"Adding Insult to Injury": Poverty and Injury in South Africa[1]

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ABSTRACT

Poorer persons in South Africa are more likely to have suffered intentional injuries and in particular injuries resulting from assaults and traffic collisions. There is a need therefore for programs aimed at improving safety in poor communities and for public health programs aimed at enhancing road safety. Absentee auditing can be particularly useful in the identification and correction of the underlying causes of these injuries and illness and in their treatment, because a relatively large number of workers have reportedly been absent from work as a result of occupational injury and illness. Given the higher incidence of occupational injury and of accidents at work amongst workers in poorer households, who are more likely to be employed in the informal sector, the expansion of occupational health and safety programs to an increasing number of workplaces and in particular to the informal economy should be a priority. The significance of alcohol dependence and of obesity in risk of illness and injury and of being absent from work as a result highlights the importance of health and wellness programs and of absentee auditing in enhancing the health of the general South African working population.

[1] I wish to extend a word of thanks to Rosana Norman (Medical Research Council) and Danuta Kielkowski (National Department of Health), who provided me with invaluable assistance in doing this work. The data employed in the analysis has been obtained from the National Department of Health. The views presented in this paper are those of the author and should not be attributed to the Department.

1. INTRODUCTION

Injury and particularly unintentional injury have been described as an accelerating epidemic. This epidemic is likely to worsen as poverty and inequality increase and as globalization, urbanization and industrialization continues to accelerate. The poor, moreover, has been argued to suffer the most insofar as they have limited access to those mechanisms that can reduce their exposure to risk of injury. As in the case of injury in general, occupational injury and disease are also associated with disparities in levels of economic development. Occupational health and safety is problematic in developing countries due to poor working conditions, especially in the informal sector, which amongst others are exacerbated by low literacy levels, the increased mechanization of the production process, and an increasingly competitive market place. There, furthermore, is good reason to believe that the poor (or in other words workers at the bottom end of the formal economy and those in the informal economy) are more likely to suffer from occupational injury and disease, given that they are less likely to be working in an environment where their rights to a safe working environment are protected. According to Zwi (1999: 270), moreover, relatively little work has been conducted in developing countries in exploring inequalities in injury and the structural and other determinants of exposure to risk of injury. As a result, it is of interest to consider the relationship between poverty and injury in general and occupational injury and disease in particular in South Africa. These inequalities in health are what Deaton (1999: 4-5) refers to as 'differences in health across different socioeconomic groups'. He also describes health inequalities as 'deeply offensive, more so than the economic and social inequalities to which they are related', with their elimination presenting a major focus of public health policy (Deaton, 1999: 6).

2. DATA AND METHOD

The relationship between poverty and injury is explored here with the aid of data from the South African Demographic and Health Survey (SADHS). Macro International has since 1984 conducted more than 70 such surveys in more than 50 countries (Sahn and Stifel, 2000: 9). The first such survey in South Africa, which represents a national survey on a representative sample of the non-institutionalized population, was conducted in 1998. The SADHS is the first survey in South Africa that provides national level data about non-

fatal injuries occurring in the general population, while it also provides the 'most broadly based indication of work-related health concerns available to date for South Africa' (Department of Health *et al.*, 2002: 188). The data employed in this particular analysis is that collected from the 12 247 households (including information for 52 906 individuals) and the 13 827 adults aged 15-49 that were interviewed as part of the survey (Department of Health *et al.*, 1999). Important, is to emphasize that these data refer to self-reported injury and illness, which of course depends to a large extent on the perceptions of respondents of these medical matters. The problem, however, in many other analyses is that the incidence of occupational disease has to be estimated from available information on reported caseloads of diseases and estimated exposures to hazardous substances in different occupations (Herbert and Landrigan, 2000: 541)[2].

In order to determine the relationship between injury and poverty, ones requires an indicator of socioeconomic status. The SADHS does not include questions on income and expenditure, which means that it is not possible to apply the conventional approach to the measurement of poverty. Filmer and Pritchett's (1998) asset index approach to the measurement of poverty, which is employed in the World Bank's HNP country reports to quantify differences in health by socio-economic status, was applied to the South African data. An analysis of this asset index has shown that the index represents an internally coherent, robust and comparable measure of poverty (Booysen, 2002a).

The relationship between poverty and injury is explored here by comparing indicators on the incidence of injury across persons of different socioeconomic status. Persons are assigned the score on the asset index for the particular household to which they belong. For the purpose of these comparisons, scores on the asset index are divided into population quintiles, with comparisons being made across the five quintiles. The country reports on 'Socio-economic differences in health, nutrition and population' compiled by the World Bank and which investigate inequalities in health with the aid of data from DHS surveys employ two summary indicators of inequalities in health. The *poor/rich ratio*, calculated as the outcome in the poorest quintile divided by that in the richest quintile, is a rather crude index indicating the extent of disparity between the poorest and richest 20 percent of the population. This ratio, however, provides no

[2] Takala (2000b), for example, estimates that nearly a million global deaths resulting from cancer, cardiovascular and cerebrovascular disease, chronic respiratory disease, pneumoconiosis, nervous system disorders and renal disorders in 1990 could be attributed to occupational causes, based largely on exposure estimates from the United States. Calculations based on an alternative method put the estimate of deaths that could be attributed to occupational exposure to hazardous substances in 1990 at some 340 thousand (Takala, 2000b).

information about the middle three quintiles. The *concentration index* reflects the extent to which a particular health status is distributed unequally across the five wealth quintiles. According to an evaluation by Wagstaff *et al.* (1991: 545-550) of measures of inequality in health, the concentration index is one of only two measures that met all four their criteria of evaluation, the other being the slope index of inequality (SII). As such, the focus here falls primarily no the analysis of the estimates of the concentration index, although the estimates of the poor/rich ratio are reported in the paper. The concentration index (CI) is derived from a Lorenz curve function (L_s) in which the cumulative proportion of the population, ranked by socioeconomic status, is plotted against the cumulative proportion of ill-health. CI represents twice the area between L_s and the diagonal. An index of -1 and +1 respectively means that all ill-health are concentrated in the most disadvantaged as opposed to the most advantaged person in the population, with zero denoting complete equality (Kakwani *et al.*, 1997: 87-89). In the case of a positive health indicator (e.g. access to health care services) the opposite will be true. Hence, the sign of the index indicates whether the particular health status is negatively or positively associated with poverty. So, for example, infant mortality and immunization coverage will respectively have a negative and positive concentration curve (Filmer and Pritchett, 1998; World Bank, 2000). The concentration index estimates reported in these pages are calculated from grouped data using the following equation:

$$CI = 2/\mu \Sigma (f_t \mu_t R_t) - 1 \qquad (1)$$

where μ represents the mean of the particular health indicator and μ_t and f_t respectively represents the value of the health indicator and population share for the t^{th} socioeconomic group. R_t is the relative rank of the t^{th} socioeconomic group, defined as $R_t = \Sigma f_\gamma + 0.5 f_t$, which indicates the cumulative proportion of the population up to the midpoint of each interval group (Kakwani *et al.*, 1997: 89). These inequality measures were calculated for the various injury outcomes based on the estimated proportion of persons in each wealth quintile exhibiting these characteristics after adjusting for differences in age, gender, education, population group and place of residence and allowing in the analysis for the design of the survey using the appropriate sampling weights. Figures 1 and 2, Figures 7 to 10 and Appendices A to C in this paper reports on the results of these comparisons and the estimates of the inequality measures for each of the outcomes.

In order to facilitate further discussion and elucidate these findings, multiple logistic regression analysis was employed in calculating the adjusted odds ratios (OR) for each of the outcomes employed in analyzing the relationship between occupational injury and poverty. The main objective here is to identify those factors that are important determinants of the likelihood of occupational injury. According to the ILO (1998), such analysis is important in identifying high-risk groups and in targeting appropriate interventions at these groups. The adjusted odds ratios were calculated in relation to the asset index, level of education, age, population group, place of residence and gender, as well as to three proxies of risk of injury, namely obesity, alcohol dependence and whether the person has ever worked underground. These results are reported in Tables 1 and 2.

3. RESULTS AND DISCUSSION

3.1 Injury and poverty in South Africa

Injury and particularly unintentional injury have been described as an accelerating epidemic, with its share in the global burden of disease estimated to increase from 15.1 to 20.1 percent between 1990 and 2020 (Zwi, 1999: 271). Injury, moreover, has only fairly recently came to be viewed as a public health problem (Rivara *et al.*, 1997a: 543). Rivara *et al.* (1997a: 543) argue that injury is the 'most common cause of death among people 1 to 34 years of age, a leading cause of disability and years of life lost, and a major contributor to health care costs' (this may not be the case in South Africa, given the impending HIV/AIDS epidemic). Injuries have a substantial opportunity cost, given that it results in costs for the injured individuals, their family, the health care system and the society at large (Department of Health *et al.*, 20002: 275). Zwi (1999: 263-264) reports that injury accounts for a significant burden of mortality, morbidity, disability and health care costs. Rivara *et al.* (1997b: 616), for example, report that the 57 million people in the United States that were injured in 1985 are estimated to have cost the economy US$158 billion, made up of US$50 billion for fatalities and US$80 and US$28 billion respectively for injuries that did and did not require hospitalization.

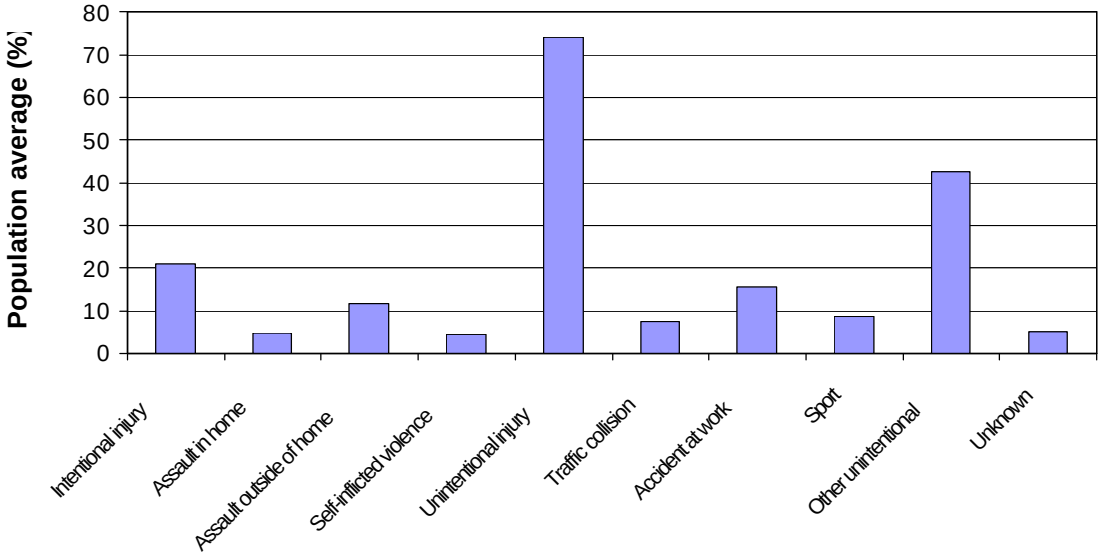
The injury epidemic is likely to worsen as poverty and inequality increase and as globalization, urbanization and industrialization continues to accelerate. The poor, moreover, has been argued to suffer the most insofar as they have limited access to those mechanisms that can reduce their exposure to risk of injury (Zwi, 1999: 271). Childhood

injuries in particular are often associated with poor standards of health, poor adult supervision and lower economic status (Roberts *et al.*, 1998; Department of Health *et al.*, 20002: 145). The poor also have limited access to emergency care services. The available evidence, however, provides conflicting views of the relationship between poverty and injury, with some studies reporting risk of injury to be higher at lower levels of socioeconomic status, while others studies found no evidence of a statistically significant relationship (Cubbin *et al.*, 2000: 70).

