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RETROSPECTIVE COHORT STUDY

Rheumatoid Arthritis Disability and Absence Trends in the United States

Richard A Brook[1]*, Nathan L Kleinman[2] and Ian A Beren[2]

[1]Better Health Worldwide, 18 Hirth Dr, Newfoundland, NJ 07435-1710, United States
[2]Workpartners, LLC, 2915 Rocky Mountain Ave, Suite 240, Loveland, CO 80538, United States

ABSTRACT

Objectives: Employers increasingly focus on absence benefits and connections with employee health. United States absence benefits include Sick Leave (SL), Short- and Long-Term Disability (STD and LTD, respectively) for non-work-related injuries/illnesses, and Workers' Compensation (WC) for work-related injuries/illnesses. This research explores all-cause absence (SL, STD, LTD, and WC) utilization and changes from baseline for eligible employees with rheumatoid arthritis to determine if the use a constant payment factor is appropriate for models.

Study Design: Retrospective multi-year database analysis.

Methods: The Workpartners database (1/1/2001-12/31/2019) was used to identify employees with rheumatoid arthritis with adjudicated medical claims. Annual prevalence, benefit utilization, mean days of leave, and median payments (as % of salary) were analyzed. Annual outcomes were calculated as a percent of baseline (2001).

Results: Rheumatoid arthritis prevalence averaged 0.5% between 2001 and 2019. At baseline, the percent of eligible employees using STD = 15.5%, LTD = 0.7%, WC = 1.7%, SL = 61.7%. Mean absence days were 48.5, 367.5, 43.8 for STD, LTD, WC, respectively and median payments were 70.5%, 22.2%, 65.7% of salary for STD, LTD, WC, respectively. From 2002-2019: 11.7%-16.9% of eligible employees filed STD claims for 82.1%-995.9% of baseline days and 80.4%-125.9% median payments; 0.6%-2.9% of eligible employees filed LTD claims for 66.6%-114.7% of baseline days and 63.2%-254.8% median payments; 0.3%-1.6% of eligible employees filed WC claims for 44.0%-472.8% of baseline days and 70.4%-271.5% median payments. Median payments were highest in 2012, 2019, 2003 for STD, LTD, WC, respectively and the most absence days were used in 2017 for SL and LTD, 2008 for STD, and 2005 WC.

Conclusion: Employees with rheumatoid arthritis used absence benefits at differing rates over time with varying leave-lengths and payments. Using a constant cost or salary replacement factor for absence costs over time and across benefits is not accurate.

***Corresponding author**

Richard A Brook, President and Head of Research, Better Health Worldwide, Inc, 18 Hirth Drive, Newfoundland, NJ, 07435-1710, United States

Tel: +1-973-208-8621
ORCID ID: 0000-0002-6277-9705
E-mail: rich@bh-ww.com

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INTRODUCTION

Arthritis was identified as one of the top pain disorders impacting employee productive time and costs in 2002 totaling $10.3b, with lost productivity responsible for 84.5% and absenteeism 15.5% [1]. Data from 2013 demonstrate that $303.5 billion can be attributed to arthritis each year through medical expenditures and earnings losses, equaling 1 percent of United States (US) gross domestic product [2]. Among people with arthritis, about 44 percent report arthritis-attributable activity limitations [3]. The US Healthy People 2030 [4] workgroup estimated 1 in 4 US adults (54.4 million people) report a diagnosis of arthritis [3] which is a leading cause of disability [5] and a meaningful driver of economic costs [2]. The prevalence of arthritis is projected to increase to 78.4 million adults by 2040 based on the aging of the population alone [6].

Rheumatoid Arthritis (RA) is the most common type of inflammatory arthritis, and characterized by chronic destructive synovitis [7-10] with RA prevalence estimates ranging from 0.5% to 1% of the adult population in developed countries

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[7]. On the basis of data from Rochester, MN [10] and the Census Bureau, the group estimated that in 2005, 1.3 million American adults, or 0.6% of the US population, had RA [7].

The symptoms, physical effects, and comorbidities associated with RA can greatly impact a person's ability to work [11-13]. In 2015, Gunnarsson, et al. [14] used 1996-2006 US Medical Expenditure Panel Survey data and estimated annual US absenteeism costs of RA to be $252 million. More recently, in 2019, the US Arthritis Foundation estimated lost productivity in employees with RA as nearly three times greater than direct medical costs [15]. The number of US adults reporting arthritis as their main cause of disability is growing [5] and the prevalence of arthritis-attributable activity limitations is already outpacing projections [3,6].

Rheumatoid arthritis is associated with shortened life expectancy and potentially reduced career length [16]. One-fourth to one-half of those with RA will become unable to work within 10-20 years [17]. Burton, et al. [18] reviewed 38 workplace RA publications and found the number of years to reach a 50% likelihood of being work disabled ranged from 4.5 to 22 years, depending on the study.

The impact of arthritis on work absence has been reported in a number of studies and models [18,20-23]. Some studies focused on RA overall [24-27]. Some on sub-populations with prior or current product use [28] and some on localized RA involvement [13,29]. Aside from those that explored the impact of therapies, those in the literature did not explore costs over time.

