Introduction

Occupational safety and health (OSH) is increasingly recognized by Latin American and Caribbean governments and international organizations as an important part of public health. OSH concerns extend well beyond the obvious health consequences of work-related illnesses, accidents and deaths. OSH is a key element in the process of social and economic development, with direct and indirect impacts on such areas as the labour market, labour productivity, household income, poverty, social security systems, international trade and the environment.

The Latin American and Caribbean labour force is one of the fastest growing in the world. In 1980 there were 112 million workers; by 1998 the workforce almost doubled, reaching approximately 202 million (ILO 1998). The OSH situation in the region is far from adequate and characterized by three factors. First, there is a general lack of awareness regarding the importance of a safe and healthy working environment. Secondly, data on occupational accidents, illnesses and deaths tend to underestimate the magnitude of the problem. Finally, the region lacks the institutional capacity and infrastructure needed to develop and sustain a safe and healthy working environment. Thus, failure to implement or enforce appropriate safety laws translates into lost production, lost wages, medical expenses, disabilities and deaths.

The occupational health risks discussed in this paper refer to the possibility of suffering a health impairment from exposure to hazards in the working environment. In the risk-assessment literature the term hazard typically refers to the source of risk. The likelihood of harming health from exposure distinguishes risk from hazard: a risk is created by a hazard. For example, a toxic chemical is a hazard to human health, but does not constitute a health risk unless humans are exposed to it.

The aim of this paper is twofold. First, it describes the health and economic dimensions of occupational safety in Latin America and the Caribbean. Work-related injuries and illnesses represent a primary health risk in the region. Specific factors negatively affect work safety in the region: the structure of the labour market, the lack of adequate resources for enforcement, prevention and research, the hazard profile, as well as the presence of vulnerable groups in the workforce. This study estimates that between 27 270 and 73 500 occupational fatal accidents occur in the region each year. It also calculates that the economic costs of these hazards represent between 2 and 4% of regional Gross Domestic Product. The paper concludes by discussing public policies that could address this problem and improve compliance with appropriate safety standards in the region.

Key words: occupational safety and health, Latin America, the Caribbean, work-related accidents

Occupational risks in Latin America and the Caribbean: economic and health dimensions

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This study analyzes health and economic aspects of occupational safety in Latin America and the Caribbean. Work-related injuries and illnesses represent a primary health risk in the region. Specific factors negatively affect work safety in the region: the structure of the labour market, the lack of adequate resources for enforcement, prevention and research, the hazard profile, as well as the presence of vulnerable groups in the workforce. This study estimates that between 27 270 and 73 500 occupational fatal accidents occur in the region each year. It also calculates that the economic costs of these hazards represent between 2 and 4% of regional Gross Domestic Product. The paper concludes by discussing public policies that could address this problem and improve compliance with appropriate safety standards in the region.

Key words: occupational safety and health, Latin America, the Caribbean, work-related accidents
domestic services and self-employed) grew from 42.8 to 46.4%, with corresponding declines in formal employment in both the public sector and large corporations. Job insecurity and precarious contractual conditions characterize employment in the informal sector. A recent survey of more than 90 studies (Jumlan et al. 2001) provides ample evidence that precarious workers – temporary staff, workers subject to job insecurity, personnel employed with outsourcing arrangement, part-time workers – are associated with worse OSH conditions. There are various reasons why the informal sector is linked to adverse OSH outcomes. First, firms in the informal sector have higher turnover, thus less incentive to invest in training and to improve OSH conditions (Foley 1996). Secondly, regulation and compliance programmes usually focus on permanent employees in larger workplaces. On the other hand, the informal sector, by definition, operates outside formal legal standards and regulation.

Workers in small businesses of less than six workers represented around 16% of the total nonagricultural workforce in 1999 (ILO 2000). OSH conditions tend to be worse in small businesses because of the presence of fixed costs and economies of scale in interventions aimed to reduce occupational hazards. Consequently, along with other factors, it is argued that the smaller the industry is, the higher the rate of workplace injury and illness (Loewenson 1994: 97).

Another characteristic is the chronically elevated unemployment and underemployment rates that exist in the region. In many countries, social security insurance and income maintenance for the unemployed are virtually non-existent for those working in the informal sector (Lora and Marquez 1998; Olivera and Lora 1998). Therefore, workers in the region may be more concerned with holding on to their jobs to feed themselves and their families than with the possible health effects of hazardous working conditions.

Labour unions

Each individual worker has an incentive to demand better working conditions, but he or she also faces a high risk of being individually sanctioned or dismissed by the employer. Workers collectively organized in unions are better able to make demands for improving working conditions and to mobilize strikes. Accordingly, unions have been found to improve occupational safety and enforcement of safety regulation (Weil 1991, 1992). In Latin America and the Caribbean, however, even in countries that have high levels of unionization, unions are not always independent organizations that speak for the interests of their rank and file (Laurell 1989; Frumkin 1999; O’Connell 1999). In fact, unions in the region have a chequered history. They have faced severe repression under numerous dictators and military regimes. In other cases, unions have been co-opted to serve political interests that do not necessarily reflect the best interests of their membership and have not been immune to the corruption that exists in all spheres of political and economic life in many countries. For these and other reasons, unions in the region have not been able to play the same positive role in improving working conditions as their counterparts in higher income countries.

