

Global Estimates of Fatal Occupational Accidents

Jukka Takala

Data on occupational accidents are not available from all countries in the world. Furthermore, underreporting, limited coverage by reporting and compensation schemes, and non harmonized accident recording and notification systems undermine efforts to obtain worldwide information on occupational accidents. This paper presents a method and new estimated global figures of fatal accidents at work by region. The fatal occupational accident rates reported to the International Labour Office are extended to the total employed workforce in countries and regions. For areas not covered by the reported information, rates from other countries that have similar or comparable conditions are applied. In 1994, an average esti-

mated fatal occupational accident rate in the whole world was 14.0 per 100,000 workers, and the total estimated number of fatal occupational accidents was 335,000. The rates are different for individual countries and regions and for separate branches of economic activity. In conclusion, fatal occupational accident figures are higher than previously estimated. The new estimates can be gradually improved by obtaining and adding data from countries where information is not yet available. Sectoral estimates for at least key economic branches in individual countries would further increase the accuracy. (Epidemiology 1999;10:640-646)

Keywords: occupational accidents, fatality rates, statistics, recording and notification systems.

The International Labour Office (ILO) collects and publishes global accident figures and rates that are based on national recording and notification systems.¹ The ILO also supports member states in the enhancement of their recording and notification systems for occupational accidents and diseases.² However, reasonably reliable data may only be obtained from a rather limited number of countries, ie, from about one-third of the 174 ILO member states. The information is not based on harmonized recording and notification systems, underreporting is common, and in many countries the reporting and compensation systems cover only selected economic activities, leaving out major sectors, such as agriculture, which are known to have higher-than-average accident-frequency rates. Furthermore, some countries cover commuting accidents, traffic accidents at work, and occupational diseases, whereas others do not. Fatal occupational accidents are better reported than nonfatal ones in developing countries, but the same limitations apply.¹ Underreported figures and low estimates are currently used as a baseline for priority setting at the national level, which leads to preventive action that is less appropriate.

In addition to a better picture on fatal accidents, rough estimates of nonfatal accidents could be derived from the data on fatal accidents. Studies in the United States,³ Australia,⁴ Zimbabwe,⁵ Finland,⁶ and the European Union^{7,8} show that, if reporting is reliable enough, a rather constant ratio exists between fatal and nonfatal

accidents leading to absence from work. This was shown first by the classical work of Heinrich⁹ as early as 1931.

Earlier estimates have been based on a crude global fatality rate (8 per 100,000 workers) obtained from existing sources of industrialized countries. No attempts have been made to estimate such rates regionally. These earlier figures have been shown, by new information from developing countries, to be underestimated. New sources are based on real counts of fatalities in selected ILO member states and range from 1.5 to 5 times higher¹ than the old estimates.

Objective

The objective of this paper is to establish a better method for estimating the number of fatal occupational accidents, in particular at global, but also at regional and national levels. This estimate can be based on available data, and it would provide a basis for setting policies and priorities for prevention of such accidents, as well as for funding and national decision making. More realistic estimates would demonstrate a visible difference compared with the actual, and often unrealistic, reported data, which in turn would motivate countries to improve their recording systems. The need for international harmonization of reporting methods and criteria would be more easily understood.

What Is Reported.. Source Data

Usually the ILO member states report both absolute numbers and frequency rates of fatal occupational accidents calculated for 1,000 workers. The frequency rates are more useful than absolute numbers for preventive purposes and for comparisons within and outside the

From the Occupational Safety and Health Branch, Working Conditions and Environment Department, International Labour Office, 4 Route des Morillons, CH-1211 Geneva 22, Switzerland.

