

REVIEW ARTICLE

Work disability prevention in rural areas: a focus on healthcare workers

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A B S T R A C T

Introduction: Approximately 20% of healthcare workers in high-income countries such as Australia, Canada and the USA work in rural areas. Healthcare workers are known to be vulnerable to occupational injury and poor work disability outcomes; given their rural–urban distribution, it is possible to compare work disability prevention in rural and urban areas. However, little attention has been paid to work disability prevention issues specific to rural workers, including rural healthcare workers. A comprehensive review of the literature was conducted to identify rural–urban differences in work disability outcomes (defined as the incidence of occupational injury and the duration of associated work absence), as well as risk factors for poor work disability outcomes in rural healthcare workers.

Methods: The databases MEDLINE, CINAHL, and EMBASE were searched, as were relevant research centers and government agencies, to identify all quantitative and qualitative English-language studies published between 1 January 2000 and 6 October 2009 that discussed occupational injury, work absence duration, work disability management, or risk factors for poor work disability outcomes, for rural workers specifically, or in comparison with urban workers. To ensure inclusion of studies of healthcare workers as a distinct group among other sector-specific groups, a broad search for literature related to all industrial sectors was conducted.

Results: Of 860 references identified, 5 discussed work disability outcomes and 25 discussed known risk factors. Known risk factors were defined as factors firmly established to be associated with poor work disability outcomes in the general worker



population based on systematic reviews, well-established conceptual models of work disability prevention, and public health literature. Although somewhat conflicting, the evidence suggests that rural healthcare workers experience higher rates of occupational injury compared with urban healthcare workers, within occupational categories. Rural workers also appear to be more vulnerable to prolonged work absence although the data are limited. No studies directly compared risk factors for work disability prevention outcomes between rural and urban healthcare workers. However, potential risk factors were identified at the level of the environment, worker, job, organization, worker compensation system and healthcare access. Important methodological limitations were noted, including unclear definitions of rurality, inadequate methods of urban-rural comparisons such as comparing samples from different countries, and a paucity of studies applying longitudinal or multivariate designs.

Conclusions: There is a notable lack of evidence about work disability prevention issues for healthcare workers in rural areas. Available evidence supports the hypothesis that rural healthcare workers are vulnerable to occupational injury, and suggests they are vulnerable to prolonged work absence. They may be particularly vulnerable to poor work disability prevention outcomes due to complex patient needs in the context of risk factors such as heavy workloads, long hours, heavy on-call demands, high stress levels, limited support and workplace violence. Additional vulnerability may occur because their work conditions are managed in distant urban administrative centers, and due to barriers in their own healthcare access. Although rural healthcare workers seem generally at greater risk of injury, one study suggests that urban emergency medical service workers experience a high vulnerability to injury that may outweigh the effects of rurality. Additional research is needed to document rural-urban disparities in work disability outcomes and to identify associated sources and risk factors. Other issues to address are access to and quality of healthcare for rural healthcare workers, streamlining the compensation system, the unique needs of Aboriginal healthcare workers, and the management of prolonged work absence. Finally, occupational injury and work absence duration programs should be tailored to meet the needs of rural workers.

Key words: absenteeism, disability management, healthcare workers, occupational injury, return-to-work, rural health services, rural population, work absence duration, work disability prevention, workers' compensation.

Introduction

Context

Work disability prevention programs, aimed at reducing the incidence of workplace injuries and their associated work absences and costs, are typically developed in urban areas, with little attention given to their suitability for the rural context (note that the terms 'rural' and 'remote', as well as 'northern' or 'outback' used in countries including Canada and Australia relate to separate yet overlapping constructs; for simplicity, the term 'rural' was used for all). In this article, work disability prevention outcomes were defined as the incidence of occupational injury and the duration of associated work absence.

Little is known about work disability in rural areas despite a large proportion of workers in industrialized countries being rural workers, including workers in the healthcare sector^{1,4}. Healthcare workers in particular are vulnerable to poor work disability outcomes, including high injury rates, prolonged work absences, and high associated costs⁵⁻⁷. Accordingly, they present an excellent opportunity to compare rural and urban workers' rates of occupational injury and work absence duration.

Despite the high costs of occupational injury and work absence⁸, which may be more significant in rural than urban areas, work disability and rural health have been studied in isolation. To understand rural workers' vulnerability to poor work disability outcomes, and to examine the interface between the fields of work disability prevention and rural health, a comprehensive literature review of work disability prevention for healthcare workers in rural areas was conducted.



Issue

Healthcare workers appear to be particularly vulnerable to occupational injury and prolonged work absence duration. In the USA in 2005, the healthcare sector accounted for the second largest number of non-fatal injuries and illnesses among all sectors, representing over 30% of all workplace injuries and illnesses involving time lost from work⁵. Similarly, in British Columbia, Canada, health care is responsible for the second largest proportion of lost work days due to occupational injury or illness, behind construction workers⁷. In Australia, the incidence of serious occupational injury claims is greater in health and community services than in any other industry⁶.

Up to one-fifth of healthcare workers in industrialized countries live and work in rural areas, facing different working and social conditions than their urban counterparts^{9,10}. Workers in rural areas face three unique challenges that may make them vulnerable to higher rates of poor work disability outcomes. First, *rural residents* are less healthy compared with urban residents in Australia, Canada, New Zealand, and many other developed countries^{10,11}. They have overall poorer health, lower life expectancy, and higher infant mortality¹⁰. Rates of disability, violence, accidents and poisoning are greater in rural areas than in urban areas¹². The health of residents in rural communities in Canada has been shown to decrease as the distance to an urban center increases¹². Second, *rural healthcare systems* differ from urban systems in that they are more poorly resourced^{10,12}. In Canada, although the per capita distribution of primary physicians may be relatively equal in rural and urban areas, the availability of specialist care is drastically reduced in rural areas¹⁰. Distance from and access to primary care services are additional major challenges¹⁰. Third, *rural healthcare workers* are socio-demographically different from urban healthcare workers, as will be discussed.

Work disability prevention and rural health have been highly compartmentalized fields. This review aimed to provide a novel perspective on these fields by focusing on their junction and highlighting areas of vulnerability for work

disability for rural workers, with a particular focus on healthcare workers.

In this review, three main questions were asked:

1. Are rural healthcare workers injured at work more frequently than urban healthcare workers?
2. Is the duration of work absence more prolonged for rural healthcare workers who experience an occupational injury compared with urban healthcare workers?
3. What are the risk factors for poor work disability prevention outcomes for rural healthcare workers, are these different from those in urban areas, and do they occur more frequently among rural healthcare workers?