Longer exposure and higher hazard profile

Occupational risk is determined both by the level and the duration of exposure to hazards. It is common for employees in many Latin American and Caribbean countries to work 50 or more hours per week, especially in economic activities such as agriculture, fishing, construction, transport and mining (ILO 1998). Thus, even when work is done in environments that are considered safe by standards established in industrialized countries, where the typical exposure is a 40-hour work week, the longer working week may result in exposure levels that exceed safety levels.

To some extent, occupational hazards are related to the geography of the country and to its natural resource endowments. For example, particularly dangerous occupations like mining play a relatively large role in the region due to a significant endowment of primary commodities such as tin, copper and gold. Moreover, high altitude or tropical climates may exacerbate the risk of certain occupational injuries or diseases. Obviously, the impact of such broad factors varies significantly across occupations, sectors and different kinds of hazards, and the evaluation of their net impact requires detailed studies. A recent study by Giuffrida et al. (2001a) analyzes occupational risks in agriculture, mining and the construction industry in Latin American and the Caribbean. Overall, it has been argued that the particular geography and resource endowments of the region exacerbate workers’ exposure to occupational risks (Michaels et al. 1985).

Vulnerable groups

In healthy people, exposure to occupational health hazards may occur up to a certain level without apparent effects because the human body has the capacity to deal with such challenges. However, some individuals can be more vulnerable because of their physical condition, age or gender (Frumkin and Pransky 1999). For example, toxicological evidence suggests that the health effects of exposure to hazardous chemicals are increased by malnutrition, and low protein diets increase the susceptibility of exposed individuals to the toxic effects of pesticides (Calabrese 1978). The population in Latin America and the Caribbean contains a large proportion of people who are less healthy and therefore more vulnerable to occupational exposure to toxic chemicals or biological agents.

Researchers have also documented the increased susceptibility of children and adolescents to toxic substances, particularly pesticides that affect growth and development of the reproductive system (Hunt et al. 1982). In addition, children and adolescent workers may be at greater risk for injuries because of their lack of training and experience (Root 1980). Child labour is still widespread in the region and it is estimated that there are around 17 million children at work (Tokman 1997). Documented examples of particularly dangerous forms of child labour are charcoal production in Brazil, gold and coal mining in Colombia and Peru, and manufacturing of fireworks in Guatemala and Colombia (Harari et al. 1997; Salazar 1998).
Women have been joining the workforce in increasing numbers. They currently account for about 40% of the population in some countries in the region, but they are still segregated into specific job categories and disproportionately represented in low-productivity, low paid and informal employment (Buvic et al. 2002). Women’s participation in the labour force has been beneficial to their social and economic wellbeing, and has also improved the education and health of their children (IDB 1998). However, women are exposed to greater health risks than their male co-workers, and their increased role in the workplace has not generally been met by adjusting work conditions to gender differences (Cabreza 1978). For example, women of fertile age are more susceptible to occupational hazards that affect reproductive functions. When pregnant, occupational hazards pose risks to the growing foetus, which may lead to congenital defects and miscarriages, as well as long-term impairments to the child’s health and development. Women may suffer from musculoskeletal disorders when the tasks or equipment used are designed for the ‘average man’ rather than adjusted to their different builds and physiology. Women appear to suffer from specific stress disorders that result from gender discrimination in the labour market, the double burden of work (workplace and home) imposed by traditional and cultural roles, and also sexual harassment (WHO 1999). For example, a study on women’s working conditions in the Mexican maquiladoras (firms in the northern free trade zone) showed that virtually all supervisors and technicians were men, while more than three-quarters of the operational employees were women. Women were more exposed to toxic chemicals and dangerous work processes than men, and sexual harassment was defined as ‘endemic’ (La Botz 1994).

Moreover, populations that are particularly vulnerable to occupational hazards (children, women and the elderly) are concentrated in informal activities, which are more exposed to occupational hazards. Thus, the negative consequences for the health of these population groups would cumulate.

Fewer resources for enforcement, prevention and research

Recent years have seen a marked increase in OSH related activities in the region. The availability of training for human resources has increased considerably in several countries and new postgraduate training programmes were organized in response to greater demand for specialists (PAHO 1998a). In Brazil, for example, FUNDACENTRO – an institution affiliated to the Ministry of Labour – has trained several thousand engineers, technicians, physicians and nurses since the inception of its programme in 1986, and set up a nationwide network of occupational health laboratories. In Mexico, the Mexican Social Security Institute (IMSS) provides OSH coverage to workers who are affiliated with this system in 1996 the worker’s health department established a national plan with a strong emphasis on health promotion and preventive services.

In relation to regional efforts, virtually all governments are affiliated with the Interamerican Center for the Study of Social Security (CIESI), located in Mexico City. CIESI’s division of worker health conducts widely attended courses and seminars, primarily for health professionals employed by social security programmes. Another regional initiative is the Pan American Center for Science and Social Policy (CEPIS). It is a specialized centre of the Pan American Health Organization established in 1968 and located in Lima, Peru, that contributes to the dissemination of technical information and cooperates in the strengthening and modernization of OSH laboratories.

