sampling of dwellings selected in clusters, as described¹⁰. The survey was conducted over 4 quarterly collection periods. Extensive efforts were made to contact nonresponders and to pursue initial refusals. Nonresponders and refusals selected for the sample were not replaced. The response rate was 88.7%. Questionnaires were available in 6 different languages. Trained Statistics Canada interviewers visited households and conducted computer assisted interviews, except for a small sample in remote British Columbia, where telephone interviews were conducted. Information was collected on all household members over age 12, by means of an interview with one proxy respondent per household; 22,000 households were surveyed, yielding a sample size of 58,439 individuals. Results from the survey were extrapolated to the entire Canadian population by using weights for each subject sampled that renders them representative at the national level. Rates presented here are those applicable to the entire Canadian population and were obtained from Statistics Canada⁹.

Study population. The study sample was drawn from all individuals who reported "arthritis or rheumatism," in response to the following question in the NPHS: "Do you have any of the following longterm conditions that have been diagnosed by a health professional?" "Arthritis and rheumatism" was included as one of the reply options, and formed a category separate from "back pain." This distinction is important, since work loss from back injuries is common and is a separate entity from work loss from arthritis. Individuals were included in the study sample even if they reported other chronic conditions in addition to arthritis or rheumatism. The same strategy was used for the general population, i.e., individuals with chronic conditions other than arthritis or rheumatism were included.

Outcome measure. Working life expectancy of men and women, ages 15 to 65, was compared between the population reporting arthritis or rheumatism and the total population surveyed. Work status was defined as "employed" if individuals reported having had a job in the preceding 12 months, in response to the NPHS; otherwise individuals were considered "not employed." The outcome "not employed" therefore represents complete cessation of work, as well as longterm work loss, since 12 months without work were necessary for an individual to be considered not employed. This represents a conservative definition of longterm work loss, since the usual duration of work used by government and private insurance companies for the definition of longterm work disability ranges between 3 and 6 months¹¹. It also represents cessation of work regardless of the reason for stopping work. This differentiates this outcome from work disability by allowing measurement of more subtle effects of disease on working life, such as early retirement, increased vulnerability to layoff, or lower threshold for individuals to choose not to work for personal reasons. Age and sex-specific employment rates were calculated as the proportion of the population in each age group who were working.

Statistical analysis. Working life expectancy was evaluated by constructing

multiple-decrement life tables using standard demographic techniques¹² for the total and the arthritis and rheumatism populations. These tables take into account current age-specific death and employment rates. The working expectation of life at an exact age, as expressed in these tables, measures the expected number of future years that a person will be employed in the workforce. Age and sex-specific population figures and mortality data used in these tables were obtained from annual estimates produced by Statistics Canada. Separate life tables were calculated for men and women to prevent the confounding effect of sex, since the proportion of women is greater in the population with arthritis and rheumatism than the general population, and women have on average a shorter working life expectancy.

RESULTS

The percentage of the population aged 15 to 65 years who reported having arthritis or rheumatism was 8.9%. For the entire Canadian population, this yields an estimate of 1,720,512 individuals with arthritis or rheumatism, from a general working-age population of 19,371,512. Age and sex-specific percentages of the Canadian population reporting arthritis or rheumatism are presented in Table 1. The prevalence of arthritis or rheumatism was consistently greater in women than men (in all age groups) and increased with age.

Table 2 summarizes the percentage of employed Canadian men and women in the population with arthritis or rheumatism and in the total population. As described, the percentage employed was lower for the population with arthritis and rheumatism, with reductions of 3 to 23%, for all age groups except ages 15 to 19 in women and ages 20 to 24 in men. The greater employment rate observed in these groups is likely a reflection of the small number of individuals with arthritis sampled in these age groups, rather than a true age related difference. When calculated for the entire population of working age, the crude percentage employed for the population with arthritis and rheumatism was 58.8% compared to 77.6% for the total population.

