OCCUPATIONAL SAFETY AND HEALTH IN BRAZIL
Guest editor: Tom Dwyer

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INTRODUCTION

This issue of OSH& Development is the fruit of three symposium sessions, organized by myself and Ester Galli, at an ICOH Conference held in 2003 in Foz do Iguacu, Brazil. The organizers particularly thank the ICOH Scientific Committee on Occupational Health and Development and the Swedish National Institute for Working Life for making these symposium sessions and this publication possible. The Brazilian Ministry of Labor and Employment and the research institute Fundacentro also made important contributions.

The symposium sessions had two objectives: 1) to introduce foreign researchers to Brazil and to show them how a number of important occupational safety and health (OSH) questions are treated and, 2) to mark a process of reflection on the subject within Brazil, given that the OHS area has changed greatly over the last twenty years. There is a perception that a profound renewal in thinking is required about interventions made in the name of health and safety at work in Brazil.

This special issue outlines the results of various research projects and interventions, all of which have been developed within the context of contemporary Brazil. However, it is also important to explain the history of these initiatives so Brazilian and foreign readers, from either developing or industrialized countries, can assess the relevance of these initiatives to their specific work or research and more general workplace health and safety. The current situation is illustrated by indicators of health and safety at work. These indicators began in the 1970s and continue to be developed. We examine epidemiological data and an evaluation of recent preventive initiatives from the viewpoint of the Ministry of Labor and Employment (MLE).

Foreign observers of occupational safety and health in Brazil frequently note a national phenomenon where people from a wide variety of academic disciplines contribute to research and interventions on OSH. This journal issue has contributions from doctors, engineers, sociologists, an epidemiologist, a statistician, a psychologist and a historian. The multi-disciplinary character of OSH work is both a cause and a consequence of much of the innovative research reported in this issue of the journal. However, as ICOH president Prof. Rantanen has so clearly said, in some developing countries, including Brazil, 60 - 65 percent of the working population is not considered or included in any occupational health policy, an inequitable and unjust situation.

Currently Brazil has a political agenda set around equity and social inclusion. It is an agenda involving the whole of Brazilian society, and was established by the new government, headed by President Lula, as it took the reins of power, a process which coincided with the ICOH Conference. The “Zero Hunger Program”, had just been announced as a project to eradicate hunger and social exclusion and was seen by many as representing a change in the desired direction.

Brazil is indeed a country of contrasts. By some calculations it is the 11th largest economy in the world and one of the major agricultural exporters in spite of protective barriers erected by the EU and the USA. Around 16 million people, (about 10 per cent of the population), are said to regularly go hungry. Brazil is one of the most unequal and unjust countries on earth. Inequality not only shows itself in differences between rural and urban areas, but also within urban areas.
The reasons for such inequity are partially historical, resulting from slavery and its abolition in 1888 which took place without simultaneous land reforms to guarantee rights to those freed. After slavery ended, a coffee boom saw Brazil produce two thirds of the world’s coffee – the wealth earned was poured back into building industry, above all in the state of São Paulo, and with this came the first legal occupational health and safety measures in this state in 1919.

Later, the Great Depression was associated with a complex series of political conflicts that involved modernizing and conservative forces, regional and national politics, and liberal and centralizing views of the economy. These forces led to a revolution in 1930 which was supported by heterogenous groups and saw the rise to power of a modernizing dictator Getúlio Vargas, now seen as the most important political figure in 20th Century Brazil. He immediately adopted measures to tame trade unions by introducing protection for workers through officially sponsored union bodies, which in turn were expected to lend support to the state apparatus. There were oppositional forces because while the government promoted centralization of the state, liberalizing pressures were also emanating from São Paulo state. In 1932 there was a constitutionalist revolution, based in São Paulo, which challenged the authority of Getúlio Vargas, however, Vargas won through the use of military force. He subsequently sponsored constitutional reform in 1934, inspired by the Weimar Republic. Three new subjects were introduced into the constitution, i.e. social and economic order; family, education and culture; and national security. Political instability continued and led to the declaration of a state of seige in 1935 which continued until 1937. In 1937, Getúlio dissolved Congress, declared the foundation of ‘the new state’ and brought in a centralizing constitution. Among the many reforms carried out by Getúlio, a number were borrowed from the fascist Italian ‘Carta del Lavoro’. Industrial relations were modified in a series of initiatives (in 1937, 1939, 1940) and resulted in the adoption of the “Consolidated Labor Laws” (CLL) in 1943. Legal provisions in the CLL included the organization of compulsory trade and employer’s unions, a trade union tax, a hierarchical union structure and workplace health and safety provisions. These provisions were applied throughout Brazil and are still in use today (albeit with some modifications). However, the only workers who have rights under this law must be legally registered, organized into a compulsory trade union structure and pay into the social security system. A gulf emerged between workers protected by the State (explained above) and those who lacked protection. Where industry and commerce had developed, mainly in the major cities, the majority of workers were relatively well protected but most workers in smaller cities and rural areas lacked State protection.

Vargas lost his hold on power in 1945, following the end of the Second World War, but regained it in the 1950s as an elected President who defended nationalist and populist policies. Intrigue and turmoil accompanied the positions and actions he took, the political system came to an impasse, and murder and the President’s suicide followed. A series of elected civilian governments followed and the period is now remembered as one marked by optimism and economic expansion (and Bossa Nova music). From 1956, President Juscelino Kubitscheck set out to push the country forward in a development leap to be carried out at a rate of “fifty years in five”. His presidency resulted in the construction of Brasília, and the beginning of a fully fledged automobile industry. At the beginning of the 1960s the election of the populist President Jânio Quadros lead to a new period of political instability and the resignation of the President who was replaced by João Goulart, his Vice President. Growing social demands, in both the city and the countryside, were accompanied by increasingly uncontrollable inflation and changes in the system of government. In 1964 a right-wing military group with civilian
allies, decided that intervention was necessary. The resulting coup d’état started a dictatorial regime that would last for two decades.

During this period of military dictatorship, the CLL and its safety and health regulations inherited from the first Vargas era were maintained. However, the relative power of workers declined as those union and political leaders defined as radical or subversive by the military rulers, were removed from their posts, imprisoned, exiled or assassinated. The administration of Social Security, previously organized on a trade union basis, was consolidated into a single, centralized, state administered system. The beginning of the military period was marked by a period of great (official) optimism and by annual rates of economic expansion of approximately 10%. The so called “economic miracle” also saw massive migration from the countryside to the cities. (In 1960, 45% of the population was urban, today the figure is around 80%).

Suddenly, in the middle of the 1970s, the military rulers were horrified to discover that the country was not only the world champion at soccer but was also the world champion for the number of work accidents. In 1976 one worker in six suffered a registered lost-time accident. This grim realization emerged because the consolidation of the Social Security system had, at least partly, resulted in the production of national statistics for the entire registered workforce.

A series of measures were taken to remedy the situation including the amendment of laws to include: the compulsory employment of OSH professionals in workplaces of particular size and/or with certain levels of risk; an increase to 14 days for the minimum lost time necessary to receive government assistance. Over a 10 year period, more than 100,000 professionals and technicians were trained. Some universities introduced OSH in medical and engineering curricula. Fundacentro was also formed during this period and made an important contribution to the training of professionals. Fundacentro has since become the leading occupational safety and health research institute in Latin America. The role of the state as an agent of social control was also reinforced. It would be true to say that the careers of most researchers and government inspectors contributing to this special issue, have largely resulted from the important changes that occurred during this period.

From the 1980s onwards there was a gradual return to full democratic rule and many technicians, researchers and civil servants embraced the workers’ cause. The OSH question became highly politicized but nearly all research and prevention efforts were concentrated on the formal labor market and unionized workers. The accident rate among these workers has significantly declined since the mid-seventies. In 1970 the fatal accident rate per 100,000 workers was 31, reducing to 11 by the year 2000. The rate of lost-time accidents in 1970 was 16,600 per 100,000 workers and this declined to 1,100 in 2000. The rate of work-related illness declined far less, from 83 in 1970 to 70 in 2000.

Two workplace safety and health inspectors, Ivone Corgosinho Baumecker and Mário Parreiras de Faria, provide an explanation of some recent reductions in officially measured accident rates which they attribute to government and private sector actions. Today, Brazil has a large professional OSH infrastructure, a research community, and statistics and knowledge which focus on a minority of the total working population. Much more is known about accidents than about illness, and while the rate of accidents has been significantly reduced, there has been very little decrease in illnesses.
Myrian Matsuo Affonso Beltrão demonstrates that we know very little about the majority of the labor force, excluded not only from the systems of protection and compensation built up by the State, but also from the system which produces knowledge about OSH. Such inequities are unjust. Victor Wünsch draws our attention to the emergence of new workplace health and safety problems which could potentially have an important impact on the greatly increased life expectancy of recent decades. This has produced a new epidemiological framework, associated with an ageing workforce. These three chapters develop insights based on analyses and statistics that show significant improvements have been made in OHS in spite of the emergence of new risks. However, it is necessary to go beyond workers in the formal sector and to consider also those excluded from this system.

In developing countries a wide range of people use traditional methods of working. Common traditional activities in Brazil include craft fishing along Brazil’s 8,000 km coastline and thousands of kilometers of rivers; craft mining for gold and precious stones; hunting, gathering and extractive activities; small scale agriculture; weaving, lace making and pottery; working with farm animals and the use of animals for transport. These workers often face a tough struggle against ‘natural conditions’ encompassing issues such as long working hours, animal behavior, ocean storms, heat, land-slips, hunger, etc. The quest for physical survival and a desire to escape extreme poverty are often the principal motivations for people to consciously expose themselves to risks and to perceive these risks as normal. When accidents or ill-health occur, they are often explained in fatalistic terms - in Brazil this is frequently seen as ‘God’s will’. It is more likely that you will find child labor, adults submitted to slavery and other forms of work relationships involving human degradation in situations where life is dominated by natural conditions.