©1999 by Epidemiology Resources Inc.

reporting field. The ILO receives reports that usually contain information on fatal accidents at work and include those accidents that occur in traffic while the worker is carrying out work duties. Fatal commuting accidents and fatal occupational diseases are often but not always separately reported although the latter figures are very poorly given. The reliability, comparability, and transparency of data are reduced, if these figures are not given separately. The data have been obtained from the annual compilation of the ILO Yearbook of Labour Statistics.⁷

Detailed accident statistics are also submitted to the ILO, and these are included in the CISDOC database.¹⁰ This database was used for the study to retrieve country-specific published data.

Employment figures have been obtained from the ILO Yearbook of Labour Statistics,¹ the United Nations Development Programme's Human Development Report 1994,¹¹ and from the Global Burden of Disease and Injury Series of Murray and Lopez.¹² When either employment or fatality rate was not available for the year in question, data were used from the closest year in which they were available.

Methods

Accident-reporting schemes of industrialized countries and of economies in transition cover a higher proportion of the employed population than those of developing countries, but even in industrialized countries, some industries and sectors, such as agriculture and the self-employed, are often excluded. Information from developing countries is often limited to a small proportion of the economically active workforce. When reported rates, in fatal accidents per 100,000 workers, are applied to the whole economically active workforce, much higher-and more reliable-numbers of fatal occupational accidents are obtained. To estimate the rates for countries where no reliable data are available, rates from similar or comparable countries have been used.

EXAMPLE

The given occupational fatality rate for Finland was 3.2 per 100,000 in 1993.⁶ The equivalent covered population was 1.729 million employees (reporting base). The number of occupational fatalities within this group was 56. The size of the employed labor force, actively employed, was, however, 2.064 million, which includes the self-employed-in particular, farmers, who are not included in the usual reporting scheme. When the rate of 3.2 is applied to all employed, a calculated but realistic figure, 66, is obtained. Ten fatalities were discovered that were not reported to the 11-0. This figure (10) was then compared with the separately reported number of occupational fatal accidents for the 131,000 insured farmers, which was 6. The remaining number of expected but not reported fatal accidents (4) for the 104,000 actively employed (=self-employed) workers who were not covered by the reporting scheme looks very reasonable (3.8 per 100,000 workers, whereas the

overall rate was 3.2 per 100,000). This method thus produced almost precisely accurate results for the fatal accidents of self-employed workers, which are normally not reported to the 11-0. In addition, the detailed statistics also reported 14 commuting fatalities and 92 fatal occupational diseases, of which almost all were caused by asbestos.

The method is not expected to be equally accurate for countries for which the missing portion of information is proportionally much higher.

Results

The results were classified according to the World Bank regions, because regional employment figures were available and comparable countries are reasonably well grouped together. Table 1 covers the Established Market Economies (EMEs) and provides well reported data. The total number of fatal occupational accidents was estimated (calculated) to be 19,662, whereas the reported number was 16,320. For some countries, specifically reported data were used to cover missing information. For example, the fatality rates for Norway are average rates from 1985 to 1989.¹³

The European Union rate (5.89 per 100,000 workers) was calculated for 1994⁷ on the basis of 13 countries according to the model of Eurostat. Data from the Netherlands and the United Kingdom were not used. The resulting rate (5.89 per 100,000 workers) was slightly lower than the latest available given rate from the EU for the previous year, 1993 (6.10 per 100,000 workers). This change may reflect either random fluctuation of the number of accidents from year to year or a real decline and improvement in work environment in the European Union. However, even the fairly well organized reporting systems in Europe miss about 3,000 occupational fatalities (9,027 expected and 5,977 reported).

For some countries, such as Japan, the fatality rate was not reported from the original source but was calculated by the author. This provides another source of error, as the given number of fatalities may well be obtained from a smaller population than the full active employment. Such errors are producing more conservative results and can be corrected once information becomes available.

Major disasters can also be detected, such as the Baltic ferry disaster, which doubles the Swedish figures for the year 1994 from the usual. A similar expected increase is not visible in the Estonian figures, which may be caused by different compensation practices.

