



Brotherhood of Maintenance of Way Employees Division of the International Brotherhood of Teamsters

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Dear Brothers and Sisters:

Attached is a Summary Report to the BMWED membership outlining the key findings of the Occupational Safety and Health research project. The Summary Report was authored by a team of highly-credentialed medical and academic researchers with extensive experience in workplace safety and health, both nationally and internationally. The full research project includes three separate areas of study: (1) epidemiology, (2) ergonomic and physical hazards, and (3) social and economic impacts.

This unprecedented study of Maintenance-of-Way (MOW) workers found statistically significant elevated levels of disease and injury compared to other workers, accompanied by unexpectedly high economic and social costs. These findings strongly suggest the critical need for intensified collaborative efforts by labor, management, and the regulatory community to better understand, and then to eliminate or mitigate, contributing occupational factors. These finding also underscore the critical need for broad and comprehensive health and welfare benefits for BMWED members.

The overarching goal of this research effort by the union is to educate MOW workers concerning job-related risks and to provide BMWED with the statistical data necessary to support collaborative Risk Reduction efforts. These collaborative Risk Reduction efforts, mandated under the Federal Rail Safety Act of 2008, are intended to reduce railroad accidents, injuries and disease and to improve the safety, heath, and working lives of MOW workers.

I encourage every member and officer to read the attached Summary Report. The three separate research papers from which this Summary Report is compiled will be made available to the membership upon publication.

Stay safe, stay strong, and stay united.

In Solidarity,

President

HEALTH AND SAFETY STUDY: MAINTENANCE-OF-WAY RAILROAD WORKERS

SUMMARY REPORT TO THE MEMBERSHIP OF BMWED

JUNE 2018

In 2015, the Brotherhood of Maintenance of Way Employees Division (BMWED) of the International Brotherhood of Teamsters funded three research teams¹ to study the impact of workplace hazards on the safety, health, and welfare of its members. The objectives were 1) to clearly define the risks and impact of injury, illness, and death among the union's membership, 2) to provide materials to educate both current and future members so they will be able to live longer and healthier lives, and 3) to provide scientific data that can be used to help prevent injuries and illnesses affecting members (and other MOW workers unaffiliated with BMWED²) through a combination of regulatory improvements and labor/management engagement.

This Summary Report to the Membership has four major sections followed by a description of study methods, strengths, and limitations:

- The Mortality Study and Survey Analysis
- The Health Study of Ergonomic and Physical Hazards
- The Social and Economic Impact Study
- General Recommendations

The three teams collaborated on a comprehensive membership survey inquiring about work history, working conditions, medical history, and related topics that was made available to approximately 39,000 current and retired BMWED members. Approximately 4,800 members responded, coming from all 48 continental states and all seven Class I freight railroads as well as a number of passenger/commuter and regional/short-line railroads.

The first report, authored by occupational epidemiologist Dr. David Goldsmith, examines whether BMWED members die at a higher rate or younger age than the general population. It also focuses upon mortality and health problems among MOW workers. His work includes a standardized mortality ratio study, a proportional mortality ratio study, and an analysis of data from the survey of approximately 4,800 current and retired members.

¹ Each research team was granted full academic freedom and responsibility for the content of their individual study sections.

² Non-BMWED represented MOW workers employed on transit systems, non-BMWED represented MOW contractor employees, and non-union employees of Short-Line Railroads who perform MOW work.

The second report is a study of health problems related to ergonomic, physical, and work organization hazards led by occupational physician Dr. Eckardt Johanning and epidemiologist Dr. Paul Landsbergis. It analyzes the BMWED survey data to assess whether BMWED members have higher rates of certain musculoskeletal conditions (MSDs) and cardiovascular disease (heart disease or stroke) compared to other non-MOW workers. This team further assessed the extent to which those conditions are related to poor ergonomics, stressful work, vibration, and the tools and vehicles with which they work.