Methods

Search strategy

The online databases of academic journals MEDLINE, CINAHL, and EMBASE were searched to identify all relevant English-language studies published between 1 January 2000 and 6 October 2009. The search was date restricted to ensure identified rural-urban disparities were representative of the contemporary context. In addition, the websites of research centers and government agencies in Australia, Canada, and the USA were searched with a focus on rural health or occupational safety (Fig1). Finally, the reference lists of articles selected for inclusion in the present review were hand-searched for additional articles of relevance, published since 1 January 2000.

The following concepts were used in the search: 'Rural' AND 'Work, occupational injury, work disability or risk factors' AND 'Countries or regions', with NOT 'Agricultural workers, non-working age populations, non-work related injuries' (Table 1). A broad cross-sector approach was chosen to ensure inclusion of studies of healthcare workers as a distinct group among other sectoral groups. Initially, the search was conducted using only the concepts for 'Rural' and 'Work, occupational injury, work



disability or risk factors'. However, over half of the returned articles addressed agricultural workers and agricultural families or rural areas in developing countries; therefore, the exclusion criteria were expanded to remove articles about agricultural workers, non-working age populations, non-work related injuries, and low-income countries. Articles were included if they discussed occupational injury, associated work absence duration or known risk factors (such as poor disability management) for poor work disability outcomes among rural healthcare workers (Fig2); or if they included rural/urban comparisons of outcomes or risk factors in their analyses. Articles were selected that focused on high-income countries because of the potential for large differences in high-income and low-income countries' occupational categories, rural context-specific variables, and occupational health and safety practices¹³. The search concepts for rurality, work disability outcomes, and risk factors will be discussed in greater detail.

Definition of rurality

A common theme in the rural health literature is the lack of a single, clear definition of 'rural'. Common definitions incorporate notions of community size, distance to population centers, access to services, occupational landscapes (such as employer size, and main industries) or commuting patterns^{14,15}. The search was not restricted to a single definition of rurality; rather, a variety of terms was used to identify articles about rural populations, rural health, rural health services, and medically underserved populations, and combined these with terms to identify work injury and disability prevention. Ultimately, the following definitions of rurality were accepted for inclusion in this review: small population size, low population density, primarily agricultural industry composition, lack of accessible goods and services, lack of accessible specialist healthcare in an area with low population size or density, limited commuting to population centers, and areas conventionally classified as rural by their governments (Table 2).

Outcomes

Two primary outcomes were focused on: occupational injury rates and associated work absence duration (Fig2). Injury

rate measures that were accepted included point prevalence rates of work-related illness or injury, including work-related pain, and incidence rates of workplace injuries or illnesses per worker or per full-time equivalent. Work absence duration measures that were accepted included point prevalence rates of return to work (ie, the proportion of workers who returned to work by a specified time), and the mean or median duration of work absence after a specified time interval, for time to first return to work or cumulative days of work absence over a given period.

Selection of risk factors

To understand the risk factors associated with potential rural–urban disparities in work disability outcomes, studies were identified that assessed or discussed known risk factors for work disability, with or without relating them directly to work disability. Search terms for risk factors are listed in the 'Work, occupational injury, work disability or risk factors' search concept (Table 2). Known risk factors for occupational injury and prolonged work absence duration were identified based on public health knowledge of rural health¹⁰, systematic reviews⁴⁹⁻⁵⁰, and internationally recognized conceptual frameworks in work disability prevention⁵¹ (Fig2 gives categories of risk factors).

Results

The database and institutional searches identified 814 references, 25 of which were selected for inclusion. Review of the reference lists of these 25 articles, led to the identification of an additional 46 potentially relevant articles. Of the 860 references identified in this way, a total of 30 were selected for inclusion: 5 addressing work disability prevention outcomes and 25 discussing known risk factors. The findings of these studies are described in detail here, and summarized in Tables 3 and 4 (work disability prevention outcomes, and risk factors, respectively).



Table 1: Search terms used to identify literature about rural occupational injury, associated work absence duration and risk factors.

Concepts	Search Terms		
	MEDLINE	EMBASE	CINAHL
Final yield of potentially relevant titles	511	318	42
Rural	Rural Population or Rural Health or Rural Health Services or Hospitals, Rural	Rural Health Care or Rural Population or Rural Area or Rural Hygiene or Rural Health Nursing or Urban Rural Difference	Association for Australian Rural Nurses or Australian Rural Nurses and Midwives or Hospitals, Rural or Rural Areas or Rural Health Centers or Rural Health Personnel or Rural Health Services or Rural Population or Rural Health
AND Work, injury, disability management, work absence, or risk factors	"Wounds and Injuries" or Musculoskeletal Diseases or Safety or Occupational Exposure or Accidents, Occupational or Preventive Health Services or Safety Management or Accident Prevention or Occupational Diseases or Disability Evaluation or Occupational Health or Rehabilitation or Job Satisfaction or Personnel Management or Workload or Occupational Health Services or Rehabilitation, Vocational or Professional Autonomy or Absenteeism or Burnout, Professional or Occupational Health Nursing or Personnel Turnover or Sick Leave or "Physical Therapy Specialty " or Occupational Health Nursing or Nurses or Nurses' Aides or Emergency Medical Services or Emergency Medical Technicians or Medical Staff, Hospital or Health Personnel or Specialties, Medical or Caregivers or Health Manpower or Health Resources or Medical Staff or Workplace or Work or Stress, Psychological or Chronic Disease or Nursing staff, Hospital	Musculoskeletal Disease or Safety or Occupational Health Nursing or Occupational Safety or Occupational Therapy or Occupational Allergy or Occupational Accident or Occupational Lung Disease or Occupational Psychology or Occupational Toxicology or Occupational Therapy Practice or Occupational Disease or Occupational Cancer or Occupational Hazard or Occupational Health Service or Occupational Medicine or Occupational Therapist or Occupational Exposure or Occupational Health or Occupational Skin Disease or Preventive Health Service or Accident Prevention or Accident or Work Disability or Disability or Rehabilitation Nursing or Rehabilitation or Rehabilitation Medicine or Vocational Rehabilitation or Job Satisfaction or Paramedical Personnel or Medical Personnel or Health Care Personnel Management or Health Care Personnel or Administrative Personnel or Rescue Personnel or Personnel Management or Laboratory Personnel or Nursing Home Personnel or Personnel or Personnel Shortage or Mental Health Care Personnel or Hospital Personnel or Operating Room Personnel or Hospital Personnel Management or Workload or Absenteeism or Burnout or Physiotherapy or Medical Leave or Nurse Practitioner or Registered Nurse or Nurse or Practical Nurse or Emergency Medicine or Emergency Health Service or Patient Transport or Medical Staff or Caregiver or Work or Job Stress or Chronic Disease	Occupational Health or American Association of Occupational Health Nurses or Health Occupations or National Institute for Occupational Safety and Health or Occupational Health Services or Work or Quality of Working Life or Women, Working or Rehabilitation, Vocational or Occupational-Related Injuries or Musculoskeletal Diseases or Low Back Pain



