

The Social and Economic Impact of Carpal Tunnel Syndrome among Maintenance-of-Way Employees

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ABSTRACT

Thousands of railroad Maintenance-of-Way (MOW) workers develop Carpal Tunnel Syndrome (CTS) from their work. Objective: This study calculates the social and economic burdens of carpal tunnel syndrome borne by thousands of MOW workers. Methods: Economic calculations are derived from the literature and also from a survey of 4,800 MOW respondents, 155 in-depth interviews, and two focus groups. Results: This one health problem alone costs at least \$128.6 million to \$225.3 million over the course of CTS cases currently diagnosed among MOW workers. Many individuals work through significant pain or have to leave the profession. Some are crippled for life. Conclusion: When a worker has carpal tunnel syndrome, beyond pain and suffering, there are often financial burdens that affect families, railroad companies, insurers, communities, and taxpayers as well as the injured workers.

Keywords: Carpal tunnel syndrome; Muscular skeletal disorders; Maintenance-of-way railroad workers; Occupational safety and health; Economic impact; Social impact; Ergonomics

INTRODUCTION

Thousands of railroad maintenance-of-way (MOW) workers develop Carpal Tunnel Syndrome (CTS) from their work. This one health issue alone costs at least \$128.6 million to \$225.3 million over the course of those carpal tunnel syndrome cases currently diagnosed. What follows is a study of MOW workers—their illnesses and the suffering and burdens they endure. While the health impact is clearly the most serious, the focus of this paper is the social and economic impacts of these infirmities. When a worker has carpal tunnel syndrome, beyond pain and suffering, there are often financial burdens that affect families, railroad companies, insurers, communities, and taxpayers as well as injured workers. These burdens include not only direct medical costs of treatment but also other related costs like over-the-counter medical devices and medications, caretaking, lower productivity of affected workers, lost work time and thus reduced income and future Social Security benefits, psychological stress on individuals and their families, and a host of other factors discussed herein. The work that follows calculates the burden of carpal tunnel syndrome borne by thousands of MOW workers and many other groups as well.

Setting

MOW workers face significant risks to their health and safety on

a daily basis. Maintaining the track is one of the most dangerous jobs facing railroad workers [1], with many dying in workplace accidents. In addition, MOW workers constantly bend, twist, and do heavy lifting, thus putting themselves at high risk of injuring their necks, shoulders, knees, backs, hips, elbows, and wrists. They face a host of ergonomic risks from their use of high vibration tools and equipment. They face high noise levels and uneven surfaces walking on ballast. Many suffer from significant illnesses, even death, related to toxic chemical exposures. MOW workers are more likely than the general public, for example, to develop cancer, Chronic Obstructive Pulmonary Disease (COPD), and kidney disease. Carpal tunnel is a serious health problem for them, but only one among many.

METHODOLOGY

An overall social and economic impact study, of which this is just one of five parts - reviewed cancer, COPD, kidney disease, and lower back problems in addition to CTS. The economic and social study itself was part of a larger assessment, funded by the Brotherhood of Maintenance of Way Employees (BMWED), that also included research on epidemiological and ergonomic and physical hazards. Institutional Review Board (IRB) approvals came from both Cook County Hospital and the State University of New York-Downstate.

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To ensure that the identity of all survey participants is legally protected from discovery, a Certificate of Confidentiality issued by the National Institutes of Health (NIH) was obtained. Results of this study contain absolutely no individual or identifiable personal information.

The entire membership of BMWED, both active workers and retirees, was invited to participate in a research survey. Of roughly 39,000 BMWED members invited to participate (35,000 current and 4,000 retired), approximately 4,800 members responded, coming from all 48 continental states. They responded to the survey on-line, in writing, or orally over the telephone, in either English or Spanish.