The third report is a social and economic impact study led by economist Dr. Ruth Ruttenberg. It examines the social and economic impact of diseases and injuries among maintenance-of-way workers by estimating the cost of work-related illness and injury, and their impact on members' lives, families, employers, insurers, communities, and taxpayers. Dr. Ruttenberg's research focuses on five health problems believed common among maintenance-of-way workers: chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), cancer, lower back problems, and carpal tunnel syndrome. Beyond the survey data, this paper utilizes an extensive literature review as well as 155 in-depth interviews and information from focus groups with BMWED members.

This Summary Report to the Membership provides an overview of findings from the three research teams. For more detail, the three separate studies will be available upon publication. The studies include over 300 pages of data and analysis.

A separate technical summary of the three reports will also be published and will include a copy of the 17-page membership survey, a map of where the survey respondents came from, and a copy of the telephone questionnaire of a group who did not respond to the survey (used to test the representativeness of the nearly 5,000 survey respondents.)

THE MORTALITY STUDY AND SURVEY ANALYSIS

Study Author: Dr. David Goldsmith

Historically, BMWED members and their union have identified a range of complex and variable exposures that include diesel exhaust, metals, herbicides and pesticides, ballast (silica) and cement dust, asbestos dust, solvents and related chemicals, heavy equipment vibration, welding fumes, PCBs, electromagnetic fields, and extreme weather conditions among others.

The study team conducted a standardized mortality ratio (SMR) study based on data from BMWED membership records and the National Death Index. An SMR is a ratio between the observed number of deaths of BMWED members and the number of deaths that would be expected if BMWED members had the same age distribution as the U.S. male population. A mortality ratio greater than 1.0 indicates that there were more BMWED member deaths compared to what was expected from the U.S. population.

An SMR study of 11,190 BMWED member deaths from 1979 to 2014 found significantly more than expected deaths among BMWED members from a range of causes. For all causes of death, the SMR is 1.63, meaning there were 63% more deaths overall among BMWED members aged 18 to 64 than there were in the U.S. male population of the same age during the same years. Specifically, the study found that active BMWED members ages 18-64 had statistically higher

than expected SMRs for the following non-cancer causes: septicemia, viral hepatitis, diabetes, anemias, Parkinson's and Alzheimer's diseases, heart diseases, hypertension, chronic liver disease, nephritis, suicide, and accidental trauma and deaths. The SMR for workplace transportation accidents and trauma was 3.27. The non-cancer SMRs are listed below:

**SMR VALUES FOR NON-CANCER CAUSES OF DEATH FOR AGES 18 TO 64
AMONG BMWED MEMBERS, 1979 TO 2014**

Causes of Death	Observed Deaths	Expected Deaths	SMR
All causes of death	11,190	6,847.6	1.63
HIV/AIDS	132	549.8	0.24
Septicemia	95	43.5	2.19
Viral hepatitis	59	37.1	1.59
Diabetes	266	168.9	1.57
Anemias	13	8.1	1.60
Parkinson's disease	7	2.3	3.09
Alzheimer's disease	13	1.8	7.15
Cardiovascular disease	2,739	1691.8	1.62
Hypertension	47	22.3	2.11
Cerebrovascular disease	308	212.1	1.45
Atherosclerosis	23	10.9	2.11
Chronic lower respiratory disease	247	130.4	1.89
Pneumonia	109	96.7	1.13
Chronic liver disease	388	246.3	1.58
Nephritis	92	36.8	2.50
Transportation accidents	1,165	356.5	3.27
Non-transport accidents	624	318.5	1.96
Traumatic assault	289	170.6	1.61
Complications of medical and surgical care	17	9.3	1.83
Suicide	579	340.8	1.70

Source: Goldsmith and Barlet

The data from SMR analysis suggest increased risk of BMWED members dying from all cancers and many specific cancers before age 65, as follows:

**SMR VALUES FOR CANCER CAUSES OF DEATH FOR AGES 18 TO 64
AMONG BMWED MEMBERS, 1979 TO 2014**

Causes of Death	Observed Deaths	Expected Deaths	SMR
All malignant neoplasms (cancers)	2,813	1,568.1	1.79
Cancer of the lip, oral cavity	61	47.9	1.27
Esophageal cancer	115	63.1	1.82
Stomach cancer	95	46.2	2.06
Colo-rectal cancer	282	141.6	1.99
Liver cancer	124	52.4	2.36
Pancreatic cancer	168	77.3	2.17
Lung cancer	948	519.8	1.82
Melanoma	54	44.6	1.21
Prostate cancer	84	43.5	1.93
Kidney cancer	89	50.8	1.75
Bladder cancer	41	21.0	1.95
Brain cancer	118	71.1	1.66
Hodgkin's disease	17	9.0	1.88
Non-Hodgkin's lymphoma	116	85.7	1.35
Leukemia	118	60.2	1.96
In situ neoplasms	43	20.4	2.11

Source: Goldsmith and Barlet

Over the 36 years covered in this study there is an increased risk of cancer deaths from the bladder, pancreas, oral cavity, prostate, kidney, esophagus, colorectal, stomach, liver, leukemias, melanoma, brain, Hodgkin's disease, and lung. In order to understand the direction of our findings we examined mortality trends over four time periods: 1979 to 1987, 1988 to 1996, 1997 to 2005, and 2006 to 2014. We found that the SMR trends for chronic respiratory disease and cancers of the bladder, pancreas, esophagus, liver, prostate, and lung were rising during the four time periods. By contrast, the SMRs for Hodgkin's disease are trending down over the four time periods; all causes of death, heart disease, and other cancers, including brain, leukemia, melanoma, stomach, non-Hodgkin's lymphoma, and oral cancers show no clear trends.

A proportionate mortality ratio (PMR) analysis, similar to an SMR, but including members 65 to 85+ years of age had similar results as was found among BMWED members less than retirement age of 65 years. Two worrisome excess SMRs for Alzheimer's and Parkinson's disease were not supported by the PMR analysis.

Survey answers were used to examine the links between selected health and injury problems and history of working in 10 MOW work classifications. This research technique is called a case-control analysis. Cases were members who said they suffered from health and injury conditions (as determined by doctors or health providers) and controls were defined as all other BMWED members who did not have the health problems of interest. The crude work histories between cases and controls were compared and adjusted for age, smoking, and race/ethnicity in odds ratio (OR) calculations. We found the ORs of having a given health problem were 2.0 or greater for the following: Bridge & Building, Surfacing, and Welders had excess ORs for memory loss and forgetfulness. Several work classifications, including Foreman, Machine Operators, Track Inspectors, Welders and Electrical Traction employees had significant elevated ORs for injuries to knees, head, hips, neck and trunk. These findings suggest a possible link between MOW work and many health conditions. The work activity findings are listed below:

**THOSE JOBS WITH INCREASED ODDS RATIOS OF DISEASE
AND ACUTE TRAUMATIC INJURY, COMPARED TO OTHER MOW WORKERS**

Job Activity	Condition	Crude Odds Ratio	Adjusted Odds Ratio*
Bridge and Building Employee	Memory Issues/ Forgetfulness	2.2	2.1
	Prostate Cancer	1.9	2.2
Electric Traction Employee	Injury to Trunk	9.6	14.9
Foreman	Injury to Head	2.2	2.0
Machine Operator	Injury to Neck	2.1	2.4
	Injury to Shoulders	1.9	2.2
Roadway Equipment Mechanic/Repairman	Myocardial Infarction	2.6	2.0
	Prostate Cancer	2.6	2.3
	Rheumatoid Arthritis	2.8	2.5
Surfacing Gang Equipment Operators	Myocardial Infarction	2.4	2.1
	Memory Issues/ Forgetfulness	2.8	2.8
Track Inspector	Bladder Cancer	2.7	2.0
	Injury to Head	2.5	2.2
	Injury to Hips	2.1	1.9
	Melanoma or Other Skin Cancers	2.3	1.8
Welder	Memory Issues/Forgetfulness	2.8	2.8

Source: Goldsmith and Barlet.