While recent developments are likely to contribute to the improvement of working conditions, gains are not distributed equally. In most of the countries, social security systems provide OSH coverage only to workers who are affiliated with these systems. Thus a large portion of the workforce is excluded. OSH research is also likely to be under-funded since estimates show that only about 5% of occupational health research in the world takes place in developing countries (Partanen et al. 1999). Overall the region has fewer experts, less safety equipment, less monitoring equipment, fewer inspectors and worse enforcement than developed nations, and the situation is particularly bad in the poorer countries (Delcol et al. 1999).

In sum, occupational health risks are likely to be higher in Latin America and the Caribbean than in the industrialized countries for a variety of reasons related to socioeconomic and political differences. First, workers are more likely to be in informal jobs and small businesses, which tend to have poorer work safety records. Secondly, labour unions have not been effective in pursuing workplace safety. Thirdly, workers work longer and are more likely to be in economic activities that are disproportionately likely to be hazardous, such as agriculture, fishing, construction, transportation and mining. Fourthly, women and children face particular risks when they are employed due to differences in training, physical vulnerability and sexual harassment. Finally, governments have fewer resources for prevention, research and enforcement of occupational safety standards. All these factors need to be taken into account when trying to estimate the magnitude of occupational health risks in the region.

Health dimensions of the problem

It is difficult to quantify the precise rate of occupational injuries and illnesses in Latin America and the Caribbean. The International Labour Organization (ILO) is the principle source of statistics in the area and publishes occupational accident figures based on the national registration systems of the majority of the world’s countries (ILO 1998). Table 1 reports the fatality rate for occupational accidents in Latin America and the Caribbean for which data are available and for some non-regional countries such as Canada, the United States and Finland by way of comparison. However, international comparisons are difficult, as information is not collected with consistent registration and notification systems. In some countries, data cover occupational diseases and accidents associated with commuting, whereas others do not. In most countries, the figures refer only to the number of compensated accidents, whereas in others the data refer to all reported accidents. In the majority of countries, the reporting system covers only the formal sector of the economy.
Overall, the average fatality rate in Latin America and the Caribbean is reputed to be 0.135 per 1000 workers. However, there is a large variation in fatality rates across the region, which vary from the absence of fatal accidents reported by Barbados in 1995, to 0.33 accidents per 1000 workers recorded in El Salvador in 1998. The absence of fatal accidents in Barbados may be explained, at least partially, by the fact that its economy is disproportionately based on economic activities such as tourism, which present lower occupational risks. On the other hand, the low accident rates in countries like Trinidad & Tobago and Venezuela may simply reflect the deficiencies of the reporting systems of these countries since primary extraction plays such a large role in their economies.

Estimates for the whole population

Owing to the difficulty of relating the cause of the illness to the working environment. Thus, there is likely to be a high level of misattribution of occupational diseases to other sources (Wünch Filho 1995). For example, Keifer et al. (1996) used a community questionnaire to estimate the degree of underreporting in a regional pesticide poisoning registry in Nicaragua and showed that even in a region with a strong emphasis on reporting illness in targeted conditions, 65% of the cases remained unreported.

In order to estimate the total number of work-related impairments in the region we use the methodology suggested by Takala (1999), which is based on applying the rates of the population covered by reporting systems to the whole workforce. The average rate of fatal occupational accidents is 0.135 per 1000 workers and the estimated workforce in Latin America and the Caribbean was around 202 million in 1998. Thus, about 27,270 fatal occupational accidents occur each year in the region. This figure is very close to the 26,374 fatalities per year in Latin America and the Caribbean estimated by Takala using data from 1994, and it is more than three times larger than the 7,443 fatal injuries reported in the official ILO (1998) statistics of the region. In the established market economies the fatality rate was 0.053 per 1000 workers. Therefore, if workers in Latin America and the Caribbean were exposed to the same risk of dying from occupational factors as workers in the established market economies, more than 16,500 lives could have been saved each year.

Presumably this is a conservative estimate of the actual number of fatal occupational accidents as it is based on the following assumptions:

### Table 1. Occupational fatality rates

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Fatality rate per 1000 workers</th>
<th>Workforce covered by ILO data (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbados</td>
<td>1995</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td>1997</td>
<td>0.111</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>1996</td>
<td>0.150</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>1996</td>
<td>0.077</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1997</td>
<td>0.069</td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td>1994</td>
<td>0.168</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>1998</td>
<td>0.330</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>1997</td>
<td>0.120</td>
<td></td>
</tr>
<tr>
<td>Nicaragua</td>
<td>1998</td>
<td>0.096</td>
<td></td>
</tr>
<tr>
<td>Panama</td>
<td>1998</td>
<td>0.140</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>1998</td>
<td>0.186</td>
<td></td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>1997</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>Venezuela</td>
<td>1997</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>1998</td>
<td>0.135</td>
<td>27.3</td>
</tr>
<tr>
<td>Canada</td>
<td>1997</td>
<td>0.071</td>
<td>84</td>
</tr>
<tr>
<td>USA</td>
<td>1997</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>1998</td>
<td>0.027</td>
<td>82</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>1998</td>
<td>0.290</td>
<td>58</td>
</tr>
</tbody>
</table>

1 commuting accidents are included; 2 occupational diseases are included; 3 both commuting accidents and occupational diseases are included.

a compensated injuries; b reported injuries; c average weighted by the number of workers covered in each country.

