Myrian Matsou Affonso Beltrão

DEATH FROM EXTERNAL CAUSES
- RECENT EVOLUTION AND THE NEED FOR CHANGE OF FOCUS

This article addresses a number of economic activities, both traditional and non-traditional, where very little is known about work related health and safety. Such activities include workers who are not in registered employment and whose occupations are excluded from official statistics, e.g. fishermen, rubber tappers, truck drivers, private security guards, amongst others. These sectors can be said to constitute a ‘zone of exclusion’ of knowledge about workers’ health.

Reasonably reliable information exists about workers engaged in the formal sector, who are the part of the economically active population (EAP). Statistics about work-related accidents and illnesses in the formal sector are publicly available from government institutions (and have been analyzed elsewhere in this journal).

We also analyze the large number of fatal accidents that occur during work activities but which are not recognized as work-related deaths. These fatalities appear in the statistics as homicides or transport accidents which contributes to an under registration of fatal work accidents in Brazil. This fact demands an understanding of the dimensions of the relationship between mortality due to external causes and work accidents in order to formulate better OHS prevention measures (Hennington, Cordeiro & Moreira Filho, 2004).

The importance of this information becomes clear when we observe that the statistics show that the number of deaths from external causes in Brazil is second only to the number of deaths from cardiovascular diseases. Homicides and road accidents are the most important causes of death from external causes (www.ms.gov.br). A number of recent studies on work accidents have included the question of violence in the major cities as a cause of accidents (e.g. the studies of Waldvogel (1999) and Machado & Gomez (1994).

Populations excluded from official statistics

It is difficult to say whether health, life expectancy and expectations about work are getting better or worse for a significant part of the Brazilian population. The little available knowledge about this population comes from epidemiological and case studies (such as those included in this journal) that reveal specific cases of very high mortality rates due to work accidents. In spite of the existence of case studies, to our knowledge, there has been no general study undertaken on the populations excluded from OSH statistics. This fact indicates the degree of social exclusion of these groups and the lack of equity in Brazil. IBGE data on the general Brazilian population, and specifically on the Economically Active Population (EAP), (i.e. individuals over 10 years of age who are employed), gives some indication of the numbers excluded from statistics. In the Census conducted in 2000, the Brazilian population was 169,873,000 inhabitants. IBGE statistics, based on the PNAD survey, reveal an EAP of 86,056,000 persons. Of this total, only 55% contribute to the Social Security system; 45% of the EAP do not contribute.
A detailed analysis of IBGE statistics in the 2000 census also shows that a large part of the economically occupied population, (which excludes unemployed members of the EAP), don’t contribute to Social Security. Among the occupied population of 65,630,000 some 31,802,000 do not contribute. Table 1 presents the distribution of the occupied population, according to position in the occupation, category of employment and whether they contribute to the Social Security system in their principal job. The result gives an idea of the scale of exclusion as 49% of individuals do not contribute.

Table 1. People aged 10 years or over according to occupation, type of employment and contribution to an official Social Security Institute in their principal job (census 2000). Source: www.ibge.gov.br. IBGE Censo Demográfico 2000. Trabalho e rendimento. Table 1.1.8

<table>
<thead>
<tr>
<th>Position in the occupational structure</th>
<th>Total</th>
<th>Contributor to Social Security</th>
<th>Non-contributers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>43,694,129</td>
<td>29,126,339</td>
<td>14,567,820</td>
</tr>
<tr>
<td>With signed work registration</td>
<td>23,929,433</td>
<td>23,929,433</td>
<td>--</td>
</tr>
<tr>
<td>Military or Public Service personnel</td>
<td>3,693,192</td>
<td>3,693,192</td>
<td>--</td>
</tr>
<tr>
<td>Others without a signed work registration</td>
<td>16,071,534</td>
<td>1,503,714</td>
<td>14,567,820</td>
</tr>
<tr>
<td>Employers</td>
<td>1,897,842</td>
<td>1,360,323</td>
<td>537,519</td>
</tr>
<tr>
<td>Working on own behalf</td>
<td>15,396,247</td>
<td>3,334,818</td>
<td>12,061,429</td>
</tr>
<tr>
<td>Unpaid workers who help a member of the household.</td>
<td>2,608,533</td>
<td>--</td>
<td>2,608,533</td>
</tr>
<tr>
<td>Working in productive activities for own consumption.</td>
<td>2,033,141</td>
<td>--</td>
<td>2,033,141</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>65,629,892</strong></td>
<td><strong>33,821,480</strong></td>
<td><strong>31,808,442</strong></td>
</tr>
</tbody>
</table>

Table 2. Distribution of the population by activity sector, according to the PNAD (IBGE), 2002.