In the SADHS, interviewers determined whether members of households had in the past 30 days suffered an injury that was treated by a doctor or nurse. If so, the interviewer also recorded the type of injury, using a list of pre-coded responses. This practice of asking the question with reference to having received treatment from a medically trained person, although necessary to eliminate minor injuries, introduces some bias in the analysis. It means that the data is limited to relatively serious injuries that require medical treatment and that the incidence of injury in the poorer part of the population may be understated, given that poorer people generally are less likely to have utilized public or private health care services (Booysen, 2002b). In fact, this practice probably translates into a general underreporting of injury, because people often tend to minor injuries at home. Despite these shortcomings, however, the results of the analysis points to a relatively clear relationship between poverty and injury, particularly across different types of injury. Appendix A reports on the injury rate and the distribution of different types of injury across the five wealth quintiles and for the total population. The inequality measures for each of these outcomes are also reported in Appendix A. An estimated 1 106 in every 100 000 persons suffered an injury that required medical attention (Appendix A). The highest injury rate is that for 'other' unintentional injuries (782.3 per 100 000). The other rates (in rank order) respectively are 135.9 (assault outside home), 95.6 (accident at work), 64.1 (assault in home), 37.5 (sport), 29.6 (self-inflicted violence) and 13.8 (traffic collision)[3].

[3] The injury rates reported in this paper, both for injury in general and for occupational injury and disease, are considerably lower than the estimates reported in the final report on the SADHS (Department of Health et al., 2002). This of course is the result of having adjusted the estimates presented here for differences amongst others in age, gender, education, population group and place of residence, while the injury rates reported in the final report allows only for the survey design. If, for example, injury rates are generally higher among older persons, as is the case in reality, and if the population includes a relatively large number of older persons, adjusting results by age would mean that the estimated injury rate is substantially lower than would have been the case in the absence of such adjustment.

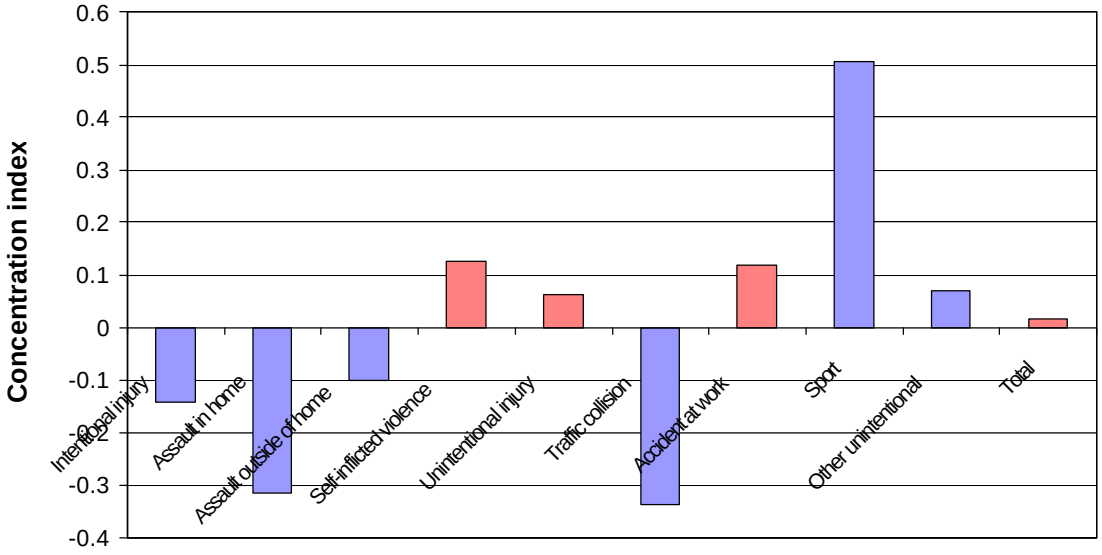
Figure 1: Composition of self-reported injury in South Africa (1998)



Source: Author's calculations from South African Demographic and Health Survey.

In terms of the broad categories of injury (Figure 1), the largest share was unintentional in nature (74,1 percent), while 20.8 percent was intentional. A small proportion of injuries (i.e. 5.1 percent) were of an unknown type. The majority of injuries (42.4 percent) were categorized as 'other' unintentional injuries, while 15.6 and 11.5 percent respectively were accidents at work and assaults occurring outside the home. The former figure is considerably higher than the nine percent reported in an earlier study (Department of Health *et al.*, 2002: 178). Less than ten percent of self-reported injuries were described as sport injuries (8.7 percent), traffic collisions (7.4 percent), assaults at home (4.7 percent), and self-inflicted violence (4.3 percent).

Figure 2: Socioeconomic inequalities in South African injury rates (1998)



Note: Injury rates were adjusted for differences in gender, age, education, and place of residence.
Source: Author's calculations from South African Demographic and Health Survey.

Of the ten injury rates reported in Appendix A, only four do not differ significantly across persons belonging to households of different socioeconomic status. In terms of the two broad categories of injury (i.e. intentional and unintentional), persons belonging to poorer households are more likely to suffer intentional injuries, compared to persons from more affluent households who are more likely to suffer unintentional injuries. However, only the former concentration index differs significantly from zero, which represent complete equality. The evidence, therefore, at least in the case of intentional injury, supports the argument that the poor, whom have less control over their environment and less access to means to protect themselves, are more likely to be at risk of injury.

More interesting in terms of the statistical significance of the concentration index estimates are the socioeconomic inequalities in different types of injury. Cubbin *et al.* (2000: 70) likewise found that the relationship between poverty and injury vary according to the cause of injury. Persons belonging to poorer households are more likely to have been the victim of assault, be it inside or outside of their homes. This result is interesting insofar as the wealthy are often perceived to be more likely to be the victims of crime (which in this case includes assault only). In fact, this health gradient may be even steeper considering the likely underreporting of injury amongst poorer persons referred to elsewhere, thus highlighting the need for increased efforts aimed at ensuring safety and security in poorer communities.

Poorer persons are also more likely to have been injured in traffic collisions, which makes sense insofar as a large number of people traveling with taxis and buses (the means of transport normally used by the poor) are killed and injured every year in road accidents in South Africa. Cubbin *et al.* (2000: 73) found that occupational risks for especially motor vehicle-related fatalities are higher in low paying jobs in the United States, which they argue reflect the fact that lower paid workers are more exposed to driving, both in their jobs itself and in commuting from home to work.

Persons in more affluent households in turn are more likely to have suffered sports injuries or 'other' unintentional injuries, which again is understandable insofar as the more affluent have the time and money to partake in sport and recreation. These estimates of the concentration index all differ significantly from zero.

The remainder of the concentration indices did not differ significantly from zero, thus pointing to insignificant differences across socioeconomic status in the incidence of self-inflicted violence, unintentional injuries in general, accidents at work (inequalities in occupational injury are explored in more detail in subsequent pages), and for injury in general.

3.2 Poverty and occupational health in South Africa

According to the ILO, an estimated 1.1 million people annually die from work-related injury and illness, which is more than the number of people annually dying in road accidents and in war (Herbert and Landrigan, 2000: 541). Occupational health and safety has its roots in the Industrial Revolution, when 'enlightened physicians and industrialists (offered) general practitioner-level health services (to) heavily burdened, poor and socially disadvantaged working people' (Rantanen, 1998: 1). In the early years, research on occupational health and safety focused mainly on the role of physical activity in occupational injury. This focus only later shifted towards occupational disease caused by exposure to physical and chemical hazards. In recent years, the emphasis has also been on health promotion activities at work, including lifestyle programs for employees, as well as the role of psychosocial factors in occupational injury and disease (Marmot *et al.*, 1999: 105).

The first commissions of enquiry into occupational health in South Africa were set up in the early 1900s and spurred the introduction of the Miner's Phthisis Act and the Mines and Works Act in 1911 (Zwi *et al.*, 1988: 692). The union movement has played a

particularly important role in the development of OHS policy in South Africa, given that the establishment of these commissions of enquiry and the subsequent introduction or revision of OHS policy has in many cases followed on union action. So, for example, the Erasmus Commission of Enquiry into Occupational Health was established in 1974, following mass strikes in Durban by more than 100 000 workers (Zwi *et al*., 1988: 693).

The World Health Organization in 1996 promulgated a Global Strategy on Occupational Health for All[4]. The national Occupational Health and Safety Act of 1995, moreover, states that 'every employer shall provide and maintain a working environment that is safe and without risk to the health of his employees' (Van der Merwe and Cochrane, 2000: 25). South Africa has also recently issued an Occupational Health and Safety Accord, which embrace the principles enshrined in ILO Conventions 155 and 176, and has embarked on a strategy aimed at turning around occupational health and safety in South Africa over the period 2001-04, which includes developing "effective OHS legislation and policies aligned to changes in the labor market and OHS environment" (Department of Labour, 2001).

As in the case of injury in general, occupational injury and disease are also associated with disparities in levels of economic development. Only an estimated five to ten percent of the working population in developing and newly industrialized countries has access to occupational health services (Goldstein *et al*., 2001: 59). Occupational health and safety is also problematic in developing countries (particularly in the mining, construction, agriculture and transport industries) due to poor working conditions, especially in the informal sector, which is exacerbated by the low literacy levels of workers, weak trade unions and the introduction of new technologies in the workplace (Loewenson, 1996; Tornberg and Forastieri, 1996; Zwi *et al*., 1996: 594; Loewenson, 1998b; Rentanen, 1998; Goldstein *et al*., 2001: 56)[5]. In fact, action on the part of business may be curbed due to vested interests in business perceiving investments in occupational health and safety as a threat to profits, which already are under pressure in the current highly competitive global market place (Zwi *et al*., 1996: 593).

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[4] The Global Strategy on Occupational Health for All has eight priorities, including the development of policy, the promotion of health at work, the strengthening of OHS services and OHS support services, the development of OHS standards, the development of human resources and registration and data systems, and the strengthening of research (Goldtein *et al*., 2001).

[5] It is not only the employed that are exposed to occupational risks. The wider population can also experience morbidity and mortality spilling over from occupational risk, albeit not classified as 'occupational' disease, e.g. the exposure of residents to the emission of pollutants by production plants in the immediate vicinity and to the risk of STD and HIV infection associated with labor migration (Loewenson, 1998b).