US employers often provide a variety of benefits to their employees. They pay for a portion of employee and dependent medical services and prescriptions. Some US employers also provide a benefit, generally called Sick Leave (SL), that replaces an employee's salary during absences due to illness typically lasting less than two weeks.

Some employers provide additional coverage to their employees for longer illnesses. Short-Term Disability (STD) usually pays 60%-100% of salary for illnesses that last between two weeks and six months. For illnesses lasting longer than six months, the employee begins Long-Term Disability (LTD) and usually receives 50%-70% of salary [30]. The Society for Human Resource Management (SHRM) 2019 health benefits survey [31] reported decreases in the percentages of companies providing STD (65% to 61%) and LTD (80% to 71%) insurance from 2015 through 2019, and did not report on any sick leave benefit information. Employees who suffer a workplace illness or accident receive coverage through Workers' Compensation (WC), which pays their medical costs and generally provides partial salary replacement (typically 66%-80%) [32].

Absences can have significant impact on business performance, and as a result, employers are intensifying efforts to manage absence benefits. Many absence studies estimate absence days using subjective survey data or proxies [6] based on location of medical care [33]. Studies on absence costs often estimate them using the average salary in the US for all benefits rather than the actual amount paid to the employee. These study estimates often combine STD and LTD and exclude WC and often assume that the percent of salary received is the same, regardless of benefit. Some researchers develop extensive models of absence predictors and then multiply the estimated absence time by constant dollars, fixed salary-replacement percentages and other metrics [21,33] to estimate absence costs across benefits and diseases.

This research focuses on all-cause utilization of SL, STD, LTD and WC in eligible employees who had medical claims for rheumatoid arthritis and explores changes from baseline to determine if constant dollar cost factors and constant utilization rates are appropriate.

METHODS

To better understand the impact of Rheumatoid Arthritis (RA) within an employed population and on work absenteeism, the Workpartners Research Reference Database (RRDb) was analyzed from January 1, 2001 to December 31, 2019. The RRDb contains de-identified employee direct medical and prescription claims on 3 million US employees and 1.6 million dependents from multiple insurers in the retail, service, manufacturing, transportation, energy, technology, financial, and utility industries. The RRDb also has data on employee job-related information (e.g., salary, full-/part-time status, exempt-/non-exempt status, etc.) and payments and lost time for four (4) absence benefits: SL, STD, LTD and WC. Over this period, 1.2 million employees in the database were eligible (had coverage) for STD, 1.1 million for LTD, 1.4 million for WC, and 710,000 for SL. Because the data were deidentified and the study did not affect patient care, the study was exempt from Institutional Review Board (IRB) review and approval.

The RRDb has been used for published research on rheumatoid arthritis, diabetes, gout, hepatitis-C, multiple sclerosis and other conditions [25,34-43].

Patients in the Workpartners RRDb were retrospectively identified, based on medical claims for conditions within the US Agency for Healthcare Research and Quality (AHRQ) "rheumatoid arthritis and related disease" category [44] using International Classification of Diseases ninth or tenth revision clinical modification (ICD-9-CM and ICD-10-CM, respectively) codes beginning with 714, 720, M05, M06, M08, M12, M45, or M48. All claims data were analyzed over fixed calendar years between 2001 and 2019 and each year's cohort with RA claims (the incident cohort) was analyzed.

The employee prevalence of RA and, as a measure of health severity, the Charlson Comorbidity Index (CCI) score [45] were calculated for each incident cohort annually. The employee population was further restricted to those eligible for, and utilizing, each absence benefit for the years they were included in the study based on payroll and eligibility information.

All absences were aggregated by benefit based on the year the leave began. LTD and WC payments included lump-sum distributions, and STD, LTD, and WC leaves potentially extended beyond the year initiated. Workplace accidents were paid under the WC benefit. Because the study focused on absence costs and time, medical-only WC claims (without absences) were excluded.

Among those eligible and filing claims, the mean days of leave were calculated, and for STD, LTD, and WC, the median payment as a percent of salary was calculated. Because SL payments are equal to salary payments, median SL payments as a percent of salary are not reported. The percent of employees annually using each benefit (utilization) was reported for each year. The annual days of leave and median payments to the employee from 2002-2019 were compared with claims processed in 2001, which was considered the baseline. To test the consistency of the data, 95% Confidence Intervals (CIs) were calculated for the baseline values. The values in each subsequent year (2002 to 2019) were checked to see if they were in the CIs.

RESULTS

The prevalence of RA (Figure 1) averaged 0.5% over the study period with the highest prevalence in in 2017 and the lowest prevalence in 2004. The patients' overall severity, as measured by the annual CCI score, increased over the study period from 1.11 to 1.50 (Figure 1).