In the workforce covered by reporting systems, all fatal occupational accidents were reported. The fatality rate in the formal sector of the economy was the same as in the informal sector. Fifty per cent of the workforce was employed in the formal sector of the economy. Clearly, the estimate is quite sensitive to these assumptions. If any of the above factors is changed, the estimate changes dramatically. In Table 2, we modify these parameters toward more plausible levels, assuming that only half of occupational fatalities are reported (instead of 100%) and that the rate of occupational fatalities in the informal sector is 50% higher than in the formal sector (instead of being the same). Under these new assumptions, the estimate of total annual occupational fatalities would be about 68,000.

In a similar fashion, it is possible to derive a more likely estimate of non-fatal accidents using this information about fatal accidents. Various studies have demonstrated that where reporting is reliable, a roughly constant ratio between fatal and non-fatal accidents exists (see Takala 1999). We use the ratio of 1 fatal accident per 750 non-fatal accidents as a conservative estimate and the ratio of 1 per 1000 non-fatal accidents that is actually observed in countries with a more sophisticated reporting system, such as Finland and the United States (Leigh 1996, ILO 1998). Using this methodology, we conservatively estimate that there are between 20 and 27 million occupational accidents causing 3 or more days’ absence from work in Latin America and the Caribbean in any given year. A less conservative estimate, taking the alternative scenario, leads to an estimate of 51–68 million non-fatal accidents each year.

**Economic dimensions of the problem**

Data on the economic consequences of occupational accidents and diseases are very scarce, both in developed and developing countries. The most accurate study of the economic costs of occupational injuries and illnesses at national level was produced in the United States and estimated that they represented approximately 3% of US Gross Domestic Product (GDP) during 1992 (Leigh et al. 1996). The ILO and the World Health Organization (WHO) have produced some approximation of the total burden of occupational accidents in Latin America and the Caribbean, arguing that the cost of occupational accidents may represent as much as 10% of the GDP (PAHO 1998a: 90).

In the region the only solid information that is available is social security payments for health care and indemnification for work-related disabilities and deaths. Table 3 summarizes the information available from several Latin America countries (PAHO 1998b). The situation is quite different among countries. In Costa Rica, where the National Insurance Institute covers 68.4% of the country’s workforce, direct costs of occupational injuries and diseases amounted to US$47.9 million in 1995, representing nearly US$70 per insured worker. In other countries, spending was significantly lower. For instance, in Chile in 1996 expenditures were US$33.80 per insured person. Of the countries listed here, Mexico spent the least – just US$21.26 per insured worker. Considering data from all the countries, the average social security expenditure per insured person amounted to US$30.62 per year.

This direct spending by social security institutions is only one part, and a relatively small part, of the social costs of occupational injuries and diseases. Costs that are not directly compensated for by the social security systems are borne by workers, their families, employers, the public health system and taxpayers. For example, in Australia the Industry Commission estimated that injured workers and their families bore around 30% of total costs of occupational illness, employers bore another 30%, and taxpayers accounted for about 40%. A similar distribution of these hidden costs was found in Norway (Quinlan 1999). The fact...

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**Table 2. Estimate of occupational accidents**

<table>
<thead>
<tr>
<th></th>
<th>Conservative estimate</th>
<th>Alternative estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporteda</td>
<td>7,443</td>
<td>7,443</td>
</tr>
<tr>
<td>Total unreported</td>
<td>19,827</td>
<td>60,704</td>
</tr>
<tr>
<td>Total fatal accidents</td>
<td>27,270</td>
<td>68,147</td>
</tr>
<tr>
<td>Excess of fatal accidents compared with EME</td>
<td>16,588</td>
<td>57,465</td>
</tr>
<tr>
<td>Non-fatal accidents with 3 or more days out of work (millions)</td>
<td>20–27</td>
<td>51–68</td>
</tr>
<tr>
<td>Assumptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reported rate of fatal occupational accidentsa</td>
<td>0.135</td>
<td>0.135</td>
</tr>
<tr>
<td>Rate of reporting in the formal sector: LACc</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Rate of reporting in the formal sector: EMEc</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Rate of fatal injuries in the informal sectorc</td>
<td>0.135</td>
<td>0.2</td>
</tr>
<tr>
<td>Share of the informal sectorc</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Nonfatal/fatal accidents ratio d</td>
<td>750–1000</td>
<td>750–1000</td>
</tr>
<tr>
<td>Rate of fatal injuries and occupational accidents in EMEd</td>
<td>0.053</td>
<td>0.053</td>
</tr>
</tbody>
</table>

EME = Established Market Economies; LAC = Latin America and the Caribbean.
Sources: a ILO (1998); b ILO (1999); c authors’ estimate; d estimated by Takala (1999).
that employers bear only a portion of these costs has implications for their incentives to create safe workplaces, as will be discussed in the following section.