Occupational health and safety also appears to be a neglected priority in developing countries. Takala (2000b), moreover, reports that developing countries had ratified only a few of twenty key ILO occupational health and safety conventions (although not reporting the specific year when the check was performed), South Africa reportedly having ratified none of these conventions. Loewenson (1998b), though, has compared the countries of the SADC region in terms of their compliance with select OHS clauses in ILO Convention 155 (i.e. OHS laws covering all workplaces, employers being obliged to provide safe work, the consultation with worker representatives on OHS matters, the right of workers to refuse dangerous work, the duty of workers to work safely, and the notification of occupational accidents). She found only South Africa and Namibia to be complying with most of these clauses, although South Africa complies partially with the clause on the right of workers to refuse dangerous work. In fact, procedures are not laid down in OHS law(s) in these countries as to the actions workers should follow in refusing dangerous work (Loewenson, 1998b).

There, furthermore, is good reason to believe that the poor (or in other words workers at the bottom end of the formal economy and those in the informal economy) are more likely to suffer from occupational injury and disease, given that they are less likely to be working in an environment where their rights are protected (e.g. having an employment contract, having access to medical and in particular OHS services, and having union structures looking after their interests), thus often being exploited and/or lacking the knowledge about appropriate health and safety in the workplace (Tornberg and Forastieri, 1996). There is also evidence that children are relatively exposed to occupational injury risk, this despite laws against child labor (Castillo *et al.*, 1994: 647-648; Runyan and Zakocs, 2000: 251-255; White and O'Donnell, 2001: 23-24).

Framkin and Câmara (1991: 1623) report occupational fatality rates for the 1980s for a small sample of mostly industrialized countries (9) that ranges from 0.016 (Holland) to 0.220 (Brazil) per 1000 workers. The rates in the two developing countries included in their sample (i.e. Brazil and Zimbabwe) being considerably higher than those reported in the developed countries. According to Takala (2000a), sub-Saharan Africa, the Middle Eastern Crescent and Asia (excluding China and India) have the highest occupational injury fatality rates in the world, rates that exceed 20 per 100 000 workers. The highest occupational injury fatality rates reported in individual countries are those reported for Indonesia (43.7), Pakistan (36.26) and South Korea (34.0)(Takala, 2000a). Estimates for 1995 of fatality rates per 100 000 workers in countries in the SADC region ranges from

1.38 in Mauritius to 21.61 for Swaziland, while injury rates per 1000 workers ranges from 1.22 in Zambia to 16.74 in Zimbabwe. The respective estimates of fatality and injury rates for South Africa are 14.02 (1995) and 49.42 (1989) per 1000 workers, which respectively are based on data from social insurance and private insurance in the mining and construction industries (Loewenson, 1998b)[6].

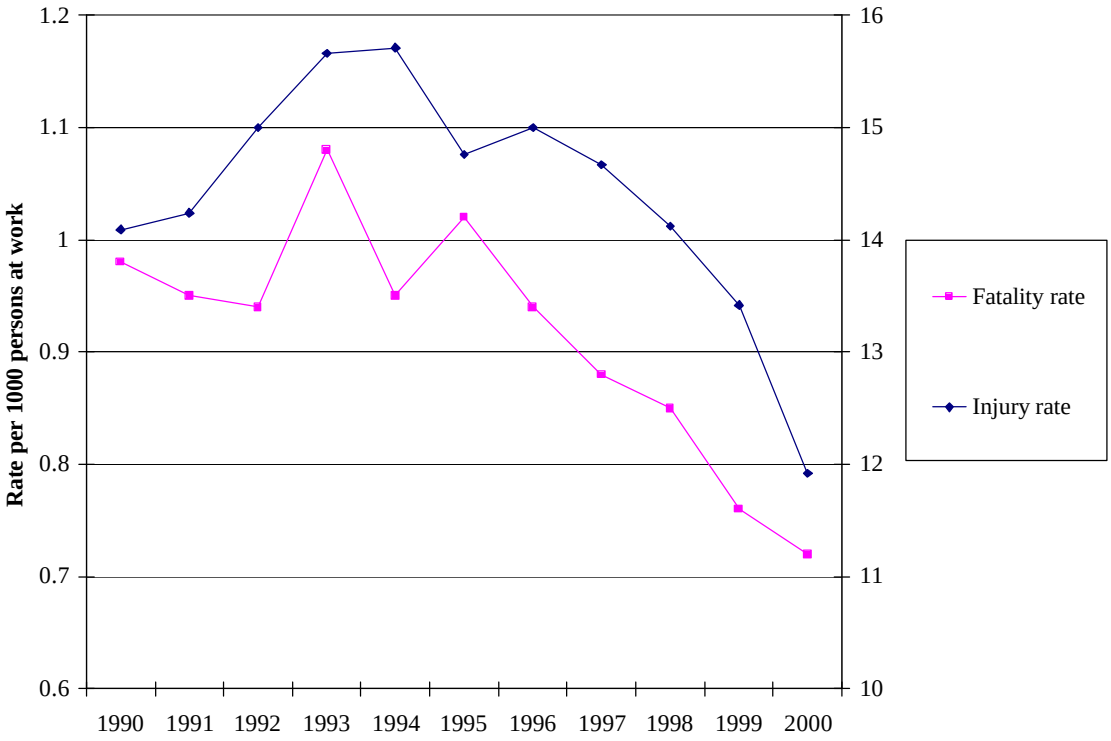
Yet, occupational injury in general and occupational disease in particular are grossly underestimated. It is estimated that the rates of occupational disease may be underreported up to fifty fold (Loewenson, 1998a). The informal sector and the unemployed (occupational disease normally only manifests in later years and unemployed persons that were formerly employed may suffer from occupational disease) generally are excluded from surveillance systems. In addition, formal surveillance systems, which often are relatively uncoordinated efforts and face considerable resource constraints, does not cover all cases (most systems, like those in South Africa, are based on inspections conducted at industry level, but also relies heavily on the notification of fatalities and incidents by industry as required by law)(Framkin and Câmara, 1991: 1623; Hnizdo and Rees, 1997: 28; Loewenson, 1998a and 1998b; Runyan and Zakocs, 2000: 249-250). Underreporting often also is attributed to the limited knowledge of general practitioners in diagnosing occupational disease and in recording detailed occupational patient-histories (Zwi and Ehrlich, 1986; Loewenson, 1996 and 1998b). Rees (2000: 10-14) shows how occupational lung disease in South Africa is underreported, using as an example the wide variation in the number of reported cases of mesothelioma in the statistics of the National Cancer Registry, the Compensation Commissioners and the Surveillance of Work-related and Occupational Respiratory Disease in South Africa (SORDSA) program. Furthermore, most medical practitioners lack to necessary skills to diagnose occupational disease (Loewenson, 1998a; Van Niftrik, 2000).

Occupational injury and disease entails considerable economic costs. The direct cost of occupational injury and disease in the European Union and Australia respectively has been estimated at €27 billion and $20 billion. These estimates exclude the indirect social and economic costs of these injuries and illness. Between 1972 and 1993 the compensation paid to American workers has increased at an average 12.5 percent per annum, growing from US$6 to US$57 billion over this period (Mikheev, 1998: 43-44).

[6] These estimates are not directly comparable insofar as some are based on data from private insurance and other on data from social insurance, with similar systems also differing in terms of the accuracy of the reporting systems.

The cost in Finland of occupational disease resulting from absenteeism, medical treatment, disability and survivor benefits are estimated at four percent of GDP (Takala, 2000b), while estimates for Zimbabwe puts this figure at between three and fourteen percent of GDP, depending on the method used in imputing the value of the associated loss in earnings and production. Estimates of the cost of occupational injury and disease to the economies of developing countries are likely to be lower, given that labor surpluses in developing countries are relatively large, that production is relatively labor-intensive and that these economies primarily employ unskilled or semi-skilled workers (Loewenson, 1998b).

Figure 3: Fatality and injury rates in South Africa's mining industry (1990-2000)



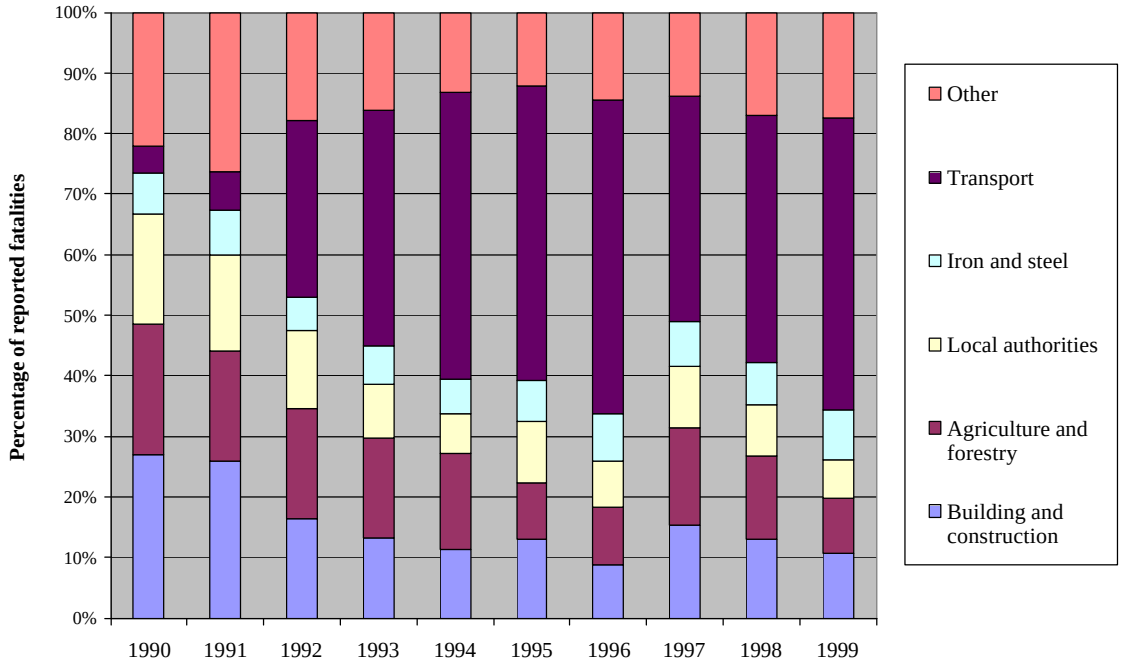
Source: Department of Minerals and Energy (2002).

The Inspector of Mines has kept statistics on fatality and injury rates in gold, coal and other mines in South Africa over a period of nearly 100 years (1904-2001). Although very low initially (probably due to underreporting, but also because of the nature of mining operations in the very early days of the gold and diamond rush), these rates at times (particularly in the postwar decades) have reached alarming levels. So, for example, the injury rate in gold, coal and other mines peaked at 64.14, 64.99 and 27.17 injuries per 1000 workers in respectively 1960, 1954 and 1948. South African fatality rates at times

have also exceeded those reported in the mining sectors in certain other developed and developing countries. So, for example, the fatality rate in South Africa stood at 1.07 per 1000 workers in 1973, compared to the 0.43 reported in the United Kingdom, 0.49 in the United States, the 0.69 in France and Germany, and the 0.71 and 0.80 respectively reported in Zambia and Kenya (Loewenson, 1998b). Since the early and middle 1980s, injury and fatality rates have largely stabilized, although fatality and injury rates have continued to decline in the course of the past decade (Figure 3).