At baseline (Table 1), the percent of eligible employees using the various benefits found sick leave to be the most utilized benefit, followed by short-term disability, workers' compensation and then long-term disability. The annual percent of employees utilizing each of the different absence benefits are shown in figure 2. From 2002 through 2019, 11.7%-16.9% of eligible employees used STD, 0.6%-2.9% used LTD, 0.3%-1.6% used WC, and 38.8%-80.7% used SL. Table 2 shows utilization of SL was within the baseline CI 94.4% of the remaining years, with the other benefits less than 45% within the CI.

At baseline sick leave payments were equal to salary, and the other benefits found the median payments as a percent of salary were highest for workers' compensation, followed by long-term disability and short-term disability (Table 1). Compared with baseline, the range of relative median payments as a percent of salary are shown in figure 3. From 2002-2019 as a percent of baseline, the median payments were 80.4%-125.9% for STD, 63.2%-254.8% for LTD, and 70.4%-271.5% for WC. Table 2 shows subsequent year payments for STD and WC were consistently within their baseline CIs, whereas only 72.2% of subsequent year LTD payments were within the baseline CI.

At baseline (Table 1), the average days of leave for the various benefits found the greatest average for long-term disability at just over one year (367.5 days), followed by short-term disability, workers' compensation, and sick leave. Annual days of leave relative to baseline by benefit are shown in figure 4. During the 18-year period (from 2002 through 2019) as a percent of baseline, relative mean days of LTD leave were 66.6%-114.7%, days of WC leave were 44.0%-472.8%, days of STD leave were 82.1%-995.9%, and days of sick leave were 86.6%-296.7%. Percent of subsequent years with days of leave within the baseline CI

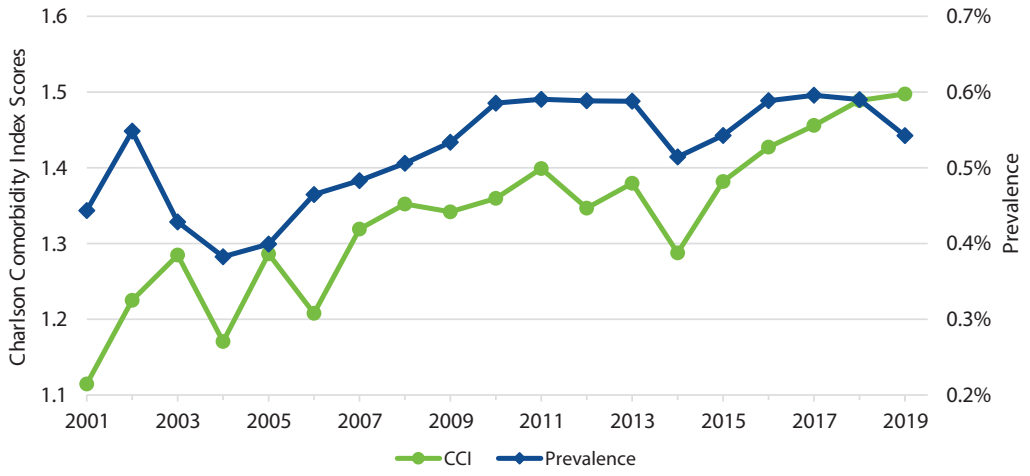

Figure 1 Annual rheumatoid arthritis prevalence and severity.

Table 1: Utilization of sick leave, short- and long-term disability and workers' compensation at Baseline (2001) for persons with medical claims within the AHRQ Rheumatoid Arthritis and related conditions category.

Baseline	Sick Leave	Short-term Disability	Long-term Disability	Workers' Compensation
Utilization, %	61.7%	15.5%	0.7%	1.7%
Median Payments as a percent of Salary, %	100%	70.5%	22.2%	65.7%
Days of Leave, Days	6.7	48.5	367.5	43.8

AHRQ: Agency for Healthcare Research and Quality

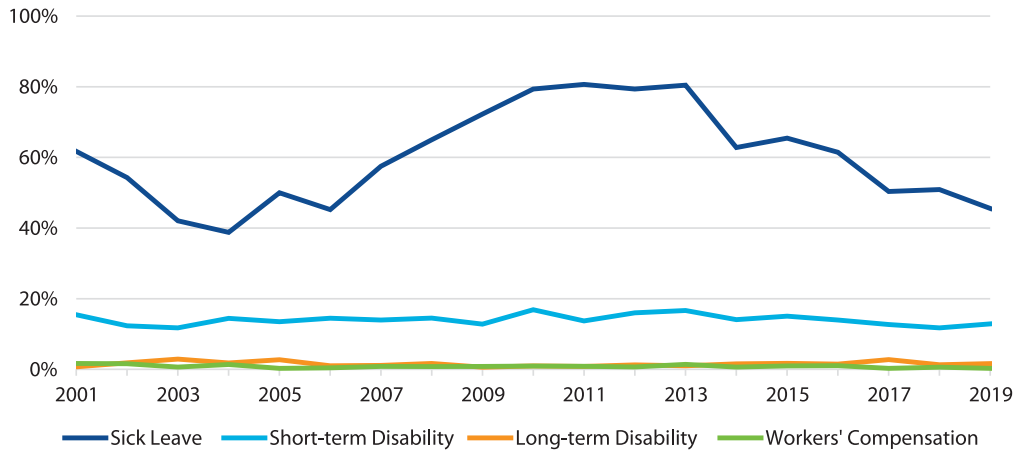

Figure 2 Percent of employees with rheumatoid arthritis filing claims by benefit.

