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Counting injuries and illnesses in the workplace: an international review

This article reviews salient features of national occupational safety and health surveillance systems within a cross section of countries, including the United States. Special attention is paid to differences in system scope and in methods of injury and illness data collection.

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Workplace injury and illness data are important for a variety of purposes: improving employee and employer understanding of work-related risks, conducting research, and making policy decisions. This article examines the properties and features of selected national occupational safety and health (OSH) surveillance systems, focusing on their data collection characteristics. It reviews the challenges, limitations, and advantages of collecting OSH data for a cross section of countries, including the United States. Explored are questions such as the following:

- How is each national OSH surveillance system set up?
- Is the OSH system decentralized or centralized by government function and role?
- How do OSH definitions vary across countries and affect the counting and measurement of work-related injuries, illnesses, and diseases?
- What types of workers and businesses are covered and counted by the OSH system?
- How are survey instruments used to count occupational injuries, and who are the survey respondents?
- Does the workers' compensation system or any other government system have a role in counting?
- How is regulatory recording or reporting of injuries and illnesses used?
- Does the national OSH system include any data collection exceptions or exemptions?

In addition to addressing these questions, the article provides a brief overview of the types of data disseminated by the nations selected for comparison, along with any notable dissemination restrictions that may apply.

The nations under review were selected on the basis of the scale of their economic activity and its comparability to that of the United States. The availability of translated documents and sociopolitical context were also considered. Countries with national health and accident insurance programs that cover a large portion or most of their employed have a distinct advantage in leveraging their in-place health and workers' compensation systems for

data management purposes. Nations without national or federalized statutory insurance and compensation systems—such as the United States, where each state oversees worker compensation—rely more heavily on regulatory reporting, databases, and statistical methods (e.g., surveys) to count workplace injuries. The collection and counting of occupational diseases remains a distinctive challenge in many nations. This is due to the lag in the onset of disease symptoms and the difficulty of matching an illness to a work exposure. Comparing international data is similarly challenging, because differences in host-nation laws and regulations produce differences in OSH systems and their associated scopes.

Background

Modern epidemiological practices and methodologies were pioneered by William Farr, a British statistician and superintendent of the statistical department of the United Kingdom's General Register Office, which was established in England and Wales in 1838. Farr contributed to the development of the modern epidemiological surveillance system so that "well-informed officials, supported by an understanding public," would take adequate corrective measures.[1] Modern systems for disease and injury surveillance have three components: collection, analysis, and dissemination of data.[2] This article examines the properties and features of a selected cross section of national occupational safety and health (OSH) surveillance systems, focusing on collection and, to a lesser degree, analysis and dissemination.

Historically, the U.S. Bureau of Labor Statistics (BLS) has collected, analyzed, and disseminated data on occupational injuries, illnesses, and fatalities in the United States.[3] The methods, scope, and coverage of the U.S. occupational safety and health surveillance system have changed over time to include an ever-increasing proportion of economic activity. In 1970, the OSH Act was passed into law to "assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources."[4] The act established national definitions and recordkeeping standards, along with a regulatory framework guided by the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor (DOL). The OSH Act also directed the Secretary of Labor to "develop and maintain an effective program of collection, compilation, and analysis of occupational safety and health statistics."[5]

In 1985, 15 years after passing the OSH Act, Congress tasked the National Academy of Sciences (NAS) with reviewing the accuracy and completeness of BLS occupational injury, illness, and fatality data for OSHA. In a study published in 1987, NAS found that BLS data lacked detailed information on injury circumstances of individual incidents.[6] In response to this finding, the BLS occupational injury and illness statistical program was redesigned and expanded.[7] The redesign was guided, in part, by the recognition that the use of a survey method for data collection had led to underreporting and, thus, undercounting of fatalities.[8] As a result, BLS adopted a census approach to counting work-related fatal injuries. The NAS study also recognized that, given the finding of considerable undercounting of work-related fatalities, nonfatal injuries may have been underreported as well, perhaps even more.[9] At the time of the study, no data existed to allow for such an assessment of nonfatal underreporting; however, research based on new data has found this early assessment to be true for nonfatal injuries.

Thirty years after the 1987 report, BLS partially sponsored NAS to develop a vision for a "'smarter,' more coordinated, cost-effective system for occupational safety and health surveillance in the United States."[10] This vision includes closing gaps of completeness, commonly called *undercount*. Cases of undercount, identified by the

safety and health research community, are instances in which a particular case is not counted but is technically covered by the OSH Act scope. These cases include “all disabling, serious, or significant injuries and illnesses, whether or not involving loss of time from work, other than minor injuries requiring only first aid treatment and which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job,” as well as cases within the scope limitations of 29 U.S.C. § 653. Undercount cases are different from out-of-scope cases; for instance, the OSH Act specifically excludes nonfatal injuries incurred in small farm establishments.

Various causes may underlie the undercount: employee fear of reporting an injury or illness, lack of employer awareness of reporting requirements, complex definitions and rules, measurement issues, and other factors influencing reporting and counting.[11] According to recent BLS research, the key reasons for the presence of an undercount among employers are confusion about case types; reliance on workers’ compensation definitions, which could vary by state; and lack of clarity how to record the injuries and illnesses of temporary workers.[12]

Data on fatal injuries published by the BLS Census of Fatal Occupational Injuries (CFOI) are obtained through a multisource census approach to counting injuries. However, this approach is impractical for collecting data on nonfatal injuries, because of the high volume of such cases. For that reason, this article gives special consideration to the collection, compilation, and analysis of nonfatal data. In addition, BLS has been exploring the feasibility of collecting OSH data with a household survey that would supplement the current BLS establishment survey, the Survey of Occupational Injuries and Illnesses (SOII).[13] Some of the nations reviewed herein already employ household surveys for the purpose of collecting occupational health data, and the household survey considered by BLS guides the research presented here.