To our knowledge, there are no studies in Latin America and the Caribbean that provide similar evidence on the distribution of costs borne by social actors other than the social security institutions. However, we expect that in the region, as well as in other developing countries, the distribution of costs is likely to be different because of the much smaller role of social security and public health systems. In particular, the share of costs borne by workers and their families is likely to be larger because of the large share of workers who do not have formal insurance coverage for occupational injuries and diseases.

In order to estimate the social costs of work-related accidents and their allocation among social security systems, injured workers and their families, employers, and taxpayers, a certain number of assumptions and extrapolations using the scarce information available will be necessary.

First, even if workers or survivors receive social security benefits in the event of an occupational accident, these benefits probably do not compensate completely for the economic costs (e.g. loss of income, extra expenditure on medicine) and non-economic costs (e.g. contribution to home activities, pain and suffering). Moreover, around 50% of the regional workforce is employed in informal activities and is typically excluded from social security and public health systems. For informal workers then, the costs of medical care and lost income are absorbed almost exclusively by the injured workers and their families. Because information on these costs to workers and their families is not available, we use two alternative assumptions to estimate these costs; namely, that these costs are, respectively, two and three times the average benefit received by injured workers when they are covered by social security.

Work-related accidents and diseases also generate costs for employers that are generally neither quantified nor even acknowledged. These costs are associated with replacing the worker, i.e. recruitment and training for replacements. But a firm’s output may also drop after an accident because the productivity of other workers falls, either because their work depends on and complements the injured worker, or because the injury reduces morale and increases stress. In addition, there may be damage to equipment, machinery, materials or facilities caused by the accident.

These indirect costs to employers are often unnoticed or uncounted. And employers are unlikely to try to improve safety when these costs are unacknowledged. Even where the direct and indirect costs are recognized by firms, the fact that firms bear only a portion of total social costs means that they do not have economic incentives to invest sufficiently in safe workplaces.

A long-standing issue in the OSH literature is the relative size of these indirect costs relative to direct costs, where direct costs are generally defined as those insured through workers compensation. Dorman (2000) explicitly addresses the varying definitions of direct and indirect costs to firms and illustrates the distinction with reference to specific studies. Heinrich et al. (1980) conducted a series of studies and estimated that, on average, indirect costs are four times the immediate direct costs. More recent studies surveyed by Dorman (1999) suggest an indirect to direct costs ratio of 1 : 1. In our calculation we use two indirect to direct costs ratios, a conservative estimate of 1 : 1 and an alternative assumption of 3 : 1.

Finally, the economic consequences of occupational injuries spill over to other sectors of the economy. For instance, occupational accidents may produce increases in the demand for public health services and other welfare agencies if they exist and are accessible. These public health care services are usually financed out of general revenues and are borne by taxpayers. Though it is not easy to estimate the amount of this cost, a recent study found that agrochemical poisoning in Yucatan (Mexico) cost US$2.7 million per year to the economy of that region (equivalent to 2% of the value of agricultural production), and 30% of this cost was borne by the state medical system (Drucker et al. 1999). Taxpayers are estimated to bear a similar proportion of work-related costs in Australia and Norway (Quinlan 1999), and we adopted this assumption in our estimate.

### Table 3.

<table>
<thead>
<tr>
<th>Country (year)</th>
<th>Costs for the social security (US$ millions)*</th>
<th>Workers insured*</th>
<th>Proportion of the workforce that is insured (%)*</th>
<th>Cost per person insured (in US$)</th>
<th>Cost per person insured/GDP per capita (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile (1996)</td>
<td>122.5</td>
<td>3,624,129</td>
<td>68.40</td>
<td>33.80</td>
<td>0.90</td>
</tr>
<tr>
<td>Costa Rica (1995)</td>
<td>47.9</td>
<td>687,114</td>
<td>58.82</td>
<td>69.71</td>
<td>3.29</td>
</tr>
<tr>
<td>Mexico (1996)</td>
<td>196.7</td>
<td>9,251,639</td>
<td>26.26</td>
<td>22.26</td>
<td>0.67</td>
</tr>
<tr>
<td>Panama (1996)</td>
<td>12.8</td>
<td>522,698</td>
<td>60.27</td>
<td>24.49</td>
<td>0.93</td>
</tr>
<tr>
<td>Peru (1996)</td>
<td>12.7</td>
<td>509,234</td>
<td>8.31</td>
<td>24.94</td>
<td>3.19</td>
</tr>
<tr>
<td>Venezuela (1995)</td>
<td>118.2</td>
<td>2,087,225</td>
<td>27.21</td>
<td>56.63</td>
<td>1.75</td>
</tr>
</tbody>
</table>

Sources: * PAHO (1998b); * calculation based on ILO (1998); * IDB (1998).
Using this information, Table 4 presents some independent estimates of the economic costs of occupational accidents and injuries. Using the average social security expenditure of US$30.62 per insured worker we get a conservative estimate of US$26 billion in social costs due to occupational accidents and injuries, representing about 2% of GDP annually. After adjusting certain factors – namely the ratio of indirect and family costs to direct costs – we get an alternative estimate of about US$53 billion in social costs. This represents approximately 4% of the annual GDP of the region, which is not quite as high as the ILO and WHO estimates, but still represents a considerable cost to society. Of this estimated US$53 billion, social security institutions compensate only 6 to 12%. The remaining costs are borne by workers and their families (US$9–15 billion), employers (US$6–18 billion) and taxpayers (US$8–15 billion).