Reported figures and corresponding frequency rates are never overestimated, as they are based on facts. However, the mixing of commuting accidents (and rarely diseases) may cause a source of erroneous increase. This is likely to be offset by the more frequent sources of erroneous decrease.

Table 2, on Former Socialist Economies of Europe (FSE), is already somewhat less reliable, given that more data are missing from those countries. Therefore, no meaningful resulting reported data to the ILO for the whole region can be given. The expected number of fatal occupational accidents (15,563) is, however, realistic.

TABLE 1. Fatal Occupational Accidents, Including Traffic Accidents at Work: Established Market Economies (EMEs)

Country	Reported Fatality Rate, (F,) per 105	Employment (E), Millions	Fatalities (F, X E)	Fatal Accidents Reported to ILO	Notes
Australia	7.00	7.921	554	324	1994*
Canada	6.93	13.506	936	724	1994*
Iceland	2.20 [†]	0.137	3	3	1995*
Japan	3.74 [†]	64.570	2,414	2,414	1994
New Zealand	5.30 (1993)	1.560	83	71	1995 [†]
Norway	3.80 (1985-1989)	2.079	79	ou	1995*
Switzerland	7.30	3.776	276	238	1994 [§]
United States	5.30 [†]	124.900	6,600	6,588	1995**
Austria	6.10	3.742	228	160	1994
Belgium	7.00(1991)	3.772 (1992)	264	115	1994
Denmark	2.90	2.555	74	75	1994
Finland	3.20	2.064	66	56	1993
France	7.40	22.110	1,636	1,082	1991
Germany	4.70 ^H	36.076	1,712	1,712	1994
Greece	4.40	3.790	166	56	1994 ^{††}
Ireland	3.60	1.268	46	iv	1994
Italy	4.50	20.002	900	649	1994 ^{††}
Luxembourg	10.00 ^H	0.190 (1990)	19	19	1992
Netherlands	3.10 ^H	6.692	213	213	1994**
Portugal	5.80 ^H	4.458	258	258	1994
Spain	10.20	12.042 (1995)	1,228	1,008	1994 ^{††}
Sweden	6.20	3.928	243	234	1994**
United Kingdom	1.40	25.317 (1993)	354	291	1994
European Union (author calculation)	5.89 ^{H§§}	147.988	8,716 ^t	5,907	
European Union (given rate)****	6.10 (1993 EU)	147.988	9,027 ^t	5,977	1993
Total EMEs (author calculation)	5.37	366.455	19,662	16,320	1994

Italics = data not available.

* Including diseases.

^H Calculated, not reported.[†] Commuting accidents and diseases included.[§] Suva, Luzern.^{††} National Safety Council.^{††} Commuting reduced.

Based on Belgian figures.

** Including commuting but without Public Administration sector.

^H Major shipping disaster.^{††} Work traffic accidents included.^{§§} Based on 13 countries (United Kingdom and the Netherlands omitted).

**** Eurostat 1997-2.

Figures on both India and China (Table 3) are much less reliable and are based on figures from other countries and regions: Malaysia (11.0 per 100,000) in the case of India and FSE (11.1 per 100,000) in the case of China. It is likely that the real figures are (considerably) higher than estimated and are expected to increase closer to the levels of countries in the group Other Asia and Islands (OAI) as the Indian and Chinese economies continue to grow.

The highest rates (23.1 per 100,000) and absolute fatality figures (80,586) are found in OAI countries as shown in Table 4. The reason is that the rapidly industrializing countries such as the Republic of Korea, Thailand, and Indonesia have reported high fatal accident frequency rates. These rates are, however, obtained from a relatively small part of the employed workforce, which is covered by the compensation schemes. The biggest component of the usually noncovered employed workforce is agriculture, which is clearly more dangerous than the average of all industries in the whole world. The given fatality rate in the Republic of Korea in agriculture (90 per 100,000) is close to three times higher than the average fatality rate (34 per 100,000). Methods in agri-

culture may, however, differ, and the average rate in agriculture may be not so high in all other countries of the region.