Table 1: cont'd

Concepts	Search Terms		
	MEDLINE	EMBASE	CINAHL
AND Countries or regions	Canada or United States or Australia or South Australia or Western Australia	Canada or United States or "Australia And New Zealand" or Australia	United States or Canada or Australia or South Australia or Western Australia
NOT Agricultural workers, non-working age populations, non-work related injuries.	Agriculture or Agricultural Workers' Diseases or School or Students or Malaria or Sexually Transmitted Diseases or Medicine, African Traditional or Malaria, avian or Malaria, falciparum or Malaria vaccines or Malaria, vivax or Malaria, cerebral	"Irrigation (Agriculture)" or Agriculture or Sustainable Agriculture or Precision Agriculture or Agricultural Worker or Agricultural Land or Agricultural Waste or Middle School Student or High School Student or School or Sexually Transmitted Disease or Malaria Falciparum or Malaria Control or Malaria or Malaria Vaccine	
Limits	English language and year="2000 - Current"	English language and year="2000 - Current"	English language and year="2000 -Current"

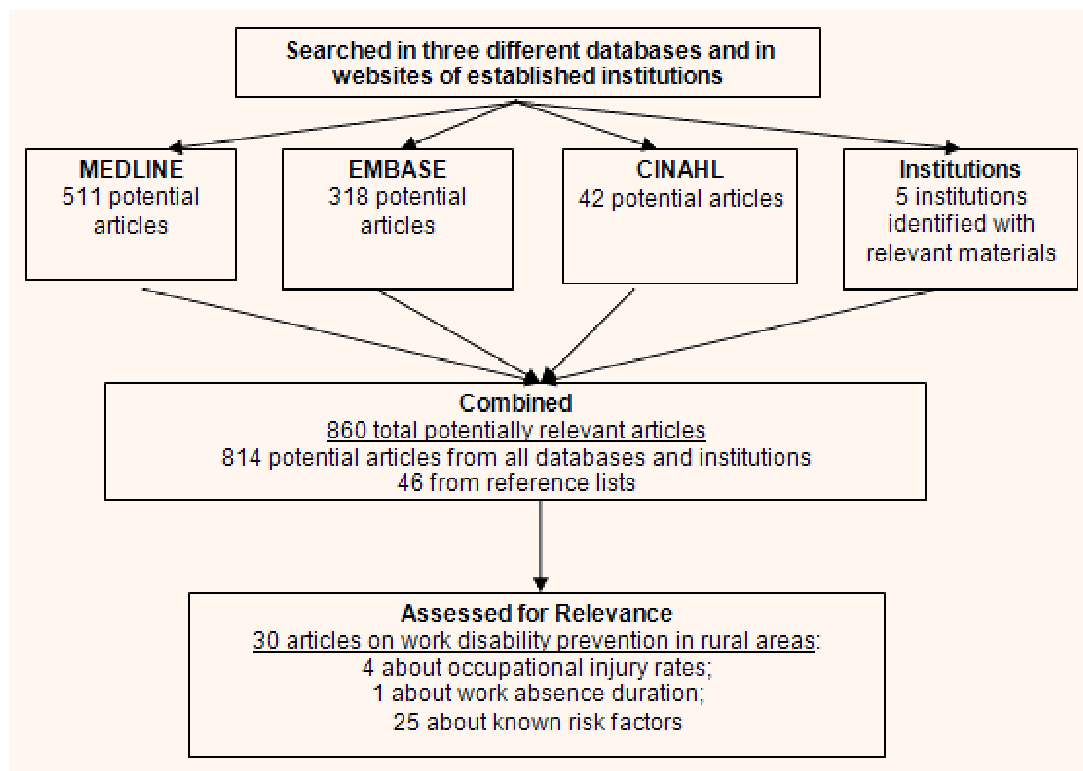


Figure 1: Search strategy to identify literature about rural occupational injury and associated work absence.

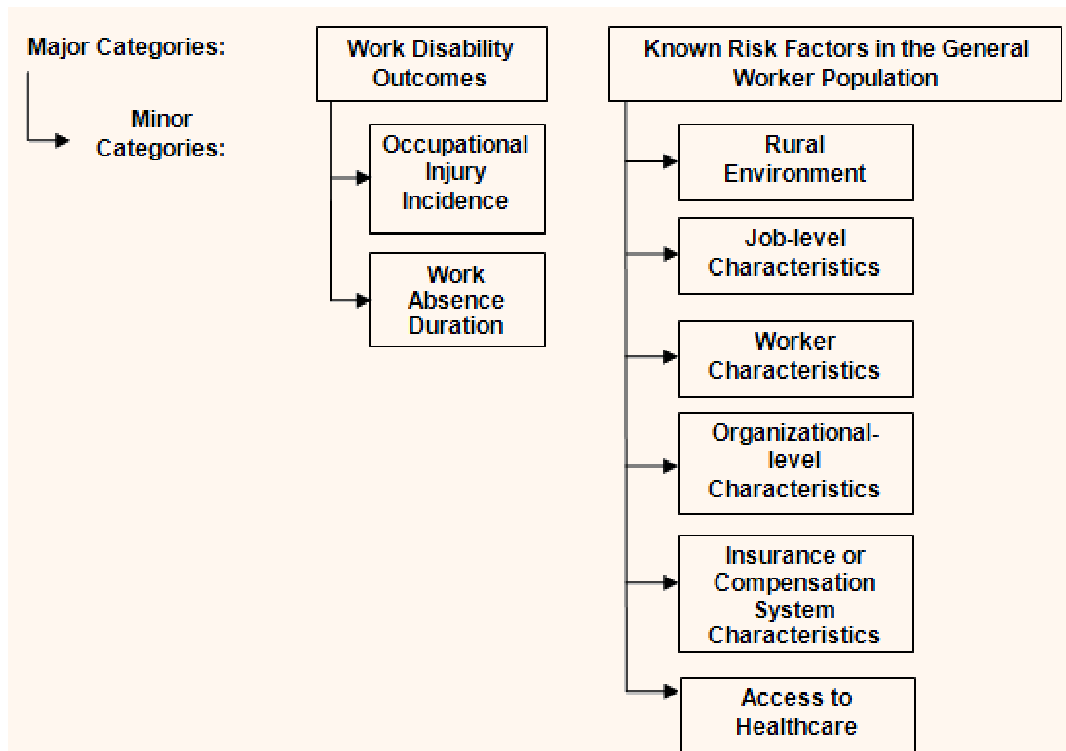


Figure 2: Major and minor search categories used to identify literature about rural occupational injury, associated work absence and risk factors.