To determine the representativeness of survey respondents, they were compared to the national membership of the union based on age, years on the job, gender, region of country, and railroad. In addition, survey respondents were compared to a random sample of non-respondents who later agreed to complete a short (10-question) version of the survey by telephone. Those members who completed the survey were, on average, younger, and had slightly better working conditions than members who did not complete the survey. Survey respondents also tended to be healthier than non-respondents. Therefore, the percent of members who reported injuries and illnesses on the large 2016-17 BMWED survey would probably be somewhat less than the percent that would have been reported by all BMWED active members or retirees if all had completed the survey, implying that the results reported in this paper are likely conservative (lower) estimates of the prevalence of ill health that would have been seen if all had completed the survey.

In addition, for this social and economic impact study, an additional 155 in-depth interviews, and two focus groups provided further worker input. The study also includes an extensive literature review, highlighting both related health issues and their economic and social impact. Calculations for economic and social costs are developed in the narrative of the article and corroborated by survey, interview, and focus group comments. The full report is available on request and contains detailed methodology and cost calculations.

The population responding was 99 percent male. Among those who did respond, 82 percent were Caucasian, 6 percent African American, 6 percent Hispanic, and 2 percent Native American (though 25 percent did not designate their race and four percent of those who did stated a mixed race).

The BMWED represents union workers who build and maintain the tracks, bridges, buildings, and related infrastructure on all Class 1 railroads in the United States. They work on road gang crews covering 300,000 miles railroad track.

RESULTS AND DISCUSSION

Major musculoskeletal disorders and carpal tunnel syndrome

“Doctors ruled my degenerative arthritis was job-related due to using the vibrating tools such as rock drills, large impact tool, and all the vibrating tools pertaining to bridge work.”

“Most of my hand problems are cramps and lack of grip strength which all came about after using a Monday mail (sledge hammer) to knock plates under the rail. I was on a tie gang where we were doing this for 12 plus hours a day, every day. I woke up numerous times in the night with my

hands cramped up. Now I still have to do it here and there, and every time my hands feel like I have been doing it all day.” [2]

Track maintenance work is the rail sector most associated with manual handling accidents and musculoskeletal disorders [3]. Musculoskeletal Disorders (MSDs) include carpal tunnel syndrome, tendonitis, rotator cuff injuries, epicondylitis (elbow problems), trigger finger, muscle strains, knee and hip problems, and low back injuries. The impacts of MSDs can be life-long. Workers with upper-extremity MSDs were more likely to have moved their residence, lost their home, lost their car, and lost their health insurance than a non-injured control group. They were more likely to have difficulties with basic daily activities such as writing, gripping, household chores, opening jars, child care, carrying bags, bathing, and driving a car. Over 40 percent of workers, 28 months after their initial claim, were still having difficulty pushing a window open, pouring from a container, writing with a pen, lifting a child, mopping floors, and placing items on a high shelf. Recreational activities were seriously curtailed [4].

Vibrating tools, forceful motions, and awkward or extreme postures while working are other important ergonomic hazards causing musculoskeletal disorders [5]. Vibration is a significant cause of MSDs in MOW rail workers. Hand-arm vibration from tamping equipment puts many maintenance-of-way workers at risk of peripheral neurological disorders and also vascular disturbance, making early detection especially important [6]. In the survey that was part of this study, 56 percent of respondents said that vibration from vehicles and equipment at work bothered them always, often, or sometimes. Fifty-nine percent said that hand tool vibration at work bothered them always, often, or sometimes.

Early intervention not only leads to better outcomes for the injured worker but can save up to 72 percent on each claim. Much of this saved cost is due to preventing lost work time. According to the Bone and Joint Initiative, [7] in 2011, the median number of days away from work for all workplace injuries was eight; for MSD injuries, the median was 11 days.

What is Carpal Tunnel Syndrome? The Centers for Disease Control and Prevention (CDC) [8] describes carpal tunnel as a “cumulative trauma disorder” caused by stress to the hand and wrist, often by repetitive motions, vibration, compression of the carpal tunnel, awkward hand positions, and forceful grasping or pinching. These are all activities common for maintenance-of-way workers. The result of such repetitive activities can lead to inflammation, resulting in compression of the median nerve as it passes through the wrist. [9,10] The compression causes pain, burning, and tingling in the hand and fingers, nerve damage and muscle deterioration in the hand. CTS also causes numbness, dry palm, and the deterioration of the muscles at the base of the thumb [11].

