REFLECTIONS
on Fatal Occupational Injury Rates in the U.S. vs. Importing Countries

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THIS RESEARCH BEGAN AS AN EXPLORATION OF OSH in different countries. The primary objective was to compare fatal injury rates in other countries with the U.S. The secondary objective was to learn about the scope, accuracy, limitations and differences in occupational injury statistics from other nations. The tertiary objective was to gain insight into the regulation and oversight of OSH, as well as economic activities of other countries. To limit the research to a manageable number of countries representing different parts of the world but having an intrinsically important relationship with the U.S., the top 12 importing countries were selected.

The U.S. has the largest import economy and the second largest export economy in the world. In 2016, the U.S. imported $2.21 trillion and exported $1.42 trillion (OEC, 2019). To place imports and exports in perspective, the U.S. gross domestic product (GDP) in 2016 was $18.6 trillion (Investopedia, 2018). The U.S. ranks in the top 10 countries of highest per capita GDP and enjoys a high standard of living. The country also has a high standard for OSH. But many products sold by U.S. companies are manufactured in other parts of the world. Products assembled in the U.S. contain components manufactured outside the U.S. Many products and equipment used by U.S. companies and residents are manufactured elsewhere.

This article reviews the top 12 importers from 2016 and common import categories. It also compares fatal occupational injury incidence rates of the top importers with the U.S. Some countries have rates notably lower than the U.S. Based on the author's analysis, approximately two-thirds of the imports originate in countries with workplaces less safe than

those in the U.S. The occupational safety record reflected in many products and components we use in the U.S. is substandard to what is permissible in the U.S.

A double standard of OSH exists in the U.S. While we congratulate ourselves on the dramatic reduction in U.S. occupational injuries since the 1970s, we are often silent on the OSH record reflected in the large numbers of imported goods used in the U.S. Further, we have failed to achieve a level of OSH reached by some countries. No quick or easy fixes exist for either side of the double standard. It is hoped that readers will reflect on the fatal occupational injury rates reviewed in this article and consider how we, working individually and together in the U.S. and across borders, can improve workplace safety in the U.S. and in other nations.

Top Imports, Importing Countries & Their Labor Forces

Figure 1 shows the 12 countries that accounted for 75.8% of U.S. imports in 2016 and the types of goods imported. The

KEY TAKEAWAYS
●**Approximately two-thirds of the 2016 U.S. imports originated in countries with workplaces less safe than those in the U.S.**
●**The U.S. has failed to achieve the low fatal injury rates attained by some top importing countries.**
●**Readers are asked to reflect on how the U.S. can share its knowledge and use its influence to reduce occupational injuries elsewhere, as well as learn from the safety and health systems implemented in countries with safer workplaces.**
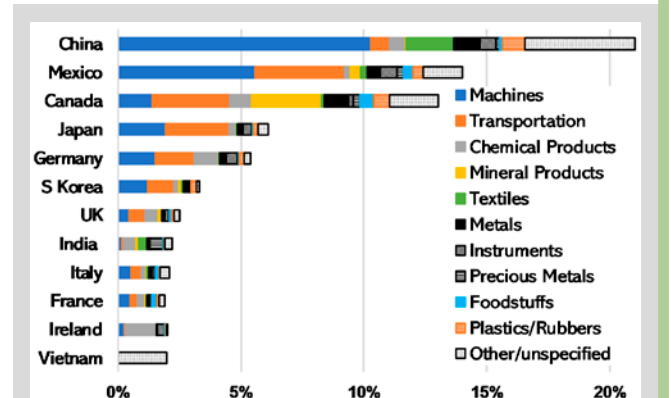
FIGURE 1
TOP 12 IMPORTERS TO U.S. & GOODS IMPORTED, 2016

Note. Data from Observatory of Economic Complexity, https://atlas.media.mit.edu/en.