Occupational injury rates

Four studies specifically assessed injury among rural healthcare workers¹⁶⁻¹⁹ (Table 3). Rates of workplace injuries/illnesses were remarkably high in rural healthcare workers: Smith et al, in a series of studies, found that 12 month incidence rates of musculoskeletal disorders (MSKs) among rural healthcare workers were 80% in Australian nursing students¹⁶, 80% in Japanese nurses¹⁷, and 92% in another study of Japanese nurses¹⁸. Lower back pain was the most common type of disorder, with prevalence rates ranging from approximately 60%^{16,17} to 83%¹⁸.

Available studies comparing rural with urban healthcare workers have used previously published data from different countries. In these studies, rural healthcare workers were noted to have higher incidence rates of MSKs compared with the urban workers. Smith and Leggat¹⁶ compared findings of their study of Japanese nurses with the findings of an

Australian study of young urban workers and concluded that 37% of young male workers and 32% of young female workers of any occupation in urban areas reported back pain in the previous year⁵³, considerably less than the 60% of rural Australian nursing students in the Smith and Leggat¹⁶ study. When comparing rural with urban nurses, Smith et al¹⁸ found lower prevalence rates of low back pain in urban healthcare workers from other countries (41% of nurses in Hong Kong⁵⁴ and 70% of nurses in Taiwan⁵⁵) compared with nurses in rural Japan (83% of nurses in rural Japan¹⁸). However, the differences were not consistently found for other MSKs; for instance, the 12 month period prevalence rate of shoulder symptoms was 60% in Australia⁵⁶, compared with 61% in rural Japan¹⁸. Overall, the comparability of urban with rural rates in these studies is seriously limited by the use of rates from other countries and other studies, and the lack of clear description of the urban and rural areas surveyed.



Table 2: Definitions of rurality used in the identified literature about rural occupational injury, associated work absence and risk factors¹⁶⁻⁴⁸

Rural concept	Definition	Example measures	Present study reference no. for studies using this definition
Population size	Rurality defined based on a maximum population size for a defined area.	<u>Rural and Small Town Canada</u> – Statistics Canada: Less than 1,000 people; and <u>Rural, Remote and Metropolitan Areas (RRMA)</u> – Australian Government Department of Health and Aged Care: 7 categories of urban, rural and remote based on population size cut-offs.	19,20, 22, 26,27, 30, 33, 46-48
Population density	Rurality defined by number of people per square kilometer or similar.	<u>Rural, Remote and Metropolitan Areas (RRMA)</u> – Australian Government Department of Health and Aged Care: Distinction between rural and remote is determined based on ‘personal distance’ as a measure of population density.	27,28,40
Commuting flows	Rurality defined by commuting patterns to urban areas as a measure of the daily-life importance of urban areas for rural residents.	<u>Metropolitan Influence Zones (MIZ)</u> – Statistics Canada: Among areas with population less than 10,000, 4 categories for rurality and remoteness using percent of workforce that commutes to urban areas.	25,28,33
Availability of resources	Rurality defined by ease of access to specific goods and services – measured directly based on defined goods and services, or indirectly by distance to metropolitan centers.	<u>Accessibility/Remoteness Index of Australia (ARIA)</u> – Australian Government Department of Health and Aged Care: Continuous index for remoteness using population size and road distance to determine accessibility to goods and services.	21,24,34,47
Primary industry	Rurality defined by the types of industries or occupations available in an area.	Areas with primary resource extraction (e.g. forestry, fisheries, mining), manufacturing, processing plant work, or agriculture as the primary industry; or areas with majority of small employers.	18
Convention	Rurality defined by convention.	Areas that are commonly classified rural by government or administrative structures.	16,17,23,29, 31,32, 35, 36-39, 45

A longitudinal study of American emergency medical service (EMS) workers¹⁹ pointed to an opposite pattern, whereby urban EMS workers (defined as those in communities of > 25 000 people) were 2.8 times more likely than rural workers (in communities < 25 000 people) to have an occupational injury or illness, after controlling for call volume, certification level and previous back problems. This study raises the possibility that urban EMS workers may have higher exposure to risk factors than their rural counterparts.

Are rural workers injured at work more frequently? Although the evidence is conflicting, and limited by the fact that only one study directly compared rural with urban injury rates¹⁹, the reviewed findings suggest that injury or illness rates for rural healthcare workers may be higher than for urban healthcare workers, within the same occupational category, with the exception of EMS workers.

Work absence duration

Only one study, from the USA, examined work absence duration (Table 3)²⁰. This study showed that, in West Virginia, work absence duration was more prolonged in rural home healthcare workers than in urban workers (rurality was defined as all counties without a city of at least 10 000 people and not located in a Metropolitan Statistical Area as defined by the US Census). The difference was large: rural workers had an average of 57.9 days of absence following an occupational injury, while urban workers averaged 37.2 days of absence²⁰. The authors suggested that rural–urban differences in work absence duration may be related to reduced access to medical care or to workplace characteristics, such as unsafe work environments associated with higher levels of poverty among rural home healthcare clientele²⁰.



Table 3: Summary of the identified literature about occupational injury and work absence duration in rural workers¹⁶⁻²⁰.

Citation	Study design	Sample characteristics	Definition of rurality	Rural-urban comparison	Findings	Potential limitations
Occupational injury						
Smith et al 2003 [18]	Cross-sectional, self-administered, anonymous questionnaire.	Rural only: N = 259 rural female nurses employed at one of three hospitals in the region. Location: Yamanashi prefecture in central Japan. Participation rates: 78.5% response rate. Date of data: 2003.	Yamanashi prefecture is located in central Japan, near Mt Fuji, Nagano and the Southern Japanese alps. Agriculture and tourism are the primary industries of the prefecture, which has a population of 900 000 people.	No direct comparison in study. Discussion compares findings with previous research among hospital nurses in other countries – rurality of these other studies' samples not described.	Prevalence of work injury: 91.9% of nurse reported any MSK in the past 12 months: <ul style="list-style-type: none"> 83% low-back pain 61% shoulder 37% neck 29% upper back 24% knee 19% upper leg 14% wrist 13% upper arm 12% lower arm. Risk factors: Patient handling was a significant risk for low back pain: OR = 16.7 (95%CI: 1.3-412.7). Rural-urban comparison: Prevalence of low back pain among nurses in other countries: <ul style="list-style-type: none"> 70% in Taiwan 64% in Sweden 45% in England 41% in France 41% in Hong Kong. Prevalence of neck pain was described as lower than in other studies (data not given).	Injury measure: an MSK was defined as any ache, pain or discomfort within a given body area over past 12 months. Data source: self-report only. Study design: cross-sectional. Other issues: <ul style="list-style-type: none"> Very large confidence intervals Lack of standardized Japanese survey tool Unclear if region is comparable to other rural areas, given population size.
Smith et al 2003 [17]	Cross-sectional, self-administered, anonymous questionnaire.	Rural only: N = 305 rural female nurses employed at a tertiary, teaching hospital. Location: Yamanashi prefecture in central Japan. Participation rates: 84% response rate. Date of data: 2002.	Yamanashi prefecture is a rural prefecture located in central Japan.	No direct comparison in study.	Prevalence of work injury: 78.4% of nurses reported any MSK in the past 12 months: <ul style="list-style-type: none"> 59% low-back pain 47% shoulder 28% neck 16% knee 12% upper leg 10% upper back 9% lower leg 8% ankle 4% wrist 3% upper arm 2% elbow 2% lower arm. Risk factors: Working in the surgical department was a significant risk for MSK at any site, relative to all other departments: OR = 2.1 (95%CI: 1.1-4.7).	Injury measure: MSK over past 12 months – not clearly defined. Data source: self-report only. Study design: cross-sectional. Other issues: <ul style="list-style-type: none"> Lack of standardized Japanese survey tool 'Rural' not clearly defined Did not compare rural and urban.