Table 2: Percent of data within 95% confidence intervals of the baseline data for sick leave, short- and long-term disability and workers' compensation for persons with medical claims within the AHRQ Rheumatoid Arthritis and related conditions category.

Fields	Sick Leave	Short-term Disability	Long-term Disability	Workers' Compensation
Utilization, %	27.8%	94.4%	44.4%	27.8%
Median Payments as a percent of Salary, %	not evaluated	100%	72.2%	100.0%
Days of Leave, %	38.9%	72.2%	61.1%	44.4%

AHRQ: Agency for Healthcare Research and Quality

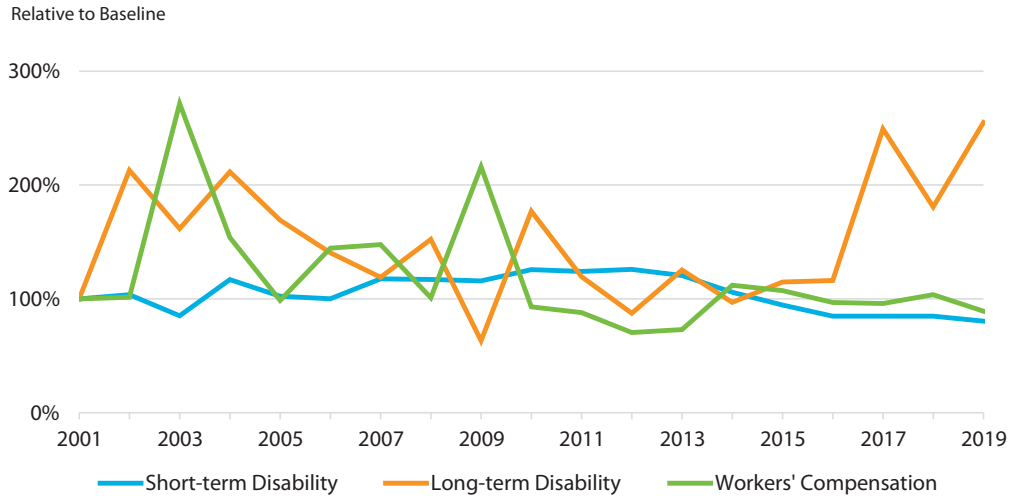

Figure 3 Relative median payment as a percent of salary for employees with rheumatoid arthritis benefit.

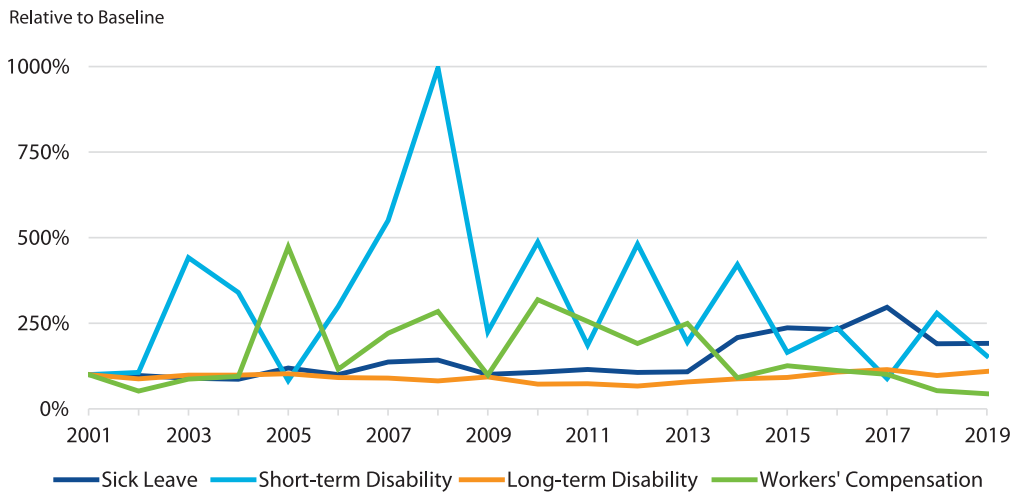

Figure 4 Relative average length of leaves for employees with rheumatoid arthritis by benefit.

ranged from a low of 38.9% for SL to a high of 72.2% for STD (Table 2).

DISCUSSION

Although many studies report using real-world data, few studies in the literature use real-world person-specific absence cost and lost time data from comprehensive employee benefits and payroll systems [34-42]. Several studies examined absence utilization, however none over time. The majority focus only on disability data or use proxies [1,33] or survey data [1,6,20,46] to estimate lost time. Survey data are subject to recall bias and may report absences that did not occur during work hours. Furthermore, published studies and models often apply a constant salary factor [21,26] often across benefits when estimating absence costs, which this research shows is inaccurate. Few studies cover multiple benefits or costs over time, with most focusing on STD only [26] or combining STD and LTD [33-47] and only a few including WC [19,24]. Some studies focused on the general population [1,6,20] and others focused on patients with RA who had other conditions [13,20,29] or inclusion requirements [28]. Some used registry data from other countries with different benefit eligibility requirements and included disability pensions [22,23]. While the SHRM survey reported on benefit availability, it was not specific to RA and did not report on benefit utilization [31].