<table>
<thead>
<tr>
<th>Distribution</th>
<th>No. of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total occupied population</td>
<td>78,168,174</td>
</tr>
<tr>
<td>Services</td>
<td>34 %</td>
</tr>
<tr>
<td>Agriculture</td>
<td>21 %</td>
</tr>
<tr>
<td>Commerce and repairs</td>
<td>17 %</td>
</tr>
<tr>
<td>Industry</td>
<td>14 %</td>
</tr>
<tr>
<td>Construction</td>
<td>7 %</td>
</tr>
<tr>
<td>Other</td>
<td>7 %</td>
</tr>
</tbody>
</table>
The data shows that in 2000 there were 5,016,000 domestic workers. 1,493,000 (30%) were registered and 3,524,000 (70%) were unregistered. These statistics do not explicitly consider other categories such as workers in private security, fishing, street commerce, etc. The little known information about these categories comes from qualitative or quantitative case studies. While this research gives us a better idea about the lives of unregistered workers, information is still fragmented and tenuous.

In Brazil, (as in developing countries in general), an important part of the working population is involved in traditional, informal and unregulated work. In such situations it is not unusual to find authoritarian work relations and unstable employment situations. Accompanying these conditions is a lack of safety and quality medical treatment, as well as poverty, hunger and exploitation. Traditional, informal and unregulated work can be considered to be part of a “zone of exclusion” in relation to OSH issues. While some see this as a problem, others see it as a perfectly natural part of Brazilian reality, difficult to resolve and so of little political importance and/or scientific relevance. In these cases, many of the variables used to explain the decline in accident rates in the formal sector, (e.g. trade union action, inspection by the Ministry of Labor and Employment, the actions of OSH technicians and professionals, etc), have no effect on workers in the informal sector.

In order to better understand what is occurring among workers in the informal sector, we examine the case studies mentioned above as well as a number of studies of deaths due to external causes which seek to include unregistered workers. Both the case studies and population studies of the informal sector use information bases which, even though incomplete, permit information gathering about work related illness and accidents.

The search for knowledge about work accidents

International literature shows that sub-contracted or temporary workers carry out more dangerous tasks than their regularly employed counterparts (Quinlan, Mayhew & Bohle, 2001). International studies also show that in the informal sector, small companies with irregular activities normally employ quite simple technologies for their operations. Such operations have poor or nonexistent safety procedures, which helps to explain the high rate of accidents suffered by these workers (Loewenson, 1998).

In Brazil, the Department of Safety and Health at Work of the Labor Inspectorate of the Ministry of Labor and Employment (MLE), recognizes the poverty of data relating to the informal sector and the necessity to investigate the real situation that exists in the country. Together with a number of universities and information institutions, this department has made efforts to produce data on informal sector workers.

The principal sources of information found in studies of accidents and work-related illnesses which seek to incorporate the informal sector are: the “System of Information concerning Mortality” of the Ministry of Health (SIM/MH) – Death certificates and the “System of Information from Hospitals” of the SUS (SIH/SUS). Beyond these two systems, some
Information systems and research into fatal accidents

The Ministry of Health’s SIM is managed by the National Epidemiology Center of the National Health Foundation. While it covers 900,000 deaths per year (a seemingly large number), coverage is still incomplete in some areas of the country, principally in the Northern and Northeastern regions. The data used in the SIM originates from Death Certificates filled out by local Coroners’ Offices.

One of the principal advantages of using death certificates as a source of data, is that a wide range of data is provided about the deceased person, including sex, age, marital status, occupation, and municipality of residence. Data is also included about external causes of death, together with a specific field designed to elicit responses about whether the cause of an accident was known and, whether an accident was due to work activities. Another advantage is that this statistic covers all workers, independent of whether their employment relationship is formally established and/or independent of their status as a contributor to the social security system. Among the problems associated with this statistical base, Waldvogel and Teixeira (2002) discuss the inadequate completion of the field relating to work accidents which they see as ‘interfering in the identification and quantification of fatal cases.’ Another problem is the lack of a “more specific record about the accident such as the causal agent, and if the worker was carrying out work-related duties or not at the time of the accident”.

Another limiting factor with death certificates is related to the coding rules which consider homicide as a type of violence incompatible with the designation of a work accident so, from this perspective, homicides that occur in the workplace are considered as violent deaths unrelated to work. This contributes to under registration of fatal work accidents.

Waldvogel and Teixeira used SIM to analyze deaths due to work accidents in the State of São Paulo between 1997 and 1999. The study made a distinction between those who contributed to the INSS and those who did not. The results showed that men were the main victims in about 95% of the cases; there were about 20 male fatalities for every female death. The distribution was similar among those contributing to the INSS and those not contributing, however, an examination of the variable ‘age’ revealed a different pattern. Among those workers who contribute to the INSS, fatal accidents occurred principally among workers aged between 30 and 39 years of age while among those who did not contribute to the INSS, fatal accidents occurred between 25 and 29 years of age.

Table 3 reveals the distribution of deaths by occupational grouping.