The 2000 Census revealed that 66 million people in Brazil are classified as being in work. Agriculture engages 11 million people with around 60% (6 million), working ‘traditionally’. Extractive activities occupy 1 million people.

Very little is known about the occupational health and safety of the 5 million workers and their families who eke out a living in the Amazon region. Hélio Barbin and Andréia Martini discuss research among a group of rubber tappers who are also hunter-gatherers, farmers and fishermen in this region. According to the 2000 census there are over 230,000 people engaged in such work. We also know very little about the 350,000 fishermen and women who work along the coast and on rivers.

Francisco Reis researched a particularly cruel mix of modernity and tradition experienced by fishermen catching lobsters for sale in metropolitan Brazil and foreign markets. The fishermen are required to use adapted modern technology that leads to accidents, injuries and many deaths. These two case studies raise at least three important questions for all developing nations:

(1) How can modern OSH techniques be applied to traditional work without destroying social equilibrium? Traditional workers often work directly with modern industrial equipment or materials such as chainsaws, pesticides, or dynamite (in mining or fishing). It is important to reflect upon how ‘best practice’, modern science and technology, can be adapted to protect these workers OSH. I refer to this as the problem posed by the ‘traditional meeting the modern’.
(2) It is also important to ask whether elements of some traditional work practices might contribute to contemporary safety management. While this may appear to be a strange notion for scientifically-oriented OSH professionals, it should not be forgotten that contemporary medicine has developed a sub-discipline which seeks to incorporate scientifically validated notions of traditional medicine (‘ethnomedicine’). This development has come after a long period of ignoring the ‘non-scientific’ approaches to healing developed by traditional populations. It seems appropriate to use an analogous term - ‘ethnoprevention’.

(3) How can we get to know about the state of health and safety of these populations without having to rely on case studies? How can a statistical methodology be developed to measure the damage to workers health that occurs in traditional activities outside the formal labor market?

This is followed by an examination of studies of unregulated or partially regulated work. Female domestic servants form the vast majority of workers designated in the census as ‘household service workers’. This category constitutes a percentage of the workforce that is more or less equivalent to that engaged in the construction industry, around about 4.5 million people. Homes are dangerous places, yet very little is known about the health and safety and working lives of household servants. Very little is known about other large sectors of the urban working population who are not registered. The 1991 census estimated that there were more than 1,200,000 street hawkers. Christiane Girard and Mário Theodoro investigated the lives of street hawkers and female domestic servants in Brasília using survey research. The 1991 census counted about 400,000 police officers. They are excluded from any conventional OSH statistics or conventional prevention strategies because they are public servants. Due to the accelerating rates of violence found in most major urban centers over recent years, police appear to be running ever greater risks of being victimized. Jacqueline Muniz presents some results of her study of victimization of police officers in the state of Rio de Janeiro. This section concludes with questions related to transport safety. The transport model developed during the accelerated growth period under Juscelino Kubitschek and in the early days of the military regime, was largely built on road transport. From the 1960s, road transport increasingly substituted railways and today the biggest share of long-distance transport is conducted by trucks and buses. The rapid growth of cities led to buses and private cars becoming the predominant means of personal transport for city and suburban dwellers. The consequences of this model for the safety and health of transport sector workers has yet to be empirically evaluated. Today there are around 2 million professional drivers in the country and millions of ordinary workers spend hours going to and from work. Bernadette Waldvogel and Celso Amorim’s chapter examines the question of accidents occurring to registered transport workers in the Belo Horizonte and São Paulo metropolitan regions.

Two questions emerge:

(1) How can an information system be built up in order to produce better indicators capable of improving our knowledge of development and implementation of public policies through administrative or private action?

(2) What specific contributions can the OSH area make to improve the life of those who work in activities which are essentially mobile, subject to frequent change and are often invisible? (This is also an important question in industrialized countries).
The third and final section suggests new horizons for the development of OSH policies. Here all four chapters give priority to the formal labor market and to activities subject to regulation where risks are normally managed through an industrial approach. This approach is familiar to all OHS practitioners - in essence the conception of work is separated from its execution; a division of labor is established through specialized tasks; work is coordinated through a system of standard procedures, rules and communications; a hierarchical and structured control system monitors adherence to rules. The literature typically identifies two distinct strategies used to guarantee application of OSH standards; one is based in the private sector and is normally voluntary, while the other, based in government regulation of private sector activity, is compulsory. These two strategies share a common conceptual basis which can be called the ‘industrial safety and health paradigm’. This paradigm is Cartesian, dividing the world into two parts, one of subjects, the other of objects, a world of thinkers and a world to be thought about. The acquisition of knowledge about dimensions of the world treated as objects, allows us to believe that it is possible to apply reason. Through the development of a series of rational strategies which limit and guide behavior, we believe it is possible to guarantee greater safety and health. While public and private approaches are built upon a common conceptual basis, thought and action are guided by different value systems. For example, capitalist firms are guided by the profit making motive while those who act as agents of the State, including public servants, may be guided by other imperatives which attempt to control the politically damaging excesses of industrial capitalism, which threaten social peace and equity.

In recent years a third approach to OSH management, referred to as ‘occupational safety and health management systems’ (OSHMS), has come into perspective. OSHMS accentuates the private sector approach outlined above and draws heavily on systems theory. However, OSHMS also refers to participative strategies that, if implemented, would constitute a break with the Cartesian based industrial health and safety paradigm.

New problems, especially those associated with the rise of knowledge-intensive industries, and major accidents and pollution produced by the chemical industry, are discussed by Carlos Freitas, Marcelo Porto and Jorge Machado. In part, because of the damage already experienced, Brazil has become a leader, among developing countries, internationally and within international organizations, in building legal safeguards which are designed to bring about greater chemical safety.

Work-Related Musculoskeletal Disorders, (WRMSD), grew enormously during the 1990s, mainly associated with large numbers of people working on computerized data entry. The explosion of WRMSD resulted in a large volume of research, reviewed by Thais Barreira.

Since the military regime ended there have been increasing demands for social and political participation which have strongly influenced the debate and establishment of preventive actions. The State also recognized the limitations of its traditional models and approaches and these two factors have resulted in new practices and innovative policies. Arline Arcuri, Luiza Maria Cardoso, Danilo Fernandes Costa and Jorge Machado have documented the history of one particularly important pioneering effort which powerfully effected policy formulation in other areas. Contemporary Brazilian OSH research reflects both the emergent problems of post-industrial times as well as demands that work be increasingly controlled through democratic processes. Leny Sato’s chapter fits in here as she looks at the day-to-day struggles and initiatives taken by workers seeking to change workplace structures and processes. Some
of the workers involved in these struggles have been forced to resort to informal, collective and clandestine practices.

Four reflections emerge from this section of the journal:

1. The necessity to develop monitoring technologies capable of detecting problems before they emerge as pandemics or epidemics.

2. The need to fix priorities for research and prevention based on the severity of the problem.

3. The need to reformulate State interventions and participatory instruments so that members of various social groups can become more deeply involved.

4. A need for new theories, particularly in the social sciences, to build new preventive practices for OSH. New theories should include dimensions of subjectivity, knowledge, participation, action and autonomy.

The building of a broad understanding of the OSH situation in Brazil should be seen as an essential step to close the gap between those workers who benefit from state protection, and the majority of the nation’s workers, who are unprotected. (Reinforcement of this gap was a perverse effect of the labor relations system founded by Vargas.) This is a legal mechanism which has contributed to the great inequities found in contemporary Brazil and better understanding of the situation would constitute a step towards closing the gap between ‘legal Brazil’ and ‘real Brazil’. The more immediate objective is for a safer and healthier work environment for all Brazilian citizens.

The articles in this journal have been published in English in an attempt to offer an introduction to OSH research and realities of life in Brazil to the foreign colleagues. (Others will also have the opportunity to read these papers in Portuguese). It is hoped that researchers and policy makers in other developing countries will find relevant insights and contributions on which to build new research agendas. It is also hoped that a new research dynamic will continue to emerge within the Brazilian research community which has shown it to be increasingly capable of producing good science and of linking research results and innovative prevention strategies.
A history of public OSH policies in Brazil

Brazil is a federal republic 8,511,000 km$^2$ in area, with 27 administrative units. The population is 169,873,000 with 137,925,000 (82%) living in urban areas and 31,948,000 (19%) living in the rural areas (figures have been rounded and are based on the Census conducted in August 2000). Brazil has 2,335,000 business establishments with 22,143,000 jobs directly covered by workplace and occupational safety and health (OSH) regulations (RAIS, 2002). Beyond the formal sector, there are many other workers who lack the cover of guaranteed social rights established in national work legislation. Those excluded are approximately six million public servants, (including military employees), and approximately nineteen million workers in the informal sector. Over all sectors, it is estimated that 75,918,000 people are potentially subject to coverage by either public and/or private OSH policies, (this is the number of persons who are classed as occupied according to the PNAD (2001)

Action by public authorities to improve working conditions is essential as work generates both products and wealth. Unfortunately, one of the products of work is accidents and diseases and these should be prevented. The prevention of accidents and diseases and the promotion of workers’ health is an activity involving employers, workers and the government, especially the Ministry of Labor and Employment.

Safety and health work in Brazil can be considered to have started in 1912, when the Brazilian Labor Confederation (CBT), was constituted during the Fourth Brazilian Workers’ Congress. This congress discussed many themes, including a demand for an eight hour working day and a six day week, compensation for work accidents, and compulsory insurance in case of illness. In 1918, the National Department of Labor was created in order to regulate work organization. In 1930, the Ministry of Labor, Industry and Commerce was created and has continuously maintained responsibility for inspection of work contracts, conditions and OSH issues, (despite frequent changes in its name).