Table 3: cont'd

Citation	Study design	Sample characteristics	Definition of rurality	Rural-urban comparison	Findings	Potential limitations
Smith & Leggat 2004 [16]	Cross-sectional, self-administered, anonymous questionnaire.	Rural only: N = 260 rural nursing students. Location: major nursing school in Townsville, Australia. Participation rates: 24 non-respondents (91.5% response rate). Date of data: 2003.	Townsville is a rural town in northern Queensland, Australia.	No direct comparison in study. Discussion compares findings with previous research among urban youth in Australia and among nursing students in other countries – rurality of these other studies not described.	Prevalence of work injury: 80% of nursing students reported any MSK in past 12 months: <ul style="list-style-type: none"> • 59% low-back pain • 35% neck • 25% knee • 24% shoulder • 17% feet and 12% legs • 13% wrists • 8% headaches. Risk factors: More males had shoulder problems (39%) than females (22%). Previous paid work as a nurse or nursing assistant was the only significant predictor for MSKs: OR = 10.8 (95% CI: 1.9-205.8). Rural-urban comparison: MSK prevalence is described as 'much higher' than reported among urban young adults in Australia. Previously reported MSK prevalence in nursing students: At any body site: <ul style="list-style-type: none"> • 49% in China • 22-37% in Japan. Low-back pain: <ul style="list-style-type: none"> • 37% in England • 36% in Korea • 28% in China • 14% in Japan. 	Injury measure: MSK over past 12 months - not clearly defined. Data source: self-report only. Study design: Cross-sectional. Other issues: <ul style="list-style-type: none"> • Very large confidence intervals • Study did not compare rural and urban • 'Rural' not clearly defined (convention).
Studnek et al 2007 [19]	Cross-sectional and longitudinal (cohort) analyses of data from the: 'Longitudinal Emergency Technician Attributes and Demographics Survey' (LEADS). Longitudinal (cohort) analysis includes EMS workers with survey responses for two or more years between 1999 and 2005 and uninjured at time of first survey response.	Rural and urban: N = 5096: rural = 1974; and urban = 3122 EMS workers registered in the National Registry of Emergency Medical Technicians. Location: USA. Participation rates: Between 28% and 34% each year. Date of data: 1998-2005.	Urban communities were defined as having > 25 000 people. Rural communities defined as having <25 000 people.	Univariate odds ratio and logistic regression with cross-sectional data from 1 st year of survey participation and with longitudinal data from 1 st and 2 nd year of survey participation for workers uninjured at time of their 1 st survey.	Work injury: 9% of all EMS workers reported a work injury or illness on their 1st completed survey. Incidence: 8.1 per 100 EMS per year. Risk factors: Sleep problems, back problems, years as EMS, intent to leave, call volume (cross-sectional analysis). Back problems, call volume, certification level, & community size (longitudinal analysis). Rural-urban comparison: In univariate cross-sectional analyses, odds of occupational injury or illness were 2.19 times higher among urban than among rural EMS (95% CI: 1.65-2.90). In multivariate cross-sectional analyses, community size was not	Follow-up length: 1 year. Injury measure: number of days absent during past 12 months due to EMS work-related illness or injury – dichotomized to 'injured' (1 or more days) and 'not injured' (no days). Data source: self-report. Study design: cross-sectional & longitudinal; retrospective. Other issues: <ul style="list-style-type: none"> • Response rate low • Injury rates combined over 7 years • Time-loss injuries only.



Citation	Study design	Sample characteristics	Definition of rurality	Rural-urban comparison	Findings	Potential limitations
					significant. In univariate longitudinal analyses, odds of occupational injury or illness were 3.46 times higher among urban than among rural EMS (95% CI: 2.16-5.55). Incidence of work injury or illness was 4.1 per 100 in rural areas and 13.0 per 100 in urban. In multivariate longitudinal analyses, urban workers had 2.79 times higher odds of work injury than rural workers (95% CI: 1.65-4.72).	
Work absence outcomes						
Meyer & Muntaner 1999 [20]	Cohort study comparing occupational injuries rates between rural and urban workers, using data from the West Virginia Workers' Compensation claims database.	Rural and urban: N=386: rural = 129; and urban = 219. Home healthcare workers with injury claims. Location: West Virginia, USA. Date of data: 1995-1996.	Urban counties are those with cities of >10 000 or Metropolitan Statistical Areas. Rural counties are all other counties. In West Virginia, the largest city is Charleston with 100 000 people; 64% of West Virginians live in counties with fewer than 2500 people.	Chi-squared tests and Van der Waerden and Wilcoxon rank-sum tests.	Incidence of injury: For rural and urban workers combined, there were 52 injuries per 1000 home health care workers per year; 43 time-loss injuries per 1000 per year; and 29 injuries with absences greater than 3 days per 1000 workers. Duration of work absence: rural home healthcare workers had a mean of 57.9 days absent following a claim, for urban workers the mean was 37.2 days ($p<0.05$). Cost of work absence: rural workers with claims had higher indemnity payments: \$1713 compared to \$1377 for urban ($p<0.10$). In addition, rural workers had higher average medical costs: \$1411 compared to \$1165 for urban (not statistically significant). Rural-urban comparison: 37% of all injuries occurred in rural counties. Rural workers with injury claims were younger, although not statistically significant: The mean age of rural workers was 35.5 years versus 37.1 for urban.	Follow-up length: not clearly defined. Return-to-work measure: not clearly defined. Data source: administrative data only. Study design: longitudinal; and retrospective. Other issues: 'urban' may not be widely generalizable outside West Virginia, due to small size (up to 100 000 people).

EMS, Emergency medical services; MSK, musculoskeletal disorder.



Table 4: Known risk factors for occupational injury and poor work disability outcomes^{21-40,45-48,52}.