* Adjusted for age, smoking, and race/ethnicity

THE HEALTH STUDY OF ERGONOMIC AND PHYSICAL HAZARDS

Study Authors: Dr. Eckardt Johanning and Dr. Paul Landsbergis

This team collected comprehensive information about type and use of tools and vehicles that are unique to this trade and industry. The team concluded that laborers/trackmen performing MOW work typically face heavy physical demands and environmental conditions affecting their feet, legs, backs, arms, joints, ears, and vital organs. MOW workers regularly stand and walk on unstable and uneven surfaces (ballast). MOW work occurs outdoors in all extremes of weather utilizing both handheld manual tools and noisy power tools and equipment. MOW workers regularly ride on and operate, carry, and use equipment with inadequate suspension, muffling, and ergonomic design. Such workers regularly exert anywhere from 20 to 100 pounds of force to lift and carry materials and equipment. They often work in ergonomically challenging positions, including kneeling, crouching, crawling, bending, and reaching. They are also subjected to significant vibration and noise from tools and vehicles.

The health study of ergonomic, physical, and work organization hazards systematically analyzed responses of BMWED members to questions from international standardized questionnaires and, in some cases, compared them to results from surveys of specific occupations or of all employees which had asked the same questions.

Previous studies have shown that prolonged and excessive whole-body vibration is a general physical stressor and has been associated with a variety of occupational health disorders, especially of the musculoskeletal system, the spine, and lower back. Long-term whole-body vibration has been identified as an important mechanical stressor causing early and accelerated degenerative spine diseases leading to back pain and prolapsed discs. Straight handle design hand tools are more likely to expose the user to “non-neutral” postures, such as bent wrists. Hand tools can also cause short duration shocks (e.g., spiking/hammering). Powered hand tools using hydraulics, air, gasoline/diesel motors, or electric power can also cause significant vibration exposure and can lead to hand-arm vibration syndrome or carpal tunnel syndrome.

Ergonomic hazards increase the risk that workers will develop musculoskeletal disorders (MSDs) of the joints and the soft tissues of the upper or lower extremities (arms and legs) as well as the spine (both the neck and back).

Key findings from the survey for this Health Study of Ergonomic and Physical Hazards include:

- 75% of BMWED members reported that their job always or often involves repeated lifting, pushing, pulling, or bending compared to 47% of U.S. male workers generally (2015 National Health Interview Survey – Occupational Health Supplement).
- Nearly 1 in 10 members and retirees (9.7%) reported having been diagnosed with carpal tunnel syndrome.
- Compared to all U.S. employed men age 18 to 74, active BMWED men were more likely to have been told by a health professional that they have carpal tunnel syndrome (7.9% vs. 3.6%).

- Measures of hand pain or carpal tunnel diagnosis were statistically associated with members' agreement with the statements "vehicle equipment vibration bothers me", "hand tool vibration bothers me", "job involves repeated lifting, pushing, pulling, or bending", and their disagreement with the statement that "health and safety of workers is a high priority with management where I work."
- The data showed that every 10 years use of power tools increased risk for diagnosis of carpal tunnel syndrome by 2.85 times.
- About 25% of members and retirees reported symptoms consistent with nerve entrapment, such as carpal tunnel syndrome, or nerve damage due to vibration, daily or weekly during the past year. Such symptoms include numbness or tingling of the fingers (26.3%), numbness or tingling of the fingers lasting more than 20 minutes during or after using vibrating tools (18.4%), waking up at night with pain, tingling, or numbness in the hand or wrist (18.9%) or difficulty picking up very small objects, such as screws or buttons or opening tight jars (13.9%).
- Carpal tunnel syndrome is found more commonly under at least five unfavorable working conditions. As seen in the table below, BMWED members report that they work under these unfavorable conditions much more often than do U.S. male workers generally.

Working Conditions	BMWED %	U.S. %
How often does your job involve repeated lifting, pushing, pulling, or bending?		
Often/Always	74.6%	46.9%
My job allows me to make a lot of decisions on my own.		
Strongly Disagree/Disagree	31.6%	12.3%
I can count on my supervisor or manager for support when I need it.		
Strongly Disagree/Disagree	39.7%	9.2%
The health and safety of workers is a high priority with management where I work.		
Strongly Disagree/Disagree	40.7%	5.2%
How often are there not enough people or staff to get all the work done?		
Often/Sometimes	88.1%	65.2%

Source: Survey of BMWED members and 2015 U.S. National Health Interview Survey.