TABLE 1
10 COMMON IMPORT CATEGORIES & PERCENTAGE OF U.S. ($) IMPORTS, 2016

Import category (% of U.S. imports)	Products
Machines (28%)	Computers, broadcasting equipment, telephones, integrated circuits, gas turbines, video displays, insulated wire, office machine parts, electrical transformers, semiconductor devices, values, spark-ignition engines, electrical control boards, industrial printers, air pumps, low-voltage protection equipment, liquid pumps, engine parts, machinery, electric motors, refrigerators, electric heaters, transmissions, centrifuges, air conditioners
Transportation (14%)	Cars; vehicle parts; delivery trucks; aircraft parts; planes, helicopters and spacecraft; tractors
Chemical products (8.9%)	Packaged medicaments; human and animal blood; heterocyclic compounds; nucleic acids; industrial fatty acids, oils and alcohols; beauty products; sulfonamides; radioactive chemicals; laboratory reagents; fertilizers; scented mixtures and perfumes; cyclic hydrocarbons
Mineral products (7.6%)	Crude and refined petroleum, petroleum gas, electricity, cement
Textiles (5.1%)	Clothing, house linens
Metals (4.8%)	Raw, refined and processed metals and alloys, metal products, copper wire
Instruments (4.0%)	Medical instruments, orthopedic and therapeutic appliances, chemical analysis instruments, measuring instruments, thermostats, X-ray equipment, metal watches, oscilloscopes, LCDs, photo lab equipment, eyewear, revolution counters, optical fibers, mirrors and lenses, surveying equipment, utility meters
Precious metals (3.0%)	Diamonds, gold, jewelry, silver, platinum, precious stones, pearls
Foodstuffs (2.8%)	Liquor, beer, wine, baked goods, flavored water, processed nuts and fruits, chocolate and cocoa beans, tobacco, fruit juice, sugar, processed fish/shellfish
Plastics/rubbers (3.4%)	Rubber tires; rubber and plastic products; various polymers; plastic sheeting, building materials and floor coverings

Note. Category items listed in descending order ($). Data from Observatory of Economic Complexity, https://atlas.media.mit.edu/en.

10 import categories listed in Table 1 accounted for 81.6% of all U.S. imports in 2016.

The total labor force (i.e., employed and unemployed) statistics in Table 2 illustrate that the top importers to the U.S. (China and Canada) have labor forces that are 4.8 times larger and merely 12%, respectively, the size of the U.S. labor force. The proximity of Mexico and Canada at least partly accounts for those countries being ranked second and third among top U.S. importers. Although the labor force of India is large (3.8 times greater than the U.S.) and growing rapidly, India represents only 2.2% of U.S. imports. The size of the labor force is an important consideration in occupational safety because size is a measure of the amount of resources that must be mobilized to help ensure safe working conditions.

Top Trading Partners in Europe

Germany, the U.K., France, Italy and Ireland account for approximately 14% of the goods imported to the U.S. Table 3 provides a rough comparison of the fatal occupational injury incidence rates in the U.S. with these European countries. The incidence rates (per 100,000 workers) for the European countries include non-draft armed forces personnel.

As defined in European Statistics on Accidents at Work (ESAW), a fatal incident at work leads to the death of the worker within 1 year of the incident (Eurostat, 2013). Incidents include roadway traffic incidents and those that occur in public places or on public transportation during the course of work. Fatal incidents exclude deliberate self-inflicted injuries or incidents from strictly natural causes (Eurostat, 2103). Similar to the U.S. Bureau of Labor Statistics (BLS) definition, an occupational fatality as defined in ESAW may be the result of violence; but, unlike BLS, ESAW excludes self-inflicted injury. BLS incidence rates are standardized based on an equivalent full-time worker (40 hours per week, 50 weeks per year); resident military workers are excluded but represent less than 1% of the U.S.

working population. Table 3 also includes U.S. occupational fatal injury incidence rates estimated from the population of employed, noninstitutionalized civilians, age 16 and over; the rate is only slightly lower than the incident rate published by BLS.

Many variables may impact the higher U.S. rates including the following:

1) 16.7% of U.S. worker fatal injuries in 2016 were due to violence, which is likely higher than in the European countries listed; 33.6% of these injuries were due to suicide (BLS, 2018a) which are not included in ESAW.

2) 40.1% of U.S. worker fatal injuries in 2016 were due to transportation incidents (BLS, 2018a), which may be much higher than in the European countries listed.

3) The U.S. and the European countries differ in the composition of economic activity. Some industries inherently pose a higher risk of worker injury.