Table 3 compares the working life expectancy of Canadian men and women in the population with arthritis and rheumatism and in the total population. The working life expectancy of people with arthritis and rheumatism at all ages was notably reduced compared to the total population. The difference was

Table 1. Percentage of the Canadian population reporting arthritis or rheumatism (A&R), according to the 1994 National Population Health Survey, by age group and sex.

Age	Total	Men		Total	Women	
		A&R	%		A&R	Total
15-19	1,057,275	7,672	0.1	989,001	12,567	1.3
20-24	837,416	12,726	1.5	902,131	35,418	3.9
25-29	1,081,492	25,549	2.4	1,058,399	33,002	3.1
30-34	1,256,270	33,401	2.7	1,359,332	73,372	5.4
35-39	1,321,761	78,963	6.0	1,272,499	78,588	6.2
40-44	1,152,329	69,006	6.0	1,117,744	105,833	9.5
45-49	1,020,450	83,007	8.1	944,966	130,922	13.9
50-54	796,597	105,526	13.2	742,047	168,048	22.6
55-59	601,308	114,777	19.1	684,576	210,083	30.7
60-64	551,075	119,794	21.7	624,841	222,021	35.5

Table 2. Percentage of employed Canadians in the population with arthritis and rheumatism (A&R) and in the total population, according to the 1994 National Population Health Survey, by age group and sex.

Age	Total	Men		Total	Women	
		A&R	Difference (A&R – Total)		A&R	Difference (A&R – Total)
15–19	61.7	38.6	–23.2	63.8	82.3	+18.6
20–24	88.8	100.0	+11.2	80.8	72.4	–8.4
25–29	92.4	80.4	–12.0	80.5	77.5	–2.9
30–34	93.2	82.8	–10.4	74.7	65.6	–9.1
35–39	93.6	87.9	–5.7	77.6	71.7	–5.9
40–44	92.7	83.5	–9.1	77.9	68.8	–9.1
45–49	90.8	82.7	–8.0	75.6	59.4	–16.2
50–54	89.2	73.9	–15.3	65.7	52.5	–13.1
55–59	77.5	73.1	–4.4	51.8	43.8	–8.0
60–64	44.9	42.6	–9.3	27.4	22.9	–4.5

Table 3. Working life expectancy of Canadians with arthritis and rheumatism (A&R) compared to the total population, according to the 1994 National Population Health Survey, by age group and sex. Working life expectancy represents the number of expected future years in the workforce, at given ages.

Age	Total	Men			Total	Women		
		A&R	Difference (Total – A&R)	SE		A&R	Difference (Total – A&R)	SE
15–19	41.62	37.42	4.19	0.020	34.19	31.06	3.12	0.010
20–24	38.70	35.64	3.06	0.018	31.05	26.99	4.05	0.010
25–29	34.44	30.81	3.63	0.017	27.06	23.41	3.64	0.009
30–34	29.99	26.94	3.05	0.015	23.08	19.58	3.50	0.008
35–39	25.51	22.96	2.55	0.014	19.40	16.34	3.06	0.008
40–44	21.02	18.74	2.29	0.013	15.58	12.81	2.77	0.007
45–49	16.60	14.75	1.85	0.012	11.77	9.53	2.23	0.007
50–54	12.28	10.80	1.48	0.011	8.08	6.63	1.45	0.006
55–59	8.07	7.32	0.75	0.009	4.88	4.07	0.81	0.005
60–64	4.45	3.88	0.56	0.008	2.36	1.93	0.43	0.005

SE: standard error of the difference.

greatest at younger ages and the gap narrowed with increasing age. This is the expected trend, since working life expectancy decreases as age increases and approaches official retirement age, therefore decreasing the difference in working life expectancy, when expressed in absolute terms (i.e., number of years). At age 15, the working life expectancy of men was 41.6 ± 0.01 years for the total population compared to 37.4 ± 0.01 years for the population with arthritis and rheumatism. For women, it was 34.2 ± 0.008 years for the total population compared to 31.1 ± 0.007 years for the population with arthritis and rheumatism. Therefore, the reduction in working life expectancy attributable to arthritis and rheumatism was 4.1 ± 0.02 years for men and 3.12 ± 0.01 years for women ($p < 0.001$ for both). This represents a relative reduction in working life expectancy of 10.1% for men and 9.1% for women.