Data on reported fatalities and injuries (or 'incidents' as they are called) in other industries in South Africa are normally reported in the Annual Reports of the National Department of Labour. The total number of fatalities and injuries has increased since 1990, but has declined somewhat since the mid 1990s. Figures 4 and 5 respectively report on the trends in the industrial composition of fatalities and incidents[7].

Figure 4: Reported fatalities in South Africa by industry (1990-99)



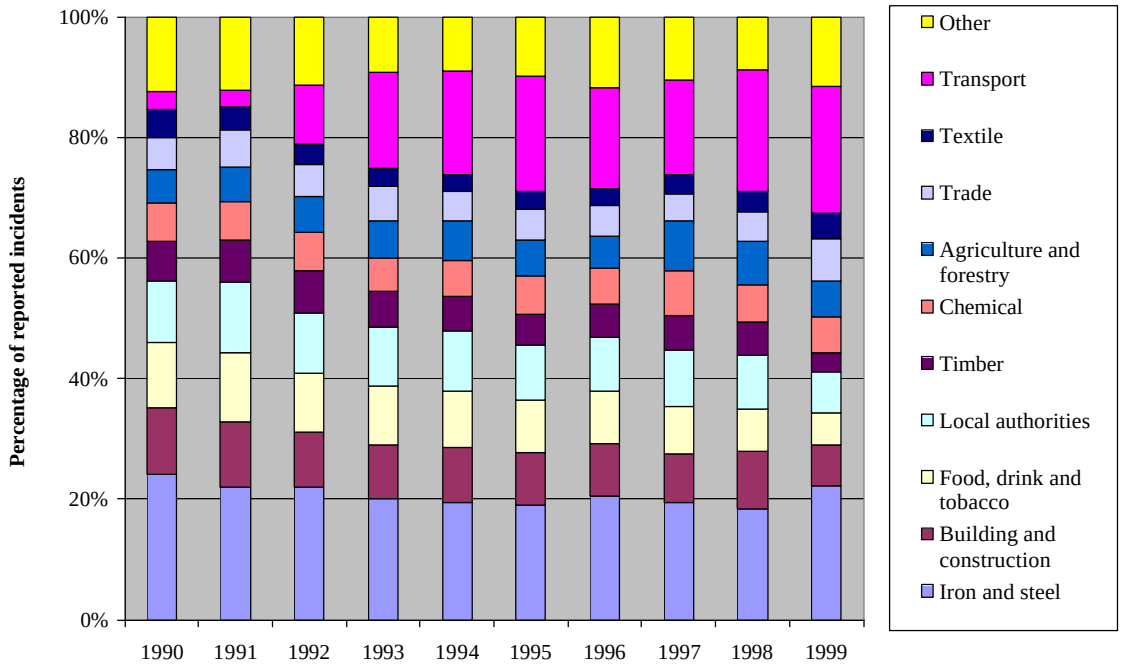
Source: Department of Labour (1994-2000).

In terms of reported fatalities, the majority of fatalities are reported in five industries only, namely building and construction, agriculture and forestry, local authorities, iron and

[7] It was not possible to calculate fatality and injury rates using this information, given the inconsistencies in the industrial classifications employed in this data and in the data for total employment reported by Statistics South Africa. The statistics for 2000, although available, were not included in this analysis due to the fact that the industrial classification employed by the Department of Labour in reporting fatalities and incidents has changed since, thus not allowing a comparable analysis of these trends.

steel, and transport (Figure 4). Looking at the trends over time, it is evident that the transport industry has become the main source of fatalities, with its share in fatalities between 1990 and 1999 rising from less than five to nearly fifty percent. The share in total fatalities of the building and construction, agriculture and forestry, and local authority sectors has in turn declined markedly over the past decade, dropping from more than seventy percent (1990) to approximately a third of all reported fatalities (1999). The trends in the industrial composition of reported incidents reflect a broadly similar picture.

Figure 5: Reported incidents in South Africa by industry (1990-99)

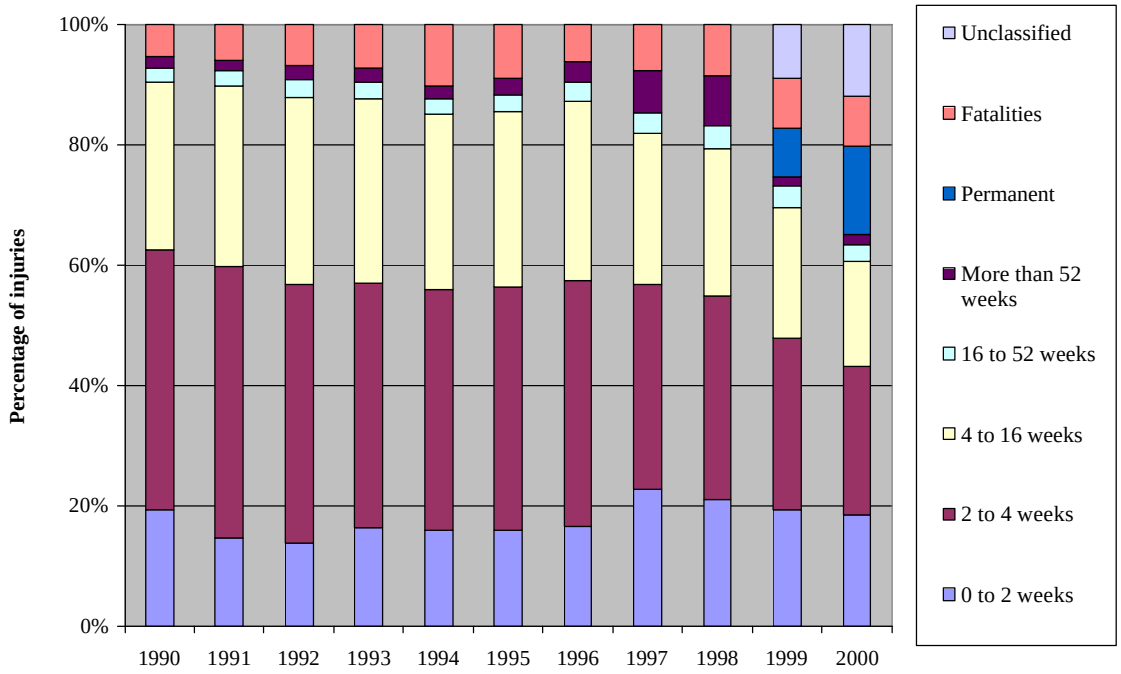


Source: Department of Labour (1994-2000).

Figure 5 reports on the share over time in total reported incidents of the ten industries reporting the largest number of incidents. The share in reported incidents of all other industries are listed as 'Other'. The iron and steel industry accounts for about one fifth of total reported incidents. Evident again, moreover, is the substantial increase in the relative magnitude of incidents reported in the transport sector. In 1990 the transport industry accounted for three percent only of total reported incidents, a figure that by 1999 had risen to more than twenty percent, making it the industry with the second largest share in reported incidents. The iron and steel and the transport sectors, therefore, by 1999 accounted for over forty percent of reported incidents. Three industries, namely building and construction, food, drink and tobacco, and local authorities have witnessed a

considerable decline in their share in total reported incidents. The other industries in Figure 3 have over the years made up a relatively constant share of total reported incidents.

Figure 6: Working time lost in South Africa as a result of injury (1990-1999)



Source: Department of Labour (1994-2000).

Figure 6 reports on the average length of time for which injured workers have been absent from work. This classification of working time lost has changed over time, with more recent reports allowing for the classification of permanent disability as well as injuries where the extent of working time lost could not be determined ('unclassified'). Evident, however, is the substantial economic loss associated with occupational injury, with just more than eighty percent of injuries resulting in workers being absent from work for two weeks or longer. The economic loss resulting from occupational injury may be increasing, given that an increasing share of injuries result in permanent disability or long-term absence from work (i.e. 16 weeks or more). The share in turn in injuries of 2 to 16 weeks of working time lost has declined markedly over this period, dropping from just more than sixty percent (1990) to just more than forty percent (1999). This suggests that occupational health and safety may be of increasing importance in terms of efforts aimed at increasing industrial productivity and at enhancing economic growth.

The data on occupational injuries and fatalities reported in Figures 3 to 6 only represent the statistics for the formal sector. In South Africa, like in other developing countries, the informal sector is home to a substantial number of workers. The available evidence suggests that occupational injury may be just as or even a bigger problem in the informal sector. A Zimbabwean survey of 1 585 informal sector workers for example revealed that injury and fatality rates at work are similar to levels found in the formal

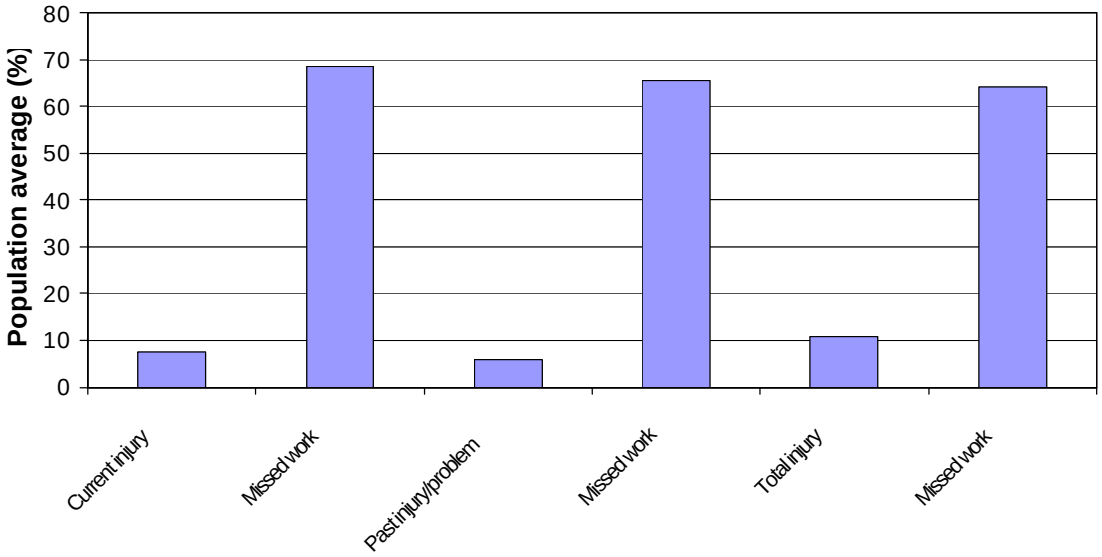
sector, while estimated levels of occupational disease exceed those in the formal sector. Other studies in the SADC region on occupational health and safety similarly have found that the risk of injury and fatality are extremely high in the informal sector (Tornberg and Forastieri, 1996; Loewenson, 1998b and 1998c). Hence, one would expect workers of lower socioeconomic status to be relatively more exposed to occupational injury, which raises the question as to what the relationship is between poverty and occupational injury and disease in South Africa.