The ranges of these estimates are an indication of the limited availability of data and the need to make assumptions regarding key parameters. Nevertheless, these estimates corroborate other studies which have concluded that the social costs of occupational hazards are quite high. They also demonstrate that occupational hazards are particularly costly in the region. And finally, they demonstrate that most of these costs are distributed across society in unmeasured and unacknowledged ways.

Regulation and incentives to promote occupational safety

How much should be done?

Given the high costs of occupational injuries and diseases indicated above, how much should occupational hazards be reduced before the workplace can be considered safe? And what should be done to improve workplace safety? Answering these questions requires a consideration of how societies view risk reduction and the role they will give to considering potential trade-offs between expenses for improving safety and the magnitude of the resulting benefits. It will also require a consideration of how these safety expenses and benefits are distributed and whether or not they are visible. This latter point is particularly important to any policy recommendations because, as seen earlier, most of the benefits from improving safety are indirect, unacknowledged and split between workers, their families, employers and taxpayers in ways that limit the economic incentives for any one group to assume the full responsibility for sufficiently improving safety.

Fortunately, there are times when answering the first of these questions (‘how much prevention?’) is relatively easy. When the process of reducing occupational hazards actually improves labour productivity more than the costs of the safety intervention itself, then there is no trade-off between improved safety and costs, and the intervention is clearly of net benefit to society. The decision to dedicate funds and incentives, or to regulate or take legal action, is unequivocal. For example, one study which analyzed potato production in Ecuador demonstrated that if the use of some particularly harmful pesticides was avoided, the reduction in the harvest was smaller than the increase in production generated by the improvements in workers’ health (Antle et al. 1998). On the other hand, policies aimed at reducing occupational hazards frequently generate a trade-off between workers’ health and productivity or jobs. In such cases, there are at least three ways in which societies have addressed the question of how much effort and resources should go into improving workplace safety.

The first of these approaches is to aim for the minimum level of risk. However, if ‘minimum risk’ is defined as ‘no risk’, then it is unattainable as it could only be achieved in a society where no one worked (Murray and Lopez 1999). Therefore,
the ‘minimum risk’ for occupational hazards is difficult to define without relating it to some other objective.

A second approach is to aim for some predefined threshold of risk, i.e. one in a million or ‘the same risk as in the average home’. Such thresholds are difficult to set because they are generally arbitrary. They also fail to address the societal costs of prevention because the same resources applied to improving workplace safety might provide more benefits to society, workers and their families if applied in other ways (education, removing environmental hazards, transportation safety, etc.).

A third option is to aim for a socially efficient level of risk, where the potential benefits of a marginal improvement in safety equal the expected costs required to achieve that reduced level of risk. In many cases the costs of safety are so trivial, and the benefits are so large, that the decision to proceed is obvious. The fact that more than two-thirds of the benefits from improved safety are indirect will weigh heavily in such judgements. In other cases, it becomes more difficult to judge whether or not safety improvements that go beyond a certain level of risk reduction, cost more than they are ‘worth’. Presumably Latin American and Caribbean countries have many opportunities to improve occupational health and safety in ways that are cost-effective, given the generalized lack of safety provisions and the excessive rates of fatal- ities and non-fatal injuries documented above. There are many simple measures, such as adequate ventilation and unobstructed work areas, that would go a long way toward reducing occupational risks in the region.

In general, weighing the costs and benefits of improved occupational safety is difficult, both technically and politically. Some public agencies are explicit in quantitatively evaluating risk-reducing interventions through assigning monetary values to benefits that can then be compared to the costs of implementing the measure. By law, the US government is required to do such quantitative analyses. In order to take indirect costs into account, US agencies have made efforts to estimate the ‘benefit value’ that should be attributed to a life. Viscusi (1993) surveyed the studies available in the US literature and found that the implicit value of life was estimated between US$600,000 and US$16.2 million – a wide range of values that are also subject to a variety of methodological, if not ethical, critiques (see, for example, Dorman 1996).

When such technical evaluations of occupational safety measures are undertaken, there are at least two issues that are rarely addressed but which are of great importance. First, an evaluation cannot assume that technology will remain static. In fact, we know that technology changes constantly (generating safer materials and processes even while it may introduce new and unknown dangers), in ways that change the relative costs of production. But of even greater importance, establishing standards and imposing requirements can actually induce technological advances. Many examples are available from cases where new materials have been developed to replace ones that were harmful to human health or the environment, such as PCBs, Freon and lead in paint.

The second major issue is related to the distribution of benefits and costs. In cases where a trade-off between worker safety and productivity occurs, the most visible benefits of improved safety will go to the affected workers, while the costs of improvements may be borne by shareholders (through reduced earnings), consumers (through higher product prices) and/or other workers (through higher unemployment). The indirect benefits of improved safety to employers and taxpayers are less visible, but will also affect the distribution of costs and benefits. These indirect benefits of improved safety may or may not offset the additional costs of preventive actions. Where the benefits are large and costs are small, the distributional consequences will be minor. But in cases where all benefits and all costs (both direct and indirect) are of similar magnitudes, distributional consequences will be of greater importance and cannot be ignored.