The nations reviewed include Australia, Canada, Germany, Japan, the Netherlands, New Zealand, the United Kingdom, and the United States, which is used as a reference. Special mention is also given to the European Union (EU); EU organizations, such as Eurostat and the European Foundation for Improvement of Living and Working Conditions (Eurofound); and the nongovernmental International Labour Organization. These bodies interact with multiple nations by serving as data intermediaries to harmonize international datasets and create standards. Developing nations were not selected because they tend to have a larger proportion of their labor force in the informal sector, and this condition leads to difficulties in collecting and comparing data.[14]

Defining injuries, illnesses, and diseases

The *Epidemiology of Occupational Health*, a publication of the World Health Organization, defines the term *disease* simply as a condition involving a disruption of a bodily function.[15] The terms *disease*, *illness*, and *sickness* are similar but not synonymous. Between the 1980s and the 2000s, numerous articles have discussed the definitions of these terms.[16] The terms *accidents*, *incidents*, and *injuries* may refer to a catch-all category or a specific type of case. For example, BLS defines an occupational injury as any injury that results from a single instantaneous exposure in the work environment.[17] Work-related diseases, called *occupational diseases*, are typified by a chronic ailment connected to the work environment. In defining such cases, which tend to be more heavily regulated, nations may choose to use what is called an open system, disease lists, or both (a mixed system).[18] Diseases under an open system are determined on a case-by-case basis, whereas those in disease lists must meet specific criteria based on epidemiological review or other medical evidence presented by experts.

Occupational diseases are generally associated with longer latency periods of symptom onset. This characteristic distinguishes them from traumatic injuries, which may present symptoms immediately. Cases involving long latency periods are difficult to capture with methodologies and data sources such as those used by the BLS SOII and CFOI programs. BLS considers an occupational illness to be any abnormal condition or disorder—other than a case resulting from an instantaneous event or exposure—that is caused by an exposure to factors associated with employment.[19] In the BLS lexicon, diseases and illnesses are synonymous terms and include cases involving skin diseases, respiratory conditions, poisoning, and hearing loss, among others.[20] Because BLS is the principal manager of U.S. OSH data, this article's references to injuries, illnesses, and diseases conform to a U.S. definitional perspective, unless otherwise noted.

Features of collection

The International Labour Organization distinguishes occupational accidents by the severity of the case for which data are collected, using three severity categories: *reportable accidents, compensated or serious accidents, and fatal accidents*.[21] These severity categories are an effective way to compare how national OSH systems count occupational accidents within their system of collection and its associated scope limitations. In 2015, BLS counted 4,836 fatal workplace injuries and over a million nonfatal injuries involving at least 1 day away from work.[22] This difference in magnitude leads to different approaches to, and limitations of, collecting data on fatal and nonfatal injuries. Whereas fatal injuries are estimated with a census approach, which involves compiling a database from multiple sources, nonfatal injuries are estimated with a survey instrument or sourced from compensation data.

The collection methods of the nations selected for review may be grouped into at least two broad categories: compensation and noncompensation. The key difference between the two categories is the original source of data. Nations with federalized mandatory accident insurance programs (commonly called workers' compensation in the United States) that cover all or a significant portion of the labor force tend to leverage the in-place workers' compensation system to collect and count occupational injuries, typically called *claims*. Closely related to the collection system are its collection limitations, called *scope* or *coverage*. The collection system and the primary data sources used (e.g., employer records, employee interviews, administrative compensation data, and regulatory reporting) determine the scope of collected data and their comparability across nations. Some of the nations reviewed here use a combination of both compensation and noncompensation systems, to minimize problems related to scope limitations and undercounting.

National OSH systems are usually delineated by government function: regulatory, enforcement, statistical, and research. A regulatory function sets rules, guidelines, and recordkeeping requirements for OSH surveillance on the basis of an existing piece of legislation and typically coincides with an enforcement function. Within government organizations, statistical and research functions often go hand in hand. For example, while the U.S. National Institute for Occupational Safety and Health (NIOSH), part of the Centers for Disease Control and Prevention (CDC), is specifically empowered by the OSH Act to perform a research function, it also collects some statistical data related to disease. Sometimes government functions may be highly centralized, as in the case of the United Kingdom's Health and Safety Executive, which is responsible for regulatory, enforcement, and statistical functions.

Following are short profiles of the OSH surveillance systems of the nations selected for review. Starting with the United States, the discussion outlines each national system by government organization and function, along with important scope features. (See table 1.) Among the key scope-related features reviewed are the minimum severity

of an injury required for counting, the types of establishments or workers within scope for counting, the capturing of illness and disease data, and the methods (if any) for counting commuting accidents. With respect to data collection based on survey methods, important aspects discussed are whether the survey is a stand-alone instrument or a supplement, the frequency of the survey, and whether survey respondents are employers or employees.

United States

BLS, an independent federal statistical agency within DOL, is responsible for collecting and disseminating estimates of occupational injuries, illnesses, and fatalities on an annual interval under a federal–state cooperative program. OSHA, also within DOL, is responsible for setting rules and inspecting workplaces, focusing on analyzing and disseminating data for regulatory and enforcement purposes. Because BLS and OSHA are part of the same department, they are sometimes mistakenly seen as a single agency.[23]

In the United States, a nonfatal work-related injury or illness is reflected in BLS estimates only if it meets general recording criteria established by OSHA. Recordable cases are defined as injuries and illnesses involving days away from work, restricted work activity or transfer to another job, medical treatment beyond first aid, loss of consciousness, and fatal injuries.[24] OSHA's *recordability* criteria differ from OSHA's *severe-injury reporting* criteria, which cover workplace accidents resulting in death, amputation, loss of an eye, or hospitalization.[25] Differentiating between recording and reporting is important because, as discussed later, OSH data collection systems in other nations, such as New Zealand, produce estimates based on certain types of serious-injury reporting.