<table>
<thead>
<tr>
<th>Occupational groupings</th>
<th>Services and commerce</th>
<th>Transport and communication</th>
<th>Industry</th>
<th>Construction</th>
<th>Agriculture</th>
<th>Other occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of accidents</td>
<td>33</td>
<td>21</td>
<td>19</td>
<td>11</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

Analysis of the raw data in this table shows that the total percentage of deaths due to work accidents is similar for contributing and non-contributing workers. An examination of professional categories reveals that drivers have the greatest participation among fatal accident victims. This group is the leader for both workers who contribute to the social security system (24%), and for workers who do not contribute (16%). The second greatest incidence of accidents is found among ‘general laborers’ in both sub-groups, followed by stonemasons, security guards and rural laborers. Their relative position differs depending on whether or not they contribute to the social security system.

For those workers who do not contribute to the social security system, transportation accidents are the major group responsible for 30% of fatal accidents followed by homicides (26%), other accidents (25%), and falls (13%).

Statistics indicate that the potential risks of accidents are growing due to social problems interfering in work activities, and also because work increasingly takes place outside the confines of factory walls. According to Waldvogel (2001), these facts result in risks for the health and safety of workers from violence which occurs in the major urban centers, chaotic traffic in cities and on highways, and from the poor state of vehicle safety.

Oliveira & Mendes (1997) sought to identify work related deaths using death certificates in the city of Porto Alegre. Of the 159 deaths they studied, 31 cases of death due to external circumstances were identified as work accidents and research was conducted with the families of victims to identify the causes of death. The main causes identified were homicides (58%), followed by traffic accidents (29%). Of the 31 deaths, 17 occurred to registered workers, however, 11 of these deaths were not included in social security statistics because the specific accident reporting documents (CAT) were not filed correctly. The other 14 deaths occurred to workers in the informal labor market. Among these workers some were engaged in illegal activities at the time of death so were not entered into formal accident statistics. These cases included robbery (3 cases), receiving and drug trafficking (2 cases), prostitution (1 case) and unknown activity (1 case). They point out the extent to which official statistics don’t reflect the realities of day-to-day work. From this perspective, it is necessary to resort to data collection mechanisms that are different to the CAT, so as to cover all situations where work involves health risks and to understand mortality patterns.
Death certificate data compiled in the important urban centers, confirm that external causes of death, (accidents, poisoning and violence), is the third cause of death, after cardiovascular diseases and malignant tumors. The circumstances that led to the ‘external cause of the injury’ may not always be known to the coroner (Laurenti & Mello Jorge, 1987). Frequently, death certificates fail to mention whether a particular injury or accident caused by a motorized vehicle, for example, has a relation to work activity or not (Mello Jorge, 1990). According to Oliveira & Mendes (1997), these diagnoses demonstrate that the question of work accidents must be seen within a wider perspective of socio-economic crisis. Homicides, traffic accidents and pedestrian deaths require different preventive methods to those traditionally used in workplace safety.

Hennington, Cordeiro & Moreira Filho (2004) developed a study on the relationship between mortality due to external causes and work accidents. An epidemiological study was carried out using death certificates of males aged between 15 and 64 years, who died between June 1999 and May 2000 in the city of Campinas. 159 cases of death were chosen at random and an effort was made to establish the work history of the deceased through household research carried out with family or friends.

The majority of deaths analyzed (100 deaths), referred to workers who were a part of the economically occupied population, (i.e. individuals who in the month of their death were engaged in some form of paid activity). 73% of these workers were working in the service sector in some way and the rest were working in industry, principally in construction. Only 30% of the workers were registered, 59% were working informally, 6% were employers and there was insufficient information about the employment status of 5% at the time of death. Of the 100 cases analyzed, 66 were victims of homicide, 29 of accidents and 5 had committed suicide.

The majority of dead individuals were aged between 20 and 29 years, lived in outlying suburbs, had little schooling and a family income of less than 10 minimum wages per month (about US$ 800 at the time of writing). 33% of deaths occurred between 20.00h and 01.00h, and nearly 50% of them on public roads.

While 27 deaths were classified as resulting from work accidents, no death certificates registered this as the cause of death! Among the work accidents, 13 were considered regular work accidents and 14 were transport related accidents. 13 of these accidents were classified as homicides due to firearms: 3 during police investigations, 2 while working as security guards, 6 during acts of theft and robbery, and 2 because of conflicts with workmates or clients.

Those work accidents classified as transport accidents, mainly resulted from victims being run over or injured with multiple traumas in the course of their work activity or, when going between work and their residence – 10 deaths, motorbike or automobile collisions. Two accidents (to a bricklayer and a carpenter respectively) were the result of falls causing head traumas. One was working at his main occupation and the other was engaged in part-time work on a weekend.
This study permits us to see that the proportion of deaths due to external causes due to work accidents, is 27%, or roughly one in four, among the adult male population of Campinas. In the state of São Paulo there were 25,644 male deaths due to external causes in the 15-64 age group in the year 2000. (AES, 2001) If the proportion found in Campinas is applied to the whole state (27/159), it is estimated that about 4,355 of these deaths would have been due to work accidents. This number is six times greater than the number of 722 deaths given by the State Government’s data processing service for the year 2000 which leads us to estimate the rate of under registration of fatal work accidents is about 83%.