A regression-based study found that employees with RA have $525 ($654 in 2021 US dollars) greater ($p < 0.05$) annual indirect costs (because of SL, STD, LTD, and WC) than controls ($N = 338,035$) [24] and the employees with RA used an additional 3.58 annual absence days, including 1.2 more SL and 1.91 more STD days (both $p < 0.0001$). Burton, et al. [18] estimated employees with RA had 38.6 annual days of absenteeism (range 7.1-109.2). Another study [19] included RA among arthritis and Associated Joint Disorders (AJD), however RA specific numbers were not included. Birnbaum [33] estimated incremental annual disability and absenteeism costs of $3069 ($3824 in 2021 US dollars).

Arthritis was reported as one of the top pain disorders impacting productive time and costs using survey data from the American Productivity Audit [1] based on the two weeks prior to survey completion. In their study, lost time for a personal health reason, or "absenteeism" was the sum of hours per week absent from work for a health-related reason and the hour equivalent of health-related reduced performance (presenteeism). They then calculated lost labor costs by multiplying the hourly estimates by self-reported annual salary or wages. Their study estimated that 2.03% of the population lost some time due to arthritis (not specifically RA), and 1.23% of the population missed more than 2 hours per week. Also, 0.11% lost more than one day per week, and 0.01 lost more than two days per week, for a total of 0.69 absence hours per week with 4.5 reduced performance hours.

Wolfe and Michaud [20] reported on self-reported work disability in RA patients and whether or not the subject was receiving US social security disability benefits. They found that persons with self-reported disability comprised 36.0% of the cohort with reporting the greatest difficulty with out-of-pocket expenses, 17.0% of the moderate-difficulty cohort and 8% for the no-difficulty cohort.

Burton, et al. [21] estimated that the 1-year total productivity cost of RA for a firm of 10,000 employees was $1.69 million ($2.21 million in 2021 dollars), with 91.7% for RA-related absenteeism, 1.2% for caregiving, and 7.1% for worker displacement.

One of the few time-based studies in RA patients [22,23] used Swedish registry data and reported SL and disability

pension increases of 79% and 91% years one and two before dropping 21% in year three. They found therapy could break the trajectory [22] in disability utilization over time for patients with continuous eligibility for benefits with similar names but different requirements than US benefits. The present study explored the utilization for annual "incident" cohorts with any eligibility.

In the present study, annual cohort inclusion, prevalence, and CCI were based on medical claims, with the remaining outcomes based on absence benefits. The prevalence increase may be related to increased promotion of therapies to manage these and other conditions, and the CCI increase may be related to overall increases in the recognition of other conditions.

The present research's focus on trends over time found that utilization varies both by benefit and type. Some of this variability may be the result of a changing mix of employers contributing data and shifts in benefit design such as Sick Leave, which does not require a reason, being reclassified by some employers as paid time off. Some may be due to random chance. The inclusion of lump-sum payouts impacts the costs, but does not impact the days or utilization. Because WC covers accidents at work, days of leave may be related to the use of pain medicines, side effects, or co-workers' accidents.

The years with the highest utilization varied by benefit. Utilization of benefits among eligible employees varied, with SL highest in 2011and STD highest in 2010, LTD highest in 2003 and WC at baseline. The highest median payments as a percent of salary occurred in 2012 for STD, 2019 for LTD and 2003 for WC and the highest/longest days of leave were in 2017 for SL and LTD, in 2008 for STD and 2005 for WC.

This research concluded that the use of constants for modeling is not appropriate over time. While the likelihood of filing an STD claim was most consistently within the baseline CI, each of the other three benefits were outside the CI more than 55% of subsequent years. The subsequent year values for days of leave were outside the baseline confidence intervals 27.8% to 61.1% of the time. Despite the demonstrated consistency of the STD and WC percent of salary medians, the CIs for these benefits were different and did not overlap, suggesting that if a constant value for STD and WC percentage of salary is used, it must differ between benefits. Because many drugs used to treat RA are used for multiple indications, they were not used as part of the inclusion criteria. Their omission may have resulted in a smaller population, however because the new agents are expensive and often subject to prior authorization, it is unlikely the patients using them did not have a medical claim in their records.

The present study has several strengths. This study used real-world, objective data from employer disability/WC claims and payroll systems that provide specific absence time and payment values for each individual leave. This study was conducted in a diverse, commercial workplace–centric database, which includes patients dispersed throughout the US. The database also includes job-related information (salary, exempt-status, and part-/full-time status) and self-reported racial information not contained in other databases. While the database includes information on spouses and dependents, this research was limited to employees.