The component of the Table 5 that covers SubSaharan Africa is almost solely based on the frequency rate in Zimbabwe. Togo figures are close to those in Zimbabwe. The resulting absolute number of fatalities is not much more than an informed guess before further information becomes available. Farmers' fatality rates are, however, providing some indicators as most of the actively employed in the region are occupied in agriculture. Burkina Faso had an agricultural fatality rate of 99.7 per 100,000. Guinea-Bissau had a 6-year average agricultural fatality rate of 90 per 100,000 but this was obviously based on a very small population covered.

Latin-American results are based on figures from the biggest country, ie, Brazil. Other available data (from Bolivia, Colombia, Mexico, Panama, and Guatemala) confirm that the rate for the region (13.5 per 100,000) is reasonable.

The Middle Eastern Crescent has been based on a weighted average of Turkey and Egypt, which are reasonably large samples of the region. The rate in agricul-

TABLE 2. Fatal Occupational Accidents, Including Traffic Accidents at Work: Former Socialist Economics of Europe (FSE)

Country	Reported Fatality Rate (F _r)	Employment (E), Millions	Fatalities (F _r x E)	Fatal Accidents Reported to ILO	Notes
Albania		0.851 (1991)	97		
Belarus	8.90	4.696	417	400	1994
Bosnia and Herzegovina				27	1991
<i>Bulgaria</i>	<i>11.43</i>	2.032	232	2	1994
<i>Croatia</i>	<i>11.43</i>	1.108 (1993)	127	73	1993*
Czech Republic	4.32	5.945	257	257	1994
Estonia	11.60	0.649	75	61	1994 ^H
Hungary	11.40	3.751	427	151	1994
Latvia	7.40	1.205	89	89	1995
Lithuania	6.00	1.675	101	128	1995
Macedonia	6.00	0.396	45		
<i>Moldova</i>	<i>11.43</i>	1.681	192	66	1995
Poland	5.70	14.747	840	645	1994*
Romania	7.00	10.914	763	482	1994
Russian Federation	13.80 (1995)	68.484	9,450	6,770	1994
Slovakia	6.00	2.147	129	121	1994
Slovenia	3.20	0.882	28	25	1994
Ukraine	12.00	19.119	2,294	2,300	1994
Yugoslavia (Serbia)		Unknown			
FSE (10 countries)	11.43	127.060	14,524		
FSF	11.10	140.282 [†]	15,563		1994

Italics = data not available; calculated based on average of other countries in the region.

* Including commuting accidents.

^H Including commuting accidents and diseases.

[†]Source: World Bank.

tural work is again higher than average. The last part of Table 5 shows an overall absolute figure of fatalities in the region to be 41,850.

World figures are summed in Table 6. The world rate is 14.0 per 100,000 workers, and the estimated absolute number of fatal occupational accidents comes close to 335,000. The earlier ILO estimate has been 220,000 fatalities, which is clearly shown to be underestimated.¹⁴

Discussion

HOW TO IMPROVE THE ACCURACY OF THE FIGURES OBTAINED?

The estimated or obtained industry (economic branch)-specific frequency rates and corresponding employment figures from regions or countries that have similar or comparable conditions would provide a more accurate basis for calculations. If, for example, rates for agriculture, construction, transport, and the informal sector could be obtained from representative countries or regions, and if these sectoral rates would be weighted with the actual numbers of sectorally employed workers, the country estimates would be much better.

How TO GET FIGURES OF NONFATAL ACCIDENTS?