Section 5 of the adult health questionnaire employed in the SADHS focused on occupational health. Respondents were first asked whether they had worked for payment in the past year. Just more than twelve percent of respondents reported that they had worked for pay (Department of Health *et al.*, 2002: 181). If so, they were asked whether they in the past year (i) had suffered an injury or health problem related to their work and/or (ii) had an existing injury or health problem that was aggravated or became worse at work. The interviewer in each case recorded the type of injury or health problem. Respondents were also asked whether they had missed work (i.e. 'had to stay away from work') as a result of this injury or health problem[8]. These responses were only coded as 'yes' or 'no'. The subsequent discussion explores the relationship between socioeconomic status (or poverty) and these aspects of occupational health, following an overview of the main trends in these variables.

Almost 1 in 10 workers suffered an injury or health problem at work or aggravated an existing injury or health problem at work (i.e. 92 per 1000 workers). The incidence of 'new' injuries or health problems was higher than the incidence of aggravated injuries or health problems, i.e. 60.4 compared to 46.6 per 1000 workers. In total, sixty out of every 1000 workers were absent from work due to an injury or illness suffered at work or a past injury or illness aggravated at work. The respective rates for 'new' and 'aggravated' injuries are 39.5 and 28.7 per 1000 workers (Appendix B).

[8] Had respondents also been asked how long they had been absent from work, what their occupation was, in what industry they were employed and in what type of employment, it would have been possible to explore the link between poverty and occupational injury in greater detail. In fact, Zwerling *et al.* (1996: 1307) found occupation to be the strongest predictor of occupational injury. The SADHS, however, like all large population surveys has to balance the need for information on a broad range of key variables with the need for more detailed information on select aspects of health and population, which normally means that many specific issues are not explored in great detail. Nevertheless, the analysis of the relationship between poverty and occupational injury and of the determinants of the likelihood of occupational injury did yield some meaningful and interesting results.

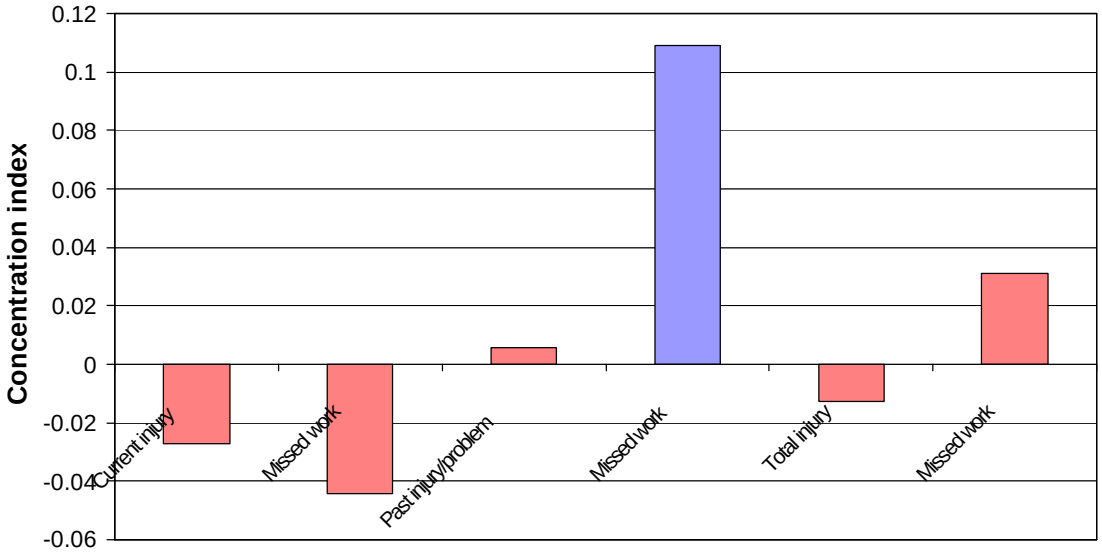
Figure 7: Occupational injury and disease and absence from work in South Africa (1998)



Source: Author's calculations from South African Demographic and Health Survey.

A relatively small percentage of workers have suffered occupational injury or illness in the past year (i.e. ten percent or less). However, more than sixty percent of these workers missed work as a result of the injury or health problem, which hints at the considerable economic cost of occupational injury, i.e. the cost of absenteeism and of associated losses in productivity. The projection, for example, of this absenteeism rate from the SADHS to the eight to nine million working South Africans means that between 700 and 800 thousand workers may be absent from work in any one year (Department of Health *et al.*, 2002: 181). Although the SADHS did not collect information on the length of time these workers were absent from work, the available statistics on working time lost as a result of occupational injury (Figure 4) suggests that this loss may be substantial, with eighty percent of injured workers reportedly being absent from work for two weeks or more.

Figure 8: Socioeconomic inequalities in self-reported occupational injury and disease rates in South Africa (1998)



Note: Injury rates were adjusted for differences in gender, age, education, population group and place of residence.
Source: Author's calculations from South African Demographic and Health Survey.

Differences in the incidence of occupational injury or disease across workers from different socioeconomic classes (workers from poorer households are assumed to be earning lower wages or salaries than workers from more affluent households) exhibit no significant health gradient[9]. Although two of the concentration indices take on negative values, which suggest that workers from poorer households are more likely to suffer from occupational injury or disease, these estimates do not differ significantly from zero. Even in the case of the estimated number of workers that were absent from work as a result of injury the concentration index does not significantly different from zero. The only exception is the concentration index for workers that aggravated an existing injury or illness at work and that were absent from work as a result, which does differ significantly from zero. Workers in more affluent households were more likely to have been absent from work as a result of having aggravated an existing injury or illness at work. One likely explanation for this may be that workers in higher paying jobs (those in more affluent households) may be more likely to have received ongoing treatment for a past injury or illness and thus be absent from work, because they are more like to be in permanent employment and have access to expert medical care. Lower paying workers

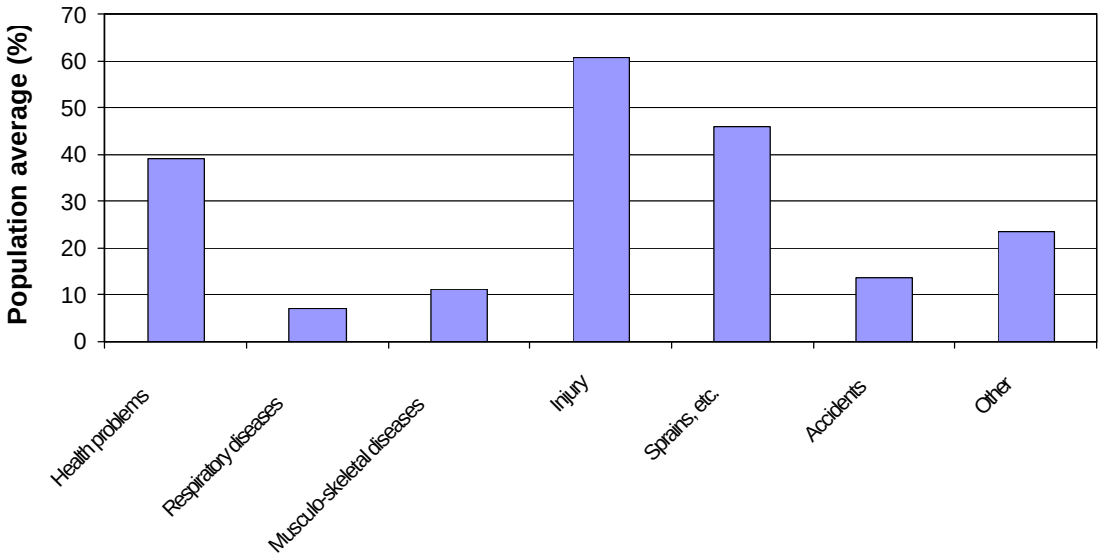
[9] This admittedly is a very rough way of attributing socioeconomic status to individual workers in the absence of data on individual earnings, given that an affluent household for example may include a number of workers employed in different industries and occupations at very different levels of pay.

(those in poorer households) in turn may not be aware of the injury or illness or the need for continued treatment or may not have access to ongoing treatment for a recurring injury or illness, thus not being absent from work as a result. This argument is substantiated by the fact that there is no significant difference across socioeconomic status in terms of the incidence of aggravated injury or illness. The concentration index did not differ significantly from zero, although it took on a positive value, which means that workers from more affluent households were more likely to have aggravated an existing injury or illness at work. Apart from access to treatment, however, this may also be the result of the nature of the injury of health problem (e.g. a worker with lung disease or one that injured his back may continue to suffer from associated health problems, while a worker suffering a sprained ankle are less likely to aggravate this injury in future if it was treated properly the first time). Differences in occupational injury rates across socioeconomic status normally only become more pronounced when considering the specific type of injury or health problem, as was the case in the analysis of the relationship between poverty and injury in general.

The analysis of the relationship between poverty and different types of occupational injury and disease includes injuries and health problems suffered at work, as well as those aggravated at work. The analysis makes a distinction between occupational injury and work-related health problems (or occupational disease). Haddon (1980: 415) defines injuries as 'pathologies that become apparent very shortly – even immediately – after their agents first began to interact with the body'. Occupational disease is described as 'pathologies that first become manifest only after much longer periods following the first exposure to their causes', including conditions whose causes not well understood. The specific types of injury or illness included in the analysis presented in this paper focus only on those categories of injury or illness where a sufficient number of cases were recorded to allow a meaningful comparison of the distribution of these cases across workers from households of different socioeconomic status. The analysis distinguishes between respiratory and musculo-skeletal disease (classified as health problems) and between sprains, dislocations, fractures and lacerations as opposed to accidents (classified as injury). These four types of injury or illness make up three quarters of reported cases of injury or illness. According to the results, respectively 50 and 38 out of every 1000 workers in the past year suffered from occupational injury of disease. The estimated injury rates per 1000 workers for the four specific categories of injury and illness are 35.6

(sprains, dislocations, fractures and lacerations), 13.4 (musculo-skeletal disease), 10.1 (accidents), and 6.6 (respiratory disease) (Appendix C).