- 61.8% of members who said that vehicle equipment vibration always bothered them (8-10 hours/day) reported back pain during the past week. If vehicle equipment vibration bothered them sometimes (1-2 hours a day), 47.8% said they had back pain during the past week. If vibration didn't bother them, the percentage reporting back pain was 28.8%. Back pain was a common symptom, but much more common for those bothered by vibration.

- Ten years of using power tools increased risk for “back pain lasting more than 1 week at a time” by 81%.
- Ten years use of non-powered hand-tools increased risk for “back pain lasting more than 1 week at a time” by 26%.
- Back pain was a common condition reported by BMWED members. Only a small percent of cases (7%) were reported to be due to “severe injuries or fractures” and only a small proportion of members and retirees (5%) reported having back problems when they started their railroad jobs. Therefore, most cases of low back pain were probably chronic conditions due to day-to-day physical work demands.

Percentage of BMWED Active Member Respondents Who Reported Back Pain Duration and Frequency			
More than 3 Times/Year	Lasted More than 1 Week at a Time	During the Past Week	Always or Often During the Past Week
70.6%	43.4%	50.4%	27.0%

Source: Survey of BMWED members

- Only in a small percent of cases (10.2%) did active members report a back-related injury to the railroad or the railroad medical department. However, members currently out on disability (48.1%), or those retired due to age (36.1%) or medical condition (60.0%) were much more likely to have reported their condition.
- Nearly half (48.9%) of active BMWED members reported back pain in the past week, a higher percent than track maintenance workers in the UK (36%).
- Over half of BMWED members and retirees (52.1%) reported severe joint pain in the past year, which included pain in the knees, hips, shoulders, neck, wrists/hands, or elbows.

Percentage of BMWED Active Members Who Report Severe Joint Pain Lasting A Day or More In The Past Year					
Knee Pain	Hip Pain	Shoulder Pain	Neck Pain	Wrist/Hand Pain	Elbow Pain
34.2%	17.7%	29.3%	24.9%	22.4%	17.4%

Source: Survey of BMWED members

Knee pain and carpal tunnel syndrome were more common among BMWED members working under the following conditions:

Work Factors	Knee Pain %	Carpal Tunnel Syndrome %
Vehicle/equipment vibration bothers me		
8-10 hours/day	42.3%	16.0%
4-6 hours/day	35.2%	9.0%
<1 hour/day	17.4%	5.0%
Hand tool vibration bothers me		
8-10 hours/day	50.0%	15.0%
4-6 hours/day	34.0%	11.0%
<1 hour/day	17.1%	3.0%
Job involves repeated lifting, pushing, pulling or bending		
Often/Always	25.5%	7.0%
Sometimes	16.8%	5.0%
Seldom/Never (ref.)	8.2%	5.0%
Health & safety of workers is a high priority with management where I work		
Strongly Disagree	33.7%	10.0%
Disagree	28.7%	8.0%
Agree	19.6%	5.0%
Strongly Agree	14.0%	6.0%

Source: Survey of BMWED members (adjusted for age, region, race/ethnicity, second job, second job vehicle vibration, spare time vehicle vibration).

Based upon survey results, years of using power tools and hand tools were both associated with increased back, hand, shoulder, and knee musculoskeletal disorders among active BMWED members, even after taking age into account.

Occupational hand-arm vibration exposure in construction and other industries has been associated with vascular (blood vessel), neurological (nerve) and inflammatory conditions of the shoulder, arm, wrist, or hand. To make better purchasing decisions, it would be useful for employers to have data on vibration associated with specific tools and equipment. However, there is very little information published in North America about the risk of powered hand-tools contributing to hand-arm vibration (HAV) (also known as segmental vibration) emissions.

The physical demands of BMWED work (repeated lifting, pushing, pulling, or bending), vibration exposure from vehicles and tools, poor walking/working surfaces (ballast), and a perceived lack

of a priority for health and safety by management were all associated with musculoskeletal conditions experienced by active BMWED members.