In 1941, the first regulation on workplace committees for accident prevention (CIPA), was introduced. In 1943, the Consolidation of Labor Laws (CLL), included the basic legislation referring to OSH issues. In 1977, Law 6,514 altered the text of the CLL, widening the reference to those OSH questions to be covered by the Ministry of Labor. Administrative Order 3,214 with 28 Regulations, was published in 1978 and contained the principal obligations of companies, workers and the State regarding the major questions on the prevention of accidents and illness at work.

In spite of the legislative and regulatory processes, public sector activity in this field was very limited, rather random and lacking specific planning. This situation arose largely because OSH intervention was not formally organized within the Ministry, and only a very small
number of specialized professionals were available and, even then, were dispersed throughout the country. This situation only started to change in 1983 when the Ministry contracted a number of professional OSH specialists.

In the 1970s the government launched a wide ranging program to train technicians and professionals to work within companies. With FUNDACENTRO's participation, training on a large scale took place and this permitted the establishment of specialist OSH Services in medium and large sized companies. Over 100,000 specialized professionals were trained including industrial doctors and nurses, safety engineers, safety technicians and assistant nurses. These days OSH professionals are trained in specialized schools, supervised by the Ministry of Education.

At the end of the 1980s, the first General Action Plan (GAP) of the Labor Ministry was elaborated, seeking to plan more effective preventive actions through the use of OSH indicators. At the same time, there was an increase in the ratification and implementation of a number of relevant ILO Conventions on OSH. Convention No. 148 on the working environment (covering air pollution, noise and vibrations) and Convention No 155 on workers’ safety and health, were particularly important.

A number of factors were associated with the increased capacity of the State to intervene in workplace safety and health, i.e. the gradual weakening and eventual end of the military dictatorship in 1985, the rise of social movements, the emergence of central trade union organizations, and social demands and strikes to improve working conditions.

On the other hand, the 1990s marked the beginning of a process whereby tripartite national negotiations were established in an effort to improve working conditions. Emphasis was placed on regulations for: Benzene; Asbestos; motorized chain saws; boilers and pressure vessels; construction; workplace OSH committees (CIPAs); OSH in the mining industry, amongst others.

It is important to highlight the 1990 change in legislation related to work organization, which not only dealt with the physical environment but with a broad range of ergonomic factors such as work rhythm, operating practices, production, and work intensity (Wisner, 1994) This legislation answered the demands of workers who saw themselves being affected by the intensification of work occurring in production processes; questions that would become central issues at the end of the Twentieth Century when production systems were widely restructured (Antunes, 1997)

In the period between 1992 and 1994, which was subsequent to the impeachment of President Collor, (and in the wake of the social movements that had lead to it), the State reaffirmed its commitment to defend citizens rights and recognized the need to widen the government’s role in social control. In addition, the State recognized the need to rethink its role in regulating capital-labor relations. Simultaneously, there was recognition of an urgent need to strengthen organizations in civil society and to create mechanisms to balance the power of various sectors of society. OSH matters were placed within the context of the democratization of work relations and put on the agenda of Collective Labor Contracts (Lopes, 1993), which resulted in an increased capacity for the State to take effective action relating to the health of workers who came to be seen not only as workers but as citizens. (FNDCCRTB, 1993)
At the same time, changes were made to legislation to enlarge the scope of action taken to improve working conditions and workers' health and quality of life. It became necessary for all companies to adopt safety and health management practices for their employees. The implementation of programs on environmental risk prevention and occupational health was made compulsory. It also became compulsory to provide workers and their representatives with information on the working environment and health issues.

There was a recognition that OSH overlapped with other areas of State action, including the work of the Ministries of Health and Social Security. An ‘Inter Ministerial Commission on Worker Health’ was set up in 1993 along with the ‘Inter-Institutional Executive Group on Worker Health’. The latter group was assigned the task of promoting actions which would integrate and harmonize the work of the various government bodies responsible for the implementation of OSH policy. See Diagram 1 (CIMST, 1993).

Diagram 1. Interface between the three main governmental activity areas related to OSH.
CAT = ‘Work Accident Communication’, LEM = ‘Report of a Medical Examination’.

In 1995, the (then named) Safety and Health Secretariat of the Ministry of Labor, established the National Campaign to Combat Work Accidents (CANCAT). The campaign used indicators of accidents, illness, and social security payments, related to work activities, to allocate priority to certain high risk sectors. Inspection services and national and regional preventive strategies were designed in partnership with the Social Welfare Ministry.
In 1996, Administrative Order No. 393 created the ‘Permanent Employer-Employee Parity Commission’ which established criteria for negotiation, alteration and publication of regulations. Consequently several regulations were changed after negotiation between workers, employers and government. Permanent National Commissions, (also with employer-employee parity), were created in order to monitor the introduction of negotiated regulations, similar to those that had already been developed, e.g. for specific sectors including construction, mining, agriculture; on benzene; dock working; the establishment of OSH committees (CIPAs). These and other initiatives led to the formation of commissions in some states and/or regions.

Currently, negotiated OSH regulations have been proposed for agriculture, electricity generation and transmission, workplace OSH services, and for the health care sector.

During 1999-2002, the Department of Occupational Safety and Health (DOSH), of the Ministry of Labor and Employment, worked under a policy which required close coordination with other government departments, and representatives from both private sector and workers’ organizations. Priority had to be given to collective negotiations and to the optimum use of resources in order to achieve the expressed objective of enhanced promotion of workers’ health and social inclusion.

In order to carry out this policy, an effort was made to: improve the quality of social indicators measuring quality of life; bring about results which would reduce damage to workers' health; establish effective tripartite relationships, sustainability and integrated action. In addition, partners were sought to engage in participative management and cooperative processes. It is important to note that priority was given to inspections conducted on the basis of information and epidemiological data about risks and work-related damage to health. Some specific sectors also received priority and research, education campaigns and public debates were conducted. Educational material was published and distributed. Staff from the MLE and other technical and inspectorate staff, were retrained. Efforts were made to use these trained people as agents for change.

This constituted an effort to make fundamental change to the “inspection paradigm”, traditionally based on actions that could be described as random, short-term, narrowly focused, reactive and limited. There was a move toward actions which could be evaluated in terms of their capacity to resolve problems, to be self-sustaining over time, and were long-term, holistic, pro-active and focused. There was a move away from a single approach to all workplaces - different strategies and tactics were used for different workplaces, in order to break the isolation of the inspectorate and to build dialogue on how to make significant changes in working conditions. These changes were based on commitment of the parties rather than on short-term inspection activities (see Table 1).

The paradigm change came about because planning, action, evaluation and control were based on a series of indicators drawn from official databases. The indicators took into account the number of establishments in a sector and their distribution across the various regions and states, and the accumulated and mortality rate of serious work accidents and illnesses. A series of actions were carried out in order to build up a “Planning System” to strengthen the inspectorate and its social partners. The planning system included: analyses of accident statistics, ergonomics; evaluation of OSH management systems; evaluation of results from inspectorate interventions.
Table 1. Paradigm changes in OSH inspection

<table>
<thead>
<tr>
<th>Old model</th>
<th>Present day model</th>
</tr>
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<tbody>
<tr>
<td>Random, short-term and relatively limited action</td>
<td>Focused, holistic, pro-active and continuous actions</td>
</tr>
<tr>
<td>Single approach for all types of workplaces</td>
<td>Differentiated strategies and tactics for different workplaces</td>
</tr>
<tr>
<td>Isolated inspectorate</td>
<td>Dialogue with social partners</td>
</tr>
<tr>
<td>Short-term changes</td>
<td>Sustainable changes</td>
</tr>
<tr>
<td>Inspection of workplaces</td>
<td>Commitment by social partners</td>
</tr>
</tbody>
</table>

Data on OSH inspection in Brazil from 1996 to 2002

Relevant data about the work of the Ministry of Labor and Employment’s OSH inspectorate was not systematized until 1996. Prior to this, relevant information was poorly organized and difficult to work with.

Table 2 provides a consolidated picture of the 1996-2002 period including the number of formal sector jobs, the number of OSH inspectors in the MLE, the number of OSH inspectors per 100,000 employees, and the number of inspections carried out each year.

Table 2. Comparative data on the number of OSH inspectors and inspections carried out between 1996 and 2002. Source: SFIT

<table>
<thead>
<tr>
<th>Year</th>
<th>Formally employed population</th>
<th>OSH Inspectors in Labor Ministry</th>
<th>Inspectors per 100,000 Firms</th>
<th>Inspections</th>
<th>OSH inspections/inspector/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>18,905,308</td>
<td>629</td>
<td>3.3</td>
<td>101,112</td>
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<tr>
<td>2000</td>
<td>20,374,176</td>
<td>694</td>
<td>3.4</td>
<td>139,515</td>
<td>201</td>
</tr>
<tr>
<td>2001</td>
<td>21,129,552</td>
<td>689</td>
<td>3.3</td>
<td>127,414</td>
<td>185</td>
</tr>
<tr>
<td>2002</td>
<td>22,142,976</td>
<td>694</td>
<td>3.1</td>
<td>125,390</td>
<td>181</td>
</tr>
</tbody>
</table>

Table 2 shows that in spite of the increase in the number of formal sector jobs over the period, the number of OSH inspectors didn’t change from 1999 onwards because no new staff were recruited after 1998.

Graph 1. shows the growth of formal sector jobs, 1996 - 2002.

Graph 2 indicates the relationship between the numbers of specialist OSH inspectors for every 100,000 companies, from 1996-2002. The graph shows a declining trend over the whole period; in 2002 the ratio is similar to that of 1997.

Graph 2. Number of OSH inspectors per 100,000 companies in Brazil, 1996-2002. Source: RAIS.

Graph 3 shows the number of annual OSH inspections from 1996-2002. In spite of the declining trend, there was a general appreciation that inspection processes should be evaluated qualitatively as the overall quality of inspection was improved by evaluation of the innovations made due to the adoption of the new paradigm and to the greatly improved and more thorough planning processes implemented.
Graph 3. The number of companies in Brazil inspected per year by specialized OSH inspectors, 1996-2002. Source: Federal Work Inspection System (SIFT) of the Ministry of Labor and Employment.