The SOII—an annual, mandatory survey administered by BLS—uses a nationally representative sample of more than 200,000 establishments in private industry and state and local government. Statutorily excluded from the SOII are self-employed workers, workers on farms with fewer than 11 employees, and federal government employees. Each state may determine the reporting requirements for its government establishments.[26] The SOII collects total and case-specific injury and illness data from employers who record this information throughout the year on OSHA-developed logs and forms. Establishments in certain low-hazard industries and establishments with 10 or fewer employees are partially exempt from maintaining logs of work-related injuries and illnesses, unless they are selected by BLS to participate in the SOII. Mining and railroad data are provided separately to BLS by the Mining Safety and Health Administration and the Federal Railroad Administration.

The BLS CFOI is collected through the same federal–state agreement as that used for the SOII. However, the CFOI's census approach to data collection involves creating a database of fatalities from multiple source documents, including death certificates, workers' compensation reports, media reporting, reports for federal agencies, and other reports (e.g., coroner reports) provided by state administrative agencies. Workers' compensation reports are used to identify and substantiate fatal work-related injuries. Employers and other respondents are contacted directly only if followup questions are required to clarify information.[27] The CFOI does not publish any data on work-related illnesses because of several factors, including the latency of many occupational illnesses and the difficulty in definitively linking illnesses to a workplace exposure.

A fatal injury must meet three requirements to be counted in the CFOI: it must have resulted from a traumatic injury; it must have occurred in the United States, U.S. territories, or U.S. territorial waters or airspace; and it must be work related. The scope of the CFOI differs from that of the SOII in that it includes self-employed workers, federal employees, and farm workers in establishments of any size.[28] Workers killed during their normal commute

to and from work are not included in the total count of fatal workplace injuries. However, workers killed while driving to perform their normal job duties (e.g., truck drivers, delivery drivers, and taxicab drivers) are included in that count.

As noted earlier, NIOSH is the principal OSH research organization that collects, analyzes, and disseminates specific types of data on occupational diseases, although it also collects data on accidents such as harmful exposures to lead, noise, and dust.[29] The National Occupational Research Agenda sets NIOSH's research priorities, by industry sector.[30] NIOSH data sources vary by the injury and disease to be captured and include occupation-specific surveillance programs (e.g., the Coal Workers' Health Surveillance Program); Social Security Administration benefits programs (e.g., the Black Lung benefit program); the National Health Interview Survey of the National Center for Health Statistics; other specialized databases; and, in some circumstances, BLS-produced work-injury data. NIOSH has launched more than 20 OSH surveillance initiatives, many of which address workplace exposures that affect the skin or respiratory systems.[31]

Japan

Working conditions in Japan are regulated by the Ministry of Health, Labour, and Welfare (MHLW), which is similar in function to OSHA.[32] The Japan Industrial Safety and Health Association (JISHA), formed under the country's Industrial Accident and Prevention Organization Law, promotes voluntary activities by employer organizations in order to prevent occupational accidents.[33] JISHA serves primarily as a public–private cooperative with an advisory role, providing risk assessments of working conditions and occupational safety and health education.[34] MHLW and JISHA publish OSH data from compensation and noncompensation sources separately. Japanese OSH data not sourced from compensation records are derived from an establishment survey similar to the U.S. SOII.

Work-related accidents in Japan are defined as cases "in which a worker is injured, contracts a disease or is killed due to causes attributable to buildings, facilities, raw materials, gases, vapors, dusts, etc., in or with which he is employed, or as a result of his work actions or attending to his duties."[35] Occupational diseases are determined by a physician inspector who may conduct medical examinations of workers. The interpretation of Japanese definitions and data could be problematic, because translations of Japanese publications into English lack exactness. After examining Japanese publications and having extensive discussions with officials from MHLW, Richard E. Wokutch and Josetta S. McLaughlin concluded that the Japanese terms for "injuries," "injuries and illnesses," and "casualties" are used interchangeably to denote what in the United States would be understood as the combined category of injuries and illnesses.[36]

Japan conducts two annual, stand-alone surveys of general establishments and construction sites and, on occasion, ad hoc surveys targeting specific work activities. In 2009, MHLW surveyed 30,300 establishments and 4,600 construction sites.[37] The survey of general establishments covers both public and private establishments in certain industries that employ 10 or more *regular* employees, with the word *regular* denoting permanent or full-time workers.[38] The concurrent survey of general construction sites has a limited scope based on insurance premiums or construction contract amounts.[39] Reporting based on compensation data is limited to claims for injuries involving 4 or more days away from work.[40]

On occasion, MHLW conducts ad hoc surveys targeting specific work activities. For example, in 2008, it conducted a special Survey on Technological Innovation and Labour, trying to understand how advances in technology affect work environments and occupational health.[41] This survey, while similar in design to the establishment and

construction-site surveys, differed in its administration. The survey was mailed to selected establishments, asking employers to identify employee respondents on the basis of *selection points*, or specific characteristics of the employee's work (e.g., the use of computers). This method of selecting respondents through the employer is distinctive in the context of OSH data collection.