4) Government oversight in occupational safety, corporate approaches to occupational safety and even culture might contribute to lower incidence rates for the European countries listed, particularly the U.K. and Germany.

5) The U.K. and Ireland exclude road incidents (Wiatrowski & Janocha, 2014).

Table 4 presents a loose comparison of fatal work incidents reported in 2015 in 28 EU countries (EU-28) by economic activity with the U.S. by select industries. Although economic activity in Europe and industry sectors in the U.S. are not necessarily defined the same, the percentages are similar except for manufacturing. The higher percentage of fatal injuries in European manufacturing may be due to 1) a higher percentage of higher-risk types of manufacturing; 2) the differences in the occupational work defined as manufacturing in Europe; and 3) a higher percentage of European workers engaged in manufacturing—roughly 12.5% (Eurostat, 2019b) versus 8.7% (BLS, 2016a) in 2015. In 2015, the economically active population (244.5 million, Eurostat, 2018b) of the EU was 50% larger than in the U.S.

TABLE 2
LABOR FORCE OF U.S. & TOP IMPORTERS

| Country | Labor force (millions) | | | | Ratio to U.S. |
	2014	2015	2016	2017	2017
Canada	19.6	19.7	19.9	20.1	0.12
China	786.6	787.1	787.1	786.7	4.81
Germany	42.5	42.8	43.3	43.5	0.27
France	30.2	30.3	30.3	30.4	0.19
U.K.	33.1	33.4	33.7	33.9	0.21
India	495.0	503.8	512.8	520.2	3.18
Ireland	2.2	2.2	2.2	2.3	0.01
Italy	25.4	25.3	25.6	25.5	0.16
Japan	66.2	66.4	66.8	66.5	0.41
Mexico	54.8	56.0	57.0	58.1	0.36
South Korea	15.9	16.0	16.2	16.3	0.10
U.S.	159.8	160.8	162.8	163.5	1.00
Vietnam	55.9	56.5	56.9	57.5	0.35

Note. Data from World Bank, Nov. 9, 2018.

TABLE 3
FATAL OCCUPATIONAL INJURY INCIDENCE RATES OF U.S. & TOP EUROPEAN IMPORTERS

Country	2011	2012	2013	2014	2015	2016
Germany	1.18	1.18	0.99	1.09	0.97	0.88
Ireland	2.65	2.34	2.13	2.46	2.51	2.14
France	3.09	3.07	2.96	2.7	2.57	2.74
Italy	2.71	2.64	2.31	2.34	2.42	2.78
U.K.	0.68	0.55	0.92	0.81	0.83	0.8
U.S. BLS	3.5	3.4	3.3	3.4	3.4	3.6
U.S. est.	3.4	3.2	3.2	3.3	3.2	3.4

Note. Data from "Fatal Occupational Injuries in 2015 (Charts)," by BLS, 2016b; "Labor Force Statistics from the Current Population Survey," by BLS, 2016c; "National Census of Fatal Occupational Injuries in 2017" (News release), by BLS, 2018a; and "Fatal Accidents at Work by NACE Rev. 2 Activity (hsw_n2_02)," by Eurostat, 2017.

TABLE 4
PERCENTAGES OF 2015 FATAL OCCUPATIONAL INJURIES BY ECONOMIC ACTIVITY OR INDUSTRY

Economic activity or industry	EU-28	U.S.
Construction	21%	19%
Transportation and storage	16%	16%
Manufacturing	17%	1%
Agriculture, forestry and fishing	13%	12%
Wholesale and retail trade	8%	9%

Note. Data from "Fatal Occupational Injuries in 2015 (Charts)," by BLS, 2016b; and "Accidents at Work Statistics: Statistics Explained," by Eurostat, 2018a.

TABLE 5
FATAL OCCUPATIONAL INJURY RATES IN MEXICO & U.S.

Incident rates	2011	2012	2013	2014	2015	2016
Mexico	2.9	3.0	2.6	2.5	2.4	2.3
% road incidents	23%	26%	24%	23%	23%	30%
U.S.	3.5	3.4	3.3	3.4	3.4	3.6
% road incidents	24%	25%	24%	24%	26%	24%

Note. Data from "Fatal Occupational Injuries in 2015 (Charts)," by BLS, 2016b; "Labor Force Statistics From the Current Population Survey," by BLS, 2016c; "National Census of Fatal Occupational Injuries in 2017 (News Release)," by BLS, 2018a; "Deaths Due to Work Risks (Completed Cases) Registered in the IMSS by Year of Occurrence of the Work Risk and Sex, According to Type of Risk," by Mexico Ministry of Labor and Social Welfare, 2019; and "Employment and Occupation," by INEGI, 2018.