This study has several limitations. These administrative claims data are derived from employees with commercial health insurance over the study period and may not be generalizable to patients who do not have employer-sponsored health insurance, who are unemployed, or have left the workforce. The study did not assess the ramifications of treatment types on patient quality of life, direct healthcare costs, or employee productivity, and did not ascertain disease control of the patients. While comparisons with baseline allow a measure of control, the study did not include specific control groups. The Workpartners RRDb provided a convenience-based sample, and the population expanded or contracted by employers joining or leaving the database. Even though the study was conducted over a 19-year period, each year was a different cohort. Finally, cost data associated with paid leaves are generally not normally distributed and may benefit from a non-linear regression-based approach.

Future research should consider examining specific rheumatic conditions within the AHRQ category, adjusting inclusion/exclusion criteria to require multiple medical or prescription claims, the impact of biologic or conventional therapies, and using two-part regression models controlling for employee job-related information. Research using control cohorts (employees without the conditions) could estimate incremental absences and costs and allow the results to be projected to the US employed population, and research within a cohort over time would give insight on the impact of the degenerative disease over time and potentially the use and impact of therapies.

CONCLUSIONS

In this real-world study, the overall severity of illness in the patient population increased during the study period. The percent of these employees using STD, LTD, WC, or SL in a given year varied greatly. Additionally, these employees had widely varying days of leave and payments as a percent of salary over time, and these also varied by benefit type. Using a constant cost or salary replacement factor over time, or for all benefits, is not accurate or appropriate in health benefit absence research. Every effort should be made to use actual person-level or claim-level absence time and payment data from employer disability, WC, and payroll data systems.