Canada

The Canadian Occupational Health and Safety (OHS) Act forms the framework for OSH surveillance in Canada. The Canadian Centre for Occupational Health and Safety (CCOHS), part of the Ministry of Labour, regulates this activity through 1 federal, 10 provincial, and 3 territorial jurisdictions in Canada. Each of the 14 jurisdictions may regulate workplaces within the framework of the OHS Act and is overseen by a Joint Health and Safety Committee (JHSC), which consists of worker and management representatives. Canadian OSH data are derived outside this regulatory framework and come from workers' compensation claims under the Workplace Safety and Insurance Act of 1997. Data are reported to the National Work Injury Disease Statistics Program (NWISP) of the Association of Workers' Compensation Boards of Canada (AWCBC).[42] Since 1982, NWISP has operated under Statistics Canada, Canada's federal statistical agency, but in 1996 data collection duties were transferred from Statistics Canada to AWCBC, a private nonprofit organization.[43] Canada is the only nation in the cross section of countries examined that uses a private nongovernmental organization to manage national OSH statistics.

Canada's NWISP defines an injury or disease as "any injury or disease resulting from a work-related event or exposure to a noxious substance. Disease, as distinct from a physical injury, results from conditions in the work environment."[44] Administrative compensation data are provided by Canadian workers' compensation boards and NWISP commissions. NWISP counts compensation claims that involve lost time, permanent disability (independent of lost time), and work-related fatalities; noncompensable injuries are not counted.[45] Occupational diseases in Canada are cases that have been verified and accepted by the provincial or territorial compensation authority.

Being mandated at the provincial level, the Canadian workers' compensation system is similar to that of the United States; it is a monopolistic state fund exempting certain industries, such as dentistry and banking.[46] Not purposely designed as an information system, it combines varying compensation scopes and coverage and, thus, exhibits both the best and worst attributes of a compensation system.[47] Because each Canadian province and territory has its own workers' compensation boards and commissions, workforce coverage and compensation scopes vary across jurisdictions, leading to data differences. For example, in 2007, 89.6 percent of Canadian workers were covered by workers' compensation and, thus, were eligible to be counted. Such coverage is as low as 69.5 percent in Manitoba and as high as 100 percent in the Northwest Territories and Nunavut.[48]

Australia

In 2009, Australia passed the model Work Health and Safety (WHS) Act to create more uniform OSH legislation. This act forms the basis of OSH legislation at the state and territorial jurisdictional levels. Australian states and territories, like those of many other nations, are permitted to regulate their own jurisdictions within the framework of the model WHS Act. Safe Work Australia (SWA)—an independent government body composed of representatives from worker and employer organizations, the commonwealth, and state and territory governments—is responsible for compiling OSH data and producing statistics from workers' compensation claims, survey data, and other databases.[49] Similarly to BLS, SWA defines injuries as conditions "resulting from a single traumatic event where

the harm or hurt is immediately apparent" and diseases as conditions "resulting from repeated or long term exposure to an agent or event."[50]

Every 4 years, the Australian Bureau of Statistics conducts the Work Related Injuries Survey (WRIS), an ad hoc module to the monthly Multipurpose Household Survey (MPHS). The MPHS is designed to provide statistics on labor, social, and economic topics, and is conducted in conjunction with the monthly Labour Force Survey (LFS).[51] The LFS is based on a multistage sample of approximately 27,000 dwellings. It excludes certain nonprivate dwellings (e.g., university student dwellings), members of the military, overseas diplomatic personnel, overseas residents, and people in certain geographic areas.[52] WRIS self-reported injuries include all nonfatal work-related injuries of people who worked at some time in the last 12 months; fatal work-related injuries or illnesses are excluded.[53] In 2013–14, WRIS had an approximate response rate of 77 percent for private dwellings.[54] By comparison, the U.S. SOII response rates are estimated to be approximately 90 percent (2003–10) for private establishments and 30–50 percent (2010) for government establishments not required by law to respond.[55] Nonfatal compensation data on occupational injuries differ from those obtained through survey methods. For example, data derived from the Accident Compensation Company (ACC) include only *accepted serious claims*, which involve injuries resulting in 1 or more weeks away from work.[56]

SWA provides the most complete count of Australian work-related fatalities, deriving its estimates from workers' compensation data, coronial databases, fatality reporting, and the media.[57] The scope of this count coincides closely with that of the U.S. CFOI and includes unpaid volunteers, military forces within Australian territories and waters, and people traveling for work. Australian fatality counts once included commuter fatalities reported in workers' compensation data; however, as fewer jurisdictions have provided commuting compensation data over the years, commuter fatalities are no longer within scope.[58] Both Australian and U.S. data on work-related fatalities include injuries sustained by another person's activity, such as violence in the workplace. Suicides are not included in SWA fatality data—an approach that contrasts with the U.S. practice of including them if the suicide occurred on a work premise or if it occurred off the work premise but could be definitively linked back to work.[59]

New Zealand

WorkSafe is New Zealand's OSH regulator, having carried out health and safety regulatory functions by industrial sector since 2013. Statistics New Zealand acts as the country's OSH data manager, providing injury and illness data to WorkSafe for regulatory functions in a relationship resembling that between OSHA and BLS.[60] Sources of data include workers' compensation claims and regulatory reporting to WorkSafe by employers and employees via phone or online notification.[61] OSH research is funded through the Health Research Council, government agencies, and additional sources providing funding to universities and other government partner agencies.[62] Statistics New Zealand defines an injury according to the 10th revision of the World Health Organization's International Classification of Diseases (ICD-10), which excludes occupational diseases from its injury definition.[63] Diseases in ICD-10 refer to diagnoses resulting from chronic exposure over time and include occupational overuse syndromes.