If not treated, carpal tunnel can lead to slowing of nerve impulses, loss of feeling, loss of strength, reduced coordination, and permanent muscle damage and inability to use the affected hand effectively. In the early stages of the syndrome, individuals experience aching and tiredness of the affected limb during the work shift, but these symptoms disappear at night and during days off work. There is no reduction of work performance. In the intermediate stage, aching and tiredness occur early in the work shift and persist at night and the individual has a reduced capacity for repetitive work. In late stages of the syndrome, aching, fatigue,

and weakness persist at rest and there is an inability to sleep and perform light duties.

The first pain is a signal that the muscles and tendons should rest and recover. Otherwise, an injury can become longstanding, and sometimes irreversible. The earlier people recognize symptoms, the more quickly they can rest, treat the problem, keep it from getting worse, and speed recovery [12].

Use of tools that vibrate, especially when the work also puts force on the wrist, [13] is very common for maintenance-of-way workers and can cause CTS. One maintenance-of-way worker interviewed for this study said that he had had rotator cuff surgery three times and carpal tunnel surgery three times. Others also reported multiple surgeries on both the same joint and on a number of different joints. One survey respondent said, “*I have severe hand pain and am losing strength on my hands.*” Supporting the reports of the MOW workers interviewed, Cartwright et al. [14] found that, among manual laborers, those who had carpal tunnel were very likely to also have rotator cuff syndrome, which can also be caused by repetitive strain.

Causes of carpal tunnel syndrome: Bernard [15] summarizes the research on causes of carpal tunnel syndrome as providing evidence of a relationship between carpal tunnel syndrome and highly repetitive work, either alone or in combination with other factors. There is also clear evidence of a relationship between forceful work and carpal tunnel syndrome. The Washington State Department of Labor and Industries [16] supports these conclusions, based on data from workers in that state. They find that “combinations of high force with high repetition and awkward posture; regular strong vibrations” result in a high risk of developing carpal tunnel syndrome.

One interviewee for this study explained that he has carpal tunnel syndrome due to repetitive stress operating a 70-foot long tamper machine to surface the track. The tamper had two levers on the console that he moved back and forth all day long, resulting in thousands of repetitions. Another interviewee described his carpal tunnel as caused by the PB8 jackhammer he used for seven or eight years which caused distress from his elbows to his fingers.

If one does not treat early stages of carpal tunnel syndrome, individuals can lose their ability to use their hands to do their job and perform basic tasks of daily living like buttoning a shirt or holding a spoon. This has profound consequences for individuals and their families and also for employers, insurers, and for government-supported programs.

Economic and social impact of carpal tunnel syndrome

The cost of treating and managing health problems can be separated into direct and indirect costs. Direct costs include prescription medications and in- and out-patient treatments such as hospital charges, visits to doctors, physical therapists, etc. Indirect costs usually take into account the impact of illness on the patient’s ability to work and costs to the workplace. Unfortunately, many indirect costs are often overlooked because most research, if it does include indirect costs, is focused on the economic impact of illness or injury on employers through lost productivity and lost work time. Very little is known about the indirect impact of specific health problems on other family members’ education or employment or psychological well-being. Little is known about how a significant illness or injury affects the patient’s and the family’s participation in the community and community activities such as sports, Scouts,

service organizations, or religious institutions, though common sense says the impacts are significant. This study puts numbers to some, but not nearly all these factors.

Traditionally, reports on the economic impact of injury and illness focus on direct medical costs only. But there are many other direct and indirect costs, including burdens to the injured or ill workers, as well as costs to their families, employers, insurers, society, and to taxpayers. Increasingly in recent years, there has been an effort to also include the economic impact of reduced productivity from lost workdays as an indirect cost.