United Kingdom

A comparison study of occupational fatalities in the U.S. and U.K. found that the 2010 overall fatality rate in the U.K. was about one-third the rate in the U.S. and the fatality rate in the construction industry was only about one-quarter. For the comparison analysis, the U.S. fatal work-related injuries due to most types of transportation incidents and violence (since there were so few in the U.K.) were removed from the data. In the U.K., the occupational injury data are collected by Health and Safety Executive (HSE), which also sets and enforces safety and health standards. In the other EU countries, injury data are collected by each country's compensation system or from a labor inspection agency. The authors of that study believe that almost all relevant fatal work injuries were included in the U.K. data (Mendeloff & Staetsky, 2014).

Germany

The German workers' compensation system has been in place for more than a century. Although numerous sources are used, the primary source of OSH data is German Social Accident Insurance (DGUV), the German statutory workers' compensation accident social insurance (Tedone, 2017). A work-related accident is defined as "an accident an employee suffers at work or outside the place of work, for example on the roads," while a commuting accident is defined "as an accident an employee suffers while travelling to or from his place of work."

The lower fatal injury incidence rates in Germany may be partly due to time limitations imposed. An injury is counted as a fatal injury if the incident occurs within "the year under review and within 30 days following the accident" (DGUV, 2019). In Germany, 731 work-related fatalities (451 at work, 280 commuting) occurred in 2017 (DGUV, 2018b). Based on the number of full-time equivalent employees (FTEs) in 2017 as documented by DGUV, the at-work fatal injury incidence rate was 1.21 and the work-related fatal injury incidence rate was 1.97 (both at work and commuting incidents).

To better understand the impact of a nation's defined time window of a death arising from an incident, statistics on latency from incident to death were obtained from BLS covering almost 60,000 fatal occupational injuries that occurred from 2006 to 2017. In any given year, at least 78% of the injured workers died on the day of the incident and at least 95% died within 30 days (personal communication, J.J. Redmond, BLS, Dec. 27, 2018).

Top Trading Partners in North America & U.S.
Mexico

Mexico and Canada accounted for 14% and 13%, respectively, of the imports to the U.S. in 2016. Table 5 shows the fatal occupational injury incidence rates (per 100,000) for Mexico, estimated from data published by the Mexican Institute of Social Security (IMSS) (Mexico Ministry of Labor and Social Welfare,

TABLE 6
AVERAGE FTE INCIDENT RATES FOR SELECT CANADIAN PROVINCES & TERRITORIES, 2013-2015

NWT[a]/Nunavit	Ontario	Quebec	Saskatchewan	Yukon
9.6	1.3	1.7	5.9	7.7

Note. [a]Northwest Territories. Data from "Work-Related Fatality and Injury Rates: A Comparison of Canadian Provinces and Territories," by S. Tucker, 2017.

TABLE 7
ESTIMATED INCIDENCE OF DEATHS FROM WORK INCIDENTS IN CHINA

China	2012	2013	2014	2015	2016	2017
Fatal injuries	71,983	69,434	68,061	66,182	43,062	37,852
Workers (millions)	767.0	769.8	772.5	774.5	776.0	776.4
Rate per 100,000 workers	9.4	9.0	8.8	8.5	5.5	4.9

Note. Data from "Statistical Communiqué of the People's Republic of China on the National Economic and Social Development," 2012-2017, by National Bureau of Statistics of China.

TABLE 8
WORK INCIDENTS: WORKER DEATHS IN 2009 & WORK INCIDENT SURVEY, DECEMBER 2014 TO JANUARY 2018

	Coal mining	Other mining	Construction	Manufacturing
2009 % deaths	25%	16%	21%	25%
Survey % incidents	11%	4%	34%	11%

Note. Data from "Work Accident Map," by China Labor Bulletin, 2018; and "Basic Characteristics of Work Safety in China," by X. He and L. Song, 2011, *Procedia Engineering, 26*, 1-9.