The ratio between fatal occupational accidents and accidents causing 3 or more days' absence from work varies with a wide range:

1 per 10, Africa¹;

1 per 600, ILO earlier estimate¹⁵;

1 per 933, U.S. ratio of fatal accidents to all disabling accidents in 1992 (6,529 per 6.09 million)³;

1 per 1,019, Finland [55 per 56,072 accidents causing 3 days or more absence from work in 1994; 1 per 975 in 1993 (56 per 54,623)];

1 per 1,818, and 55 per 99,980, for all reported accidents in Finland; and

1 per 2,029, U.S. ratio of fatal to all nonfatal injuries in 1992 (6,529 per 13.247 million).

A low ratio indicates underreporting of minor accidents, which is very common. No cases of overreporting are expected. A reasonably conservative ratio, 1 per 750, between the fatal accidents and nonfatal accidents could be a basis for a new ILO estimate of nonfatal occupational accidents. This would elevate the ILO estimate of the number of accidents to 250 million per year in the

TABLE 3. Fatal Occupational Accidents, Including Traffic Accidents at Work: India and China

Country	Reported Fatality Rate (F)	Employment (E), Millions	Fatalities (F x E)	Fatal Accidents Reported to ILO	Notes
<i>India*</i>	<i>11.0*</i>	334.000	36,740*	310	Human Development Report 1994, labor force, employment; F, based on Malaysia total (11.0)
<i>China^H</i>	<i>11.1^H</i>	614.690	68,231 ^H	7,235	1994 State-owned enterprises reported

* Italics = data not available; rate based on estimate and Malaysian average (11.0), Indonesia total (43.7), Bangladesh manufacturing (10.0), India mining (42.0), Republic of Korea agriculture (90.0), and Kazakhstan agriculture (15.6).

^H Italics = rate based on Former Socialist Economics of Europe average calculated value.

TABLE 4. Fatal Occupational Accidents, Including Traffic Accidents at Work: Other Asia and Islands

Country	Reported Fatality Rate (F)	Employment(E), Millions	Fatalities (F, X E)	Fatal Accidents Reported to ILO	Notes
<i>Bangladesh</i>	11.00*				1994H
<i>Cambodia</i>	11.00	56.160	47%	119.5	6,178
<i>Comores</i>	11.00	3.780	43%	8.8	415
<i>Fiji</i>	40.00	0.220	38%	0.6	24
<i>Hong Kong</i>	10.90	0.240	35%	0.7	96
<i>Indonesia</i>	43.70	2.915			318
<i>Korea, Democratic Republic of</i>	11.00	78.104	1992		34,131
<i>Korea, Republic of</i>	34.00	10.170	45%	22.6	1,118
<i>Laos</i>	11.00	19.837			6,745
<i>Macau</i>	11.00	2.470	55%	4.5	272
<i>Malaysia</i>	11.00	0.173			19
<i>Myanmar</i>	11.00	7.645			840
<i>Nepal</i>	11.00	16.817			1,850
<i>Pakistan</i>	11.00	8.240	40%	20.6	906
<i>Philippines</i>	36.26	33.047			11,984
<i>PNG</i>	19.20	25.166			4,832
<i>Singapore</i>	11.00	1.920	47%	4.1	211
<i>Sri Lanka</i>	10.50	1.649			173
<i>Thailand</i>	11.00	5.148			566
<i>Vietnam</i>	19.20	32.095			6,162
<i>Total</i>	23.12	34.050	47%	69.5	3,746
		339.840			80,586

Italics = data not available; rate based on Malaysian average rate.

* Dockers F_r = 41.0.

H Human Development Report, Labour Force, 1994¹¹

I Including commuting accidents and diseases.

§ Based on approximately 6 million employees; includes commuting accidents.

|| Manufacturing F_r = 17.5.

¶ Based on Thailand.

|| Including commuting accidents.

whole world, if the estimates are derived from the figures presented above. Using a higher ratio experienced in Finland and the United States (1 per 1000) would result in a world figure of 335 million. In fact, the recently presented ILO, WHO, and United Nations figures (250 million occupational accidents and 160 million occupational diseases) are still based on relatively conservative estimates.¹⁶

How To GET ALL WORK-RELATED FATALITIES?