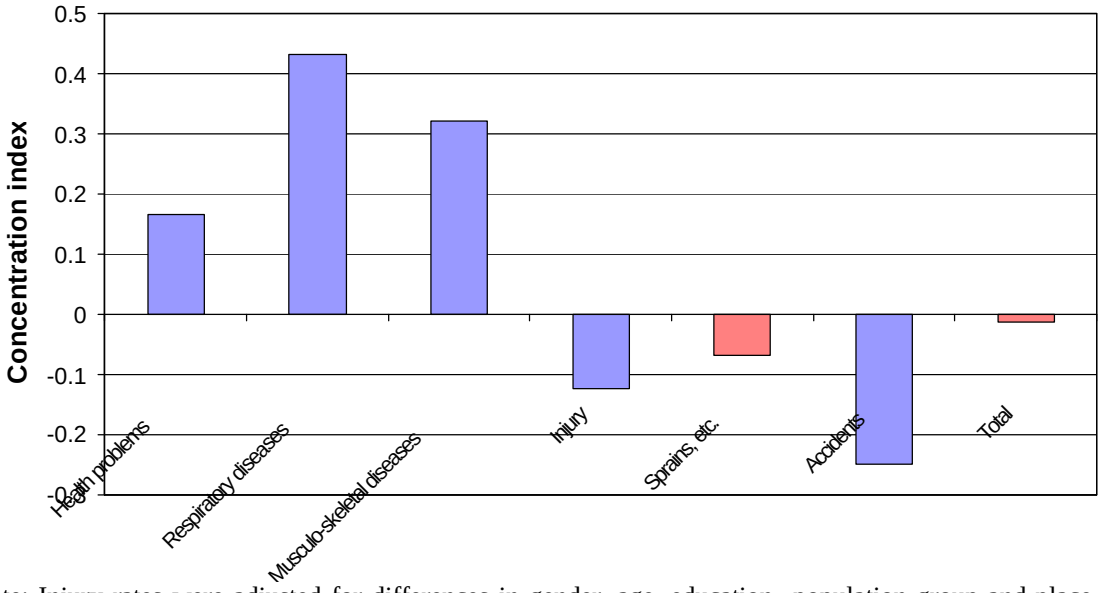
Figure 9: Composition of self-reported occupational injury and disease in South Africa (1998)



Source: Author's calculations from South African Demographic and Health Survey.

Evident from Figure 9, is that just more than sixty percent of all cases are associated with occupational injury, whereas some forty percent are related to occupational disease. Sprains, dislocations, fractures and lacerations are by far the most common type of reported injury, making up 45.9 percent of all reported cases of injury and illness. Accidents represent 13.7 percent of all cases, while musculo-skeletal and respiratory diseases respectively make up a further 11.1 and 7.1 percent. 'Other' health problems and injuries, which include a wide variety of classes of occupational illness and injury, make up nearly a quarter of reported cases. More interesting, though, are the differences in the incidence of these types of occupational illness and injury by socioeconomic status.

Figure 10: Socioeconomic inequalities in self-reported occupational injury and disease rates in South Africa by type of injury or illness (1998)



Note: Injury rates were adjusted for differences in gender, age, education, population group and place of residence.
Source: Author's calculations from South African Demographic and Health Survey.

Five of the seven concentration indices in Figure 10 differ significantly from zero, which denotes complete equality, thus hinting at significant socioeconomic inequalities across different types of occupational injury and illness. The only exceptions are the indices for occupational disease and injury in total and for sprains, dislocations, fractures and lacerations, which did not differ significantly from zero.

Workers in poorer households are more likely to suffer from injury in general and from accidents at work compared to workers from more affluent households (index takes on negative value). This most likely reflects the extent to which workers in poorer households primarily are employed in occupations where they do physical or manual work or work with machines, thus being relatively more exposed to risk of injury in general and to risk of accidents in particular.

Workers from more affluent households are more likely to have suffered from occupational disease in general and from respiratory disease and musculo-skeletal problems in particular (index takes on positive value). One explanation of the increased incidence of health problems amongst workers in more affluent households is the possible nature of their jobs, e.g. office-type work where workers are more exposed to stress[10] and

[10] Moch (1999: 30-32) estimates that some fifteen percent of workers in South Africa suffer 'Burnout' (i.e. where stress levels cause work performance to decline), while only one in four workers operate in the 'Ideal Zone' (i.e. where work performance is maximized at intermediate levels of stress).

to ergonomic risks and the associated health problems. In addition, workers in higher paying jobs (who are more like to be in permanent employment and have access to medical aid or in-house OHS services) are more likely to have access to the expert medical care required for the diagnosis and ongoing treatment of occupational disease. Lower paying workers in turn may not be aware of such illness nor have access to ongoing treatment, thus being less likely than workers from more affluent households to report suffering from a work-related health problem.

The health gradient is quite pronounced in the case of respiratory disease. This particular finding is interesting insofar as one would have expected miners (and in particular those working underground) and workers in the chemical industry to be at a very high risk of respiratory disease. In addition, tuberculosis is considered a disease of poverty. Hence, one would have expected workers in poorer households to be more at risk than workers in more affluent households, while the results point to the opposite. One possible explanation for this finding may be that these workers are in fact categorized as relatively affluent in terms of the asset index, i.e. they are likely to live in formal dwellings, own a number of assets and have access to most public services. One way in which one can further explore this finding is to employ an alternative asset index in analyzing the relationship between socioeconomic status and respiratory disease, e.g. an index that for example measures urban poverty rather than poverty in general (Booysen, 2002a).

However, the incidence of occupational injury and disease are also associated with determinants other than socioeconomic status, which brings us to the analysis of the determinants of the risk of occupational injury and disease. Such analysis can shed more light on the specific relationship between poverty and occupational injury and disease reported in the above pages. Multiple logistic regression analysis was employed in calculating the adjusted odds ratios (OR) for each of the outcomes employed above in analyzing the relationship between occupational injury and poverty. The main objective here was to identify those factors that are important determinants of the likelihood of occupational injury or disease, as well as the likelihood of being absent from work as a result. The adjusted odds ratios were calculated in relation to the asset index, level of education, age, population group, place of residence and gender. Included as well are three commonly used proxies of risk of occupational injury or disease, namely obesity (body mass index, which is calculated as weight in kilograms divided by the square of height in meters, equal or greater than 0.30), alcohol dependence (having answered in the

affirmative to two or more of four questions from the so-called CAGE questionnaire) and having worked underground (which represents the only proxy of occupation or industry). These variables are amongst those predictors of occupational fatalities that Zwerling *et al.* (1996: 1307) included in their analysis of data from the American Health and Retirement Study. The results of these regressions are reported in Tables 1 and 2.

Table 1: Determinants of the likelihood of self-reported occupational injury/disease in South Africa (1998)

Socio-demographic characteristics	Total occupational injury/disease	Injured/ill and missed work as a result	Current occupational injury/disease	Suffered injury/illness and missed work as a result	Past injury/illness aggravated at work	Aggravated past injury/illness at work and missed work as a result
Asset index (quintile 1 = 1.000)						
Quintile 2	0.719	0.792	0.736	0.886	0.824	0.766
Quintile 3	0.575*	0.635	0.460*	0.490*	0.839	0.828
Quintile 4	0.876	1.016	0.827	0.917	0.988	1.117
Quintile 5	0.757	0.970	0.708	0.702	0.931	1.425
Education (none = 1.000)						
1-7 years	0.918	1.471	1.092	1.587	0.989	1.578
8-12 years	0.770	0.984	0.892	1.046	0.911	1.317
> 12 years	0.615	0.370*	0.449*	0.434*	0.988	0.529
Age (15-24 years = 1.000)						
25-34 years	1.066	1.182	1.307	1.493	1.131	1.211
35-44 years	0.876	1.025	0.822	1.090	1.199	1.140
45-54 years	1.405	2.140*	1.498*	2.232*	2.003*	2.821*
55-64 years	1.430	1.713*	1.191	1.874*	2.159*	1.958
> 64 years	0.736	0.879	0.681	1.216	0.654	0.233
Population group (African = 1.000)						
Coloured	1.400	1.058	1.417**	1.368	0.915	0.417*
White	2.553*	1.936*	2.323*	2.018*	2.576*	1.461
Asian	1.299	1.283	1.424	1.290	1.029	1.049
Place of residence (urban = 1.000)						
Rural	1.507*	1.590*	1.702*	1.639*	1.501*	1.767*
Gender (male = 1.000)						
Female	0.710*	0.861	0.614*	0.674*	0.868	1.004
Obesity	1.399*	1.421*	1.431*	1.460*	1.200	1.243
Alcohol dependence	2.084*	1.935*	2.311*	2.075*	1.637*	1.563*
Have worked underground	1.916*	1.505	1.809*	1.539	1.588	1.647
Sample (n)	*4465*	*4465*	*4465*	*4465*	*4465*	*4465*

Note: Odds ratios with one asterisk are statistically significant at the 5% level, while ones with two asterisks are significant at the 10% level.
Source: Author's own calculations from South African Demographic and Health Survey (SADHS).

According to the evidence presented in Table 1, workers with some tertiary education (i.e. more than 12 years) were much less likely to have suffered a work-related injury or disease in the past year and were also much less likely to have missed worked as a result compared to workers with no education. This probably is the result of the type of jobs these workers are employed in (i.e. jobs with relatively low exposure to risk of injury or illness, excluding stress-related illness), their higher level of education and their access to information about healthy living (i.e. most large companies invest considerable money in health and wellness programs for employees, either via medical aid schemes or directly).

Physical and mental health deteriorates with age and therefore increases the susceptibility of workers to injury and illness. Hence, workers in the higher age bands (i.e. 45 to 64 years) were significantly more at risk of occupational injury and illness than younger workers and were more likely to be absent from work as a result.

In terms of population group, White workers (and in one case Colored workers) were much more exposed to risk of injury or illness and were more likely to have been absent from work as a result than are Africans. This probably reflects the continued racial inequalities in labor markets, with Whites (and Coloreds) being more likely to be employed than Africans and therefore being relatively more exposed to risk of injury or illness. Female workers in turn were much less likely to have suffered an occupational injury or illness and to have been absent from work as a result. This may similarly to a large extent reflect inequalities in the job market (with males being much more likely to be employed than are females), although the type of jobs in which male and female workers are employed is part of the answer (with men being employed in jobs where they generally are more exposed to risk of injury and illness, e.g. physical or manual work).

The results in Table 2 also show that workers living in urban areas were more at risk of occupational injury and illness than workers in rural areas and were more likely to be absent from work as a result, which reflects the fact that employment opportunities generally are concentrated in urban areas.

Interesting in terms of the OR values for the different quintiles of the asset index, is the much lower risk of injury or illness in the third quintile and of having missed work as a result compared to the bottom quintile. This suggests that workers in middle class families (at least insofar as the asset index can be employed in distinguishing between classes) may be less likely to have suffered an occupational injury or illness compared to workers in households at the bottom and top ends of the distribution of household wealth. A likely explanation is that workers in very low paying jobs are exposed to risk of injury

and illness due to generally unsafe and hazardous working conditions, while very high paying jobs in turn expose workers to other types of risks, particularly those associated with burnout or stress and with heart disease. However, more analysis is required to determine exactly why workers at the bottom and top ends of the wealth distribution may be more exposed to risk of injury and disease than workers in the middle quintiles.

Most interesting, was the extent to which the associated risk factors (i.e. obesity, alcohol dependence and having worked underground) featured as significant determinants of the risk of injury and illness and of the likelihood of being absent from work as a result. Alcohol dependence in all cases was a significant determinant of injury and illness and of absence from work. Alcohol dependent workers were more likely to suffer an occupational injury or illness and were also more likely to be absent from work as a result. Van der Linde (1997), moreover, estimate that the cost of treatment for illness related to alcohol abuse and of shifts lost as a result of absenteeism related to such abuse amounts to some R28 million per annum for every 100 000 workers employed in the South African mining industry.