DISCUSSION

This is the first study to look at the effect of arthritis and musculoskeletal conditions on working life expectancy, and one of the few studies evaluating the magnitude of this problem using population based data. Our results indicate that men and women reporting arthritis or rheumatism will lose, on average, 4 and 3 years, respectively, of work over a lifetime, compared to the general population. This represents a loss of 10 and 9%, respectively, of their working life. Since this figure represents an average for all individuals self-reporting any musculoskeletal condition and excludes back pain, it likely underestimates the loss in working life expectancy due to all forms of arthritis. The loss of working life expectancy observed may be either a direct consequence of the arthritis or rheumatism reported, or an indirect consequence of it, such as

due to comorbid conditions associated with arthritis and its treatment.

Premature departure from the workforce has important consequences socially, psychologically, in terms of quality of life, and of course economically for both the person affected and their family. The years of work lost result in income loss as well as reduced eligibility for social security benefits. From a societal perspective, this reduction in productivity represents an important cost. Using age and sex-specific average salaries for Canadians indexed to the year 2000, the cost from wages lost translates into a lifetime cost of \$177,435 for men and \$86,296 for women. Since the number of Canadians of working age reporting arthritis or rheumatism are 650,418 men and 1,069,854 women, this represents a cost to Canada of \$208 billion, over the lifetime of these individuals.

This has never been studied before. A literature search of the medical and social science literature identified only one other study evaluating the impact of specific chronic diseases on working life expectancy¹³. This US study found that in 1990, the average number of years of working life lost due to death from cancer was 3.4 years per death for men and 2.5 years per death for women. For death from ischemic heart diseases, the figures were 2.3 working life years lost for men and 0.6 years for women; for deaths from stroke, 2.2 working life years lost for men and 0.9 years for women. Although this allows some comparison across diseases and may suggest that the effect of arthritis and musculoskeletal diseases would be greater than cancer, ischemic heart disease, or cerebrovascular disease, a number of differences between that study and ours prevent direct comparison. The data represent the average number of years of working life lost for each person who will die from the chronic disease; whereas our figure represents the average number of years of working life lost for each person who has the disease. Further, their calculation of working life expectancy loss¹³ only took into account the effect of premature death on working life expectancy, without taking into account reduction in workforce participation rates at different ages due to the diseases. Our study does the opposite: it takes into account reduction in workforce participation from arthritis, but not increased mortality. Since these 3 groups of diseases are likely to cause disability and reduced workforce participation, their actual effect on working life expectancy is probably greater than that implied by the study. We can conclude that the reduction in working life expectancy from reduced workforce participation associated with arthritis of 3 and 4 years, as found in our study, is greater than the reduction in working life expectancy due to mortality from the 3 leading causes of death in the US. However, we cannot compare the overall effect of arthritis and of the 3 leading causes of death on working life expectancy from these studies.

Caution should be used when interpreting the results of our study. First, although the NPHS attempted to be representative of the entire population, it excluded a few remote areas of Quebec and Ontario, Indian Reserves, Canadian Forces bases,

and, by its nature as a household survey, institutionalized individuals.

Second, the presence of arthritis or rheumatism was a self-reported medical condition. Although the NPHS did ask subjects to report only chronic conditions that had been diagnosed by a physician, the reporting remained subject to patient interpretation. Therefore, this was not as accurate as physician derived or medical record derived information. The category of arthritis and rheumatism includes a wide variety of diseases and conditions. Any pain of musculoskeletal origin without a specific diagnosis could have been reported as arthritis or rheumatism. Thus, one can expect the study sample to include individuals with milder conditions and less physical impairment than if only individuals with arthritis, as diagnosed by a physician, had been included. The effect on working life expectancy would be greater in patients with true arthritis than in the actual study population.