The numbers of work accidents in Brazil

Data on work accidents is collected by the Ministry of Social Welfare through “accident communication forms” (CAT) which should be completed whenever any event occurs which is covered by the legal definition of a work accident, including work-related illnesses. This data refers only to those workers engaged in the formal labor market.

An evaluation of the number of work accidents registered from 1988-2002 shows a gradual reduction. However, from 1994 onwards, the decrease was less pronounced than in earlier years, which may mean traditional prevention methods have reached their limits; see Graph 4.

Graph 4. The number of work accidents in Brazil, 1988-2002.
Source: AEAT
Graph 5 shows the variation in the rate of work accidents from 1998-2002. From 1997-2001 there was a continuous decline of 27%.

Graph 5. Rate of Work Accidents in Brazil, 1996–2002. The accident rate corresponds to the number of registered work accidents divided by the number of registered employees multiplied by 100. Source: AEAT RAIS.

Between 1998 and 2002 there was a very significant change in the number of deaths and in the fatal accident rate; see Graphs 6 and 7. In the selected period – 1998 to 2002 - the reduction in the rate of fatal accidents was 45%:

Graph 6. Number of Deaths from Work Accidents in Brazil, 1996-2002
Source: AEAT
Graph 7. Fatal Work Accident Rate in Brazil, 1996–2002. The accident rate corresponds to the number of registered work accidents divided by the number of registered employees multiplied by 100,000. Source: AEAT, RAIS

Graph 8 shows that during the period 1998-2002, there was a reduction in the rate of serious accidents, including fatal accidents and accidents causing total, permanent incapacity. (This rate is taken as a reliable indicator of the overall changes in work accidents in the country because it calculates accidents causing permanent incapacity, which like fatalities, are likely to be reported.)

Graph 8. Serious Work Accidents Index, Brazil, 1996 - 2002. The serious accident rate is calculated by dividing the number of registered deaths and permanent, total incapacity accidents due to work accidents, by the number of registered employees, multiplied by 10,000. Source: AEAT, RAIS
Graph 9 compares fatal accident rates in Brazil 2002 with a selected group of countries and regions.

Graph 9. Rate of Fatal Work Accidents in Brazil (2002) and a Selected Group of Countries and Regions (1990s). (The fatal accident rate of other countries and regions was drawn up by the ILO, this table must be treated with a certain level of caution given that the statistics do not refer to the same calendar year and the criteria for inclusion can vary from one country to another.) Sources: International Labour Organisation www.ilo.org, AEAT, RAIS

Graph 10 presents a comparison of fatal work accident rates in Brazil in 2002, compared with economically developed countries.

Graph 10. Fatal work accident rates in Brazil in 2002 compared with economically developed countries (1990s). (Concerning the measures, see the text of Graph 9.) Sources: International Labour Organisation www.ilo.org. AEAT, RAIS
The preceding graphs show that a lot remains to be done in order to reduce the rates of work accidents. Currently, available statistics only permit examination of the reduction of work accidents in the formal sector, and even here, caution is needed when interpreting the figures. One reason for caution is under notification because accidents or illnesses are not properly reported to the Ministry of Social Welfare. Historically, under reporting has occurred in many countries, particularly in relation to minor injuries, which is in fact a very important indicator of human suffering. A particular reason for under reporting in Brazil is the fact that accidents that result in less than 15 days of lost working time, (the minimum period necessary for payment of a social welfare benefit), are rarely registered.

Two further points can be raised on the reduction in the number of reported accidents. Firstly, while many people working in the formal labor market are covered by some legally approved form of social welfare, their accidents do not result in the issuing of an accident communication form (CAT), the basis of the accident reporting system. (The statistics used in this chapter are based on CATs). Public servants, military personnel, domestic workers and ‘individual taxpayers’ are among them because they are not entitled to payments from the ‘work accident compensation system’. Secondly, there is a group in the labor market statistics defined as ‘others’, i.e. a group made up of people employed in the formal economy but who work informally. For example, this occurs frequently with laborers who are engaged under temporary contracts by one firm which then sub-contracts their services to another formal sector firm. In other words, such workers are considered to be employed in terms of the major labor legislation (CLL) but, because they are not legally registered, their employment relationship is not formally recognized and they don’t contribute to the General Social Welfare Fund. These employees suffer accidents like any other employees but, because of their situation in the labor market, their accidents are generally not registered.

There is a third category that can be defined as ‘legal, informal workers’, including the enormous number of street hawkers, scavengers and other underemployed people. It is a neglected category, and should receive more attention from everyone concerned about welfare at work. Existing labor and social welfare legislation will have to be reformed to cover this group of workers, rather than try to fit them into existing legislation.

There are also many “hidden” occupational illnesses that are not recognized and categorized as being caused by work and therefore are not officially registered as work accidents. It is estimated that within the Social Welfare system, about 30% of all occupational illnesses are “hidden” and not registered. Without doubt, this problem is directly influenced by problems in the basic public health system and because medical specialists employed in the Social Welfare system fail to diagnose and recognize such illnesses.

By using the denominator of 22,143,000 registered employees, 29% of the working population of 77 million, an extrapolation can be made about the overall situation of work accidents in the country, including the whole EAP (Economically Active Population). Such an exercise assumes that the average rate of accidents is the same across both the formal and informal sectors. (If this assumption is incorrect, the average rate would be higher in those sectors that have not been evaluated and would result in an even larger number.) Unfortunately, there is no information available to indicate accident rates in informal work, however, an extrapolation of the number of accidents affecting the EAP leads to an estimate of more than 1,300,000 work accidents per year, which constitutes an enormous cost to the country.
The work carried out by the MLE, is important. The Ministry currently has 694 OSH inspectors, including industrial doctors and safety engineers, who carried out 125,000 inspections in 2002. In addition to inspections, the Inspectorate engages in a variety of other activities of vital importance. Production processes are the result of open and dynamic socio-technical systems which constantly lead to new work practices and new risks, so it is fundamental that effective regulations are maintained. It is imperative that a permanent retraining structure for inspectors is maintained so that they remain capable of dealing with technological innovations and new forms of workplace organization. In addition, employees and employers also need information and training to deal with changes in the workplace. The role of the MLE in the development and monitoring of indicators is also worthy of mention, as well as their coordination action between various government services that also have OSH responsibilities.

**Proposals for the development of private and state OSH interventions**

Given the various themes raised in this chapter, a series of steps relating to private and public policies on OSH, can be proposed in order to produce more positive results:

- **Build a single, overall policy on the prevention of work risks that is coherent and systematic.** Such a policy should go beyond the dispersed regulations and actions historically carried out by public sector bodies that have resulted in an accumulation of differentiated approaches and orientations, many of which originated prior to the country’s current Constitution which dates from 1988. The overall policy should lead to practices focused on transforming the everyday reality of work and the achievement of visible results.

- **Articulate various spheres of government action which result in direct or indirect interventions on OSH.** Interventions could include labor relations policies; action by the Health Ministry as part of its ‘Unified Health System’ (SUS); action by the Social Welfare Ministry, particularly involving Accident Compensation; wider environmental issues. Other OSH questions are relevant to other government ministries including Ministries of Education, Justice, Economic Development, and Industry and Commerce.

- **Aid in the development of private OSH policies, irrespective of whether they are carried out by non-government organizations (NGOs), or within companies.**

- **Expand social dialogue by strengthening institutional mechanisms for negotiation and consolidate a new system of labor relations which will increase the participation of citizens in State action.**

- **Increase the number of workers covered by public or private policies on prevention of work-related risks.** Introduce new methodologies and strategies for action to guarantee a universal right to adequate working conditions, irrespective of the manner in which people are involved in the labor market (formal or informal).

- **Enlarge the scope of the social welfare system to guarantee compensation for work accidents, paying special attention to certain categories of workers such as young people, older workers, women, pregnant workers, those who have recently given birth, and those with special needs.**
Establish compulsory analysis of the causes of all accidents or illnesses treated within the public health system. This can be done by organizing a communications system that can bring together information on work accidents occurring in the informal labor market. This would help detect under-notification and under-registration.

Build a common system for managing accident data and other pertinent information. This requires all data bases (existing or planned), to be made compatible through the creation of comparable categories. Data must be available to the various government services involved in OSH. Such a data system would permit real time analysis and could be used to guide interventions by State officials and to build programs for different sectors of the economy.
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>TOTAL</td>
<td>65,629,892</td>
<td>33,821,480</td>
<td>31,808,442</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
rigorous, household based, survey research also contributes to widening the knowledge base on OHS in the informal labor market.

**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. Moreover, 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.

Graph 1. Brazilian population in million by age group, over time. Graph in log scale.

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 inequalities 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 (Ilmarinen, 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 multiples 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.
In this chapter we discuss community participation and ethnoprevention, based on the experience of primary healthcare projects in the Extractive Reserve in the Alto Juruá area, between 1994 and 2002. Ethnoprevention is used to describe the use of local resources and capabilities to avoid and prevent accidents and illnesses. Community participation was one of the strong points in the implementation of disease prevention and treatment.

Ethnoprevention is discussed in relation to work accidents and is focused on a population where most workers do not participate in the formal labor market but hunt, fish, plant and tap rubber trees in the forest for their day-to-day survival. Such work has its own specific characteristics and led us to consider the importance of social participation in local systems in order to guarantee equity, equality and efficiency in the prevention, diagnosis and treatment of health problems.

The first part of the chapter describes the Alto Juruá Extractive Reserve (AJER) and the second part examines a number of questions relating to ethnoprevention.

The Alto Juruá Extractive Reserve

Extractive reserves are “territories that belong to the Brazilian State destined for sustainable use and conservation of natural renewable resources, by a population of extractors”, (Decree Law no. 98897, January 1990). The AJER is located in the western part of the state of Acre and was the first Extractive Reserve created in Brazil.