TABLE 9
FATAL INCIDENT RATE JAPAN

Japan	2012	2013	2014	2015	2016	2017
Fatal incident rate	2.21	2.07	2.11	1.92	1.80	1.87

Note. Data from "Accidents Rate in 2017 (2017_fatal_accidents_rate .xls)," by JISHA, 2017.

TABLE 10
2017 DEATHS IN JAPAN DUE TO INDUSTRIAL INCIDENTS

Select industrial sectors	Percentage
Construction	33%
Land cargo transportation	14%
Manufacturing	16%
Agriculture/livestock/fishery, forestry	8%
Tertiary (service)	25%

Note. Data from "Accidents Rate in 2017 (2017_fatal_accidents_rate .xls)," by JISHA, 2017.

2019) and Mexico's economically active population (INEGI, 2018). Unlike the U.S. and many other countries, Mexico categorizes incidents that occur in transit between the home and workplace as occupational incidents (Sánchez-Romén, Juérez-Pérez, Madrid, et al., 2006).

IMSS only provided coverage to 30% of the economically active population in 2004; IMSS itself identified underreporting work-related incidents (including nonfatal) at 26% (Sánchez-Romén, Juérez-Pérez, Madrid, et al., 2006). Although the fatal injury incidence rates for Mexican workers (Table 5, p. 41) appear lower than those for U.S. workers, the lower rates are probably due to underreporting within the IMSS and a large working population that is totally outside its realm.

Mexico adopted a new, comprehensive federal regulation of OSH in 2015. The new law, enforced by the Ministry of Labor and Social Welfare, aims to provide workers with environments that are free from hazards and conducive to life and good health. The law requires an employer to provide notice of a work-related death within 72 hours of knowledge of the death (Bustamante, 2015).

However, resources for implementing the law are limited. It is known that occupational electrical safety work in Mexico is still in its infancy compared to workplaces in the U.S. (Martinez & Corvalan, 2017). It is expected that the reporting and data collection system on work-related fatalities in Mexico is not as far reaching and sophisticated as the BLS Census of Fatal Occupational Injuries (CFOI). Each work-related U.S. death counted in the CFOI is substantiated by a minimum of two (average of four) documents including death certificates, workers' compensation reports, news reports, coroner reports and OSHA reports (Tedone, 2017).

Gonzalez-Delgado, Gómez-Dantés, Fernández-Niño, et al. (2015), conducted a study to determine the factors associated with fatal occupational injuries that occurred in Mexico during 2012. The economic activities with the highest odds ratios for fatal injuries were 1) mining; and 2) farming, livestock, fishing and hunting. Notable injury conditions with higher odds ratios included inadequate workplace conditions, factors related to the work environment and the condition of work materials, all of which suggest that workplace conditions contributed to fatal incidents. External causes with significantly higher odds ratios included 1) shooting and explosions; and 2) exposure to electrical current, radiation and temperature.

Canada

In Canada, Association of Workers' Compensation Boards of Canada (AWCBC) provides national statistics on work-related fatalities, which includes fatal injuries and occupational diseases. Deaths that occur in workplaces not covered by compensation board insurance may not be counted in AWCBC data. In 2010, coverage in the provinces varied from nearly 100% to 70% in Manitoba (OCA, 2010). Families of deceased workers may seek compensation from sources outside compensation insurance (e.g., auto insurance, product manufacturer), so the fatally injured worker may not be counted in the AWCBC data. Also, workers found dead might be presumed to have died from natural causes and may not be included.

Like the U.S., Canadian work-related injury statistics include violent attacks by persons or animals and self-inflicted injuries. Transportation incidents are also included. In 2015 and 2016, the fatal injury rates in the Canadian provinces ranged from 0.8 to 5.4 per 100,000 FTEs (Tucker, 2017; Tucker & Keefe, 2018).