Third, our study looked at complete and longterm (greater than 12 months) work loss only, and therefore ignored reduction in work activities due to arthritis and rheumatism that do not lead to complete cessation of work (such as reducing to part time work) or that cause temporary work interruptions. The advantage of our outcome measure is that evaluating working life expectancy allowed us to capture the effect of work disability as well as more subtle effects on working life, such as early retirement, increased vulnerability to layoff, or lower thresholds for individuals to choose not to work for personal reasons.

Finally, in the calculation of working life expectancy, the age-specific mortality rates used for both groups were estimates from the Canadian general population, since age-specific rates are not available for individuals reporting arthritis or rheumatism. Yet it is known that certain forms of chronic arthritis, such as rheumatoid arthritis, are associated with increased mortality¹⁴. Higher mortality rates for individuals with arthritis or rheumatism would further decrease their working life expectancy. All the limitations discussed constitute conservative biases, leading to an underestimation of the true difference in working life expectancy in people with arthritis compared to the general population.

In summary, Canadians with arthritis and rheumatism have a significant reduction in their working life expectancy. They can expect to lose, on average, 3 years of work over a lifetime for women and 4 years for men. This likely represents a conservative estimate of the effect of arthritis and rheumatism on working life. This has important consequences for individuals with arthritis and rheumatism, for their families, and for society. We believe our results have important implications for policymakers. Determining the impact of arthritis and musculoskeletal conditions on the working life of patients is an important step in raising awareness of the problem, so that health care professionals raise the issue in the context of regular patient visits, to justify the allocation of funds for interventions such as vocational rehabilitation and other programs

aimed at keeping arthritis patients employed, and to guide further research, especially intervention studies.

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REFERENCES

1. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability and health care utilization: findings from the 1990 Ontario Health Survey. *J Rheumatol* 1994;21:505-14.
2. Felts W, Yelin E. The economic impact of rheumatic diseases in the US. *J Rheumatol* 1989;16:867-84.
3. Badley EM, Wang PP. Arthritis and the aging population: projections of arthritis prevalence in Canada 1991 to 2031. *J Rheumatol* 1998;25:138-44.
4. Yelin EH, Katz PP. Labor force participation among persons with musculoskeletal conditions, 1970-1987: National estimates derived from a series of cross-sections. *Arthritis Rheum* 1991;34:1361-70.
5. Yelin EH. Musculoskeletal conditions and employment. *Arthritis Care Res* 1995;8:311-9.
6. Kramer JS, Yelin EH, Epstein WV. Social and economic impacts of four musculoskeletal conditions: A study using national community-based data. *Arthritis Rheum* 1983;26:901-7.
7. Badley EM, Webster GK, Rasooly I. The impact of musculoskeletal disorders in the population: Are they just aches and pains? Findings from the 1990 Ontario Health Survey. *J Rheumatol* 1995;22:733-9.
8. Badley EM. The impact of disabling arthritis. *Arthritis Care Res* 1995;8:221-8.
9. Statistics Canada. 1995. National Population Health Survey 1994-95. Public use microdata files. Ottawa: Statistics Canada; 1995.
10. Tambay J-L, Catlin G. Sample design of the National Population Health Survey. *Health Reports, Statistics Canada* 1995;7:29-38.
11. Haber LD. The disabling effects of chronic diseases and impairment. *J Chronic Dis* 1971;24:469-87.
12. Pollard AH, Yufuf F, Pollard GN. *Demographic techniques*. 2nd ed. Sydney: Pergamon Press; 1990.
13. Stewart SD. Effect of changing mortality on the working life of American men and women, 1970-1990. *Social Biology* 1997; 44:153-8.
14. Myllykangas-Luosujarvi RA, Aho K, Isomaki HA. Mortality in rheumatoid arthritis. *Semin Arthritis Rheum* 1995;25:193-203.