Commuting accidents are generally not included in the results given above. The ratio of occupational accidents (at the workplace and in traffic at work) to commuting accidents is 68%/32%¹⁷ (or, more precisely, fatal acci-

dents at work/fatal traffic accidents at work/fatal commuting accidents: 49.3%/18.6%/32%). If the estimate for the world, 335,000 fatal occupational injuries caused by accidents, is taken as a baseline, the estimate for fatal commuting accidents will be 158,000 (Figure 1).

The ratio of work-related traffic fatalities from all traffic deaths is 7.67%¹⁷ (traffic at work/commuting: 2.77%/4.89% of all traffic fatalities). In the United States, the ratio of fatal highway work accidents is 3.04 from all fatal road accidents,¹⁸ ie, slightly higher than that in Finland. The ratio of fatal commuting accidents (of all fatal traffic accidents) in the United States is most likely also higher and is probably clearly higher for developing countries, where proportionally less time is

TABLE 5. Fatal Occupational Accidents, Including Traffic Accidents at Work: Sub-Saharan Africa, Latin America and Caribbean, and Addle Eastern Crescent

Reported Fatality Rate (F) per 105	Employment (E), Millions	Fatalities (F, X E)	Notes
Sub-Saharan Africa 21.0	218.400	45,864	Employment 39% of 560 million,* fatality rate based on Zimbabwe, 1995
Latin American and Caribbeant 13.5	195.000	26,374	F, = based on Brazilian rate (13.5); E = 44% of* 444 millionI
Middle Eastern Crescentg 22.5	186.000	41,850	F, based on weighed average rate in Turkey, 28.3, (E = 25,537,000); in Egypt, 12.0 (E = 15,241,400) E = 37%* of 503 million

Italics = data not available.

* Human Development Report, UNDP, 1994.¹¹

H Other fatality rates: Bolivia, 12.5; Colombia, 14.1; Mexico, 12.0; Panama, 22.0; and Guatemala, 25.0.

I Global Burden of Disease, 1996,¹² p. 493.

§ Other fatality rates: Bahrain, 16.5 (1995); Jordan, 8.2; Tunis, 9.1; Cyprus, fishing, 298.1 (1994); Egypt, agriculture, 13.0 (1994); Turkey, agriculture, 39.9 (1994).

|| Global Burden of Disease, 1996,¹² p. 497.

TABLE 6. Fatal Occupational Accidents in the World: Estimates (All Regions)

Region	Fatality Rate (F,) per 105	Employment (E), Millions	Fatalities F, x E	Notes
EME	5.3	366.437	19,662	World Labour Force 2.7 billion
FSE	11.1	140.282	15,563	
IND	11.0	334.000	36,740	
CHN	11.1	614.690	68,231	
OAI	23.1	339.840	80,586	
SSA	21.0	218.400	45,864	
LAC	13.5	195.000	26,374	
MEC	22.5	186.000	41,850	
World	14.0	2,394.667	334,870	

EME = Established Market Economies; FSE = Former Socialist Economies of Europe; IND = India; CHN = China; OAI Other Asia and Islands; SSA = Sub-Saharan Africa; LAC = Latin America and the Caribbean; and MEC = Middle Eastern Crescent.

consumed in leisure-time traffic (and there are fewer motor vehicles).

EXAMPLE

Murray and Lopez¹⁹ estimate that 222,000 road traffic accidents occurred in 1990 in the developed regions. Of those, 7.67% or 17,027 fatal road accidents are work related (at work in traffic or commuting accidents). Roughly the same number, or 17,000 (49.3% of total work-related fatal accidents), are expected to take place at a stationary workplace, and 6,324 while in traffic at work, with a total at work of about 23,000. The calculated figure for such fatalities in EME countries was 19,662 in 1994.