The rate in Manitoba was 0.8 in 2015 and 2016. As Tucker and Keefe (2018, p. 10) note, "Moreover, lower coverage rates can skew fatality and injury rates when the proportion of uncovered workers is employed in relatively more (or relatively less) dangerous industries." Based on 2015 and 2016 labor force statistics (Statistics Canada 2016; 2017) and fatal injury counts (AWCBC, 2017), the fatal injury incidence rate of Canada was estimated at 1.7 in 2015 and 2016 per 100,000 employed workers. The FTE rate is likely to be somewhat higher since about 20% of the Canadian workforce was part time in 2015 and 2016, even though some full-time employees work more than 40 hours per week.

Although the national incidence rate estimate for Canada may appear considerably lower than in the U.S., all workplaces in Canada are not necessarily inherently safer. From 2013 to 2015, Ontario and Quebec, where more than 60% of Canadian residents live, had low average fatal incident rates (Table 6). The rates for Saskatchewan, Yukon and Northwest Territories/Nunavut were considerably higher than those for Ontario and Quebec, and the U.S. incidence rates listed in Table 3 (p. 41). The industries associated with higher fatal injury rates are 1) logging and forestry; 2) fishing, hunting and trapping; 3) agriculture; 4) construction; and 5) mining, quarrying and oil wells. Canadian provinces and territories with higher incident rates are likely concentrated with higher risk industries (Grant, 2017).

Top Trading Partners in Asia

China, Japan, Republic of Korea, India and Vietnam accounted for about 35% of U.S. imports in 2016.

People's Republic of China

China, the world's second largest economy, accounted for 21% of the goods imported into the U.S. in 2016. Like other countries, China strives to ensure safer workplaces and working conditions. Employee and workplace safety are regulated by Ministry of Emergency Management (MEM, formerly State Administration of Workplace Safety, SAWS). In 2014, the amended Workplace Safety Law strengthened the government's regulation and control over workplace safety and the prevention of incidents in China (ILO Office for China and Mongolia, 2012; Pang, 2017; Zhou, 2018). However, China Labor Bulletin (2018b) states the following on work safety:

In reality, however, employers are free to ignore their obligations and employees are often unaware of their rights regarding work safety.

It is the responsibility of local government officials, under the overall purview of the Ministry of Emergency Management (MEM), to ensure that all workplaces comply with work safety regulations.

Very little happens until a major accident, after which local officials go into crisis containment mode.

The fatal occupational injury incidence rates (per 100,000 workers) in Table 7 were estimated from the numbers of employed workers and deaths due to work incidents published by National Bureau of Statistics in China (2013; 2014; 2015; 2016; 2017; 2018). The fatal injury incidence rates dropped by nearly half from 2012 to 2017. The significant reduction of deaths from work incidents in 2016 and 2017 may be definitional; SAWS reformed work incidents in 2016 to exclude "nonproduction accidents" (National Bureau of Statistics of China, 2016). The statistics are supposed to cover all workers in China, but little information is provided about the parameters for counting a death from a work-related incident.

China's work incidents have reduced in number and severity in comparison with those 10 or 20 years ago, as China's economy has changed (e.g., less coal production) and the Chinese government has become more active in worker safety. Table 8 presents a loose comparison of the percentages (per select industrial sector) of worker deaths from incidents in 2009 (He & Song, 2011) and a survey of 1,700 fatal work incidents (that involved one or more deaths) from December 2014 to January 2018 (CLB, 2018a).

Table 8 suggests that the construction sector in China today may warrant the most concern for worker safety. Construction incidents commonly involve structural or mechanical failures that kill or injure multiple workers or result when a worker falls to a lower level (CLB, 2018b).

Japan

Higashi (2019) found that in 2009 the industry sectors in Japan and the EU employed similar percentages of workers. Like many European countries, Japan promotes improving OSH through risk assessment and reducing risk in the design and manufacturing stages of machinery (Higashi, 2019; Japan Ministry of Health, Labor & Welfare, 2018). Moreover, Japan's fatal occupational injury rates are considerably lower than many European countries.

The fatal injury rates in Table 9 published by Japan Industrial Safety and Health Association (JISHA, 2018) are per 100,000 nongovernmental workers in Japan. According to Oda (2018), Japan's work-related fatal incident rate between 2014 and 2017 was 1.73 per 100,000 Japanese workers; this rate excludes foreigners working in Japan. In 2017, 26% of the fatal incidents were caused by falling from height and 21% were caused by traffic incidents on public roads.