THE SOCIAL AND ECONOMIC IMPACT STUDY

Study Author: Dr. Ruth Ruttenberg

This study begins with a review of research on the costs and impacts on individual, family, community, railroads, and taxpayers of five diseases common among BMWED members: chronic obstructive pulmonary disease (COPD), chronic non-cancerous kidney disease (CKD), cancer, lower back problems, and carpal tunnel syndrome. The information was combined with data from the survey, interviews with members, and two focus groups of members to help assess the cost of *not* preventing these diseases and illnesses among BMWED maintenance-of-way workers. Direct costs such as medical bills are substantial. Indirect costs associated with illness and injury, include: lost productivity; lost wages of the victim as well as those who may have to stay home to care for the individual; out-of-pocket expenses to get to and from medical treatment; and reduced productivity of ill workers and distracted family members. These “indirect” expenses were actually higher than the direct costs of medical treatment.

Key findings:

- Costs of injury and illness are borne not only by the workers, employers, and insurers, but also by families, communities, and taxpayers.
- According to the American Cancer Society, “All cancers of occupational origin are preventable.”
- Workers and their families often face extreme financial hardship when the MOW worker must leave the job temporarily or permanently. Out-of-pocket expenses from a work-related illness or injury can put an entire family in crisis.
- Workers and their families often face extreme social and emotional hardship when a MOW worker is injured on the job or becomes ill. The BMWED survey is in agreement with past scientific research on this issue. The educational and work lives of other family members often must change. For severe injuries and illnesses, living space can become more like a hospital than a home. Tensions in interpersonal relations can flare up. Many may have to take on a significant role as caretaker.
- Often overlooked is the potentially severe impact on quality of life of injured and ill MOW workers. The survey, interviews, and focus groups found that a person in constant/frequent pain who can no longer hunt or fish or play ball with one’s children; a person who must spend all non-working hours resting in order to be able to return to work and support their family; an individual who becomes disabled or facing life-threatening illnesses due to their work; the emotional stress in a family when a member is in pain or sick – all of these burdens falls to workers and their families, but preventive measures could spare them of these burdens.

- Five diseases common among BMWED active members (chronic obstructive pulmonary disease, chronic non-cancerous kidney disease, cancer, lower back problems, and carpal tunnel syndrome) cost workers and their families, railroad companies, insurers, taxpayers, and society billions of dollars. Statistically, BMWED active members have more of these diseases than the general population (considered as “excess disease”). For each current disease among active BMWED members in these five categories there is an associated cost. Over the time period that each individual suffers from these current “excess diseases,” this study found the total estimated financial burden is \$1.7 billion to \$2.3 billion. If BMWED retirees and non-BMWED affiliated MOW workers were included, the cost would be greater.
- Using OSHA’s estimates, railroads would need to have \$3.7 billion to \$9.8 billion in additional sales to cover the costs for the five work-related health issues that are the focus of this paper. These billions of dollars of cost are incurred over the period that each individual suffers from the given disease.
- Presenteeism (the concept of poor productivity while on the job due to pain and disability) is estimated, for the five studied diseases alone, to cost the railroads \$150 million to \$286 million over the course of those diseases currently facing MOW workers.
- Data show that the average caregiver in the U.S. spent 18 hours on care per week in 2013, or the equivalent of 936 hours a year. Calculated at \$12.51, per hour, the average caregiver worked for an average (unpaid) value of \$11,709 per year.
- Caregivers across the U.S. reported spending an annual average of \$6,400 for their caregiving and the needs of their family member.
- The estimated amount of income-related loss U.S. family caregivers aged 50 and older who leave the workforce to care for an ill or injured family member can exceed \$300,000. They may also lose health and pharmacy benefits.
- Estimates of the cost to the BMWED community of these 5 health issues are based on (1) OSHA’s cost estimation per incident for the five diseases, (2) estimates in the scientific research literature of numbers of these diseases in the general working age population, and (3) “excess mortality” among BMWED workers for each disease.³ The total estimated cost is for diseases in these five disease categories are as follows:

³ Excess mortality is the number of additional BMWED deaths from COPD, CKD, and cancer for men 18-64 compared to what would have been expected in the U.S. male population.