The ratio of fatal occupational accidents/fatal occupational diseases was 51%/49% calculated from all fatal occupational injuries in Finland in 1990-1994, and 40%/60% in 1994.¹⁷ This would mean 325,000 fatal occupational diseases in the whole world. Counting all of these together gives the following figures: 335,000 fatalities at the workplace; 158,000 fatalities for com-

muting between work and home; 325,000 fatal occupational diseases; and 818,000 total fatalities.

This does not, however, cover diseases that are only partially work related, such as diseases of the heart and circulatory system. S. Hansen's (Denmark) estimate in Working Conditions and Environment in Figures 20 is that 10% of such diseases are work related. There are about 6.26 million deaths caused by ischemic heart disease in the world, which would mean, if Hansen's estimate is used, 626,000 additional work-related deaths. Furthermore, the reference values in Finland cover no silicosis, as it is rarely found and practically no fatalities occur any more from this condition. Thus, the number of fatal occupational diseases is expected to be underestimated.

The Australian National Occupational Health and Safety Commission estimates that there are 2,900 work-related fatalities in Australia annually.⁴ The total employment in Australia was 8.235 million in 1995. The frequency rate for fatal work-related injuries (work-related accidents and diseases) is 35.2 per 100,000 workers. The extrapolated world number of work-related fatalities is 843,299.

Murray and Lopez¹⁹ estimate that there were 1,129,000 to work-related fatalities in 1990. Taking into account the missing work-related diseases in the calculations above, the magnitudes of the three methods seem to match well. This number, 1.1 million, could be considered the best available estimate of annual work-related deaths in the world. This means 3,000 deaths caused by work every day.

Figure 1 presents the categories of work-related injuries and the estimates of fatal injuries in each category. Information that will be annually accumulated and added to the ILO databases will certainly increase the accuracy of these estimates; however, radical changes are not expected. Probably a small gradual growth can be expected because of better reporting and increasing world population and active labor force.

Critical Comments

Although the numbers given above are based on practically all available information, precautions in interpreting them are necessary for the following reasons.

1. Conditions are never completely comparable from one country to other; industrial structures influence strongly the rates of accidents. This results in inaccuracies if rates of one country or region are used, in the absence of proper data, to estimate numbers in another area. For example, if mining and con-

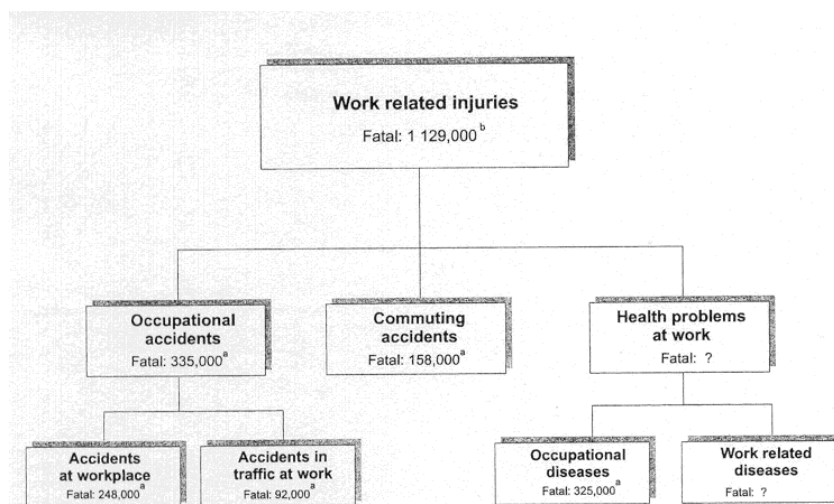


FIGURE 1. Division and categories of occupational injuries. ^aGlobal Annual estimate by the author. ^bGlobal Burden of Disease, see references.

struction industries in one country employ relatively more workers than in another country or region, figures and rates are poorly transferable.