According to Hennington, Ordeiro & Moreira Filho (2004), the main cause of work accidents is related to urban violence. Some violent accidents occur during travel between home and work or during regular work, for example, among security guards, plainclothes and uniformed police who die in conflicts with bandits. However, urban violence is becoming a new category of work accident. Accidents such as assaults and homicides are no longer restricted to the spaces where work is carried out but occur increasingly in public thoroughfares. Such accidents include being hit by stray bullets, assaults and other types of violence that affect workers on their way between home and work, a situation that we believe can be found to a greater or a lesser extent in all the large Brazilian cities.

Both quantitative and qualitative methods were used to build up data about work related accidents and illnesses among fishermen. Dall’Oca’s (2003) study of members of fishing communities in the principal regions of the state of Matto Grosso do Sul, pointed out that in 1996 and 1997 only two fatal accidents were registered for this category of workers in the official accident statistics compiled by the INSS.

This small number of registered fatal accidents shows the need to seek out more accurate information about fisherman because official statistics do not reflect the reality. Dall’Oca collected data in the 8 main fishing communities in Matto Grosso do Sul and found that there were about 5,000 professional fishermen. A semi-structured questionnaire was applied in order to obtain an outline of the epidemiological situation: socioeconomic characteristics, the gender composition of the labor force, working conditions and information relating to other variables was collected. Given the large scale of under registration of illnesses and accidents discovered, the researcher sought information about these phenomena by going into the field. Local leaders informed him about the principal accident related incidents that had occurred, as well as illnesses and risk factors constantly experienced by craft fishermen. Fishermen told of fatal accidents in nearly all of the colonies in the state. 21 deaths were reported, mostly caused by drowning due to boats overturning in rivers (15 cases), collisions of boats (1), drowning (3), brain hemorrhage (1) and unknown cause (1). A variety of illnesses were found, these were related to the heart, the kidneys, the column, mycoses, rheumatism, leishmaniosis, and leprosy, arm injuries and/or inflammation of the nerves of the hand (RSI). It was estimated that the fatal accident rate among the fishermen was 4.2 per thousand workers, per year. The poor working conditions become clear when this statistic is compared with the mortality rate for work accidents in the state of Matto Grosso do Sul’s construction industry which was 0.3 per thousand (AEPS, 2002 and 2003).
The question of under registration of fatal accidents among fishermen is also seen in a study about lobster fishing on the coast of Rio Grande do Norte (see Chapter 5). Francisco Reis found that according to representatives of the fishing communities, it was estimated that approximately 700 divers worked in the years 1999/2000. On the basis of this figure, the fatality rate was calculated and estimated to be 3 per thousand divers in 1999 and 14 in 2000, compared to their counterparts in the construction industry in the same state, who had 0.4 fatalities per thousand workers in 2002 (AEPS, 2002).

Jacqueline Muniz carried out a study of the mortality of uniformed Military Police in the state of Rio de Janeiro, mainly between 1983 and 1998, (see Chapter 7). Her research was based on statistics drawn from state government agencies. A considerable number of policemen use their leisure time to work longer hours, either formally (e.g. overtime to guarantee staff coverage) or, informally (contrary to the law) as private security guards. There is a strong incentive to engage in such activities as the pay rates may be greater than the salary paid by the police force. A number of deaths that can be considered to be ‘work accidents’, occur when officers carry out this informal work. There are also high risks of death in situations found in regular police work, especially where police get caught up in armed conflict. Analysis of the data shows that the mortality rates of on duty Rio de Janeiro police are far higher than those of their counterparts in the United States. In the US, the mortality rate over the period 1994-2003 was between 0.2 and 0.3 police deaths per thousand police officers, while in Rio de Janeiro the rate of deaths caused by firearms was 0.8 over the same period. By contrast, construction industry workers in Rio de Janeiro suffered a fatality rate of 0.3 per thousand workers in the year 2002.

**Information systems and research on non-fatal accidents**

The SIH includes information that originates from public institutions and those with contracts with the Unique Health System (SUS). It covers about 80% of the hospital treatment in the country and the data it collects refers to some 13 million hospitalizations per year. However, a flaw can be seen in the data when figures for the year 1997, for accidents and violence, only register the nature of the injury without any reference to the cause. A decree was published requiring the external causes that produce injuries resulting in hospitalization to be registered from 1998 onwards. In spite of legal requirements, the system of epidemiological information relating to emergency department treatment is practically inexistent, and this hinders in-depth studies.