References

1. Stewart WF, Ricci JA, Chee E, Morganstein D, Lipton R. Lost productive time and cost due to common pain conditions in the US workforce. JAMA. 2003 Nov 12;290(18):2443-54. doi: 10.1001/jama.290.18.2443. PMID: 14612481.
2. Murphy LB, Cisternas MG, Pasta DJ, Helmick CG, Yelin EH. Medical Expenditures and Earnings Losses Among US Adults With Arthritis in 2013. Arthritis Care Res (Hoboken). 2018 Jun;70(6):869-876. doi: 10.1002/acr.23425. Epub 2018 Apr 16. PMID: 28950426.
3. Barbour KE, Helmick CG, Boring M, Brady TJ. Vital Signs: Prevalence of Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation - United States, 2013-2015. MMWR Morb Mortal Wkly Rep. 2017 Mar 10;66(9):246-253. doi: 10.15585/mmwr.mm6609e1. PMID: 28278145; PMCID: PMC5687192.
4. Healthy People 2030 Arthritis Workgroup. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, U.S. Department of Health and Human Services. 2021.
5. Theis KA, Steinweg A, Helmick CG, Courtney-Long E, Bolen JA, Lee R. Which one? What kind? How many? Types, causes, and prevalence of disability among U.S. adults. Disabil Health J. 2019 Jul;12(3):411-421. doi: 10.1016/j.dhjo.2019.03.001. Epub 2019 Mar 28. PMID: 31000498.
6. Hootman JM, Helmick CG, Barbour KE, Theis KA, Boring MA. Updated Projected Prevalence of Self-Reported Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation Among US Adults, 2015-2040. Arthritis Rheumatol. 2016 Jul;68(7):1582-7. doi: 10.1002/art.39692. PMID: 27015600; PMCID: PMC6059375.
7. Helmick CG, Felson DT, Lawrence RC, Gabriel S, Hirsch R, Kwoh CK, Liang MH, Kremers HM, Mayes MD, Merkel PA, Pillemer SR, Reveille JD, Stone JH; National Arthritis Data Workgroup. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part I. Arthritis Rheum. 2008 Jan;58(1):15-25. doi: 10.1002/art.23177. PMID: 18163481.
8. O'Dell JR. Rheumatoid arthritis. In: Goldman L, Ausiello D, eds. Cecil Medicine. 23rd ed. Philadelphia, PA: Saunders Elsevier; 2007.
9. Lee DM, Weinblatt ME. Rheumatoid arthritis. Lancet. 2001 Sep 15;358(9285):903-11. doi: 10.1016/S0140-6736(01)06075-5. PMID: 11567728.
10. Gabriel SE, Crowson CS, O'Fallon WM. The epidemiology of rheumatoid arthritis in Rochester, Minnesota, 1955-1985. Arthritis Rheum. 1999 Mar;42(3):415-20. doi: 10.1002/1529-0131(199904)42:3<415::AID-ANR4>3.0.CO;2-Z. PMID: 10088762.
11. Treharne GJ, Hale ED, Lyons AC, Booth DA, Banks MJ, Erb N, Douglas KM, Mitton DL, Kitas GD. Cardiovascular disease and psychological morbidity among rheumatoid arthritis patients. Rheumatology (Oxford). 2005 Feb;44(2):241-6. doi: 10.1093/rheumatology/keh441. Epub 2004 Nov 2. PMID: 15522922.
12. Gabriel SE. Cardiovascular morbidity and mortality in rheumatoid arthritis. Am J Med. 2008 Oct;121(10 Suppl 1):S9-14. doi: 10.1016/j.amjmed.2008.06.011. PMID: 18926169; PMCID: PMC2858687.
13. Prior Y, Tennant A, Tyson S, Kjeken I, Hammond A. Measure of activity performance of the hand (MAP-Hand) questionnaire: linguistic validation, cultural adaptation and psychometric testing in people with rheumatoid arthritis in the UK. BMC Musculoskelet Disord. 2018 Jul 31;19(1):275. doi: 10.1186/s12891-018-2177-5. PMID: 30064399; PMCID: PMC6069818.
14. Gunnarsson C, Chen J, Rizzo JA, Ladapo JA, Naim A, Lofland JH. The Employee Absenteeism Costs of Rheumatoid Arthritis: Evidence From US National Survey Data. J Occup Environ Med. 2015 Jun;57(6):635-42. doi: 10.1097/JOM.0000000000000461. PMID: 26053366.
15. Arthritis By the Numbers: Book of Trusted Facts & Figures. Arthritis Foundation. 2019.
16. Gabriel SE, Crowson CS, Kremers HM, et al. Survival in rheumatoid arthritis. Arthritis Rheum. 2003;48:54-58. https://bit.ly/3JlcfIt
17. Mikuls TR. Rheumatoid arthritis incidence: what goes down must go up? Arthritis Rheum. 2010 Jun;62(6):1565-7. doi: 10.1002/art.27432. PMID: 20191577.
18. Burton W, Morrison A, Maclean R, Ruderman E. Systematic review of studies of productivity loss due to rheumatoid arthritis. Occup Med (Lond). 2006 Jan;56(1):18-27. doi: 10.1093/occmed/kqi171. Epub 2005 Nov 11. PMID: 16286432.
19. Muchmore L, Lynch WD, Gardner HH, Williamson T, Burke T. Prevalence of arthritis and associated joint disorders in an employed population and the associated healthcare, sick leave, disability, and workers' compensation benefits cost and productivity loss of employers. J Occup Environ Med. 2003 Apr;45(4):369-78. doi: 10.1097/01.jom.0000063621.37065.26. PMID: 12708140.
20. Wolfe F, Michaud K. Out-of-pocket expenses and their burden in patients with rheumatoid arthritis. Arthritis Rheum. 2009 Nov 15;61(11):1563-70. doi: 10.1002/art.24724. PMID: 19877107.
21. Burton WN, Morrison A, Yuan Y, Li T, Marioni RE, Maclean R. Productivity cost model of the treatment of rheumatoid arthritis with abatacept. J Med Econ. 2008;11(1):3-21. doi: 10.3111/13696990701748837. PMID: 19450107.
22. Neovius M, Simard JF, Klareskog L, Askling J; ARTIS Study Group. Sick leave and disability pension before and after initiation of antirheumatic therapies in clinical practice. Ann Rheum Dis. 2011 Aug;70(8):1407-14. doi: 10.1136/ard.2010.144139. Epub 2011 Apr 25. PMID: 21518724.
23. Neovius M, Simard JF, Askling J; ARTIS Study Group. How large are the productivity losses in contemporary patients with RA, and how soon in relation to diagnosis do they develop? Ann Rheum Dis. 2011 Jun;70(6):1010-5. doi: 10.1136/ard.2010.136812. Epub 2011 Mar 15. PMID: 21406455.
24. Kleinman NL, Cifaldi MA, Smeeding JE, Shaw JW, Brook RA. Annual incremental health benefit costs and absenteeism among employees with and without rheumatoid arthritis. J Occup Environ Med. 2013 Mar;55(3):240-4. doi: 10.1097/JOM.0b013e318282d310. PMID: 23471034.
25. Filipovic I, Walker D, Forster F, Curry AS. Quantifying the economic burden of productivity loss in rheumatoid arthritis. Rheumatology (Oxford). 2011 Jun;50(6):1083-90. doi: 10.1093/rheumatology/keq399. Epub 2011 Jan 18. PMID: 21245074.
26. Ozminkowski RJ, Burton WN, Goetzel RZ, Maclean R, Wang S. The impact of rheumatoid arthritis on medical expenditures, absenteeism, and short-term disability benefits. J Occup Environ Med. 2006 Feb;48(2):135-48. doi: 10.1097/01.jom.0000194161.12923.52. PMID: 16474262.
27. Ma VY, Chan L, Carruthers KJ. Incidence, prevalence, costs, and impact on disability of common conditions requiring rehabilitation in the United States: stroke, spinal cord injury, traumatic brain injury, multiple sclerosis, osteoarthritis, rheumatoid arthritis, limb loss, and back pain. Arch Phys Med Rehabil. 2014 May;95(5):986-995.e1. doi: 10.1016/j.apmr.2013.10.032. Epub 2014 Jan 21. PMID: 24462839; PMCID: PMC4180670.
28. Harnett J, Gerber R, Gruben D, Koenig AS, Chen C. Evaluation of Real-World Experience with Tofacitinib Compared with Adalimumab, Etanercept, and Abatacept in RA Patients with 1 Previous Biologic DMARD: Data from a U.S. Administrative Claims Database. J Manag Care Spec Pharm. 2016 Dec;22(12):1457-1471. doi: 10.18553/jmcp.2016.22.12.1457. PMID: 27882833.
29. Cavaliere CM, Chung KC. A cost-utility analysis of nonsurgical management, total wrist arthroplasty, and total wrist arthrodesis in rheumatoid arthritis. J Hand Surg Am. 2010 Mar;35(3):379-391.e2. doi: 10.1016/j.jhsa.2009.12.013. PMID: 20193858; PMCID: PMC2909683.
30. Understanding Disability and Long Term Care Insurance Policies. 2021.
31. Healthcare and Health Services SHRM Employee Benefits 2019. Society for Human Resource Management.
32. Hunt HA. Is compensation for workplace injuries adequate? Employ Res. 2002;9:1-3.
33. Birnbaum H, Pike C, Kaufman R, Marynchenko M, Kidolezi Y, Cifaldi M. Societal cost of rheumatoid arthritis patients in the US. Curr Med Res Opin. 2010 Jan;26(1):77-90. doi: 10.1185/03007990903422307. PMID: 19908947.
34. Brook RA, Kleinman NL, Patel S, Smeeding JE, Beren IA, Turpcu A. United States comparative costs and absenteeism of diabetic ophthalmic conditions. Postgrad Med. 2015 Jun;127(5):455-62. doi: 10.1080/00325481.2014.994468. Epub 2014 Dec 31. PMID: 25549691.
35. Kleinman NL, Brook RA, Patel PA, et al. The impact of gout on work absence and productivity. Value Health. 2007 Jul-Aug;10(4):231-7. doi: 10.1111/j.1524-4733.2007.00173.x. PMID: 17645677.
36. Brook RA, Kleinman NL, Su J, Corey-Lisle PK, Iloeje UH. Absenteeism and productivity among employees being treated for hepatitis C. Am J Manag Care. 2011 Oct;17(10):657-64. PMID: 22106459.
37. Su J, Brook RA, Kleinman NL, Corey-Lisle P. The impact of hepatitis C virus infection on work absence, productivity, and healthcare benefit costs. Hepatology. 2010 Aug;52(2):436-42. doi: 10.1002/hep.23726. PMID: 20683943.