Estimated Costs to the BMWED Community for 5 Major Health Issues Affecting Maintenance-of-Way Workers (In millions of 2016 dollars)						
Health Issue	COPD	Chronic Kidney Disease	Cancer	Back Problems	Carpal Tunnel Syndrome	Total
Direct & Indirect Costs as Estimated by OSHA	\$134.9	\$335.6	\$205.5-\$284.0	\$568.8	\$96.4	\$1,341.2-1,419.7
Presenteeism	\$17.5	\$43.6	\$10.1	\$58.6-\$234.4	\$20.2-\$80.7	\$150.0-\$386.3
Out-of-Pocket Expenditures	\$20.9	\$52.1	\$9.6	\$70.0-\$280.0	\$12.0-\$48.2	\$164.6-\$410.8
Value of Unpaid Caretaker Wages	\$1.5	\$3.8	\$0.9	\$5.4	--	\$11.6
Caretaker out-of-Pocket Expenditures	\$4.2	\$10.4	--	\$14.0	--	\$28.6
<i>TOTAL</i>	<i>\$179.0</i>	<i>\$445.5</i>	<i>\$226.1-\$304.6</i>	<i>\$716.8-\$1,102.6</i>	<i>\$128.6-\$225.3</i>	<i>\$1,696.0-\$2,257.0</i>

Source: Calculations within the full Economic and Social Impact report.

GENERAL RECOMMENDATIONS

These study results document elevated rates of injuries, illnesses, and occupational risks for BMWED workers raising important health and safety concerns. There are nevertheless areas and particular findings identified in this study that provide opportunities for prevention and others that need urgent control and monitoring.

Since these workplace risks occur in a complex regulatory and contractual environment, addressing them will require collaborative participation on the part of many parties from union and corporate officers to governmental entities.

Recommendation: There should be a commitment to improvements and serious conversations among the parties on how to achieve safer and healthier work places for MOW workers.

It is important to recognize that the survey results represent a single snapshot in time. They invite further and more detailed investigation as appropriate.

Recommendation: Affected parties should jointly and collaboratively formulate thoughtful recommendations geared to reducing job hazards and risks of injury and illness.

All affected and involved parties should explore ways to share existing, potentially relevant data gathered by other entities from government to health insurance companies. Indeed, railroad companies themselves likely have relevant exposure and environmental data unavailable to outside entities.

Recommendation: Existing environmental site studies, data, or surveys should be made available to interested parties in jointly and collaboratively developing reasonable mitigation and prevention strategies.

Recommendation: Going forward, means should be identified to measure health risks and outcome trends over time. It is important to determine whether these health risks have improved over time, remain the same, or worsen over time. Such insights would also be valuable in evaluating the effectiveness of risk mitigation and safety and health hazard risk reduction strategies.

Recommendation: An effort should also be made to examine whether and how regulatory considerations affect workplace safety and health and how those factors could be helpfully utilized to improve workplace safety and health.

Because this study is one of the first, if not the very first of its kind, we assume that it will invite comment and criticism. We welcome such discussion.

Recommendation: To the extent further study is warranted and undertaken, it should take such comment and criticism into consideration.

Recommendation: Consideration should be given to how these data might inform the collaborative development of Risk Reduction Programs and Safety Management Systems to assist railroads, workers, and their unions in identifying and mitigating health and safety risks.

NOTEWORTHY OBSERVATIONS

Conservative Estimates of Study

The estimates in these studies may underrepresent the true extent of the problems. They are conservative for a number of reasons:

- Frequently, BMWED members responding to the survey expressed fear of being disciplined, taken out of service, or being permanently dismissed for reporting injuries or illnesses.
- BMWED workers reported a hesitancy to take time off for injuries and illnesses for fear of being taken out-of-service or losing pay. Of 1,000 people taking the survey who said why they took off work, only 3 said they took time off for colds or flu. Reasons given for taking off work were more serious: amputation, broken bone, surgery, cancer, joint replacement.
- A follow-up telephone questionnaire was administered to 135 randomly sampled members who did not participate in the survey. Those who responded to the membership survey were found to be healthier (with the exception of back pain) than those who only responded to the telephone questionnaire.
- Cost data are primarily calculated on active BMWED members, excluding retirees and non-BMWED maintenance-of-way workers. Assumptions made for cost calculations were conservative. For example, in the study on social and economic impact, the cost estimates are incomplete. They do not cover retirees or non-BMWED MOW workers. They cover only five health issues, and do not measure income and retirement losses of caretakers, presenteeism of caretakers, or burdens to widows and orphans. Also, the burden to the RRB of paying for disability and sick benefits is not included, to ensure that there is no double-counting with OSHA's indirect cost estimates.