Obesity in four of the six models featured as a significant determinant of risk of injury and of being absent from work as a result, the exception being existing injuries or illness that were aggravated at work and being absent from work as a result. Obese workers were more likely to suffer from occupational injury or illness and were also more likely to be absent from work as a result.

The significance of alcohol dependence and of obesity in risk of illness and injury and of being absent from work as a result suggests that employers need to take particular care in managing these problems in the workplace. Zwerling *et al.* (1996: 1307) also found obesity and alcohol dependence to be predictors of increased injury risk, their analysis having focused specifically on older workers in the United States.

Finally, in the case of workers having worked underground, the risk of occupational injury and disease in general (including either a current injury/illness or an injury/illness aggravated at work) and of suffering an occupational injury or illness in the past year are higher for workers having worked underground, which is understandable insofar as this particular work environment is especially dangerous and unsafe, both in terms of health risks (e.g. lung disease) as well as in terms of injury risks.

Table 2: Determinants of likelihood of self-reported occupational injury/disease in South Africa by type of injury/disease (1998)

Socio-demographic characteristics	Occupational disease	Respiratory disease	Musculo-skeletal disease	Injury	Sprains, dislocation, fractures and lacerations	Accidents
Asset index (quintile 1 = 1.000)						
Quintile 2	0.585	>100.000*	0.543	0.762	0.771	0.789
Quintile 3	0.427*	>100.000	0.778	0.645*	0.730	0.591
Quintile 4	0.745	>100.000*	2.852	0.898	1.074	0.532
Quintile 5	1.436	>100.000*	3.679	0.421*	0.601	0.201*
Education (none = 1.000)						
1-7 years	1.357	0.859	2.056	0.724	0.696	1.019
8-12 years	0.835	0.426	1.534	0.734	0.735	0.708
> 12 years	0.812	0.297	1.780	0.600	0.590	0.380
Age (15-24 years = 1.000)						
25-34 years	1.035	0.839	0.803	1.089	1.027	1.802
35-44 years	0.860	1.567	0.785	0.854	0.827	1.214
45-54 years	1.837*	2.744	0.810	1.066	0.984	1.923
55-64 years	1.300	-	1.504	1.356	1.347	2.126
> 64 years	0.649	1.232	-	0.812	0.460	3.219
Population group (African = 1.000)						
Coloured	1.267	1.821	1.272	1.573*	1.691*	1.153
White	2.002*	3.034*	1.225	2.929*	3.396*	0.751
Asian	0.618	1.657	0.311	2.128*	1.903	3.689*
Place of residence (urban = 1.000)						
Rural	1.374	1.483	2.140*	1.581*	1.620*	1.647
Gender (male = 1.000)						
Female	1.523*	2.031	1.047	0.413*	0.446*	0.318*
Obesity	1.253	1.372	1.190	1.567*	1.504**	1.889*
Alcohol dependence	1.741*	1.139	1.655	2.146*	2.475*	1.151
Have worked underground	2.757*	8.781*	1.644	1.401	1.663**	0.680
Sample (n)	*4465*	*4072*	*4374*	*4465*	*4465*	*4465*

Note: Odds ratios with one asterisk are statistically significant at the 5% level, while ones with two asterisks are significant at the 10% level.
Source: Author's own calculations from South African Demographic and Health Survey (SADHS).

The results in Table 2 are perhaps less interesting and clear-cut that those presented in Table 1. This could be the result of the analysis not being able to allow for the variety of other factors that determine workers' exposure to specific types of injury or illness, notably occupation and/or industry. Zwerling *et al.* (1996: 1309), moreover, emphasize how the absence of data on the nature, severity and circumstances of injuries limits researchers in determining the risk factors associated with different types of injuries. These results nevertheless include some worthwhile observations about the nature of the determinants of the risk of occupational injury and disease. There in this case were no significant differences in risk of injury by level of education. Differences across the age bands was only significant in one instance, with workers aged 45-54 being more likely to have suffered from occupational disease compared to workers aged 15-24 years. This reflects the extent to which physical and mental health deteriorates with age and increases the likelihood of illness.

Interesting, moreover, was that female workers were more likely to suffer from occupational disease, while male workers in turn were more likely to have suffered an injury, a sprain, dislocation, fracture or laceration, or an accident. As explained elsewhere, this may reflect the likelihood of men generally being employed in jobs where they generally are more exposed to risk of injury (e.g. in physical or manual jobs), while women generally are employed in jobs where they are relatively more exposed to illness than to injury.

Similar to the evidence presented in Table 1, the results in Table 2 suggest that White workers in particular (and in some cases Colored and Asian workers) are relatively more exposed to risk of injury and illness than are African workers. As argued elsewhere, this may reflect racial inequalities in the job market, with Whites, Coloreds and Asians being more likely to be employed compared to Africans and therefore being more exposed to risk of injury or illness.

Workers living in urban areas were more at risk of musculo-skeletal disease, of injury and of sprains, dislocations, fractures and lacerations compared to workers residing in rural areas, which as argued elsewhere, probably is indicative of employment opportunities being concentrated in urban areas.

Interesting in terms of the different quintiles on the asset index, is the much lower risk of workers in the top wealth quintile of exposure to injury and accidents. This substantiates the conclusions drawn elsewhere in this paper that workers in poorer households are more likely to have suffered an occupational injury or to have

been involved in a work-related accident. The evidence in Table 2 also suggests that workers in more affluent households were more likely to have suffered from respiratory disease. However, this finding needs to be interpreted with caution, given that there was not one worker in the bottom quintile that reportedly had suffered from respiratory disease. Furthermore, as explained elsewhere, the ambiguous relationship between respiratory disease and socioeconomic status may be the result of the asset index being an inappropriate measure to assign socioeconomic status to workers, given that it may classify workers at the bottom end of the wage spectrum as relatively affluent. There again is limited evidence that workers in middle class families (at least insofar as the asset index can be employed in distinguishing a middle class) were less likely to have suffered an injury or work-related health problem compared to workers in households at the bottom and top ends of the distribution of household wealth. A likely explanation of this is that workers in very low paying jobs are exposed to risk of injury and illness due to the unsafe and hazardous working conditions in which they often work, while very high paying jobs in turn expose workers to other types of risks.

As in the case of Table 1, obesity, alcohol dependence and having worked underground featured as significant determinants of the risk of injury and illness. Alcohol dependence was a significant determinant of risk of work-related health problems in general, of injury in general and of sprains, dislocations, fractures and lacerations in particular. Obesity in turn was a significant determinant of risk of injury in general and in particular of risk of sprains, dislocations, fractures and lacerations and of accidents. As argued elsewhere, the significance of alcohol dependence and obesity in risk of illness and injury implies that employers need to take particular care in how they manage these problems in the workplace. Finally, in the case of workers having worked underground, the risk of occupational disease in general and in particular of respiratory disease and of sprains, dislocations, fractures and lacerations (injuries associated with the unsafe and hazardous working conditions in the mining environment) were higher for workers having worked underground.

4. CONCLUSIONS

Injury prevention and control should be a national public health priority, given that injury represents one of the leading causes of mortality and morbidity amongst South

Africans (Department of Health *et al.*, 2002: 275). The success of modern public health measures lie in the realization that successful intervention requires the focus to shift from an individual-centered emphasis to a community-centered focus (Haddon, 1980: 416), given that many of the causes of injury lies outside of the control of the individual and requires structural processes and systems to change. According to Zwi (1999: 274-277), however, responses to the injury epidemic has to date been characterized by ambivalence and neglect, because these responses often are seen as falling outside the ambit of public health, limited effort has been invested in research on injury and injury prevention, and civil society and the public health community has not mobilized to garner the political momentum and resources necessary for an effective response to the growing injury epidemic. The OHS Turnaround Strategy of South Africa, however, makes particular mention of the need for advocacy and communication, which it aims to achieve via an OHS advocacy and awareness campaign, the establishment of partnership-based regional and national OHS forums, the development of OHS human resources, and the revision of current and development of new OHS policies (Department of Labour, 2001).

South Africa also needs to look at implementing those public health techniques that in industrialized nations have resulted in reductions in injury rates (Department of Health *et al.*, 2002: 275). These strategies, however, in the case of fatal injuries at least do not come cheap. A review of the cost-effectiveness of 500 interventions aimed at saving lives reported a direct median cost of US$42 000 per year of life saved (Rivara *et al.*, 1997b: 616-617), which in the currency of South Africa and other developing countries translates into a substantial amount.

Public health efforts aimed at reducing the incidence of injury can be categorized as primary, secondary or tertiary in nature. Primary prevention is aimed at ensuring that injuries do not occur in the first instance (e.g. regulating traffic using traffic lights). The objective of secondary prevention is to minimize the health damage in the event that an injury does occur (e.g. wearing a safety belt when driving a motor vehicle). Tertiary prevention is geared towards mitigating the most severe manifestations of injury (e.g. improving emergency, hospitalization and rehabilitation services)(Zwi, 1999: 273). This paper has shown that the poor is particularly vulnerable to intentional injury (particularly injury related to assault) and to injury related to traffic collisions, thus highlighting the need for programs aimed at improving safety and fighting crime in poor communities and of primary, secondary

and tertiary public health interventions aimed at enhancing road safety, particularly for protecting pedestrians, commuting workers and people using passenger transport services targeting the lower end of the market.

A relatively large proportion of workers are affected by occupational injury and disease (Department of Health *et al*., 2002: 275), which means that the effective management of occupational injury and in particularly occupational disease (which is substantially underreported) is of the utmost importance. This, amongst others, requires enhanced surveillance, active case finding, more research and the better use of available data on occupational health (Loewenson, 1998a and 1998b; Herbert and Landrigan, 2000: 544; Rees, 2000: 10-14). Surveillance systems, however, currently are relatively poorly developed in South Africa, apart from companies with in-house OHS services and the program for Surveillance of Work-related and Occupational Respiratory Disease in South Africa (SORDSA). Ferrie (1998: 11) argues that few employers conduct occupational risk assessments, although employers in certain industries are required by law to perform these assessments, which means that OHS compliance measures need to be improved.

Evidence from the literature on occupational health points to a number of workplace interventions that can improve the health of workers. So, for example, musculo-skeletal disease, which accounts for a substantial share of self-reported occupational disease, can be managed through the continued integration of ergonomics into existing occupational health programs (Van der Merwe and Cochrane, 2000: 26). Coopoo (2000: 15-19) reports how an exercise and lifestyle program has enhanced the health of a group of employees suffering from chronic diseases. According to Van Niftrik (2000: 19-20), absentee auditing is crucial in efforts aimed at preventing breakdowns in worker health. Such an auditing program sees a team of independent doctors and occupational therapists monitor absenteeism on a daily basis, using a software program designed specifically for this purpose. This allows employers to identify anomalies in the work attendance of specific groups or individuals and in specific areas of work. Only in this way can the potential onset of impairment and disability be identified early and addressed with appropriate medical and/or occupational health intervention (Van Niftrik, 2000: 19-20).