Statistics New Zealand uses mostly regulatory reporting and compensation data from the Ministry of Health's Accident Compensation Corporation (ACC) to produce workplace injury statistics. The general sources of work-related injury data are categorized by WorkSafe into serious-injury outcome indicators (SIOIs), serious-harm data, and compensation claims.[64] Health-professional claims channeled through the ACC, voluntary reporting to the

Notifiable Occupational Disease System, and other specialized databases provide the main sources of data on occupational diseases in New Zealand.[65]

SIOIs, developed by Statistics New Zealand, are combined with serious-harm data and compensation claims to produce fatal injury statistics and serious nonfatal injury statistics. Serious-harm data have to be reported to WorkSafe. The term *serious harm*, redefined in the newly enacted Health and Safety Act of 2015, includes *notifiable injuries or illnesses*. The definition of notifiable injuries or illnesses is similar to that of OSHA's recordable injuries. It covers injuries or illnesses that involve treatment beyond first aid and includes amputation of any part of the body, serious head injuries, serious eye injuries, serious burns, tissue separations (such as degloving), spinal injuries, loss of bodily function, and serious lacerations.[66] In addition, injuries leading to hospitalization, substance exposures that require treatment within 48 hours, and serious infections meeting certain criteria are included in the new definition of notifiable injuries and illnesses.[67]

United Kingdom

The United Kingdom's Health and Safety Executive (HSE) and Health and Safety Commission were established by the Health and Safety at Work etc Act in 1974.[68] HSE serves as both OSH data manager and regulator under periodic review from the U.K. Statistics Authority. Similar in function to BLS, the U.K. Statistics Authority has an independent executive body, the Office for National Statistics (ONS), responsible for reviewing and assessing HSE's job performance as an OSH data manager.[69] The United Kingdom arguably has the most comprehensive OSH data collection system, using data sources such as compensation claims, regulatory reporting, survey data, reporting by medical professionals, and other databases specialized for disease surveillance.[70] The United Kingdom defines injuries, illnesses, and diseases separately, by respondent and data source. Illnesses and injuries are conditions that are self-reported by workers, whereas occupational diseases are diagnosed by doctors and specialist physicians.[71]

HSE data sources are categorized by the severity of the injuries they include, with degrees of severity ranging from mild to severe to fatal. Each data source is rated by preference and selected on the basis of the nature of harm. For example, the preferred data source for musculoskeletal disorders is survey data, although other sources, such as medical reporting by general practitioners under The Health and Occupation Reporting Network, may also be used.[72]

Among the most preferred sources of data is the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (RIDDOR) system, a legal regulatory system by which employers and others with a legal status of a *responsible person* must report certain workplace incidents to HSE, local authorities, and the Office of Rail Regulation (in the case of railroad accidents). The definition of the term responsible person depends on the type of incident, the injury status of the worker, and the worker's employment status. A responsible person's failure to report in accordance with RIDDOR is a criminal offence.[73] The scope of RIDDOR reportable cases includes fatal and nonfatal work-related injuries, defined occupational diseases, dangerous occurrences, and certain gas incidents. For work-related fatalities and injuries other than gas incidents, three criteria are required for a case to be within the scope of RIDDOR: (1) an *accident* must have occurred to cause the injury, (2) the accident must have been *work related*, and (3) the accident must have resulted in an injury type classified as *reportable*.[74] An accident under RIDDOR is an identifiable and unintended incident that causes physical injury. It specifically includes nonconsensual violence at the workplace—a specification that closely mirrors the violence scope criteria

of the BLS CFOI. For an accident to be classified as work related, it must be linked to a work activity or such factors as inadequate worksite conditions, machinery issues, and exposures to harmful substances.

Reportable injuries are defined by various regulations and include fatalities, specified injuries, incapacitation for more than 7 days, and hospitalization.[75] Accidents not reportable under RIDDOR include commuting accidents (including those involving work-related travel), accidents related to maritime shipping and civil and air navigation, and accidents to members of the armed forces.[76] In 2011, a review of safety regulations by Ragnar E. Löfstedt recommended giving a special exemption to self-employed workers whose activities pose no potential risk of harm to others, and this exemption was adopted and went into effect in 2015.[77] Self-employed workers in high-risk work activities, such as construction work, must still report their injuries. Self-employed workers injured at work on their own premises are not required to report under RIDDOR, but if they do report, they are counted and included in published data.[78] Self-employed workers killed on the job must be reported by a responsible person in control of the premises. There is no responsibility to report if the self-employed person dies on premises that he or she owns or occupies.

HSE conducts two ad hoc survey modules—one focusing on workplace injuries and one on workplace illnesses—attached to the Labour Force Survey, whose sample consists of about 38,000 households responding each quarter.[79] The two ad hoc surveys are designed, developed, and managed by ONS, the United Kingdom's largest independent producer of national statistics. The workplace injury survey provides estimates of workplace injuries by demographic and employment-related characteristics, complementing the RIDDOR data. The workplace illness survey captures self-reported illnesses and attempts to elicit information on possible diseases that may not be accounted for through other sources. Research by HSE shows that carefully constructed surveys of self-reported work-related illnesses are broadly reliable and provide valid information when other sources are unavailable.[80]

European Union

The European Union (EU), in a relationship resembling the federal–state partnership in the United States, sets minimum safety and health requirements for working conditions in EU member nations. This is accomplished through the OSH Framework Directive, which is similar in purpose to the U.S. OSH Act of 1970.[81] The EU framework applies to both private and public sector employees, but exempts members of the armed forces and the police. Eurostat, the EU's statistical office, is responsible for providing statistics to enable comparisons among EU countries and regions. Eurostat publishes harmonized accidents-at-work data, which are collected under the European Statistics on Accidents at Work project per article 153 of the EU Treaty.[82]

Every 5 years since 1991, the EU's Eurofound has conducted the European Working Conditions Survey (EWCS).[83] The EWCS is a stand-alone household survey that provides information on working conditions in over 35 European countries, including both EU and non-EU member states. The 2015 EWCS sample consisted of about 44,000 households, surveyed in face-to-face interviews; eligible respondents were those who met minimum age requirements and were employed for at least an hour in the week preceding the interview.[84] The EWCS questions cover a broad range of labor-related topics, including employment, pay, and work-related health.