In Japan, employment injuries include those that occur on business trips and during sales activities outside the workplace. Self-inflicted injuries and "violence by a third party caused by personal enmity" are excluded (JISHA, 2018). Commuting incidents are also eligible for industrial accident compensation but are not included in the industrial incident rate. Deaths arising from work incidents are counted in the statistics if the death occurs before the early April deadline of the following year (Japan Ministry of Health, Labor and Welfare, personal communication, Dec. 27, 2018).

Table 10 shows the percentage of deaths by industrial sector in 2017. A comparison to Table 4 (p. 41) reveals that the EU and Japan have similar percentages of fatal injuries in the land cargo transportation and manufacturing sectors. The percentage of worker deaths in construction is approximately 1.5 times higher in Japan. However, in 2017 the construction industry employed 7% of workers in Japan (Klein, 2017). In 2015, 2.3% of the total workforce in the EU (Eurostat, 2019a) and roughly 4.5% workers in the U.S. (estimated from BLS, 2016c; Eurostat, 2019a) were employed in the construction industry.

As in other countries, some industries in Japan are associated with higher incidence rates of work-related fatal and nonfatal injuries. In 2010, these industries included forestry, fishing, mining and construction. In addition, although incidence rates of work-related injuries in the manufacturing sector were relatively low for the whole industry in 2010, some types of manufacturing, such as molded products, and timber and wood products, were notably higher than others (Sakurai, 2012).

TABLE 11
FATAL INJURY INCIDENCE RATES FOR IACI WORKERS IN REPUBLIC OF KOREA

Republic of Korea	2012	2013	2014	2016
IACI fatal injury rate	7.3	7.1	5.8	5.3
IACI workers (millions)	15.5	15.4	17.1	18.4
Economically active pop. (millions)	25.5	25.9	26.5	27.3
IACI/workers (%)	61%	60%	64%	68%

Note. Rates are calculated from "KOSHA Annual Report, 2016," by KOSHA, 2016; "KOSHA Annual Report Archives," by KOSHA, 2019; and "Economically Active Population in South Korea From 2007 to 2016 (in Millions)," by Statista, 2017.

TABLE 12
INDIA FATAL INJURY INCIDENCE RATES IN MINES & FACTORIES

Sector	2011	2012	2013	2014
Mines	19	22	21	19
Factories	9	9	14	

Note. Data from "Statistical Yearbook India 2017," by Government of India, Ministry of Statistics and Program Implementation, 2017.

Republic of Korea

The fatal occupational injury incidence rates for the Republic of Korea (South Korea), shown in Table 11, are notably higher than in the U.S. (Table 5, p. 41). The fatal injury rates were calculated from the number of fatal injuries among workers covered by Industrial Accident Compensation Insurance (IACI). The fatal injury incidence rates in Table 11 do not include occupational diseases. Since 2012, deaths that occur from work-related incidents within 1 year of the incident are counted in the IACI statistics (S.-K. Kang, personal communication, Dec. 17, 2018).

The economically active population, also noted in Table 11, reveals that the number of workers covered by IACI increased from 61% in 2012 to 68% in 2016 (Statista, 2017). In 2010, the economically active population (EAP) was 24.5 million; IACI covered 14.2 million workers (58% of the EAP) and other social security systems covered 1.5 million workers (6.2%), which included government employees and military personnel (Kang, 2012).

In Republic of Korea statistics, fatal injuries include traffic incidents by commuting, animal bites, drownings and violence. In 2010, 32.8% of fatal injuries resulted from falls from height and 16.7% resulted from traffic incidents; the construction industry accounted for 40.2% of all fatal injuries (Kang, 2012). In comparison, for the U.S. in 2010, the top three causes of fatal occupational injuries were transportation incidents (40%; 22% highway), violence (18%) and falls (14%; 11% to a lower level). In 2010, the construction industry accounted for only 17% of all fatalities in the U.S. (BLS, 2012). However, it accounted for 6.5% of civilian employment in the U.S. that year (estimated from BLS, 2016c; and BLS, 2019); in South Korea, 22.5% of workers covered by IACI were employed in the construction industry (Kang, 2012).