This paper has shown that a relatively large number of workers have reportedly been absent from work as a result of occupational injury and illness. Workers in more affluent households have been shown to be more likely to miss work

as a result of an existing injury or illness that have been aggravated in the workplace, which probably translates into potentially large productivity losses. Absentee auditing, therefore, can be particularly useful in the identification and correction of the underlying causes of these injuries and illness and in their treatment. Such program need not be costly, given that it can utilize personnel in existing human resource functions and be funded through medical aid schemes (Van Niftrik, 2000: 19-20). These health and wellness programs and absentee auditing is also likely to be important in the management of occupational health in the workplace in the context of the significance of alcohol dependence and of obesity in risk of illness and injury and of being absent from work as a result.

Given the higher incidence of injury and of accidents at work amongst workers in poorer households, who are more likely to be employed in the growing informal sector (Loewenson, 1998b), the expansion of occupational health and safety programs to an increasing number of workplaces and in particular to the informal economy should be a priority in enhancing the health of the general working population of South Africa. Tornberg and Forastieri (1996) argue that these measures should be of low cost and of a practical nature to ensure the sustainability of such efforts. They describe a pilot study in Dar es Salaam that introduced OHS in the informal sector by for example training the informal sector operators in OHS (including training in first aid, the provision of first aid kits and the development of simple record-keeping systems), by promoting primary health services in these areas, and by establishing communication channels between informal sector employers and providers of OHS services.

Another challenge is of how to manage the incapacitated worker (i.e. workers affected by ill health, injury and disease). This requires employers to do an impairment assessment and then accommodate the ill worker in the workplace in an appropriate manner. This task ideally should be conducted by a whole team of people, including a medical doctor, occupational therapist, psychologist, social worker, biokineticist and an expert in industrial relations and/or labor law) (Buys and Van Biljon, 1998: 33; Botha *et al.*, 2000: 23-27).

5. APPENDICES

Appendix A: Socioeconomic inequalities in self-reported injury in South Africa (1998)

Indicator	Wealth quintile					Population average	Poor/rich ratio	Concentration index	Standard error
	1	2	3	4	5				
1. Injury rate per 100 000 population									
Intentional injury	272.7	293.3	260.5	131.5	144.0	225.9	1.894	-0.14273*	0.0515
Assault in home	87.3	129.8	64.3	7.7	16.2	64.1	5.389	-0.31589*	0.1496
Other assault outside of home	189.6	113.8	147.1	89.1	125.0	135.9	1.517	-0.10143*	0.0486
Self-inflicted violence	0.0	57.0	28.5	49.6	18.1	29.6	0.000	0.12470	0.2339
Unintentional injury	756.5	657.6	741.2	720.1	1081.3	782.3	0.700	0.06268	0.0487
Traffic collision	25.6	21.0	7.8	5.1	5.4	13.8	4.741	-0.33873*	0.0578
Accident at work	91.3	78.1	56.0	103.1	160.9	95.6	0.567	0.11713	0.0822
Sport	6.6	6.6	35.5	39.4	116.9	37.5	0.056	0.50683*	0.1013
Other unintentional injury	353.1	316.6	478.6	384.7	499.9	402.3	0.706	0.06962*	0.0252
Total	1110.4	1040.1	1113.0	1010.1	1273.3	1106.0	0.872	0.01713	0.0241
Sample (n)	*12210*	*10313*	*10445*	*9634*	*8792*	*51394*			
2. Type of injury (%)									
Intentional injury	27.2	32.3	27.3	13.7	11.8	20.8	2.305	-0.20110*	0.0443
Assault in home	6.9	9.5	6.2	1.3	2.3	4.7	3.000	-0.29587*	0.0702
Other assault outside of home	16.8	12.9	15.7	7.5	8.1	11.5	2.074	-0.16043*	0.0288
Self-inflicted violence	3.6	9.9	4.1	4.9	1.3	4.3	2.769	-0.21687	0.1462
Unintentional injury	66.0	64.3	69.6	72.7	88.2	74.1	0.748	0.06521*	0.0140
Traffic collision	8.9	11.7	5.3	6.3	6.4	7.4	1.391	-0.09960*	0.0386
Accident at work	20.2	20.7	10.7	13.3	15.2	15.6	1.329	-0.06826	0.0461
Sport	1.5	0.0	5.3	7.8	20.5	8.7	0.073	0.47730*	0.1183
Other unintentional injury	35.5	32.0	48.4	45.2	46.1	42.4	0.770	0.05817*	0.0274
Unknown	6.7	3.3	3.0	13.7	0.0	5.1	-	-0.12526	0.2619
Total	100.0	100.0	100.0	100.0	100.0	100.0			
Sample (n)	*74*	*71*	*84*	*97*	*129*	*455*			

Note: Refer to injuries suffered by adult respondents aged 15-49 in the 30 days preceding the interview and that was treated by a doctor or nurse. Injury rates are adjusted for differences in gender, age, education and place of residence. The population average is calculated by weighting the quintile rate for the particular indicator by the proportion of the total number of individuals at risk in that specific quintile. Concentration indices with one asterisk differ significantly from zero at the 95% level, while ones with two asterisks differ significantly from zero at the 90% level using a two tailed t test.

Source: Author's own calculations from South African Demographic and Health Survey (SADHS).

Appendix B: Socioeconomic inequalities in self-reported occupational injury and disease in South Africa (1998)

Indicator	Wealth quintile					Population average	Poor/rich ratio	Concentration index	Standard error
	1	2	3	4	5				
1. Injury rate per 1 000 working adults									
Current occupational injury	82.4	66.9	39.4	69.0	57.6	60.4	1.431	-0.02698	0.0532
Missed work as result of injury	50.9	48.3	25.3	46.7	35.2	39.5	1.446	-0.04414	0.0486
Past injury/problem aggravated	51.0	44.1	42.5	49.9	46.7	46.6	1.092	0.00556	0.0167
Missed work as result of injury	26.6	21.5	21.9	29.5	37.0	28.7	0.719	0.10902*	0.0229
Total occupational injury	117.0	92.8	70.2	103.9	89.1	92.0	1.313	-0.01260	0.0398
Missed work as result of injury	66.7	57.0	43.3	68.2	64.1	60.0	1.041	0.03122	0.0304
Sample (n)	*424*	*727*	*906*	*1060*	*1412*	*4529*			
2. Type of injury (%)									
Current occupational injury	11.9	9.3	4.8	7.2	7.3	7.5	1.630	-0.06054	0.0736
Sample (n)	*421*	*720*	*900*	*1052*	*1408*	*4501*			
Missed work as result of injury	65.2	77.9	71.8	75.3	57.0	68.5	1.144	-0.03923	0.0322
Sample (n)	*45*	*59*	*46*	*68*	*90*	*308*			
Past injury/problem aggravated	7.1	5.5	4.7	4.9	7.1	5.9	1.000	0.04030	0.0533
Sample (n)	*420*	*719*	*900*	*1052*	*1407*	*4498*			
Missed work as result of injury	71.9	66.5	69.2	66.9	60.3	65.4	1.192	-0.03143*	0.0094
Sample (n)	*25*	*41*	*36*	*43*	*80*	*225*			
Total occupational injury	15.4	11.4	7.6	10.2	11.7	10.8	1.316	-0.00835	0.0651
Sample (n)	*420*	*718*	*900*	*1052*	*1406*	*4496*			
Missed work as result of injury	64.6	67.8	67.4	67.3	58.6	64.3	1.102	-0.02537**	0.0132
Sample (n)	*58*	*81*	*68*	*97*	*141*	*445*			

Note: Refer to occupational injuries suffered at work or to injuries aggravated at work in adult respondents aged 15-49 that were working for pay in the 12 months preceding the interview. Injury rates are adjusted for differences in gender, age, education, population group and place of residence. The population average is calculated by weighting the quintile rate for the particular indicator by the proportion of the total number of individuals at risk in that specific quintile. Concentration indices with one asterisk differ significantly from zero at the 95% level, while ones with two asterisks differ significantly from zero at the 90% level using a two tailed t test.
Source: Author's own calculations from South African Demographic and Health Survey (SADHS).

Appendix C: Socioeconomic inequalities in self-reported occupational injury and disease in South Africa (1998)

Indicator	Wealth quintile					Population	Poor/rich	Concentration	Standard
	1	2	3	4	5	average	ratio	index	error
1. Injury rate per 1 000 working adults									
Health problems	42.5	26.9	18.4	31.9	59.5	38.0	0.714	0.16671*	0.0759
Respiratory diseases	0.0	3.8	0.9	5.5	14.5	6.6	0.000	0.43108*	0.1095
Musculo-skeletal diseases	6.1	3.6	4.9	17.9	22.8	13.4	0.268	0.32088*	0.0895
Injury	70.8	58.9	46.4	64.5	30.6	50.0	2.314	-0.12332**	0.0661
Sprains, dislocations, etc.	44.1	37.3	32.0	47.0	25.8	35.6	1.709	-0.06783	0.0536
Accidents	18.3	15.0	11.3	10.5	4.2	10.1	4.357	-0.24944*	0.0778
Total	117.0	92.8	70.2	103.9	89.1	92.0	1.313	-0.01260	0.0398
Sample (n)	*424*	*727*	*906*	*1060*	*1412*	*4529*			
2. Type of injury (%)									
Health problems	38.6	29.3	26.4	30.2	56.9	39.0	0.678	0.12940*	0.0540
Injury	63.4	68.8	71.2	69.3	44.3	60.8	1.431	-0.07822**	0.0427
Total	100.0	100.0	100.0	100.0	100.0	100.0			
Sample (n)	*58*	*81*	*68*	*97*	*141*	*445*			
Respiratory diseases	0.0	5.2	1.4	5.4	14.9	7.1	0.000	0.40018*	0.1180
Musculo-skeletal diseases	5.6	4.0	6.7	14.8	17.0	11.1	0.329	0.26049*	0.0690
Sprains, dislocations, etc.	41.6	45.6	50.9	51.9	41.2	45.9	1.010	-0.01037	0.0292
Accidents	21.0	21.5	20.3	12.9	3.6	13.7	5.833	-0.29588*	0.1128
Other health problems and injuries	31.9	23.7	22.5	17.3	25.2	23.6	1.266	-0.03257	0.0553
Total	100.0	100.0	100.0	100.0	100.0	100.0			
Sample (n)	*58*	*81*	*68*	*97*	*141*	*445*			

Note: Refer to occupational injuries suffered at work or to injuries aggravated at work in adult respondents aged 15-49 that were working for pay in the 12 months preceding the interview. Injury rates are adjusted for differences in gender, age, education, population group and place of residence. The population average is calculated by weighting the quintile rate for the particular indicator by the proportion of the total number of individuals at risk in that specific quintile. Concentration indices with one asterisk differ significantly from zero at the 95% level, while ones with two asterisks differ significantly from zero at the 90% level using a two tailed t test. The percentages in the bottom half of the tables adds up to more than 100 in some cases, because the analysis combines the data for current injuries or health problems experienced at work and for injuries or health problems aggravated at work.

Source: Author's own calculations from South African Demographic and Health Survey (SADHS).

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