Absenteeism is one important factor affecting productivity. While the cost of absences is more often being measured, rarely measured is the economic burden of “presenteeism,” [17] or the lower productivity of a sick or injured worker who comes to work but, because of work-related infirmities, cannot perform tasks fully or efficiently. (For example, whereas absenteeism for arthritis averaged 8.5 lost days a year, presenteeism led to estimated lost productivity, on average, of 15.6 days per year. And, even more rarely calculated is the presenteeism of caregivers—workers who often are exhausted and may need to use work time for making arrangements for their injured or sick loved ones. Studies of absenteeism and presenteeism provide evidence that if one wants to increase productivity, part of the solution is “an integrated approach to mitigate job-related injuries, promote employee health, and improve the fit between a worker’s duties and abilities”[18].

Hemp, writing in the Harvard Business Review, [19] argues that presenteeism can be significantly more costly than absenteeism and that presenteeism “can cut individual productivity by one-third or more.” He goes on to explain that unlike absenteeism, presenteeism is not always apparent and one may not be able tell how much a medical condition is hindering someone’s performance.

Stewart et al., writing in the Journal of the American Medical Association [20] concluded that “Pain is an inordinately common and disabling condition in the US workforce. Most of the pain-related lost productive time occurs while employees are at work and is in the form of reduced performance.”

An Ohio State University researcher [21] found that occupational injuries and illnesses affect:

- injured workers, coworkers, employers, management, office staff, and safety and health officials.
- workers’ families, workers’ friends, workers’ colleagues, and workers’ neighbors.
- Workers Compensation insurers, other insurers.
- health care providers, labor unions, other worker groups.
- employer groups, lawyers, judges, regulators, and lawmakers.

The effects included:

- reduced wages, diminished productivity, unemployment, retraining.
- stress, depression, anger, stigmatization, isolation, violence, suicide, unhealthy behaviors such as smoking and drugs.
- medical care utilization, household tasks passed on, problems with interpersonal communication.

- problems with family relationships, sleep and sexual disruption, divorce, reduced community involvement, and discrimination.
- physical impairment, disability, pain, negative effects on activities of daily living.

Workers, their families, insurers, and taxpayers pay most of the costs of workplace injuries and illnesses. In addition, workers earn, on average, \$31,000 less over ten years following an injury in 2014 dollars, [22] or \$31,874 in 2016 dollars.

Impacts on families

Approximately 10 percent of children in the U.S. grow up with a parent who has a chronic medical condition. Negative consequences for the children can include internalizing problems, stress, and a lower GPA [23]. Based on survey and interview results, the percentage of children in families with chronic illness and/or disability is likely higher for children of maintenance-of-way workers. Children may live without a real childhood due to caretaking responsibilities [24]. Compromised parenting because of stress and illness leaves many children with developmental problems [25].

Families with chronically infirm individuals can become unstable—finances may become precarious, making housing and food security and health interventions unpredictable. According to OSHA, workplace injuries and illnesses contribute to the pressing issue of income inequality as “they force working families out of the middle class and into poverty.” [26] If families become unstable, it affects entire communities [27]. Children from these families may need more attention and services in school. In some instances, there may be substance abuse in the family and more need for police and social services. Sick and injured individuals and family members are likely to be less able to volunteer to coach sports, lead Scout troops, be active in their places of worship, or serve on local boards and committees. Local taxpayer resources may be needed to help these individuals and families—from EMT to meals-on wheels, from housing assistance to visiting nurses and food stamps.

Sixteen percent of workers with MSDs needed care from family members. And, 38 percent of the family members of those with MSD also had to take on extra household chores that used to be done by their injured family member. Loss of income from the injured worker often leads to reduced family income which limits the ability to hire caretakers, so family members, in order to care for the injured worker, may reduce their work hours and lose even more household income [28].

Impacts on quality of life

“My body is beat up and wore down after 41 years working on the railroad. My retirement years are miserable.”

Individuals who suffer from work-related illnesses or injuries are often in a life-long struggle to participate in important personal and family obligations as well as to sustain the energy to do their job. Because of the fear of being taken out-of-service or permanently dismissed, many injured and ill MOW workers, as affirmed by thousands of surveys and more than 150 interviews, hide their infirmities and do not receive the treatment they need for cure or symptom relief. Many have to give up on hobbies like motor biking, hunting, fishing, and other sports because joint pain makes pursuing them too difficult. Many need their off hours and even their vacation time for recuperation. Some are in constant pain.