This type of conservation area was proposed by the social movement of rubber and nut gatherers, (organized by Chico Mendes and other leaders of the National Council of Rubber Tappers), the Workers’ Party (PT), the local Catholic Church and also by the indigenous movement, as an alternative to previous models of economic development, such as monoculture and cattle breeding (Almeida and Menezes, 1994), that had been proposed in the region. Currently, the inhabitants of AJER are organized by the Association of Rubber Tappers and Farmers of the Alto Juruá Extractive Reserve (ARTFAJER). They are co-managers of the area and actively take part in the preparation and execution of projects to promote the well-being of everyone in the area.

AJER is located in the extreme west of the state of Acre in the municipality of Marechal Thaumaturgo, about 300 km from the city of Cruzeiro do Sul. It takes from three to six days to travel by boat between Cruzeiro do Sul and the ‘entrance’ to the AJER on the Amônia River where Marechal Thaumaturgo’s main municipal offices are sited. The AJER is 5,100 square kilometers, 90% of which is made up of extremely diverse tropical forest. The AJER borders on four indigenous areas: Ashaninka (Kampa) on the Amônea River, Jamináwa-Arara on the Bagé River, Ashaninka-Kaxinawá on the Breu River, and Kaxináwa on the Jordão River. Together with the National Park of Serra do Divisor, it is one of the world’s largest continuous environmental conservation areas.
According to the official survey carried out in 1994, the AJER has a population of 5,800 inhabitants, a density of one inhabitant per square kilometer. There are 865 dwellings, with an average of seven inhabitants per family, located in 325 settings and on 10 farms, identified by names, occupied and worked by variable numbers of domestic units. The population is 55% male and 45% female, with around 56% aged under 15 years. 37% of the population is of school age (5-15 years), a total of 2,265 children (Feitosa, 1995, 59).

A ‘setting’ can be described as a group of dwellings, located in a forest clearing. Originally, a system existed for dividing up and controlling rubber tapping, creating a circular territory, with a variable number of roads leading to native rubber trees (Almeida, 1994, 176). About 60% of the population lives in such locations which occupy about 2/3 of the land in the municipality.

The AJER can be roughly divided into two main zones of occupation, the interior of the forest and the river banks. The interior corresponds to the so-called “centers”, made up by dry land dissected by tributaries of the main rivers that run through the Reserve, (e.g. the Tejo, Acuriá, São João, Caípora and Breu Rivers on the right bank and by the Amônia and Arara Rivers on the left bank), all of which flow from the Juruá River. The local perspective is used in river navigation; it is the perspective of a person who travels downriver from its source to its mouth. The river bank is seen from the perspective of a person who is going downriver.

River access is difficult and dangerous, even during the period when waters run high, and only small canoes and boats can be used. During the dry season, many places can only be reached on foot. There is a landing strip in the municipality which is usually used during the summer, (May to October).

Nowadays, the population is mainly concentrated along the river banks that cut through the Reserve but, until ten years ago, the population was more dispersed, near the headwaters of the small natural canals and the rubber roads. At that time rubber generated only a little income which was used to complement income obtained almost exclusively from agricultural products. With the progressive decline in rubber prices, many inhabitants migrated to the river banks to work with agriculture, to have easier transport for produce, to get access to education for their children, and have better possibilities for medical care.

The banks of the rivers and natural canals are characterized by strips of “beach” and very fertile banks that sit above the water level during the dry period. There is also a narrow flood zone along the watercourse which is used for seasonal crop farming and as natural pasture. There are three quite large communities in the Reserve, located on the banks of the Tejo and Juruá Rivers. Localities known as Foz do Tejo, Foz do Breu and Restauração are all former headquarters of rubber farms; the latter two are the only small towns in the AJER. Foz do Tejo is the entrance to the Reserve and is the headquarters of the Association (ARTFAJER). At present, there is a small warehouse on the riverfront, where the Tejo drains into the Juruá, several residences, a school, a health clinic, a radiotelephone post and other facilities such as a canteen, meeting room, office and lodgings.

Restauração was declared to be a “small town” by the current Mayor. The town is located on the left bank of the River Tejo, (next to the Riozinho tributary), a 1-3 day motorboat journey from Foz do Tejo. The town was the former headquarters of an important rubber farm and is currently the headquarters for an administrative sub-area of the municipality and has a school, a health clinic (currently closed), a radiotelephone post and Roman Catholic and Baptist
churches. The Association’s center (ARTFAJER) is located in a house about 30 minutes away (by foot) and there is also a base for researchers. The inhabitants of Restauração work with extraction of rubber and other products from the forest cattle breeding, agriculture and small-scale commerce. Other important sources of local income are employed teachers, municipal employees, health care workers and pensions.

Foz do Breu is on the border between Brazil and Peru, on the right bank of the Juruá River. It is also classified as a small town due to a mayoral administrative order. Besides being the headquarters for another administrative sub-area of the municipality, it has recently inaugurated a state school with both primary and secondary levels, and a radiotelephone post. The main local activities are agriculture (mainly beans and tobacco), beef farming and the breeding of animals for domestic consumption.

There is currently no rubber tapping activity in Foz do Breu, formerly the headquarters for the rubber plantations located in the Alto Breu. There are no rubber trees in the area of the river mouth, and its headwaters or sources are located in territories which have been legally defined as indigenous.

AJER is dissected by several rivers and natural canals, between the basin of the Juruá and Tejo Rivers which are the main transportation routes in the region. The source of the Juruá is in Peru and runs across the whole state of Acre, before draining into the western part of the Amazon River. It is navigable all year around but, during the dry summer season, (May to October), boats over two tons have difficulty in reaching river mouth. The Amônea River, a tributary of the Juruá, is navigable all year, although there are limitations in the whole region during the dry season.

The mouth of the River Tejo, the Juruá’s main tributary in this region, is two hours away from Marechal Thaumaturgo town by motorized canoe. The Tejo is navigable throughout the year but only canoes or small boats of less than one ton can travel on it during the dry season. The River Bagé, one of the main tributaries the Tejo, is only partly navigable by small boats. In the dry season, small canoes must be used to reach Seringueirinha, located in the High Bagé area, on the border with the indigenous area Jaminawá/Arara. Several midwives and renowned faith healers live in Seringueirinha.

In the Alto Tejo River, above of the small town of Restauração, there are two natural canals the Machadinho and Riozinho. These are tributaries of the main river, the Tejo, and are the main fluvial access routes to the areas located above Restauração. These canals are only navigable by small canoes, even in the wet season (November to April).

Social relations

The territory known as the Alto Juruá Extractive Reserve started to be extensively occupied by ‘white’ populations from the end of the 19th Century, a time known as “the rubber period”. Thousands of north eastern Brazilians fled from drought and arrived in the Amazon region looking for work and wealth extracting the native rubber (“rubber fever”). During this period, the rural population in the Amazon region tripled in size (Parker, 1985).

Before the creation and establishment of the AJER, the rubber tappers were oppressed by bosses and a form of slave labor. The “truck system” meant a boss advanced merchandise to
rubber tappers in exchange for the guarantee to a future monopoly on the purchase, sale and commercialization of both rubber and merchandise.

With the creation of the Reserve, the whole system changed as existing legal title to the rubber plantations was invalidated and rights were conceded to the rubber tappers, promoting autonomy at work and in production. Production was previously organized around the sheds, rubber trees and the houses of the truckers, who advanced merchandise and credit to the rubber tappers, but now incorporates families and domestic units (Almeida, 1992). Nowadays, the inhabitants of the AJER are the children, grandchildren, and great-grandchildren of the thousands of northeasterners who migrated in the 1870s.

The extended and enlarged family is the most common living arrangement in the region1 with father, mother and children living near to sons-in-law, daughters-in-law, mothers-in-law, grandparents, uncles and aunts. Friends may also share the same house if the need arises. Even in contiguous living units, the networks of relations and interactions among neighbors/relatives are very intense, with a series of services being rendered and reciprocated every day.

Generally, a marriage and a new domestic unit starts with the ‘theft’ of a girl (who has already menstruated), by her future husband. It is a consensual form of ‘theft’, locally known as ‘carrying the bride or the wife’ (Martini, 1995). At a predetermined and agreed moment, the future husband carries the girl to a son-in-law's house, into the forest or to his own house. The marriage begins after the couple has sexual relations and is eventually made official within the Roman Catholic Church through a dispensation delivered by the priest on a year-to-year basis. The dispensation gives the faithful the sacraments of the Catholic Church, especially baptism and marriage, and is normally paid for.

In general the women look after the domestic space which includes the house and land, children, husband, extended family, and crops, principally those on the river beaches and plots of peppers, kale, anguria plants and herbs and spices. The men generally work in the forest, hunt, clear trees and bush, plant and appear to control the domestic economy. The older children have to look after the younger ones, go to school, help their parents in their daily tasks and also help in the cassava fields, and with hunting and fishing.

Many women, be they widows, single with children2, wives of sick men or those crippled by snakebite, forest clearing and other accidents, have to hunt, fish, build houses and tap rubber trees, activities normally carried out by men. There are also women who like fishing or hunting and provide their family's food through their work. Men who live alone because they are widowers, separated or whose wives are ill or have just given birth, must accomplish all the activities of the “feminine domain” if he is without female neighbors, daughters or kin. In reality, circumstances do not allow these domains to become too rigid as in practice, the boundaries between male and female activities are found to be flexible.

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1 Martini, Andréa. 1996. In this report we see the notion of enlarged family, developed through the observation of kinship and affinity relations in Foz do Breu. Later on this notion will be applied to analyze the case of the Milton family in a doctoral thesis: PANTOJA, Mariana Ciavatta 2001.