In reality, few decisions about safety measures and regulations are made purely by technical analysis. In fact, existing occupational safety levels are really the outcome of many social forces, at different levels and in many places. Workers have struggled for improved working conditions both through direct negotiation with firms and business associations and through political pressure brought to bear on governments (Dorman 1996). The challenge for public policy is to respond with solutions that are both effective and proportional to the occupational hazards involved.

**Safer workplaces through effective regulation, outreach, and incentives**

Countries use a variety of methods to improve workplace safety. The most effective approaches are likely to combine a mixture of regulations, outreach and incentives. The process of setting workplace safety standards goes beyond the scope of this paper and is covered extensively by other sources (ILO 1997). Rather, the purpose here is to consider the implications of the estimated costs of occupational hazards and their distribution for inducing greater investment in workplace safety.

Even in the absence of public policies, laws and enforcement, many employers will take measures to reduce occupational risk, if only out of self-interest. As we saw earlier, occupational accidents generate direct and indirect costs for firms, which encourage employers to take precautions. However, because the total social burden of occupational injuries and diseases is distributed across other groups, employers do not have sufficient economic incentives to make adequate investments in workplace safety (Dorman 2000).

This opens an avenue for public policy to induce better safety conditions through judicious use of economic incentives. Firms will have greater economic incentives to make workplaces safer if they must pay workers more for hazardous occupations. They will also be encouraged to invest in safety if they are legally liable for workplace injuries when they can be attributed to a failure by the firm to protect its workers. If litigation is a credible threat, firms may invest in safety in order to avoid costly litigation and judicial awards or workers’ compensation benefits. Employers also face incentives to
invest in safety when they are taxed or charged for insurance premiums in relation to their past safety performance.

The impact of insurance bears particular scrutiny because at the same time that it creates a compensation mechanism for workers, it reduces the incentive for firms to improve workplace conditions by reducing their liability. This creates a situation of 'moral hazard' for the employer (in theory for the employee, as well) to reduce safety at work. However, if insurance premiums are based on a firm’s previous safety record, this so-called ‘experience rating’ encourages investment in safety by offering the promise of lower insurance premiums in the future (Lanoie 1991). To demonstrate the complexities, such experience rating can also encourage under-reporting of occupational injuries. This demonstrates how economic incentives often need to be coupled with improvement in the resources and capacity of the public sector’s surveillance and enforcement system. Guiffrida et al. (2001b) discuss these issues in the specific case of Mexico.

Economic incentives have a number of advantages over other forms of public action, such as regulation, because they are effective in getting employers’ attention. Such incentives can also be designed to reach higher safety standards than might be forthcoming from a regulatory approach that merely establishes ‘minimum standards’. Economic incentives also adapt more rapidly to new risks than standard regulatory approaches, which require time to design and enact. Finally, economic incentives have the advantage that they allow firms themselves to seek out the most efficient ways of achieving the safety goals (Dorman 2000).

But economic incentives are only one important tool for public policy aimed at improving the workplace. The most common approaches have been to regulate safe workplaces by establishing and enforcing standards, and to provide ‘outreach’ services that share new production technologies and methods for increasing safety (along with strong advocacy work). There are costs to designing and implementing such regulations, but where most countries in the region have fallen short is on enforcement. Therefore, it is worth considering under what conditions employers might actually be willing to cooperate in promulgating and following safety standards. Two of these conditions are related to competitive pressures and information costs.

Competitive pressures make it difficult for individual firms to take the lead in improving occupational safety standards, even when they want to, because these initiatives may raise their costs over and above those of their competitors. Thus, collective enforcement of certain occupational safety standards, by the government or even private industry associations, may be the only way to assure that socially beneficial standards are followed and ‘defections’ from the common agreement are limited.

Information costs are another impediment to the adoption of better occupational safety measures. It can be costly for a single firm or a single worker to investigate occupational hazards and remedies. By banding together in industry associations or unions, collective actions can be taken to research these issues and find effective ways to better working conditions. Many of these experiences in industrialized countries have been conducted under the framework of ‘self-regulation’ or ‘co-regulation’. Induced technology, referred to earlier, can be one result of such collaborations. In many cases, governments take on the role of improving the amount and kinds of information that are available to workers and firms. Ashford (1976) provided a justification of imposing OSH regulation based on the argument that these standards represent a ‘public good’.

Public information about occupational hazards and about collectively established standards can be of particular value to workers when negotiating with their employers. On the one hand, the existence of public standards can provide moral backing to unions or groups of workers who are trying to negotiate changes with a particular firm or industry. On the other hand, the provision of better information can improve decisions made by workers regarding how much risk they are willing to assume when taking a job, or choosing between different careers.

One study simulated the effects of tighter enforcement of safety standards in the Mexican economy and demonstrated that more stringent regulations can be beneficial to firms and workers alike (Maskus et al. 1995). The authors pointed out that this policy would improve information in the market and better disclose the true level of hazards. Thus, tighter safety standards would have a positive impact on workers. But, firms would also benefit because pricing of goods and wages would incorporate more accurately the occupational hazards of the various industries. Just such an effect was empirically demonstrated in a study of Quebec’s manufacturing, showing that the enforcement of occupational safety and health regulations had a positive effect on productivity growth of the sector in the mid-1980s (Dufoir et al. 1998). Therefore, tighter regulation of occupational health in the region should not be viewed solely as a constraint upon employers, since it may also be a potential mechanism for increasing productivity and profitability.