Netherlands

The Dutch Ministry of Social Affairs and Employment (SZW) has a role similar to that of the U.S. Department of Labor, with its subordinate inspectorates monitoring and supervising compliance with rules and regulations.[85] The Dutch OSH strategy is based on a multilayered, free-market approach: employers and employees are jointly

responsible for ensuring safe and healthy working conditions and are encouraged to work together to instill a culture of workplace safety.[86] The nonprofit Netherlands Organization for Applied Scientific Research (TNO) is responsible for OSH research on behalf of SZW. TNO data, published in cooperation with Statistics Netherlands, are derived from surveys similar to those used for OSH data collection in the United States.[87] In the Netherlands, occupational injuries are sourced from accident reports (with accidents referred to as instantaneous events), whereas diseases are reported by occupational physicians and counted by the Netherlands Center for Occupational Diseases (NCvB).[88] NCvB has a statistical and research role similar to that of the U.S. NIOSH.

TNO is a major independent research organization that manages three stand-alone surveys: the Employers Labour Survey (WEA), the Self-Employed Labour Survey (ZEA), and the Netherlands Working Conditions Survey (NEA). These surveys gather a broad spectrum of labor-related information from employees and employers, including data on working conditions. The WEA is an establishment survey of approximately 24,000 for-profit and nonprofit establishments with at least two employees; of those establishments, about 5,500 responded in 2014.[89] Self-employed workers are covered separately in the ZEA. The ZEA sample consists of around 24,000 self-employed independent business owners, of which about 6,000 responded in 2017.[90]

The NEA is a household survey that, concurrently with the WEA and the ZEA, collects work-related injury data from employees each year. The NEA, like the WEA and the ZEA, asks questions not limited to occupational injuries, including questions on sexual harassment; discrimination; and work-related injuries, illnesses, and accidents. Workers who have additional self-employed work are included in the NEA, but workers who are solely self-employed fall exclusively under the ZEA.[91] The NEA was sent to approximately 144,000 people in 2015, of which over 40,000 responded (the actual response rate of the survey was 32 percent).[92] Since 2014, TNO has been experimenting with using lottery prize incentives to increase the response rate of the NEA.[93]

Germany

The German Federal Ministry of Labour and Social Affairs, which functions similarly to the U.S. Department of Labor, oversees the Federal Institute for Occupational Safety and Health (BAuA). Like the U.S. NIOSH, BAuA works to incorporate science into policy and corporate practice. Each German state has labor inspectorates responsible for monitoring and enforcing OSH legislation in conjunction with accident insurance institutions and inspectors. The German statutory workers' compensation accident social insurance, called German Social Accident Insurance (DGUV), is a key part of the German OSH surveillance system and is the primary source of OSH data. German OSH data are published by BAuA and are derived from national and state statistical offices.

German data published in English use the term "accident" in reference to instantaneous events; occupational diseases are adjudicated by physicians and expressly outlined in disease lists under German ordinance.[94] The scope of OSH data collection is defined by the German workers' compensation system, which has been in place for over a century. Work-related injury and illness data—derived from more than 100 different sources—are recorded by workers' compensation institutions to produce various statistics and indicators. The scope of the German accident insurance system is broader than that of a typical workers' compensation system. In the United States, a state-specific workers' compensation system would typically include only wage-earning workers. In Germany, that scope is extended to workers employed by a German company and to children educated in Germany from nursery school through university. Volunteers and those who have given blood are also covered by the DGUV and are thus countable.[95]

German reportable accidents are defined as work-related injuries that involve a fatality or incapacity leading to more than 3 days away from work.[96] Fatal accidents in DGUV data include those which occurred "within the year under review and within 30 days following the accident."[97] Accidents at school or on the way to or from school that lead to medical attention or fatality are also differentiated and included in reportable accident data. Commuting accidents are covered and counted under the German workers' compensation system. These practices differ notably from those in the United States: the CFOI has no time limitation for counting fatal accidents, and student and commuting accidents are not covered and counted in U.S. injury and illness data.

Analysis and dissemination

The analysis and dissemination of occupational injury information across nations may be set apart in a few ways. (See table 2 for an overview of available OSH data features, by nation.) For all nations, work-related injury data are categorized by severity and grouped into at least two injury types: fatal and nonfatal. Nonfatal cases are additionally categorized by some type of measure of injury duration or disability. BLS clusters nonfatal cases by injury severity, using a measure of median days away from work. Australian and U.K. data use the number of weeks out of work, in addition to median days away from work, to further classify the severity of nonfatal injuries. Another common severity grouping, used when compensation data are available, is by disability status. Classic groupings by employer, employee, and case circumstances are used across the cross section and vary in depth of classification among nations. Data on occupational diseases, which are distinctive in that they may involve multiple repeated events, are more difficult to collect in a noncompensation system.

An important aspect of disseminating OSH data is the regulatory framework used by each nation to ensure safe working conditions. All nations count injuries and estimate occupational risk through incidence rates, taking into account the employment share of workers in certain industries or occupations. The size of a business, an enterprise, or an establishment—size usually measured by the number of employees—is a common variable in tabulating employer-sourced OSH data. For example, in BLS data on nonfatal injuries, establishment sizes are grouped categorically by number of employees. Germany has adopted a similar approach, grouping data by total company size, measured by the number of full-time employees. The terms enterprises or businesses, on the one hand, and establishments, on the other, are not perfect substitutes, because an establishment is a geographic location under an enterprise or a business. Occasionally, an establishment may be the only physical location for a particular business.