Potential risk factor		Present study reference no. of literature on rural healthcare workers	Risk factor for occupational injury incidence [†]	Risk factor for prolonged work absence [‡]	
Rural Context	Climate	26, 29, 31	✓	✓	
	Road safety	28, 29	✓	✓	
	Distance	24, 26, 27, 30	✓	✓	
	Remoteness	21, 24, 30, 32	✓		
	Social isolation	21, 24, 30		✓	
	Cultural barriers	21, 24, 30			
Worker Factors	Age	22, 23, 31, 32	✓	✓	
	Gender	31, 32	✓	✓	
	Educational level	23, 30, 32-34	✓	✓	
	Income level	26, 52	✓	✓	
	Aboriginal status	No data		✓	
	Overall general health	No data	✓		
	Presence of chronic health conditions	No data		✓	
	Presence of mental health conditions	No data		✓	
	Substance abuse	No data		✓	
Job-Level Factors	High workloads	21, 28, 30, 33, 47	✓	✓	
	Scope/breadth of practice	28, 52, 47		✓	
	Professional support (workplace isolation)	28, 32, 33		✓	
	Long hours and on-call hours	21, 24, 26, 30, 38	✓	✓	
	Workplace violence	21, 24, 31, 36-39	✓	✓	
	Presence of social issues among patients	36	✓	✓	
	Aging patient population	31	✓	✓	
	Access to safety equipment: For example, ceiling lifts	31	✓	✓	
	Social support at work	31, 32			
	Workplace stress	21, 31, 34, 35	✓	✓	
	Job satisfaction	23, 25, 30, 32, 33, 35, 46, 52		✓	
		Part-time employment	31, 32, 48	✓	✓
	Organizational-level Factors	Staff shortages	23, 24	✓	✓
Availability of replacement staff		21, 24		✓	
Availability of leave		21, 24	✓	✓	
Distance management structures		23, 24, 33	✓	✓	
Employer size		31, 32	✓	✓	
Ratio of staff to patients		45	✓	✓	
Distribution of facility type: Long-term care, acute care, etc		31	✓	✓	
		High turnover	No data	✓	
Workplace Disability Management Factors	Availability of work accommodations or transitional work	No data		✓	
	Availability of educational or re-training opportunities	21, 23, 24, 32, 33	✓	✓	
	Early contact with the worker by the workplace	No data		✓	



Table 4: cont'd

Potential risk factor		Present study reference no. of literature on rural healthcare workers	Risk factor for occupational injury incidence [†]	Risk factor for prolonged work absence [†]
Workplace Disability Management Factors	Contact and advice between healthcare provider and workplace	No data		✓
	Ergonomic worksite visits	No data		✓
	RTW coordination	No data		✓
	Delays in case management	No data		✓
	Active role of supervisors and unions in RTW	No data		✓
	Trust and goodwill among all parties involved	No data		✓
Insurance and Compensation System Factors	Delayed filing of claims	40		✓
	Claim acceptance rates	No data		✓
	Prior work absence	No data		✓
Access to Healthcare Factors	Access to follow-up and rehabilitation services	No data		✓
	Access to specialty services	No data	✓	✓
	Delays in referral process	40		✓
	Long distance to travel to services	27, 30, 45		✓

RTW, Return to work.

[†]The two right columns show whether or not a factor has been found to be a risk factor for occupational injury incidence, prolonged work absence duration, or both, in the general worker population, based on systematic reviews, conceptual frameworks, and public health literature.

Is duration of work absence more prolonged for rural workers? There is limited information about work absence duration among rural healthcare workers. The one available study²⁰ found that rural home healthcare workers had longer average work absences than urban workers. More research is needed to determine if these findings are generalizable to other healthcare occupations, and in other settings.

Risk factors for injury and poor disability management outcomes

Potential risk factors were categorized (Table 4) as rural environment, worker characteristics, job-level characteristics, organizational-level characteristics, disability management characteristics, insurance or compensation system characteristics, and access to healthcare issues (Table 3). Interestingly, these a priori categories mapped closely to the main sources of work stress identified in a 2009 systematic review of remote area nurses in Australia: remote context, workload and scope of practice, community and

workplace violence, and organizational issues such as poor management²¹.

In this review, 25 articles focused on risk factors. Of note, no study directly examined the relationship between the risk factors and work disability prevention outcomes, and very few studies examined workplace disability management processes.

The rural environment

For many healthcare workers, the isolation and beauty of rural environments is part of the attraction of rural areas²²⁻²⁴, and satisfaction with one's community can be an important predictor of rural healthcare workers' job satisfaction^{23,25}; however, the geography and climate of rural areas can increase the vulnerability of rural healthcare workers. Rural workers must often travel large distances^{26,27}, on sometimes dangerous roads^{24,28}. In addition, hazardous weather conditions can compound dangerous road conditions in rural



areas, particularly for home healthcare workers²⁹. Home healthcare workers can be forced by inclement weather to stop seeing their clients if road access is reduced and, as a result, their income may be reduced during winter months²⁹. Furthermore, icy sidewalks can increase the risk of slips, trips and falls²⁹. Both climate and dangerous roads, combined with longer distances (and longer travel times), are clearly risk factors for occupational injury, as well as factors that complicate return-to-work processes by making the commute to work more challenging.

Social aspects of rural life also present challenges for workers. The insular and close-knit nature of a small community makes healthcare workers highly visible^{21,30}. As a result, many healthcare workers report being approached for health-related advice during their non-working hours, making it difficult to maintain a work–personal life boundary^{24,30}. In addition, being injured, absent from work, and facing return-to-work issues are highly private processes that can become difficult to manage in small communities where privacy is difficult to protect.

Many rural healthcare workers find the social isolation of rural life challenging²¹. The majority of rural healthcare workers did not grow up in the communities where they work, and so are often viewed as outsiders^{24,28}. In Canada, 98% of nurses working in the northern territories and 40% of nurses working in rural British Columbia were educated in other provinces³⁰, and 26% of physicians working in Canadian rural areas across the country graduated from medical schools outside of Canada⁵⁷. Similarly, nearly half of the primary care physicians in rural parts of Florida were born outside the USA²; while in Australia, international medical graduates were found to make up over 30% of the rural medical workforce, but only 20% of the total medical workforce⁴⁹. As a result, healthcare workers in rural areas often have a steep learning curve in cultural competency^{24,30}. Rural nurses in both Canada and Australia have described the challenges of working with patients from unfamiliar cultures, especially when there are language barriers, religious or spiritual differences, differing views of gender

roles or conflicting attitudes towards health and wellness^{21,24,30}.

Worker characteristics

Work absence duration and number of episodes of work absence are increased in older workers⁵⁸ and among women⁵⁰. Rural nurses are often older than urban nurses^{31,32}, possibly because older nurses are more likely to have the experience to perform at the high skill level required in rural nursing²³. However, despite the challenging nature of rural nursing practice^{23,28,30,33}, rural nurses have lower education levels than urban nurses^{30,32,57} and limited access to continuing education³⁰⁻³⁴.