2 The term ‘woman’ applies to females who are not virgins. Virgins are called ‘girls’ or ‘single girls’. When they become women, especially when they become pregnant and are not married, or in cases of separation, are called respectively: ‘single women’ and ‘abandoned or separated women’.
Children help both men and women, following along this same “gender division of work”, which has to be seen to have both a distinct context and to be relative. For example, fishing can be done by men and women, however, there are techniques that are more commonly used by men, e.g. diving and casting of nets, while others are more commonly used by women and children, e.g. the use of fishhooks, fattening fish, and poisoning with tingui. There are activities in which the whole domestic group cooperates. The principle one is the “farinhada”, when men, women and children work intensely for one or two days, in a series of different tasks to manufacture cassava flour. They rip the cassava out of the ground, clean and wash it, grate the bulbs, press, and sieve and then toast the grated and pressed cassava paste.

The clearing of bush also involves the whole domestic group. While the phases of drilling, the use of machetes to cut the secondary vegetation, felling, the use of axes for larger trees and burning are predominantly male activities, others like planting, sowing, burying and periodic weed cleaning are carried out by both sexes.

For Gabriela Jahnel Araújo (1998), “there is a distance between the ideal and practice. Thus, fishing is considered a masculine activity, despite the fact that women hunt for shellfish. There are also exceptions because of choice or circumstances. Domestic groups try to achieve a balanced number of males and females of working age in order to approach the ideal division of labor by gender. To the extent that its members get older, they try to rear children and young people who, in exchange for room and board and some gifts, carry out the heavier tasks”.

Frequently, in spite of the female work that produced them, agricultural produce and cassava flour are considered the man's property. It is generally the head of the family who manages the sale and the earnings from flour, agricultural produce or rubber, however, it is not unusual to find couples who sell their products separately. Generally, plots for food production are shared by a domestic group and a household.

Rubber tappers’ dwellings are generally built from rasp palm (Iriartea exorrhiza) that is cut, beaten and acquires a special shine with time. They are covered with straw taken from the jacitara and other palm trees although now many dwellings have sheet aluminum roofing as a result of favors granted at election time. Houses may also be built of sawn hardwood such as mahogany, cedar, araroba and cherry.

Houses usually have a living room, a bedroom and a kitchen. The living room is empty or only has a stool flush against the wall. The walls are carefully decorated with pages from magazines and calendars together with a photo of the couple that owns the house. The bedroom holds the family’s clothes and hammocks and is the most private area of the house. Adolescent sons may have their own rooms or sleep in the kitchen or living room.

In the kitchen there is a wood-burning stove and some wooden shelves, decorated with balls, drawings and lace made out of paper. Sometimes there will be a table, generally without chairs. The residence is built on water-resistant stilts about 1 meter above ground. The animals such as pigs, chickens and sheep that live on the family plot, sleep under the house.

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3 The technique known as “tinguizada” has been learnt from the Indians who mix poisonous plants, such as jacquimia, “oaca” and “barbaça”, and cassava flour, either pounded or into balls which are placed in waterholes, lakes or canals to make the fish drunk or asphyxiated.
The houses are found along the rivers and natural canals and also in the so-called centers, separated from each other by distances that vary from a one minute to a two hour walk. Several houses may be found together in a same location, without necessarily being close to the river. Around the house is a circular area, about 100 meters in diameter, called a yard. In the yard one typically finds a henhouse, spice and herb gardens, fruit trees and domestic animals, sometimes including cattle. Next to the yard is a smoke house where the sap tapped from the rubber trees is smoked and transformed into semi-processed boards or balls.

If the house is on the bank of a natural canal, there will always be a high part of the bank where pumpkin is planted, with beans, corn, sesame seeds and watermelons grown on the lower lying beach area. To avoid pigs and other domestic animals invading the beach plantations, families usually cultivate the beaches and high banks opposite where they live and breed domestic animals. The same criterion guides the choice of the places to plant cassava, rice, corn, beans and tobacco, combined with considerations related to the soil, topography and handling of crops.

A field next to a natural canal may have a flour house for manufacturing cassava flour. (Flour together with game meat or fish provides the basic menu of the population). It may be located in a spot in the scrub that had previously been used as a field or in untouched native forest. After two years of consecutive cultivation the field is abandoned to grow over for three to eight years, a system that is useful for regenerating the soil. Rotation of crops of sweet cassava, corn and beans, the burning of the cut wood and roots, together with long periods without planting, are also used to regenerate the soil.

“Rubber roads” are found in the forest, always following the rubber trees cut by the rubber tappers. A characteristic of the rubber road is that you always come back to the starting point if you travel the whole length of the road (a “buckle road”).

The inhabitants feed themselves mainly on game, fish and cassava flour. The field (‘roça’) is a term used for both the cultivation of cassava and for the cassava plant and is the most common form of agriculture. Game is highly appreciated, and fish or shellfish complement meals if there is no meat available. While vegetables are cultivated and used, the population doesn’t show much enthusiasm for them. Watermelons, beans, corn, rice, sugar cane, coffee, sesame seeds and pumpkins are planted in clearings on the beaches and in the woods. The breeding of domestic animals including chickens, goats, domestic pigs, (different to wild boars or peccaries), cattle and sheep provide a reserve of food when there is a shortage of fish or game.

In the majority of locations there is no electricity. In some places where a larger number of houses are concentrated, there will be a diesel motor which is used for short periods in the evening. Motors are rarely used to pump water which comes from the rivers, canals, waterholes and springs. Rain water can be caught at certain times of the year when it is abundant and constant and is usually used for drinking. Women and older daughters are responsible for carrying cans and pails of water to the home. A small proportion of houses have out-houses or toilets located at the end of the yard but the great majority use what is known as a “cat’s stick”, a fallen trunk in the forest or a papaya tree, as the family toilet. The main religion on the Reserve is Roman Catholic. Other religions, namely Evangelists, Baptists and Daimistas, bring together small groups of people. (‘Daimistas’ is a syncretic religious cult, which originated at the beginning of the 20th century in the state of Acre, which uses the conscious altering drink ‘ayahuasca’ in its ceremonies). All these religious
manifestations have a direct or indirect concern about the health of their faithful, mostly related to aspects of prevention and cure.

The forest dwellers’ day starts before sunrise. At dawn, 4–5 am, they go to the field, to hunt and to cut. At daybreak they have their first meal, breakfast. This first meal, as well as lunch and dinner, is composed basically of game, fish, cassava flour, or domestic animals. Often, when something tastier is unavailable, they eat cassava flour mixed with water, popularly called “jacuba”, together with some fresh fruit.

At dawn the forest dwellers enter the forest barefoot or wearing only sandals. Dawn is the time when most latex is produced and they cut trees along the whole road and return later, harvesting as they go. On the return journey they carry a heavy load on their shoulders, and may also bring home an animal such as a land turtle or even bigger game, such as a deer or wild boar, for dinner. On their daily walk, forest dwellers are always looking for clean, running water to drink from the rivers and canals.

Women and children also work constantly, often carrying out heavy work. When planting or collecting food in the family plot, people must walk great distances. In the case of children, they must walk to school and many children walk two hours, alone in the forest, to get there. Sunday is a day of rest when nobody works or travels because it is a “sin”. People also eat only certain foods as they believe there is a greater possibility of contracting disease or suffering accidents, particularly snake bites, on a Sunday. The main sources of collective amusement are religious feast days such as the Catholic novenas, and small dance parties on the weekends. Saturdays and Sundays are considered the best days for festivities.

Health status

The general picture of morbidity and mortality in the AJER is the same as other regions in the Amazon. The epidemiology of the region indicates a high prevalence rate of illnesses linked to diarrhea and verminosis (intestinal parasites), the quality of drinking water, and poor sanitation and hygiene.

The most common illnesses are verminosis and gastroenteritis (46%), followed by diseases of the respiratory system (21%), and infectious diseases (6%). The illnesses most directly related to work are hernias, accidents caused by poisonous animals, pains in the joints, back pain and traumas that jointly account for 8%.

The risks of work accidents in the Amazon forest should be analyzed from two distinct and complementary perspectives. Few workers have formal links with the public or private system and are only rarely registered. Teachers, health professionals and boat drivers differ from the majority as they receive a salary and are formally employed.

It is important to recognize the fact that the receipt of a salary leads to a differentiation of income, prestige and power of those employed and has become an important incentive to attract people to these careers. The minimum wage level set by legislation, is received by

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4 BARBIN Júnior, Hélio, 2002. These statistics are based on the visits made by healthcare agents, midwives and midwives’ assistants, qualitative and quantitative reports of all consultants, doctors, nurses and anthropologists who worked over the eight years that the project existed.
retirees, and provides a level of income which very few people have access to. While less than 1% of the local population receives a salary, they still face numerous accident risks directly related to their work. We found that there is no differentiation in accident risks compared with the rest of the population because these are the day-to-day risks of living in the forest. The daily lives of the majority involve them in informal work, and their main objective is to guarantee survival and well-being of the family or household group.

A rubber tapper usually works 267 days a year on the rubber roads, preparing his plots and making flour. The income gained from selling these products is spent by the head of the family to acquire basic products: salt, soap, ammunition for hunting and fishing, axes, machetes, knives, blades for cutting rubber trees, shotguns for hunting, motors to make flour and nylon fishing nets. Items such as cloth, hammocks for sleeping, and sundries for personal consumption are also bought (Feitosa, 1995, pp.57-58).

The risk of work accidents or illnesses for rubber tappers is directly related to everyday practices and tasks. They face the risk of accidents and infectious and contagious illnesses, such as verminoses and malaria, while cutting and clearing rubber trees and scrub, or in planting plots when searching for food. According to Ministry of Health data for 2003, the rate of malaria in the Amazon region is 4 cases per 1,000 inhabitants, and the rate is higher inside the forest. From this point of view, the risks and prevention of work related illnesses and accidents should be analyzed within the context of the local system of basic health care.

A proposal to improve health conditions appeared soon after the creation of the Reserve through the initiative of the ARTFAJER, and was supported by non-governmental organizations (NGOs). In 1991 a project began with the objectives of installing a basic health infrastructure and training health care workers. The project lasted until 1996 when financing ended. Basic health care continued to be a focus in the municipality, particularly in the areas of reproductive health and public health.