Worker characteristics captured in international OSH data include age, gender, race and ethnicity, length of service, occupation, employment status, and, in some circumstances, education. The first three characteristics are covered by nearly every nation, although race and ethnicity may be excluded or treated differently in certain cases. European countries use nationality instead of race and ethnicity in their data tabulations, and Japan uses neither. In BLS data, the term length of service refers to the period a particular worker was employed at an establishment at the time of injury and is not typically found in other national OSH data. In most instances, education variables are either not collected or collected but not published as part of regular dissemination. Most nations publish data under both industrial and occupational classifications, ensuring that, at a minimum, the injury is linked back to the industry in which the worker was employed. Employee-related data elements have increasingly focused on certain types of employees, including workers classified as contractors, volunteers, interns, foreign-born workers, and students, to name a few.

Detailed case circumstances and other special delineations among data elements are commonplace within the cross section of nations examined, although these characteristics could vary in depth. BLS uses the following characteristics to classify occupational injury and disease cases: *nature of injury*, *part of body affected*, *source or secondary source of injury or illness*, and *event or exposure*.[98] Canadian data follow closely the U.S. classification, whereas Australian data refer to sources as *agents* and to events as *mechanisms*. In the United Kingdom, sources are called *agents* or *factors* and events are called *kinds*. In Japan, published OSH data include case-circumstance elements called *type* and *causes*, which correspond to the U.S. terms event and source, respectively. New Zealand and Germany use a concept equivalent to the U.S. nature of injury, but refer to it as *type*.

Conclusion

An effective occupational safety and health surveillance system relies on data collection methods that produce quality data. How data are collected depends on the legal framework underlying a nation's OSH system and its health and workers' compensation system. Workers' compensation systems that cover a greater portion of the population (usually federalized systems) have an advantage in collecting certain types of data, particularly information on occupational diseases and illnesses with long latency periods. Illnesses and diseases with a long lag in symptom onset are difficult to capture with survey methods, because such methods typically use a fixed survey period that, unlike longitudinal approaches, does not follow workers over time. However, survey methods can be effective in collecting many types of OSH data that fall within a nation's legislative and design scope. For example, in the case of the United Kingdom and the Netherlands, surveys directed at workers rather than employers may be effective in eliciting normally difficult-to-collect information, such as illness data.

Comparing international OSH data is challenging because of differences in national OSH systems and their associated scopes, which are governed by different laws and regulations. For example, the BLS SOII counts all recordable injury cases but provides detailed data only for cases involving at least 1 day away from work. The amount of time away from work that is required for a nonfatal case to be counted varies across nations. For instance, in Japan and Germany, that time is 4 or more days away from work; in the United Kingdom, it is more than 7 days.[99] Even in the case of fatalities, there are subtle but important differences in scope, such as those related to how private and public workers are counted, whether or not commuting is work related, and how self-employed workers are counted. Because of these differences, cross-national comparisons must be conducted at higher industrial or occupational aggregations, only after careful scope harmonization and explanation.[100]

Tables

Table 1. Cross section of occupational safety and health (OSH) data systems, by selected nations and scope features

Scope features	United States		Canada	Australia	New Zealand	United Kingdom	Japan	Germany	Netherlands
	Nonfatal	Fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal
Key OSH organizations by role: (Reg) Regulator; (Enf) Enforcement; (Sta) Statistical; (Res) Research	(Reg/Enf) Occupational Safety and Health Administration (OSHA); (Sta) U.S. Bureau of Labor Statistics; (Res) National Institute for Occupational Safety and Health		(Reg/Sta) Association of Workers' Compensation Boards of Canada; (Res) Canadian Centre for Occupational Health and Safety; (Enf) varies by province or territory	(All) Safe Work Australia	(All) WorkSafe New Zealand; (Sta) Statistics New Zealand	(All) Health and Safety Executive; (Sta) U.K. Statistics Authority	(All) Ministry of Health, Labour, and Welfare	(Reg/Sta) DGUV (Deutsche Gesetzliche Unfallversicherung); (Enf) Federal Ministry of Labour and Social Affairs; (Res) Federal Institute for Occupational Safety and Health	(Reg/Enf) Ministry of Social Affairs and Employment; (Sta/Res) TNO; (Sta/Res) Netherlands Center for Occupational Diseases
Data source(s), scheme(s)	Survey	Census database	Compensation	Compensation, survey, census database	Compensation, regulatory reporting	Compensation, surveys, regulatory reporting	Compensation, survey	Compensation, survey	Survey, census database
Scope overview	OSHA-defined recordable cases and all recordable injuries are counted. Detailed case-circumstance data require minimum of 1 day away from work.	Data include traumatic injuries fulfilling a work-relationship criteria.	Accepted time-loss injuries or disabilities for which the worker is compensated for lost time are included. Claims with no time loss are excluded. Each province or territory has its own workers' compensation legislation, policy, and operating procedures.	Scope limitations vary by data source and data type. Compensation data include only accepted serious claims resulting in 1 or more weeks away from work.	Data include only serious/severe injuries. Definitions and scope vary by source. Worker injuries resulting from natural causes are excluded. Suicides and intentional self-harm are included. Maritime or aviation fatalities are excluded.	Data include death of any person and specified injuries to workers, injuries to workers that result in worker incapacitation for more than 7 days, injuries to nonworkers that result in hospitalization for treatment, and specified injuries to nonworkers that occur on hospital premises.	Data include injuries involving an absence of 4 or more days. Surveyed establishments, except those in construction, have a minimum of 10 employees.	Data include injuries involving an absence of 4 or more days.	Netherlands Working Conditions Survey: Accidents at work with only natural causes, such as a heart attack or a stroke, do not count.