The chronic pain and illness, as well as the frequent injuries, makes being a maintenance-of-way worker hard during working hours, but perhaps equally hard during non-working hours. According to one survey respondent: *“I have severe wrist and joint pain. I attribute it to using a tamp gun for extended periods of time. Also, the hydraulic impact is used daily to tighten bolts with stripped threads causing extended use and jarring of wrist, elbows, shoulders, and neck...”*

Social and economic impacts caused by work-related health problems cause stress on the victim or family members. The financial pressures on a family can include the need for a caregiver, need for additional income from children or spouse to fill the gap between previous earnings and workers compensation, or psychotherapy for family members to cope with harsh new realities. When children lose their chance at college and higher future earnings, the impact is likely to be hundreds of thousands of dollars over their lifetimes [29,30]. When an injured worker loses a career path, and for the remaining years of working life is in a job earning less per hour or a job with no retirement benefits, the results can also be hundreds of thousands of dollars lost. Psychological trauma and physical suffering are just two examples of burdens that defy monetization, but that should not be an excuse for leaving them out of analysis.

Cost in caregiving

The impact of illness and disability is likely to affect family members as well as the victim [31]. Family caregivers are the backbone of long-term care in the U.S. [32] Chronic illness often affects a couple’s relationship, parenting, household management, work responsibilities, and social relationships [33]. Over 75 percent of married people who develop a chronic illness get divorced. And, chronic illness of a parent can increase the likelihood of psychiatric illness in children, acting-out behavior, social withdrawal, sexual promiscuity, and use of drugs or alcohol. CTS is likely to cause family members to take on increased household obligations, but because full-time caregiving is unlikely, except after surgeries, economic impact calculations in this paper do not include caregiver costs for this health problem.

Sixty-nine percent of employed caregivers report making changes to their paid work situation because of caregiving responsibilities [34]. Working fewer hours and turning down overtime, caregivers suffered a 5 percent to 60 percent reduction in pay. Absences tend to increase, with full-time employed women who are also caregiving missing an average of 24.7 days of work per year. Fifty-eight percent of caregivers left work early or came in late because of their caregiving responsibilities. Productivity is known to decrease (presenteeism) because of mental preoccupation, distractions, making and taking phone calls, low morale, stress, and caregiver fatigue. All of these can reduce not only productivity, but job security as well.

Costs to taxpayers have been underestimated

There are many potential costs to taxpayers, and they can go far beyond medical expenses only. When a maintenance-of-way worker gets hurt or sick, there is the potential tax deduction for health care expenses (in the hundreds of billions of dollars nationally) with a portion of that due to work-related issues such as Carpal Tunnel Syndrome (CTS). There are tens of billions of dollars in earned income tax credit nationally, and a portion of that is due to families qualifying as a result of rail-related health problems such as CTS. And beyond these financial burdens to U.S. taxpayers, the government often absorbs the cost of disability benefits, housing

subsidies, unemployment insurance, food stamps, VA care, and a host of other third-party and safety net programs. In addition, lost productivity poses a taxpayer burden because individuals with work-related health problems, who miss work or are less productive, negatively affect personal and corporate income taxes collected. The total burden to the victims and their families (seen here as potential benefits if a health problem is prevented) can run into the millions of dollars per person [35].

Cost to the railroads

While railroad companies themselves do not pay for all the costs of work-related health problems and injuries, as the causal party, they should be liable for them. Instead, according to survey and interview reports, they frequently threaten injured and ill workers with being taken out of service if they report a health problem. While BMWED members have health insurance, only direct medical costs are eligible (with deductibles and co-pays), leaving indirect expenses and lost wages also unreimbursed.

Yet, Class I freight railroads alone are estimated to have \$250 billion a year in operating revenue [36] and 20 percent in profit margin and 30 percent in operating margin [37]. By OSHA estimates, on the costs estimated by OSHA, the amount of additional sales required to pay just for carpal tunnel syndrome would be \$214 million to \$320 million, based on margins of 20 percent to 30 percent. Beyond absenteeism, sick pay, disability pay, etc., just presenteeism (poor productivity while on the job, due to pain and disability) for CTS cases is estimated to cost the railroads \$20 million to \$80 million over the course of the number of carpal tunnel syndrome cases of current active members of the BMWED (Table 1).