During this period, there was a cooperative endeavor involving the population, technical, medical, nursing, educational personnel and anthropologists that proved to be a significant experience in terms of both bettering peoples’ lives and building up knowledge about health. Traditional and scientific health practices complemented each other, not only in relation to health but to all sorts of different work-related activities.

In the beginning, a health care sector was formed within the ARTFAJER which planned and managed activities together with the NGOs involved. The interdisciplinary and “intercultural” milieu that formed permitted all those involved to increase their knowledge of the social, economic and cultural components relative to a healthcare project in the area. Personal and professional growth was also experienced by the whole group. In order to build a participative and democratic healthcare system, it was judged necessary to build what became a space for community interaction and citizenship.

Since then, the community has appropriated the process for its own needs in order to make decisions on planning, monitoring, execution and evaluation of the healthcare services. The community started to value its own knowledge about health promotion and disease prevention and demanded the inclusion of such knowledge in the official agenda, especially through the creation of the Marechal Thaumaturgo Municipal Health Board in 1996.

The previous limited response to community needs was recognized and an effort was made to establish goals to meet community requirements. In this way the community began to accu-
mulate the necessary knowledge on how to manage health services at different levels and budgetary restrictions. This knowledge combined to provide an opening for the discussion of joint actions. In addition, this context created incentives at local level, for the acquisition of qualifications and for personal participation in all parts of the process and its work activities. This process resulted in a strengthened identity for the rubber tappers and created a greater interest in their fight for an improvement in their quality of life. This process of building knowledge had a built-in feedback mechanism. Biomedical analysis provides scientifically recognized techniques and knowledge about the prevention and treatment of diseases, and this has been incorporated into the techniques and the representations held by the population about the causes of ill health and disease.

In this way, each group develops their own special methods and “social roles” according to the knowledge and resources available, adapting or reacting to a preventive experience and/or treatment of an illness. According to Minayo (2000), two types of extreme analysis carry weight. One builds diagnoses “in accordance with the vision of an over determined hegemonic biomedical model”, the other through “a relativistic viewpoint which emphasizes that culture is ‘truth’, and therefore reduces the importance of pathological processes calling them ‘normal’”. Both approaches are out of date and need to be “fitted in as additional elements for understanding the whole picture.”

The local healthcare system in the AJER has all the characteristics of a “synchretic system”, as it incorporates explanations, diagnoses, treatments and prevention of many illnesses, through reference to the (so-called) ‘folk beliefs’, which are added to biomedical concepts learnt over the years. It is worth recalling that self-medication, prayer and traveling medicine sellers were the only sources of medical assistance in the region until the middle of the 1990s. Such amalgams of beliefs and values constitute a medical-epistemological model. In this model, influences from northeastern Brazil are added to biomedical and indigenous influences. Without preconceptions, people use folk practices such as healing prayers and forest plants as well as biomedical knowledge, in the form of pills, medicines and information for the prevention, treatment and prognosis of illnesses.

As an example, we cite accidents caused by snake bites. Snake bites occur frequently when rubber tappers walk in the forest and are responsible for serious injuries and many deaths. On such occasions tappers use their beliefs and folk technologies for prevention, e.g. they always carry a roll of twine which has been blessed by faith healers, for protection. When they are bitten by a snake, victims are isolated from their normal social contacts because it is believed that the strength of a gaze could worsen the victim’s state. Only the healer and nearest relatives can approach. They also obstruct the work of doctors and use of their techniques, like anti-snake bite serum.

Nowadays, all the precautions for the prevention and treatment of snake bites are frequently carried out, including the ‘snake cure’, a technique whereby a faith healer ‘closes the body’ to snakes. Victims are now sent to the nearest health clinic, if it is located close by, to take serum.

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5 We adopt the term ‘biomedicine’ in the spirit expressed by E. Jean Langdon. Hans and Kleinman (1973, 306) adopted the term ‘biomedicine’ instead of ‘scientific medicine’ to designate our medical tradition in order to avoid the implication that other medical models are not, or cannot be scientific.

6 Further information about snakes and the treatment of their attacks or bites among rubber tappers and Indians belonging to the Ashaninka, Hunikuin and Katukina tribes can be obtained in the chapter on ‘Cobras’ in Souza, Moisés. B. de., Martini, Andréa [et al]. 2002.
because serum prevents crippling and amputation of the affected limb, but subsequently they return to their state of social isolation. It is important to cure the patient with prayer, diet, serum or forest plants - the method used is not important and all the therapeutic methods are frequently used together.

Accidents involving bones and joints are another example where beliefs and folk and scientific technologies are used altogether. People are submitted to a three day praying process, for either prevention or treatment of a condition popularly called ‘crooked bone’ (desmintidura or osso torto in Portuguese). Many of the local healthcare workers also know folk practices of praying and blessing. In some situations healthcare workers may pray and finish treatment with an antiphlogistic (anti-inflammatory), should one be available, or may start with an antiphlogistic and finish with prayers.

The syncretism of different models of healthcare can also be observed with malaria. Rubber tappers believe that malaria is cured by medicine available in the pharmacy but, in conflict with medical knowledge, believe that malaria is transmitted by water. Even today, they still do not believe in the scientifically established fact that transmission occurs through a mosquito (Anopheles darlingi), however, such doubt does not prevent them from sometimes using mosquito nets for prevention.

The building and favoring of social and political spaces, where both popular and scientific knowledge can be recognized equally through the effective participation of the community, represents important progress for the implementation of models of ethnoprevention. It builds a stage where social actors can enter into dialogue and through their experience and knowledge, improves the quality of life and strengthens citizenship through the development of preventive techniques with cultural meaning and also articulated with scientific knowledge and appropriate methodologies.

The Unified Health System (SUS) in Brazil has community participation as one of its fundamental premises, along with decentralization and priority for preventive actions rather than welfare. The democratization process in the public health area started in the 1980s through SUS, but it only came to Marechal Thaumaturgo in 1996 when the Municipal Secretariat for Health and the Municipal Health Board were created. Despite innovative public policies, implementation of elementary level health programs supported by federal government, faces many difficulties.

It is difficult to retain university trained healthcare professionals in the municipality. Political quarrels, poor planning and inappropriate expenditure of the municipality’s budget jeopardize the implementation and execution of programs with preventive and social goals. Resources end up being put into welfare or paternalistic programs.

A holistic view of health, supported by principles of equity and completeness, should take local characteristics into account, (be they managerial, planning or socio-cultural characteristics), when establishing healthcare services for the populations of the Amazon region. Debate should result in the creation and establishment of differentiated public policies for this population, distinct from extreme positions of ‘cultural patriarchy’ or ‘Cartesian science’. Respect for cultural diversity and the development of full citizenship are prime factors for proposals to establish democratic ethnoprevention, a system that is more efficient and has smaller cultural, social and financial costs.
Francisco Alves dos Reis Junior

THE RISKS OF USING COMPRESSORS IN LOBSTER FISHING

Introduction

Lobster fishing is an important activity and lobsters are a principal export of several Brazilian states, especially in the northeastern region. Although the activity is of great economic and social importance in a number of places, “fishing with compressors”, has caused a high number of fatal and incapacitating work accidents among divers.

When traveling through the lobster fishing communities on the coast of Rio Grande do Norte State, it is common to find paraplegic fishermen or to hear about accidents and deaths resulting from diving using compressors. It is worrying that more and more people appear to be getting into this activity after the end of each closed season, (an annual period when lobster fishing is prohibited along the whole Brazilian coastline), despite the high risks and the evident depletion of lobster stocks. The various public agencies involved with this illegal activity do little or nothing to change this reality in spite of widespread public awareness of the problem that has led to articles in the press. Divers continue to be at risk as public officials continue to perpetuate negligence and omission and the public watches on passively. While accidents and deaths in this predominantly craft activity continue to proliferate, the figures are excluded from official statistics.

This chapter aims to show the severity of the problems arising from the use of compressors for lobster fishing. The chapter describes the path taken by the Ministry of Labor and Employment OSH inspectorate after the problem was recognized, revealing a situation where the limits of inspectorate functions are not clear. The main factors that produce accidents are analyzed to encourage debate and recommendations about priorities for the OSH inspectorate.

Information for the analysis was obtained in a number of ways, using a variety of methodologies, over a three-year period of contact and work with communities using compressors when diving for lobster fishing.

Intervention by the OSH inspectorate

In the year 2000, the Regional Work Delegation (DRT) of the Ministry of Labor and Employment, started planning the “National Campaign for the Prevention of Work Accidents”, (CANPAT), in the State of Rio Grande do Norte. Their first task was to find statistical data and information about work accidents from official databases and through exchanges of information between inspectors. Official data gave the impression that all was well with a minimal number of fatal or disabling accidents that were not concentrated in any particular activity. However, information obtained informally gave another picture; occasional reports indicated that the use of compressed air in lobster fishing was leading to large number of accidents, including fatal accidents.

A reconnaissance visit to a community using compressors for lobster fishing as their main activity was arranged by the DRT and the local mayor. The fishermen received these visitors with open arms and described their work, its risks and equipment. Victims of accidents that had caused paralysis, (paraplegias), and other irreversible injuries, especially to the nervous
system, were interviewed. The first impressions were: lobster fishing using compressed air was a high risk activity, many people had died or suffered serious irreversible injuries as a consequence, and the fishermen wanted to change the situation. The high price paid to fisherman for a kilogram of lobster tail, R$60.00, (US$20.00), was undoubtedly the reason why the activity attracted so many fishermen. The quantity of lobsters caught had been decreasing over the years. State intervention had no credibility in the eyes of the fishermen as they saw it as playing a purely punitive role so this forced the civil servants participating in the project to show that the state was able to play other roles.

The second step was the identification of the localities and techniques employed for fishing, followed by bibliographical and other relevant research. Five lobster fishing localities were visited and it was decided that medical doctors, who acted as inspectors in the state’s OSH inspectorate, would use questionnaires in three of them. Given the lack of any statistical data about work accidents, a primary goal was to assess the importance of the problem, as well as increasing understanding of the activity through descriptions of accidents and their consequences.