Conceição, Cerqueira, Nascimento and Oliveira (2003), evaluated the proportion of accidents in an emergency department in the city of Salvador in the state of Bahia. Their study sought to describe the work accidents which caused lesions requiring treatment. In the authors’ view, a large proportion of workers suffering accidents would be sent to hospital emergency department services, whether they worked in the formal or informal sector. This being the case, emergency services could serve as important sources for collecting more complete information about work accidents than is presently available, without great difficulty and at low cost.
This research established that among the 215 patients studied, conventional work accidents represented 78% of all occurrences versus 22% of accidents which occurred whilst traveling between work and home. About 90% of the victims were male, their mean age was 31 years and their average level of schooling was low. 69% of victims had not finished primary school, and of these, 6% were illiterate. The main occupations were: bricklayer (10%) and carpenter (9%). The principal branches of activity of the firms where the victims worked at the time of the accident were: construction (27%), commerce (25%), industry (15%), agriculture (6%) and others (28%).

41% of victims were classified as autonomous workers, some of whom contributed to the social security system while others did not. A further 37% were registered workers, 15% were employees without registration and 7% were domestic workers (registered and non-registered). All the domestic workers were considered to be informal workers because social security legislation did not permit their accidents to be registered.

Santana (2003) developed a study based on data collected among 2,990 residents of Salvador city. This population-wide survey analyzed the annual rate of non-fatal occupational accidents among registered and unregistered workers in the year 2000. The results showed that the majority of women workers had no formal labor contract, whereas about half the males had no such contract.

The analysis of the occupational characteristics, in accordance with gender and type of labor contract, shows that the majority of both men and women without a contract carry out their paid activities either in their own home (traditional craftwork), in the street (street hawkers, traveling salespeople) or in other peoples’ homes (domestics).

For women, the accident rate for non-fatal accidents was higher among those who had only an informal employment relationship (7.0/100 full time workers/year) as opposed to those formally contracted (4.6/100 full time workers/year). Santana established that unregistered female workers were at greater risk of being accident victims than other female workers, considering their area of activity and services. The situation for men was entirely different as in most areas where the men worked with a contract, their annual rates of accidents were higher than those found among non-contracted workers. This finding could be due to a significant proportion of males, without a formal contract, working in their own homes (traditional craft work), whereas the women without a contract worked as maids, and also suffered psychological risks. Such a hypothesis is compatible with the approach to maids’ work developed by Nunes and Theodoro (see Chapter 6), that discusses certain psychological risks involved in maids’ work. According to these authors, maids suffer from actions which end up devaluing them as not only as professionals but as human beings. The main reasons quoted for maids quitting their jobs are humiliation (in more than 50% of cases) and low salaries (19% of cases). Conflicts in social relations affect both their psychological and physical health.
Final reflections

The “zone of exclusion” from knowledge is quite large, as we have little knowledge from the formal sector about certain types of deaths due to violent causes, homicides and traffic accidents (directly work-related or transport related), and occupational illnesses. In the informal sector, knowledge about all forms of death and injury is excluded from nationally available statistics.

The studies examined here give an indication about the mortality and accident profile of workers whose situation is little known. Many of this group including fishermen, watchmen, security guards and rural workers, work in activities where safety procedures are inadequate or inexistent. Other workers such as bus drivers and police, are exposed to risks that are a product of a complex urban society and are quite different from those which OSH preventive measures were originally designed to combat. We have also been able to ascertain from some of the studies that the majority of victims are younger, male, have low levels of schooling, and receive lower than average remuneration. Another phenomenon observed is that some informal workers are ten times more likely to suffer a fatal accident than their counterparts who work in the most dangerous of all major industries covered by the social security system – the construction industry. This complex set of results highlights the fact that the way to safer and healthier work requires a mix of traditional OSH interventions in activities that have so far been ignored. An expansion of interventions to treat problems that have been largely ignored by the dominant OSH perspectives, especially violence, traffic safety and psychological problems, is also needed. Considerable effort is required to build and reinforce research, to find new perspectives and develop appropriate measures Professionals, government and other political forces must be convinced to change the highly inequitable situation that currently exists.

In conclusion, I consider that the following measures should be adopted. The information presented in this chapter should stimulate further studies in order to verify the extent to which the facts revealed here are reflected in other sectors of economic activity, regions and groups of workers. Attempts should be made to build robust comparative knowledge on the basis of Brazilian data and data from other developing countries. More investigations about populations not yet studied are required in order to widen our knowledge base and to build data bases about workers whose situation is largely unknown. In a democracy, public policies should seek to implement a regime of equity and protection for these workers who face particularly important health and safety problems at work.
Visible changes have occurred in the profile in diseases and causes of death in the Brazilian population over the last decades. This epidemiological transition has as its main characteristic the continuous substitution of mortality due to infectious illnesses by those due to chronic non-infectious illnesses, and this relates to the demographic transition, where the population now has a larger proportion of individuals who have reached more advanced ages. Such events, relatively recent and with special features in the Brazilian context, have important repercussions for the labor force and for workers’ health.