2. Employment figures used were often inaccurate.

3. Underreporting is likely even in the most advanced countries.

4. Only limited information is available for the two most important sectors in developing countries, the agricultural and informal sectors. These cover more than 50% of the world active employment. Additional specifically planned studies should be undertaken to reveal more accurate information.

5. The number of unemployed was estimated, but the number of underemployed has not been taken into account. It is likely that a major proportion of the underemployed are engaged in the informal sector, but details are not available.

Acknowledgments

The staff of the ILO Occupational Safety and Health Branch has contributed greatly to this paper. Mary Anderson has efficiently processed the tables and the text, and K. Mikkola, of the Ministry Health and Social Affairs in Finland, has provided statistical advice.

References

1. Yearbook of Labour Statistics (in English, French, and Spanish). 55th ed. Geneva: International Labour Office, 1996.
2. Recording and Notification of Occupational Accidents and Diseases: Code of Practice. Geneva: International Labour Office, 1996.
3. Leigh JP, Markowitz SB, Fahs M, Shin Q, Landrigan P. Occupational Injury and Illness in the United States. *Arch Intern Med* 1997;157:1557-1568.
4. Australian Occupational Health and Safety. Statistics Bulletin No. 1. Trends Over Recent Years. Sydney, National Occupational Safety and Health Commission, 1997.
5. Leewenson R. Health Impact of Occupational Risks in the Informal Sector in Zimbabwe. Geneva: International Labour Office. Available at <http://ilo.org/public/english/90travail/sechylglpapers/inhimb/index.htm>
6. Accidents at Work 1993. Official Statistics of Finland (in Finnish, Swedish and partially English). Helsinki: Statistics Finland, Ministry of Labour, 1996.
7. Accident at Work in the European Union in 1993: Initial Results. Eurostat. Statistics in Focus 1997/12. Luxembourg: European Communities, 1997.
8. Accidents at Work in the European Union in 1994. Eurostat. Statistics in Focus, 1998/12. Luxembourg: European Commission, 1998.
9. Heinrich HW. Industrial Accident Prevention. 1st ed. New York: McGrawHill, 1931.
10. International Occupational Safety and Health Information Centre. CIS: CISDOC Bibliographic Database (printed, on-line, and CD-ROM versions, in English and French). Geneva: International Labour Office, 1997.
11. United Nations Development Programme. Human Development Report 1994. New York: United Nations, 1994.
12. Murray CJ, Lopez AD. The Global Burden of Disease, Global Health Statistics, World Health Organization, World Bank. Cambridge, MA: Harvard School of Public Health, 1996.
13. Fatal Accidents at Work: Fatal Accidents in the Nordic Countries over a Ten-Year Period. Copenhagen: Danish Work Environment Service, 1993.
14. International Labour Office (ILO)/World Health Organization (WHO). Methods for Health Impact Assessment in Environmental and Occupational Health: Report on WHO/11,0 Consultation. Geneva: ILO/WHO, 1998:20.
15. Programme and Budget for 1998-99. Geneva: International Labour Office, 1997.
16. Annan KA. Occupational health and safety: a high priority on the global, international and national agenda (Editorial). *Afr Newslett Occup Health Safety* 1997;7:51 (also published in *Asian-Pacific Newslett Occup Health Safety* 1997;4:59). Geneva: International Labour Office; Helsinki: Institute of Occupational Health.
17. Accidents at Work 1994: Official Statistics of Finland (in Finnish, Swedish and partially English). Helsinki: Statistics Finland, Ministry of Labour, 1997.
18. Accident Facts, 1996 Edition. Itasca IL: National Safety Council, 1996.
19. Murray Q1-, Lopez AD. Summary: The Global Burden of Disease, World Health Organization, World Bank. Cambridge, MA: Harvard School of Public Health, 1996:1S.
20. Sosiaalija-terveysministeriö. Työolot numeroina. (Ministry of Social Affairs and Health. Working Conditions and Environment in Figures.) Tampere, Finland: Ministry of Social Affairs and Health, 1997.