In general, any form of economic incentives, regulation or outreach will be constrained in Latin America and the Caribbean by the same institutional and political factors that constrain effective legal, administrative and judicial enforcement of public policies. In particular, unsystematic responses by the judiciary to civil suits currently make it difficult for employers’ liability to play more than a minor role in inducing preventive actions, except in a few countries and in particular those of the Caribbean. There are more hopeful experiences in the collaboration between large employers’ associations and social security institutions in several countries, such as Chile, indicating that this avenue is worth exploring in other countries of the region. Also, current initiatives to extend health insurance beyond the formal sector are promising with regard to easing the burden of medical expenses currently borne by informal sector workers and their families. It may be that the main challenge is for public policy and public administration in the region to shift away from the current model of ‘supervision’ and audits – which is overextended, generally ineffective and sometimes
corrupt—toward a model that is more flexible, innovative and aimed at better compliance by providing information about workplace hazards and safer technologies, establishing open and publicly debated standards, and introducing intelligently designed economic incentives through experience rating, taxes and subsidies.

Before concluding, it is important to recognize other factors that lead employers to be more responsive to occupational health concerns less directly related to economic incentives and regulation. In fact, there is an extensive literature arguing that the characteristics of a firm will make it more or less receptive to internal and external pressures for safer working conditions. Often the most important determinant of a company’s response to new occupational safety regulations is its existing ‘safety culture’ (Saari et al. 1993), which is defined as the combination of the importance the company attaches to safety, and its ability and willingness to take effective action.

Other characteristics of the work environment that affect compliance are the degree of workers’ participation, the presence of labour unions, the relative power of the union and the union’s level of internal democracy. In general, studies in developed nations have found that occupational safety is greater in countries and industries where there is an open social and political dialogue about safe and healthy working conditions. Also, when unions effectively represent workers, occupational safety is enhanced both by creating a favourable climate for protective measures and by creating mechanisms to ensure compliance with safety standards. In these terms, occupational health policies need to explicitly address improvements in relations between workers and unions, and toward greater ‘democratization’ of industrial relations, which can include processes of so-called ‘co-regulation’ (see Dorman 1996).

The shift in Latin American countries away from authoritarian governments certainly improves the chances that unions can play a positive role, at least among the formal sector workers who they represent. The linkage between unions and political parties in the region sometimes subsumes worker interests within larger political goals, but it can also provide valuable leverage for improving public sector activities and legislation aimed at greater worker safety. Historically, the region’s unions and employers have been relatively antagonistic to one another. Therefore, efforts to introduce more collaborative approaches to improving workplace conditions are contingent on an improvement in union–employer relations.

There is some room for optimism in the region because, over the past two decades, countries have generally become more democratic and participatory, and have improved their regulatory and enforcement capacities. But progress is not systematic. As countries enter into multilateral agreements, such as the WTO, many questions arise regarding whether labour standards will be eroded or strengthened by greater globalisation. Similarly, debates continue over whether foreign direct investment harms workers in the region, by exposing them to more hazards and greater exploitation, or improves worker safety by introducing better work practices and safer technologies. A full review of these issues is beyond the scope of this paper, but bears a serious consideration as the region embarks on a review of public policy toward occupational hazards in Latin America and the Caribbean.

Conclusion

Latin America and the Caribbean have a high incidence of occupational injuries and diseases. This is due, in part, to particularly high risk in many of the region’s economic activities, but also to limited collective efforts to improve workplace safety. Occupational injuries and illnesses are generally under-reported in the region. This is due to data collection systems that are restricted to places of formal employment, to reliance on employers for notification in the face of incentives that discourage such notification, and misattribution of occupational diseases to other sources of illness by physicians. More consistent and standardized injury and disease surveillance is clearly required.

We calculated that if workers in Latin America and the Caribbean were exposed to the same risk of dying from occupational factors as workers in established market economies, between 16,500 and 57,000 lives per year could be saved. Moreover, we have estimated that the economic consequences of work-related accidents and diseases represent between 2 and 4% of the GDP of the region.

Latin American and Caribbean countries also illustrate the disparity that often exists between legislation ‘on the books’ and reality. Some countries in the region have a relatively complete set of laws regarding occupational health and safety, but enforcement is erratic. Legislation alone cannot improve workplace conditions, and consequently excessively hazardous conditions persist.

Instead, public policy needs to look beyond constitutional guarantees and legal provisions toward a variety of measures that can alter this situation. Such policies need to support the generation and dissemination of information regarding the importance of occupational safety, its costs and its remedies, thereby informing the continuing debates between workers, firms, occupational health professionals and regulators. Public policy must pay attention to finding the most effective ways to induce compliance with laws – whether through economic incentives, audits, litigation, direct supervision or outreach.

The social and human costs of occupational hazards are simply too large to overlook any of the available policy instruments.

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