No literature was found documenting levels of chronic health conditions, including mental health conditions, in rural healthcare workers, which are factors known to affect work absence duration in the general population of workers⁵⁹⁻⁶⁸. However stress is a recurring and important theme for rural healthcare workers^{21,31,34,35}, and is associated with rural nurses having a greater likelihood of taking time away from work³¹.

Workplace characteristics

Workplace characteristics that are known risk factors for both prolonged work absence and the incidence of occupational injury in the general worker population include high job strain (for duration^{58,69-72} and for incidence⁷⁰); low support at work^{69,70,72,73}; time management aspects of work, such as number of hours worked and presence of shift work^{74,75}; and high physical demands, which are associated with absence duration under all circumstances examined⁷⁶ and with injury when combined with low rewards⁷⁰. In addition, high job insecurity and poor organizational climate are associated with a higher incidence of workplace injuries⁷⁴.

Workplace characteristics can also be beneficial. The positive interpersonal aspects of work, including improved nurse relationships with physicians, improved decision-



making processes⁷⁵, and higher levels of respect and support⁷⁷, are associated with shorter work absence duration in the general worker population and appear to be of particular relevance for healthcare workers. Although these factors have not all been studied with a rural–urban lens, they are partly addressed by research on rural and urban healthcare workers, as will be discussed.

The heavy workloads of rural nurses have been particularly well documented^{21,28,30,32,33}, with rural nursing being described as a ‘multi-specialist’ profession rather than a generalist one²⁸, meaning that rural nurses need ‘both a great diversity and depth of knowledge’ (p.75)²⁸. The multi-specialist nature of rural nursing is due to many factors, such as limited professional support available in rural healthcare settings, limited or no back-up for rural nurses, lack of physicians routinely available to provide on-the-spot consultations^{21,28}, and the complex health needs of rural populations^{10,23}. In many cases, a single rural nurse may be the sole healthcare provider in the community³², and even when rural nurses are working with colleagues, they may feel less supported at work and are more likely to report that their managers and supervisors set poor examples for safety³¹. Rural nurses are also less likely to believe that their own health and safety are high priorities for management³¹. Low support at work has been shown to be associated with prolonged work absence among all healthcare workers^{69,70,72,73}.

Rural healthcare workers are often required to work long hours and have heavy on-call demands^{21,24,26}, which may place them at increased risk for injury, or workplace violence, particularly for nurses working alone or in isolation. For example, GPs in rural Iceland are routinely on-call between 5 and 14 days each month²⁶. Burdensome on-call demands are also reported from rural healthcare workers in Australia^{21,24} and Canada³⁰. High workloads and long hours can present challenges for return to work for healthcare workers, and may result in prolonged work absence, especially if a worker is only physically able to return to shorter hours or modified duties⁷⁴⁻⁷⁶.

Exposure to violence has been identified as a major concern for rural healthcare workers^{24,31,36-38}. Nurses are concerned about being on call and having to make house calls at night, with inadequate support and protection²⁴, including inadequate safety features in buildings²¹. In an Australian study, 86% of remote area nurses reported experiencing violence or aggression at work in the previous 12 months, compared with 43% of urban nurses²¹. They also reported receiving limited or delayed support following critical incidents, such as violence²⁴. However, working in a rural healthcare setting does not appear to confer higher risk of workplace violence. Although rural paramedics in Australia reported experiencing high levels of workplace violence, with 87.5% reporting some type of violence over a 12 month period, urban paramedics were equally likely to have experienced workplace violence³⁹.

Possibly as a result of their higher exposure to certain workplace risks, there are also certain positive trends in workplace health and safety in rural areas, especially in terms of preventive measures. Indeed, Australian rural nurses, compared with urban nurses, were less likely to report blood-borne pathogens or noise levels as risks in their workplaces, more likely to receive training about workplace violence, more likely to have workplace health and safety inspections, and more likely to feel qualified to use safety equipment³¹. Although rural nurses report spending more time lifting and transferring patients than do urban nurses, they also report more frequent use of lifting devices or safety belts³¹. In addition, high skill discretion and decision authority are associated with reduced job strain⁷⁸, an important risk factor for prolonged work absence, and the multi-specialist nature of rural nursing may provide protection against high job strain for rural nurses. Tellingly, high decision latitude, autonomy and work discretion have been found to be associated with high levels of job satisfaction among rural healthcare workers, including physicians⁵² and nurses³², as well as contribute to rural physicians’ higher levels of job satisfaction compared with urban physicians⁵².



Organizational factors

Job-level risk factors may be exacerbated by organizational-level risk factors. Lack of replacement staff is a major source of stress and burnout for rural nurses and hampers their ability to take leave for personal, medical, or professional development reasons^{21,24}. Lack of replacement staff can increase workload, which in turn can increase the risk of injury and present a challenge for return to work. It can also create resentment among co-workers, who may be required to increase their workloads²⁴. Even when replacement staff are available, rural healthcare workers describe them as typically inexperienced and the workload of a returning worker can be great because of the work left incomplete by the replacement worker²⁴. Importantly, healthcare workers who feel less replaceable, or who believe that their absence would be unfair to colleagues, are more likely to continue working while ill or injured⁷⁹.

Rural healthcare workers are commonly managed by regional administrative structures located far away^{23,24,33}. Rural nurses report believing that centrally located administrators fail to understand the challenges of rural nursing, especially the high workload and broad practice scope^{24,33}. When asked to give advice to administrators, rural nurses in Canada stressed the importance of programs and policies developed specifically for rural areas rather than simply for urban settings, and the need for education and travel opportunities to gain experience with rare health conditions³³. Rural nurses often report being left out of the decision-making process when administrators are located in urban areas^{23,33}, and perceive distant managers as inaccessible and non-responsive to their concerns, lacking innovative thinking and not being engaged with workers or their communities²⁴.

Workers in smaller facilities are known to have fewer opportunities for modified work duties following an occupational injury, due to the limited number of positions available in these facilities⁸⁰. Within healthcare, rural workers appear to be more likely to work in smaller facilities. In Australia, for example, a national survey of

nurses found that 90% of rural and remote nurses worked in facilities with less than 1000 employees, compared with 45% of urban nurses³¹. Community, palliative and nursing home care settings are also known to have higher rates of occupational injury²⁰, and a higher proportion of rural nurses work in community, palliative or aged care³¹. Community care workers have less control over the safety of their environment, often work alone, and typically have no access to assistive equipment²⁰; while in palliative and nursing home care, factors such as restricted patient mobility and increased rates of dementia affect the likelihood that workers will be injured⁸¹.