Most CTS infirmities occur after years of exposure and stress on the body. Knowing when it is appropriate to report a chronic condition can pose a problem to workers when it is not caused by a specific event or injury. This is especially true for carpal tunnel syndrome. Railroad companies often deny work-related claims if a health problem or injury is not immediately reported, but this is not always possible. Some of these issues were discussed by survey participants:

- Have multiple pains (elbow, knee, back, wrists). Can't pinpoint specific instance where injury happens, so can't turn [it] in.
- I have serious elbow pain and wrist pain. I'm getting treatment to try to calm it down but no one event can be reported to the railroad because this is a condition that has worsened over time.
- A lot of times injuries happen over time. The company wants to know a specific incident that injured you. I know people who put off surgery because they cannot prove an injury happened at work and cannot afford disability.

Economic costs of carpal tunnel syndrome

Some of the most complete data available on direct economic costs of occupational injury were collected by the Washington State SHARP program [38]. The report's data, from Washington State, were part of a large study of all workers' claims in the state filed in 1993-1994 and followed-up for six years. The report reveals that workers with carpal tunnel syndrome missed more days from work (median: 138) than those with fractures (median: 46). In addition, "The typical CTS claimant loses about 30 percent more of their pre-injury level of earnings than do claimants with either dermatitis (DERM) or upper extremity fractures (FRAC)." The study also

found that older workers lose more time from CTS and lose more income in subsequent years. Men working in construction or transportation lose more time and lose more long-term earnings when they develop CTS than do men working in "fixed-site industries."

Indirect costs for carpal tunnel syndrome include familial, societal, and economic effects. Beyond lost wages, family members may be negatively affected psychologically, and the patient and family may be less involved in their community involvement. These indirect losses can be just as powerful and painful as direct economic losses. Even non-life-threatening conditions often carry large price tags. OSHA's safety Pays Estimator [39] yields direct costs of \$30,509 and indirect costs of \$33,559 for carpal tunnel syndrome, for a total cost per case of \$64,068.

Social costs of carpal tunnel syndrome

Many workers with CTS find that they are unable to perform family and social roles. Many develop depression, live with constant pain, and find that they can contribute less to community life [40]. Over 40 percent of CTS claimants reported that other members of their household had to spend more time on household chores because of the patient's disability. And they reported that their partners increased work hours due to their injuries, and they were more likely to be separated or divorced than those with fracture claims. Nearly 60 percent said they had to draw down their savings as a result of their carpal tunnel. CTS can mean that an individual is no longer able to tie shoes or button shirts, pick up small items, and sometimes not hold an eating utensil, requiring constant help from those around them. Interviews with BMWED workers and retirees showed this level of disability among many of them. Social support of family and friends reduces pain intensity, reliance on medicines, and encourages individuals to return to work [41].

Costs of carpal tunnel syndrome to the BMWED membership and to individuals

The direct cost of treating carpal tunnel syndrome depends on the type of treatment; e.g., outpatient vs. in-patient. While the procedure itself can cost, as discussed above, just \$1,700 to \$3,300, the average total direct plus indirect cost is actually much higher at \$64,068 per individual, according to OSHA. Much of the indirect cost is due to the high number of lost work days following a procedure. Many maintenance-of-way workers need surgery on both wrists, sometimes multiple times. The railroads need to make sales of \$214,000 to over \$320,000 in order to be able to pay the \$64,068 cost of carpal tunnel syndrome for one individual.