From 1960 to 2005, the percentage of agricultural workers decreased sharply from 66% to 10% of the country's employed workers (Kang, 2012). However, in 2010 the number of agriculture, forestry and fishing workers only accounted for 0.9% of workers covered by IACI. Many agricultural workers are self-employed, and the industry is largely made up of family-run operations. Although the number of work-related fatal injuries reported by IACI is likely accurate, a fairly large percentage of workers are not represented by IACI and these workplaces are more likely to lack adequate workplace safety measures (Kang, 2012).

India

In India, the Ministry of Labor is responsible for worker safety and health. Although legislation exists to protect workers in India, implementation is limited and incomplete due to insufficient manpower, infrastructure and spending (Saha, 2018).

Of all countries, India has the second largest population, as well as the second largest population of people living in extreme poverty (Slater, 2018). More than 90% of workers are unorganized (or informal) and have limited or no employment benefits, compensation or social security (Ministry of Labor & Employment, Government of India, 2018). Unorganized workers are likely to work under less safe work conditions where safe work practices are not implemented (Satpathy, Patnaik & Tripathy, 2017).

During 2015 to 2016, 47.3% of the workforce was engaged in agriculture (ILO, 2017). The construction sector employed the second highest percentage of the workforce, which was estimated at 10.9% of the population during 2011 to 2012. Since India's Ministry of Statistics does not publish incident statistics in the construction sector, a research study was conducted and projected the fatal injury incidence rate for 2012 at 22 per 100,000 construction workers. This rate was derived by examining the 2008 to 2012 fatal incident records of a large corporation and a newspaper's articles on fatal construction incidents in the National Capital Territory (NCT) Delhi during the same period. The projection factored in an underreporting rate of 17.85% (Patel & Jha, 2016).

The fatal injury incidence rates per 100,000 workers shown in Table 12 are recalculated from the published rates per 1,000 workers (Ministry of Statistics & Program Implementation, Government of India, 2017).

Vietnam

The reported incidence rates of work-injury fatalities in Vietnam ranged from only 1.14 to 1.18 (per 100,000 workers) in 2011 to 2013, respectively (Chinh, 2018). The industry sectors associated with the highest fatality rates were construction, mining and electricity. The rates are surprisingly low, since ILO has estimated a worldwide incidence rate of 14 deaths per 100,000 workers, with developing countries having the highest rates. A 2006 surveillance project implemented in a Vietnamese commune suggests significantly higher work-related injury rates than what had been reported. In fact, the 2006 study data from a district hospital found that work-related injuries were about 24 times higher than the official count in 2004 (Marucci-Wellman, Wegman, Leamon, et al., 2013).

Several important OSH laws were passed in Vietnam from 2012 to 2015. The laws included providing measures for guaranteeing OSH policies and compensating victims of occupational incidents and diseases. In 2012, Vietnam's Ministry of Health, and Ministry of Labor, Invalids and Social Affairs issued a guide on reporting, investigating, recording and collecting statistics for occupational incidents (Chinh, 2018).

Although each country's economy is unique, developing countries such as Vietnam can differ markedly from developed nations such as Canada, Germany and the U.S. Marucci-Wellman, et al. (2013), note that the majority of businesses in Vietnam are home-based and employ 10 to 20 workers. In 2014, 46.8% of the workforce in Vietnam was engaged in agriculture, forestry and fishing (Chinh, 2018), but only 1.4% of the U.S. workforce was engaged in agriculture, forestry, fishing and hunting (Henderson, 2015).

Conclusion

The fatal occupational injury statistics presented in this article provide insight into workplace safety in the U.S. in comparison with its top 12 importers. Countries are unique with differing industrial compositions and definitions of fatal work injury. The accuracy of fatal injury statistics varies among countries and, in some countries, large numbers of workers are not covered. But the statistics presented here suggest that large disparities exist in the fatal injury incidence rates and, therefore, workplace safety. The U.K., Germany and Japan have much lower incidence rates of work-related fatal injury. In the U.S., we need to examine workplace safety measures and practices to reduce the number of workplace injuries. On the other hand, about two-thirds of the goods we import originates in countries where workplaces are much less safe than in the U.S. Reducing occupational injuries in the U.S. and in other countries is not an easy task, but can be achieved by working together and across borders. **PSJ**

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