Demographic trends and economic structure in Brazil

Global projections show that the aging of the working population is one of the principal structural transformations in course in contemporary societies and will continue for the next quarter of a century (OIT, 1992). On the other hand, the characteristics of work are themselves being modified as a consequence of the globalization process which governs the new economic order (Rifkin, 1995. Wünsch Filho, 1995). This conjunction of variables imposes phenomena which are not understood completely, for which there are no simple solutions and also lead to future perspectives for work and employment being very different to what occurred during most of the second half of the 20th Century.

Life expectancy at birth for Brazilians has doubled over the last 100 years. In 1900 it was about 34 years, it reached 46 in 1950 and, by 2000, had reached 69 years (IBGE 2000). At the beginning of the 20th century, Brazil was formed essentially by a young population, on the threshold of the 21st century it is ageing. The proportion of the population group that is 60 or more years of age has increased constantly throughout this period going from 3% in 1900 to 9% in 2000 (IBGE, 2000).

Two main variables influence demographic transition, mortality and fertility. The mortality rates of the Brazilian population started to decrease from the 1940s. However, the fertility rate remained stable until the 1970s when it began to fall. Between 1970 and 2000 the fecundity of Brazilian women was reduced by more than 50%. The coming together of stable fertility, between 1940 and 1970, and simultaneously the sudden reduction in mortality, provoked explosive population growth. In the opinion of some authors, the fall in fecundity promises to be the principle component of the aging population in the Brazil (Carvalho and Garcia, 2003).

Another variable has been pointed out as being involved in the demographic transition – migration. However, its effect has been limited. In some specific circumstances it can contribute to changes in a population’s age structure. Such is the case in Northeastern Brazil, where important migratory movements of the younger population to the Southeast, particularly in the second half of the 20th Century, contributed in part to the relative aging of the Northeast’s population (Monteiro, 1997).

Graph 1 displays the trends of the Brazilian population, between 1950 and 2000, distributed by age groups. Since 1990 the group of those under 15 years of age has stabilized. The 15 to 59 year age group, which corresponds to the bulk of the economically active population,
showed a tendency to increase over the period, although the strength of growth is clearer for the age group aged 60 or over.

At the same time as the age composition of the population was changing, the 1950-1960 period saw important economic changes. Until then basically an agrarian country Brazil became a country with an industrial profile. And today it seems to be heading towards deindustrialization (Wünsch Filho, 1995, 1999), a phenomenon also observed in other countries (Loomis, 2003). In this context of profound demographic and economic changes the data continues to show Brazil as a society with chronic inequalites and a high income concentration.

Epidemiological transition and the labor force

The causes of death of the Brazilian population show notable transformations. In Graph 2 we can see the proportional variation in the main causes of the death between 1930 and 2000. One notes the important decline in deaths due to infectious diseases, which stabilized at around 5% to 6% over last decade. On the other hand, cardiovascular diseases increased over the period, and have recently tended to stabilize. One trend is an increase in the rates of deaths due to external causes, this affects younger segments of the population, and of neoplasias, which affects older individuals.

In Brazil and in other Latin American countries, the epidemiological transition corresponds to what is known as an accelerated model, one which is dependent on health technologies. For example, the recent revolution in the survival of children in many developing countries is a result of the application of a limited number of technological interventions, such as immunization against infectious diseases, oral rehydration therapy for gastroenteritis and antibioticotherapy for acute respiratory diseases (Gribble & Preston, 1993).
The shift in the dominant age structure towards older age groups results in the predominant causes of mortality being characteristic of those age groups. There is, therefore, an “aging of mortality” (Monteiro, 1997). All this has great economic impact on the society, because many non-infectious illnesses lead to death only after prolonged periods of chronic illness. In this way, the importance of populational morbidity increases as a result of illnesses such as rheumatic arthritis, diabetes or silicosis.

Recently, discussions have become increasingly frequent about a new epidemiological transition, given that, next to the decrease in mortality due to cardiovascular diseases, we see the emergence or reemergence of some infectious diseases, like AIDS, malaria, tuberculosis and dengue (Susser & Susser, 1998. Luna, 2002). Complete morbidity and mortality data are not available for all regions of the country, in general the poorest are left out. We suppose that such sub-populations suffer more infectious and parasitic diseases than the rest of the population but also, paradoxically, have higher rates of non-infectious diseases. There are indications that such populations have higher levels of arterial hypertension, tobacco use, alcohol consumption, obesity and work more frequently in unsafe occupations and workplaces and, consequently, are at greater risk of acquiring occupational diseases. It should be emphasized that a decision to change health and resource allocation priorities from a given group of illnesses (which affect a particular age group) to another, can benefit some parts of the population to the detriment of others. This is a permanent dilemma in the underdeveloped countries. Brazil is a heterogeneous society and exhibits a complex bipolar health structure, where a modern nosologic pattern, with a large number of non-infectious diseases, divides space with an archaic nosologic pattern, where infectious diseases predominate. This picture complicates planning and raises the costs of health care.