Methods Used in Study

- Thorough review of past scientific research studies.
- Cause of BMWED member death information from the National Death Index.
- Review of data on the ergonomics and vibration of the tools and equipment typically used by MOW workers.
- Survey made available to 35,000 active BMWED members and 4,000 retirees of record. Survey was available on-line, as hard copy, over the telephone, and in English or Spanish.
- Use of questions from the National Health Interview Survey and the National Quality of Work Life Survey to compare BMWED respondents with all employed workers in the U.S.
- In-depth interviews with 155 volunteers from among the survey respondents to probe their survey responses more deeply.
- Focus groups to discuss working conditions, illnesses and injuries, and impacts on work and quality of life.
- A 10-question telephone questionnaire was administered to a random sample of 135 BMWED members from across the country and across railroads who had not responded to the larger survey. Survey respondents were generally younger and healthier (with the exception of back pain) and had reported more challenging work conditions than the non-responders.
- The study results were peer reviewed by national and international occupational safety and health experts.

Strengths of the Study

- Approximately 4,800 maintenance-of-way workers provided survey data – believed to be the largest such survey ever undertaken of this occupation in the U.S. This response rate permitted statistically valid findings.
- A diverse team of high caliber researchers looked at MOW health and safety through different professional lenses.
- The study underwent substantive peer review by national and international experts. These experts reviewed everything from the study design to completion of the research studies.
- Significant steps were taken to assure the anonymity and/or confidentiality of BMWED participants, including a Certificate of Confidentiality issued by the Department of Health and Human Services.

- A number of methodologies were used for analysis: Surveys (including questions from national U.S. surveys), interviews, focus groups, National Death Index, and review of tool and equipment data.
- Survey and interview participants could use either English or Spanish. Surveys could be filled out on-line, with hard copy, or over the telephone.
- Survey participants came from all 48 states of the continental U.S. and from all seven Class I freight railroads, as well as from a number of passenger/commuter and regional/short-line railroads.
- Only BMWED members and retirees were given access to the survey through a membership verification process.

Limitations of the Study

- Although producing statistically valid data based upon thousands of maintenance-of-way workers responding to the survey, the response rate overall was about 12%.
- Although anonymity was assured, some members chose not to answer questions that they might have felt were “too sensitive.”
- There is limited similar railroad-specific literature with which to compare our findings.
- The Railroad Retirement Board does not categorize its data on disability and sickness benefits by craft.
- Because the Railroad Retirement Board does not break down its data according to International Classifications of Disease (ICD) codes, we could not compare the reported diagnoses from our survey. Also, we did not have access from railroad companies or health insurance carriers to International Classifications of Disease (ICD) codes for members’ claims, which tell diagnosis.
- Neither health insurance claims nor disability claims data were available for comparison with survey results.
- The survey data collected are a snapshot in time rather than a study which looks at work hazards and injuries and illnesses sequentially over time.
- Survey, interview, and focus group data on medical diagnoses are based upon self-reports rather than claims data. (In some cases, however, self-reporting may be more accurate in assessing the degree of illness and injury across the population.)
- Some questions were worded differently than in national surveys, making it more difficult to make direct comparisons.

- There may be recall bias by survey responders, which may have resulted in over- or under-reporting of hazardous working conditions, symptoms, disorders, or expenses.
- BMWED members who answered the survey were in somewhat better health than members who did not answer the survey. Some BMWED members who were either disabled or on temporary sick leave at the time of the survey, or who had lost their MOW job due to sickness/injury, may not have been aware of or completed the survey. For these reasons, the survey probably underestimates the extent of injuries and illnesses faced by BMWED members.
- Field measurements and actual vibration emission data of tools and vehicles could not be obtained.

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