Insurance and compensation systems

Limited information was available about insurance and compensation system differences for rural and urban workers. An American study from Washington State found differences between rural and urban areas in claim filing time with the time from injury to claim filing longer in rural areas⁴⁰. Rural providers filed 61% of their patients' claims within 7 days, whereas urban providers filed 70% within 7 days⁴⁰. Delays in the processing of claims are associated with longer time to return to work⁴¹, not only due to the simple addition of days in the process, but possibly due to workers' sense of unfairness of the process⁴². Importantly, perceived procedural and relational injustice in the workplace has been shown to be associated with longer work absence duration among healthcare workers^{43,44}.

Access to health care

Delays and difficulty accessing healthcare can significantly affect duration of work absence; challenges with access to healthcare in rural areas are well documented¹⁰. An Australian study highlighted the challenges for access to rehabilitation care, due to long distances covered, and higher client-therapist ratios for rural occupational therapists⁴⁵. A similar study from Nebraska found that rural occupational therapists were routinely expected to travel large distances, often over 161 km (100 miles), to see patients²⁷.



Are risk factors for poor work disability prevention outcomes different for rural workers? The studies discussed suggest that rural healthcare workers may be particularly vulnerable to poor work disability prevention outcomes because of their increased exposure to risk factors for poor work disability outcomes: older age, lower education levels, high workloads (long hours, extensive on-call demands, complex patient needs), low professional support, exposure to violence, lack of replacement staff, and working in small facilities and high-demand subsectors (community, palliative, and home care). They may face delays in the healthcare and compensation systems, as well as obstacles to access to the healthcare system for their own return-to-work issues. Finally, they operate in systems managed by regional administrations who are often located far away, and poorly attuned to the specific needs of rural healthcare workers.

Methodological limitations of studies of work disability prevention and associated risk factors in rural areas

Several methodological limitations in the literature about rural work injury and disability management were noted:

1. There is limited documentation of the definitions of rurality, impeding direct comparison of study findings.
2. Rural–urban comparisons are often made by comparing rural workers with urban workers from different studies, from different populations, and even from different countries.
3. There are a limited number of studies relating risk factors to work disability outcomes.
4. Most study findings have not been stratified by factors known to be related to work disability outcomes in healthcare workers including type of facility, type of nursing practice, or workplace factors such as job strain.
5. Data about work disability prevention outcomes come primarily from Japan and the USA, while data about risk factors come primarily from Australia,

potentially reducing the comparability of outcomes with risk factors, and potentially reducing the generalizability and applicability of findings to other contexts.

6. No study has explicitly examined the outcomes of Aboriginal populations, despite their substantial representation in rural populations in many countries.
7. Few risk factor studies have used longitudinal designs or multivariate statistical approaches, which greatly limits the certainty with which causal relationships between risk factor and outcome can be inferred.

Conclusions

This review points to a glaring lack of evidence about work disability prevention issues for healthcare workers in rural areas. Of the 860 references identified, 5 articles addressed specifically work disability prevention outcomes (with only 1 addressing work absence duration), and 25 focused on risk factors for work disability outcomes. Of those 25 studies, none directly related risk factors to work disability outcomes.

The limited evidence is nevertheless consistently suggestive of higher rates of injury in rural healthcare workers compared with urban healthcare workers. Limited evidence points to more prolonged work absences in rural healthcare workers, and suggests that injury rates and work absence duration across the rural–urban continuum vary substantially according to occupational category. Of note, EMS workers and paramedics may not follow the same pattern as other healthcare workers. This finding suggests that urban settings may lead to higher levels of exposure to risk factors for EMS workers and paramedics than rural settings.

The profile of the healthcare worker in rural areas emerges as one of an older worker facing extremely high work demands including long hours and high on-call demands, who is expected to be a multi-specialist with little



educational or professional support, in a context of staffing shortage, and who responds to a patient population that presents with complex health and social needs. Workplace violence, lack of replacement staff, and challenges unique to rural contexts including hazardous roads, harsh climates, long distances, and isolation, are key risk factors for poor disability outcomes in rural healthcare workers. In addition, rural healthcare workers may face frustrations associated with being managed by centralized regional administrations, as well as delays and access challenges in the healthcare system following an occupational injury.

Comparison with other sectors

The findings of this review, that rural healthcare workers are highly vulnerable to work injury and prolonged work absence, and experience high prevalence of risk factors for poor work disability outcomes, are also found in the few studies of rural workers in other industrial sectors^{40,82-84}. In addition, rural workers from other sectors likely share some of the risk factors for poor work disability outcomes identified in this review, including lack of access to health care and insurance systems, harsh climate and large distances, and limited access to re-training or continuing education opportunities, because these risk factors are largely determined at or above the community level. As a result, community-level interventions may hold the key to addressing work absence duration and work injury for all rural workers. A pilot program in rural upstate New York recently demonstrated the potential of community-level interventions to successfully reduce work absence duration, through a program of dedicated return-to-work coordinators working at the county-level, rather than at employer-level⁸⁵.

Strengths and limitations

There are certain limitations to this review. First, systematic quality assessment of the reviewed studies was not performed and, consequently, we presented a narrative rather than systematic review. Second, the impact of various legal frameworks were not considered; this is a complex question that goes beyond the objectives of this review. Third, and for

the same reason, the impact of immigration policy related to the legal frameworks was not considered. Fourth, direct and indirect costs of injury and work absence as an outcome were not examined.

The strengths of the review are, first and foremost, that this review is the first to focus on the topic of work disability in rural healthcare workers. The comprehensiveness of the review represents a key strength – the search strategy was developed in such a way as to maximize the identification of all relevant studies, which is important when a review addresses a topic for the first time. Finally, both quantitative and qualitative studies were included in the review.

Recommendations

Although the data are sparse, several recommendations emerge from this review. In particular, this literature review suggests two promising future avenues to improve the work disability outcomes of rural healthcare workers:

1. Healthcare and workers' compensation policies and processes should be tailored to the unique needs of workers in rural areas, taking into account access to healthcare challenges.
2. More research is needed about rural–urban differences in work absence duration and about the relationship between risk factors for occupational injury and work disability prevention outcomes.

At the policy and practice levels, future research should focus on developing ways to improve access and quality of healthcare for rural workers, including a focus on the unique needs of Aboriginal healthcare workers. It should also focus on examining rural–urban differences for workplace disability management processes.

These recommendations need to be tempered by the fact that important methodological limitations are pervasive in this area of research. It will be critical in future studies to address these by using comparable samples to examine rural–urban disparities and by developing a common definition of



rurality applicable to multiple jurisdictions. The use of geographic information systems (GIS) techniques could potentially allow for a finer, and more systematic, categorization of rural and urban communities. These considerations may permit more rigorous documentation of the disparities in work disability outcomes of rural and urban workers, and in developing a better understanding of the sources and risk factors associated with these disparities. Finally, policy developers and administrators should be aware of the vulnerability of rural healthcare workers and ensure that occupational injury and work absence duration programs are tailored to meet the needs of rural workers.

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