In the advanced industrialized economies a preoccupation with the aging labor force has been a part of occupational health policy priorities for about 20 years, not only in the public sphere, but also in corporations (Robertson & Tracy, 1998). In Brazil, as well as in other Latin American countries, the perception of the problem is more recent. Reflections and proposals over the last five years originate from countless groups of researchers which, given the evident effects of the demographic transition, have for some time been looking at questions
relevant to the health of senior citizens (Sobral, 1999. Moreira, 2000. Camarano, 2001. Giatti & Barreto, 2002. Giatti & Barreto, 2003. Lima & Veras, 2003). The theme of the aging labor force is sparsely studied and eclipsed by serious problems which affect the workers in the country, such as high level of both unemployment and informal work. Unemployment, unstable employment and the aging of the labor force are interlinked variables. Studies in North America have shown that unemployment and unstable employment regimes are proportionally higher among older population groups (Robertson & Tracy, 1998). In Brazil, the overall rate of employability in the formal labour market increased by 4% from 2000 to 2001. It declined, however, by 6% for workers aged over 65 years. These workers and those between 15 and 17 years old were the only two age groups for which employment levels declined over this period (RAIS, 2001).

Aging at work: Myths, perceptions and facts

Currently the aging of workers is still subject to a series of stigmatizing myths and prejudices that originated in a period when the population as a whole, and especially the working population, was disproportionately made up of younger people. There is a belief that increasing age is related to a decline in work performance, although this is not supported empirically or scientifically (McEvoy & Cascio, 1989). Studies in the United States and Europe have shown that older workers are recruited in order to exercise predominantly part-time activities, tasks that make lower skill demands and also repetitive tasks and, as a consequence, tasks with smaller responsibilities and salaries (Robertson & Tracy, 1998). But, faced with inevitable and now established change, this picture will tend to alter, because the number of studies on the theme will increase and therefore contribute to building new perceptions based on scientific foundations and, therefore, less prone to prejudice.

For gerontologists, age starts and to be a problem over 75 years. Brazilian research about aging and work usually, examines the social implications of the aging of the labor force and, generally, focuses on populations in the age group of 65 years and over following in the tradition of general studies about population aging (Moreira, 2000. Giatti & Barreto, 2002. Giatti & Barreto, 2003), or on those over 60 years (Camarano, 2001). This information refers to individuals who have already reached retirement age, despite the fact that many continue to work in unstable jobs in order to increase family income. Studies that seek to incorporate projections relating to the aging labor force that pay attention to age cohorts within the economically active population and to the psychological and physiological consequences of this situation are virtually nonexistent. When research interest is directed towards the aging of the economically active population and the health of these workers, the age cohort examined should be widened to include those who are more than 40 years of age, although some studies limit themselves to workers aged over 45 or even 55 (Robertson & Tracy, 1998). Therefore, when the question relates to the aging of the working population, this generally refers to middle-aged people or to those in the first phase of aging, with ages between 40 and 65. In the industrialized countries, individuals over 50 years of age have difficulties in finding work (Ilmarinen, 1997). In Brazil, placement difficulties can sometimes affect those in their forties in some activities. In the European Union, it is estimated that by the year 2025 the proportion of people in the 50 to 64 years cohort will be greater than 33% of the economically active population, and those aged from 15 to 24 years old will fall below 18% (Härmä & Ilmarinen, 1999). This situation has obvious implications of such a situation for occupational health.
Factors that lead to psychological stress among more senior workers, and which tend to aggravate the effects of the aging process on health include contemporary working conditions, globalization and the consequent fragmentation of work, high competitiveness, the increasing number of new technologies and continuous demands for the learning of new skills, pressures for productivity, irregular working hours and shift work.

There are, however, positive aspects to the aging of the labor force which should be stressed. Aging can, at least for some groups of workers, be associated with an improvement in their mental state, because these individuals have greater experience and a wider strategic vision of their own work. Other qualitative characteristics are developed with age, like reasoning, perspicacity, prudence and judgment (Ilmarinen, 1997. Robertson & Tracy, 1998).

**Age, work and health**

The study of relations between age, work and health involve biological, psychological and social components that change with age. The health of older workers is affected by biological processes associated with aging and also by lifestyle (Härmä et al, 1999). The proportion of older workers who are free of a diagnosed illness is far smaller than that found among younger workers. A Finnish longitudinal study, conducted over 11 years with the same group of workers aged over 45, detected a declining perception in the capacity to work. The decline was greater for those jobs involving physical rather than mental demands (Ilmaren et al, 1997). Four elements were shown to be important: biological characteristics typical of aging, health, work and lifestyle. There is an intense interaction among such factors (Ilmaren, 1997). The discussion of interest in this article only examines aspects related to the normal course of aging, without paying attention to specific situations that befall groups of workers submitted to particularly adverse working conditions which induce particular physiological or psychological changes, chronic or temporary, which negatively affect health.