Table 1. Cross section of occupational safety and health (OSH) data systems, by selected nations and scope features

Scope features	United States		Canada	Australia	New Zealand	United Kingdom	Japan	Germany	Netherlands
	Nonfatal	Fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal
Employment scope	Self-employed workers and workers on farms with fewer than 11 employees are excluded.	Self-employed workers, volunteers, and military personnel are included.	Self-employed workers opting for coverage are included. Volunteer coverage varies by province or territory. Industrial/ occupational coverage varies by province or territory.	Self-employed workers are excluded from workers' compensation.	Unpaid and volunteer workers are excluded. Injuries on farms may not be counted. Self-employed workers not employing others are included in compensation data.	Self-employed workers, except those subject to specific exemptions, are included.	Self-employed workers are excluded from surveys, but may be included under workers' compensation.	Self-employed workers are included.	Employers Labour Survey: all Dutch enterprises of profit and nonprofit companies and institutions with at least two employees; Netherlands Working Conditions Survey: employees ages 15 to 64; Self-Employed Labour Survey: self-employed workers
Illnesses and diseases	Yes (limitations collecting illness and disease data given survey design and data source)	No	Yes	Yes	Yes	Yes (coverage varies by occupational illness and disease)	Yes	Yes	Yes

Table 1. Cross section of occupational safety and health (OSH) data systems, by selected nations and scope features

Scope features	United States		Canada	Australia	New Zealand	United Kingdom	Japan	Germany	Netherlands
	Nonfatal	Fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal
Commuting and travel	Injuries are not recordable until the work commute ends. Also not counted are injuries arising from motor vehicle accidents that occur on a company parking lot or access road while commuting to or from work.	Fatal events or exposures that occurred during a person's commute to or from work are out of scope, unless the incident occurred on the employer's premises. Injuries are in scope if the travel was for work purposes (except recreational activities) or condition of employment.	Workers' compensation board determines if the worker's injury was actually related to the job (usually defined in legislation as "in the course of employment").	All injuries experienced while travelling to or from work or while on a break away from the workplace are excluded.	Injuries resulting from someone else's activity or experienced while commuting to or from work are excluded.	The case should meet "reportable" criteria.	Workers' compensation system grants compensation benefits for commuting accidents that are closely related to the job.	Commuting accidents are included if incapacity lasted longer than 3 days.	Netherlands Working Conditions Survey: Industrial accidents during commuting to or from work do not count.
Government	Federal government is excluded. State and local government exclusions vary by state law.	Federal, state, and local governments are included.	Yes	Claims lodged by police in Western Australia and military personnel of the Australian Defense Forces are excluded.	Workers of a New Zealand organization (e.g., defense forces and police) who are injured outside of New Zealand are excluded.	Yes	Yes	Yes	Yes

Table 2. Cross section of occupational safety and health data systems, by selected nations and data features or dimensions

Data features or dimensions		United States		Canada	Australia	New Zealand	United Kingdom	Japan	Germany	Netherlands
		Nonfatal	Fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal
Data overview	Release schedule(s)	Annual	Annual	Annual	Annual	Annual, monthly	Annual	Annual	Annual	Annual
	Published units of measure	Counts, rates, medians	Counts, rates	Counts, rates	Counts, rates, medians	Counts, rates	Counts, rates, 3-year averages	Counts, rates	Counts, rates	Counts, rates
	Description of regularly published data	Summary reports with extensive published data available through website tables and database applications; more complex queries available upon request		Small number of summary tables available for free; more extensive report available for a fee	Summary reports and data tables; custom query options available upon request	Published data available through website tables and database applications	Extensive summary reports and data that vary by source	Published in Japanese by the Ministry of Health, Labour, and Welfare; translated and republished in English by the Japan Industrial Safety and Health Association	Extensive published report with summary data tables	Summary report and additional data available on website
	Custom data and cost, if applicable	Free	Free	$75 minimum	Fee-for-service basis	$115 minimum	Pay for commercial purposes	No	No	No
	Microdata availability (may vary by data source)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Employer characteristics	Industry or economic activity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Enterprise or establishment size	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
	Geographic, administrative levels	National, state	National, state, Metropolitan Statistical Area	National, province, territory	National, state, territory	National, region	National, region	National, prefecture	National, state	National, province
Worker characteristics	Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Gender	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

See footnotes at end of table.

Table 2. Cross section of occupational safety and health data systems, by selected nations and data features or dimensions

Data features or dimensions		United States		Canada	Australia	New Zealand	United Kingdom	Japan	Germany	Netherlands
		Nonfatal	Fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal	Nonfatal, fatal
	Race, ethnic origin, nationality	Yes	Yes	No	No	Yes	No	No	Yes	Yes
	Length of service, job tenure	Yes	Yes	No	No	No	No	No	No	No
	Occupation	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
	Employment status (part time, full time, contractor, etc.)	No	Yes	No	No	Yes	Yes	No	Yes	Yes
	Education	No	No	No	No	No	No	No	No	Yes
Case characteristics	Severity, injury length, disability	Yes	Not applicable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Nature of injury or illness	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Diseases only	Yes
	Part of body affected	Yes	Yes	Yes	Yes	Yes	Yes	No	Diseases only	Yes
	Source of injury or illness	Yes	Yes	Yes	Yes	No	No	Yes	Diseases only	No
	Event of injury or illness	Yes	Yes	Yes	Yes	No	Yes	Yes	Diseases only	Yes
Other	Musculoskeletal disorder/repetitive movement	Yes	Not applicable	Yes	Yes	Yes	Yes	No	Yes	Yes
	Mental health (e.g., stress, depression, anxiety)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Cost estimates	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes

Notes: Prices are in host-nation currency. Comparability of case-characteristic classifications across nations is approximate; in some instances, multiple case characteristics may be represented by a combined single dimension. Case-characteristic dimensions are based on the Occupational Injury and Illness Classification System of the U.S. Bureau of Labor Statistics.

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