According to the National Health Interview Survey, conducted by the U.S. Census, [42] 3.6 percent of the employed male population have been told by a medical professional that they have carpal tunnel syndrome. Among respondents to the BMWED survey, from a similar demographic, the percentage is more than twice as high; 7.9 percent have been told that they have carpal tunnel syndrome. At 3.6 percent of 35,000 active members, one would expect 1,260 cases. If 7.9 percent of maintenance-of-way workers have carpal tunnel, that suggests that there would be 2,765 current cases of carpal tunnel among the 35,000 active BMWED members. The chances that carpal tunnel developed on the job are high. But if only the "excess" cases are counted, there are still 1,505 "excess" cases among the active membership of 35,000. The estimated total cost per individual, for the time period for which the case exists,

Table 1: Estimated Costs of Carpal Tunnel Syndrome to Individuals and to the BMWED Community*

	Cost Category			
	Direct and Indirect Costs**	Presenteeism***	Out-of-Pocket	Total
Average Cost to the Individual	\$64,068	\$13,405-\$53,620	\$8,002-\$32,010	\$85,475-49,698
Cost to the BMWED Community (in million \$)	\$96.4	\$20.2-\$80.7	\$12.0-\$48.2	\$128.6-\$225.3

Sources: Calculations within this report.

*These costs are spread across several groups: individuals and their families, employers, insurance companies, government entities, and society at large.

**As estimated by OSHA.

***Twelve days a year, assumed to be working on the job for 5-20 years with carpal tunnel syndrome. Most with carpal tunnel develop it early in their careers and may well live with the pain, on-the-job for 20 years or more. To be conservative, the assumption is that the pain of carpal tunnel does not usually require a caretaker and that out-of-pocket expenses are half that of other serious work-related health problems.

is \$85,000 to \$150,000. If one only count “excess cases,” the cost to the BMWED community would be \$128.6 million to \$225.3 million, and this does not include caretaking costs and the social costs associated with dependency as the syndrome becomes more serious. These estimates do not include the proportion of MOW workers that match national rates. (It only includes cases in excess to expected incidence.) They do not include either retirees or non-represented MOW workers, and in addition because many cases of CTS are misdiagnosed as arthritis and are also not included, these cost estimates should be considered extremely conservative.

Using OSHA estimates and only the 1,505 excess cases, total direct and indirect cost is \$96.4 million. If one uses the higher estimate of 2,765 cases, acknowledging that nearly all the cases are probably work-induced, then the total for direct and indirect cost is \$177.1 million. When adding in presenteeism and out-of-pocket costs, the total rises to \$128.6 million to \$225.3 million for the entire BMWED community (Table 1). Even this high-level estimate does not include the significant costs to retirees and non-BMWED-represented MOW workers, which could easily double the burden.

CONCLUSION

Maintenance-of-way workers on the railroad face many hazards and dangerous exposures. As a result, many more get sick or are injured than in the general population. Carpal tunnel syndrome is a painful condition that affects at least 7.9 percent of those active members taking the BMWED survey. Early treatment can avoid surgery and/or permanent damage to the wrist. Vibration and repetitive motion are a major cause. Often those affected miss weeks of work to recover from surgery. More than 60 percent of carpal tunnel patients say they have to draw down on their savings because of their affliction. The estimated cost per individual, for the time period for which the worker has carpal tunnel syndrome, is \$85,000 to \$150,000. If one only counts “excess cases,” the cost to the BMWED community would be \$128.6 million to \$225.3 million.

Not included in these costs are lost income for MOW workers and family members who are caretaking, cash payments to caretakers, lost future Social Security and retirement income for family caretakers, out-of-pocket co-pays, over-the-counter medications and drug copays, travel to doctors and parking, lost future income to children who forego education in order to care for a sick relative or who forego income by postponing entrance into the work force, legal fees, specialized equipment, home modifications, physical aids, and a myriad of effects related to pain and suffering.

There is a broad range of potential policies and workplace changes that could simultaneously improve worker health and safety and

also improve productivity and save money for workers, their families, their communities, railroad companies, and taxpayers. Healthy workers are more productive workers. Any improvements are likely to be a win-win situation.

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Note: These costs are societal and have not been allocated to individual parties or groups of parties because of the complexities of third-party payment and differences across geography. This is especially the case for allocation of burden among employers, private insurers, workers compensation, and Federal Employers Liability Act (FELA)-sanctioned legal compensation. Calculations in this paper do not include thousands of MOW retirees, many of whom suffer from CTS (and according to the survey, at a higher rate than active members) nor do they include non-represented MOW workers.

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