**Changes in the sensory, motor and cardio-respiratory functions**

Two sensory functions, audition and vision, are particularly important for the execution of many activities and begin to change when people reach their 40s. Normally deterioration is gradual, and is slight to moderate, however, despite individual differences, such sensory losses are widespread with age. Perceived changes in hearing sensitivity lead older workers to feel unable to do those jobs which require this sensory function even though they were previously able to accomplish them. The loss of vision can interfere with the dexterity of older workers, especially for a lot of informational work that incorporates new technologies involving the treatment of images and computer based work.

Also, the decline in motor functions with advancing age tends to be gradual and moderate. The loss of physical strength is a product of the deterioration of muscular mass with age. However, it is not yet clear if such a decline of motor functions is due simply to age or to the contribution of other possible causes such as, for example, reduced motivation in relation to the performance of physical activities, lower social expectations, or the role of illnesses which interfere in motor mechanisms. (Robertson & Tracy, 1998).

Important cardiovascular changes occur with age including an intrinsic decrease of the myocardium’s contractible function (WHO, 1993). One consequence of this is the reduction
in the physical capacities of more senior workers. Aging reduces the range of circadian rhythms and increases the loss of synchronization within the organism (Härmä & Ilmaniren, 1999). The rate of cardiovascular diseases increases with age and multiplies among older workers who are engaged in variable shift schedules. This combination of age and shift work is seen as an important risk factor in heart diseases (Boggild & Knutsson, 1999). It was also observed that workers over 40 years of age who perform shiftwork tend to have greater sleep disorders (Monetta et al, 1996) that can increase stress and also aggravate cardiovascular diseases.

Alterations in cognitive competence

The occurrence of work accidents varies according to the branch of activity, occupation and the worker's experience (Wünsch Filho, 2000). Work accidents have been extensively studied in relation to the effects of workers’ age. Research indicates two main conclusions: a) the occurrence of accidents is inversely correlated with the worker's age; b) the severity of accidents in workplaces is directly correlated with the worker's age (Robertson & Tracy, 1998). These observations do not support the widely accepted myth of intellectual deterioration with age. Considering the first conclusion, an explanatory hypothesis would be that effort is made to protect older workers by allocating them to less dangerous activities. However, given the same environmental and productive conditions, senior workers seem less likely to be involved in accidents than their younger counterparts (Andersson et al, 1990) which indicates that cognitive mechanisms remain the same and that tasks and safety measures are better memorized as they get older. Cognitive losses tend to only increase among older individuals who suffer from cardiovascular diseases or who live in adverse sociocultural conditions, are poor and subject to little stimulation. This second conclusion indicates that the greater physical frailness of older workers tends to result in accidents with more serious injuries (permanent damage, amputations, etc.) and fatalities.

We now know that individuals can continue to learn as they get older and many studies have investigated different phases of information acquisition and retention, particularly among older workers (WHO, 1993). Although these workers require greater time and effort to code information into the nervous system, once it is registered it is retained in a manner similar to that of their younger counterparts.

Conclusions

Life expectancy in different regions varies in accordance with the availability of relevant social opportunities for development, e.g. epidemiological policies and public health, opportunities for education and employment (Sen, 2001). Aging populations are a worldwide process, one that should stabilize, according to some projections, over the next quarter of a century (Rantanen, 1999). It occurs side-by-side with important transformations in the characteristics of work, with the increasing incorporation of computerized technologies and the fragmentation of production among different regions of the world.

A lot of scientific research into the aging labor force in the industrialized countries looks at questions related to productivity. Such investigations seek to analyze the performance of older workers in relation to task execution within current production systems. It is important to state that the treatment of the specific work conditions experienced by older workers does
not differ from those related to occupational health more generally. Much evidence indicates that tense and dangerous workplaces are factors which lead to a deterioration in working capacity, regardless of the worker's age. The strategy of occupational health has always been to adapt the working environment to the workers, not to adjust the workers to the workplace. At the beginning of industrial capitalism most of the labor force was made up of young workers, including many children. Public health action was carried out on two fronts, taking children out of the workplace so that they could be educated and interventions designed to make the working environment more healthy. With the aging of the labor force, new questions emerge and should be adequately studied by occupational health specialists. Natural biological processes associated with aging lead to older workers running down physically, but their cognitive competence remains. Much more research is necessary on the effects of age on both the physical and mental capacities of workers including research that takes account of different social contexts.

The world of work should seek to make the best use of the accumulated experience of older workers and to develop programs of permanent education to prepare them for dealing with information technologies. Once again the emphasis should not be to try to adjust the older worker to the working environment, but rather, the reverse (Ilmarinen, 1997). The preservation of employment for these workers is fundamental to preserve their self-esteem and mental health and to permit a gentle evolution towards a healthy old age after retirement.