38. Brook RA, Rajagopalan K, Kleinman NL, Melkonian AK. Absenteeism and health-benefit costs among employees with MS. Curr Med Res Opin. 2009 Jun;25(6):1469-76. doi: 10.1185/03007990902905468. PMID: 19422277.

39. Hersh CM, Brook RA, Beren IA, et al. The implications of suboptimal year-1 outcomes with disease-modifying therapy in employees with multiple sclerosis. J Med Econ. 2021 Jan-Dec;24(1):479-486. doi: 10.1080/13696998.2021.1906013. PMID: 33739915.

40. Brook RA, Kleinman NL, Rajagopalan K. Employee costs before and after treatment initiation for bipolar disorder. Am J Manag Care. 2007 Apr;13(4):179-86. PMID: 17408337.

41. Brook RA, Wahlqvist P, Kleinman NL, Wallander MA, Campbell SM, Smeeding JE. Cost of gastro-oesophageal reflux disease to the employer: a perspective from the United States. Aliment Pharmacol Ther. 2007 Sep 15;26(6):889-98. doi: 10.1111/j.1365-2036.2007.03428.x. PMID: 17767473.

42. Brook RA, Kleinman NL. Human Capital Costs and Absenteeism among Employees with Various Conditions. In: Rizzo MF, Gallo A, eds. Human Capital and Resources: Developments, Management and Strategies. Hauppauge, NY: Nova Science Publishers, Inc. 2012:33-60. ISBN: 978-1-61470-898-8.

43. Lynch WD, Markosyan K, Melkonian AK, Pesa J, Kleinman NL. Effect of antihypertensive medication adherence among employees with hypertension. Am J Manag Care. 2009 Dec;15(12):871-80. PMID: 20001168.

44. Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. Med Care. 1998 Jan;36(1):8-27. doi: 10.1097/00005650-199801000-00004. PMID: 9431328.

45. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40(5):373-83. doi: 10.1016/0021-9681(87)90171-8. PMID: 3558716.

46. Strand V, Jones TV, Li W, Koenig AS, Kotak S. The impact of rheumatoid arthritis on work and predictors of overall work impairment from three therapeutic scenarios. Int J Clin Rheumatol. 2015.

47. Strand V, Tundia N, Song Y, Macaulay D, Fuldeore M. Economic Burden of Patients with Inadequate Response to Targeted Immunomodulators for Rheumatoid Arthritis. J Manag Care Spec Pharm. 2018 Apr;24(4):344-352. doi: 10.18553/jmcp.2018.24.4.344. PMID: 29578852.

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