The research process

A total of 125 questionnaires were applied to divers from three different lobster fishing locations in Rio de Fogo, Zumbi and Caiçara do Norte. The localities were chosen because of the interest of local fishermen in the research. In addition to information about the number of accidents, the questionnaires sought to gather data about the causes of accidents, the depth at which they occurred, the age of victims and length of time they had been working in the activity. Completion of the research was difficult for two reasons, the frequency of the fishermen’s voyages and the absence of precise information originally sought (e.g. researchers were unable to precisely calculate the number of divers in each community). In addition, analysis was difficult because of the large number, variety and inaccuracies about the number of accidents reported by the divers. Problems also resulted from confusing descriptions of accidents, due to reliance on people’s memories. It is important to note that 86% of the divers interviewed, (105), reported that they had suffered at least one lost time accident, (and often five, six, or more), and that most of these were due to alterations in pressure during diving.

The search for alternative sources of information proved worthwhile, and revealed two important facts. Firstly, a number of high quality monographic studies and other written work on lobster fishing already existed. A second revelation was the fact that while a large number of government agencies had responsibilities related to this activity they all lacked structure, staff, policy priorities and organized sources of data on the subject. This portrait of disorder, together with the lack of policies and priorities for the whole fishing sector, became clear after consideration of the number of agencies that had been created and disbanded throughout the years. In addition, there had been frequent changes to the government body responsible for control of the sector.

The state’s Health Secretariat was approached in an attempt to find better quality data. It was thought that examination of the causes of death of fishermen, as recorded on death certificates, would make it possible to calculate their fatal accident rates. Death certificate

7 The questionnaires were administered with by Maria José Alves and Lis B. Cunha Coutinho.
data has been computerized since 1985, however, in spite of the importance of fishing, fishermen were only included as an occupational category for the registration of fatal work accidents from 1999 onwards. In the two years (1999 and 2000), for which statistics for “frequency by occupation and year of death” and “death from drowning” included fishermen, the numbers of “deaths from drowning and from accidental submersion” were 2 and 10 cases respectively. There is no precise calculation of the number of lobster divers in Rio Grande do Norte, and we know that not every death from lobster fishing with compressors is registered as a “death from drowning and accidental submersion.” As a result of conversations with leaders from the lobster fishing communities, we estimated that about 700 divers worked over the 1999-2000 period, which would mean a mortality rate of at least 3 and 13 per 1000 divers, per year, in those two years. In comparison, the work accident mortality rate in the construction sector in the state was 0.4 per thousand in 2002, one of the highest mortality rates in the last 10 years (AEPS, 2002).

Based on the memory of interviewees, communities in Zumbi and Rio de Fogo supplied the names and year of death for those who had perished diving for lobsters. Between 1975 and 2000, 9 people had died in each of these communities. In the Zumbi community, researchers were also informed of the names and addresses of another 46 individuals who, over the same period, suffered disabling injuries of such severity that they were forced to abandon diving. When we examine data related to these two communities alone, (there are thirty two such communities in the state), and consider that twelve fishermen’s deaths had been officially defined as due to “drowning and accidental submersion” over a two year period, the probable size of the problem come into focus. (N.B. the cause of death does not appear to have been precisely defined, however.) It should also be noted that lobster fishing, particularly diving using compressors, occurs along much of Brazil’s 8,000 kilometer long coastline, principally in the northeastern region.

Recognizing that this is a very serious problem, what can be done about it? Given the size of the problem and the social repercussions of any possible intervention, it was understood that no measures could be taken without the participation of the fishermen and their communities. Two strategies for action were defined: the development of a “collective work analysis” (CWA) with the fishermen, and a wide-ranging discussion of the problem with all the institutions and actors involved.

CWA is a research technique which seeks to understand work from the worker's perspective, or more precisely, on the basis of the worker's perspective. A group of workers is invited to participate spontaneously in a meeting, (that may be recorded with the consent of the group), where participants talk about what they do when they work so that researchers can better understand the situation through the collective experience and knowledge of workers. This process also allows workers to be ‘owners’ of knowledge and speech and to have a possibility to externalize their knowledge and to develop a better understanding of their activity and what it represents for their lives - they can transform and can be transformed at the same time. This exchange is important because workers start to develop and cement new ideas, question deeply held beliefs, and consequently change behavior and actions.

The project was elaborated and developed by myself (author of this article), together with two researchers from FUNDACENTRO, Leda Leal Ferreira and Sandra Donatelli and results will be published as a book. Research also relied upon the support and involvement of fishermen from Zumbi and Rio de Fogo. A total of five meetings were held, all audio taped. Three initial meetings were held with about twenty five lobster fishermen and boat owners, followed by
two meetings where the ideas were returned to the participants (an important component of the research technique). Overall, about eighty people participated, and the material that had been developed was presented to the participants before writing the final version of the report. The aim was not only to discuss and clarify the draft, but also to seek suggestions and agreement for the final report, and to ensure that the participant’s history and work were adequately represented.

The focus of discussion widened as CWA began. The main government bodies involved in the activity was identified and, after initial contact with the body that oversees harbors (‘Capitania dos Portos’, part of the Brazilian Navy), a first meeting was scheduled to discuss the problem. The Public Prosecutor’s Office for Work-related Issues, the Federal Government’s Nature Conservation Agency (IBAMA), the Federal University of Rio Grande do Norte (UFRN) and the Agriculture Ministry also attended. Later, the fishing communities, represented by the Rio Grande do Norte Fishermen’s Federation, were included. The State Fisheries Committee was resuscitated, coordinated by the state government’s Agriculture Department, in order to study proposals and discuss solutions. New partners were invited including the Association of Fishing Enterprises in the State of Rio Grande do Norte; the Rio Grande do Norte Association of Fisheries Engineers, the State Legislative Assembly and, occasionally, other public agencies or civil entities. The regular schedule of meetings was occasionally interrupted. A government agency interrupted the process by engaging in a highly visible action, seizing compressors and illegal equipment. While this was ineffective and only had a short-term effect, it triggered actions and political pressure from fishermen. Since then discussions have stopped and there is little chance of progress.

While the fishermen from poorly resourced fishing communities are organized, they work in fragmented groups, have no leadership training and have "questionable” representatives. There are ‘lifetime leaders’ in almost all the State Fishing Federations. (Federations charged with organizing different professions at the State level were institutionalized as a part of the official corporatist union structure set up by President Getúlio Vargas.) These lifetime leaders were not originally involved with fishing activity, and seem to be more worried about their personal agendas and keeping their jobs than about organizing and contributing positively to the structure of the fishing sector. Although the fishing companies talk about good intentions, they continue to make money from the disorganization and undercapitalization of the fishermen. They determine prices through buyer networks, purchase lobsters when the season is closed and buy under-sized lobsters which increases competitiveness and rivalry among fishermen and make little or no contribution to the preservation of lobster stocks. The government is generally represented in the State Fisheries Committee by agencies that lack adequate staffing, are poorly structured, have no decision-making power and which continue to operate without a policy for craft fishing. The consequences from this state of affairs are worsened by the fact that the fishermen lack political representation.

**The activity of lobster fishing**

**History**

Between 1967 and 1977, important developments occurred in companies and industrial activities involving fishing, thanks to a policy based mainly on tax exemptions for the whole fishing industry. While these measures accelerated the development of industrial fishing, craft fishing – which occurs where fishing activity is not carried out by capitalist companies -
continued to survive without benefits or policies to help it develop and grow. The policy aimed to increase production and productivity, but neither research nor planning to determine sustainable maximum fishing levels for various species was carried out prior to implementation. In many cases, this led to over fishing and biological implications for fishing resources.

The process was no different in the case of the lobster. Industrial scale fishing began in the 1950s, albeit in a modest way, and gradual growth began only in the second half of the 1960s, caused mainly by the structuring of the sector, the introduction of a range of fishing methods and growth itself. A gradual decline in stocks and decreased productivity resulted. This fact, associated with the end of tax incentives to industrial fishing activities in 1977, led to rising production costs and resulted in several companies closing and withdrawing from fishing activity. These companies went from being producers to buyers, maintaining their processing and commercialization activities, principally aimed at overseas markets. They stimulated and financed lobster fishing by the craft sector. This period coincided with increasing activity involving diving and the use of compressors, especially in Rio Grande do Norte, that resulted in greater productivity and lower costs than the more traditional use of lobster pots and related methods. From this point onwards there was continual growth in lobster fishing using compressors.

The workgroup

The workgroup is generally made up of five people: two divers, two hose handlers and a master. The master’s job is to sail the vessel to places where lobsters are to be found. He is also responsible for the boat and coordinates the crew’s work so is in fact in charge of the boat’s operation. He must also ensure that the boat motor is always running for should it stop during a dive, the lives of divers will be endangered due to lack of air supply.

Hose handlers look after the hoses and the divers’ air supply. Incidents such as those caused by hose blowout, breaking of a transmission belt, a hose being cut by their boat’s propeller (or by that of another boat), all require urgent reactions by hose handlers. If hose handlers do not rapidly correct problems caused by accidents such as those described above, the quantity of air contained in the reservoir is usually insufficient to continue a dive forcing divers to return to the surface without adequate decompression. This results in the high morbidity and mortality rates found among divers.

The equipment

There must be a supply of compressed air for a diver. The compressor is hooked up to the boat’s motor by a transmission belt. A small hose carries the compressed air to a cylinder, (like those used for gas cooking), that acts as a holding tank. Although the cylinder is small, it stores the air, plays a role in separating out impurities, and helps stabilize the gusts of air that the compressor produces. A reserve supply should be sufficient to guarantee the diver’s safe return to the surface in cases of emergency. The cylinder’s small size, however, means that supply of reserve air is insufficient to permit the necessary time for decompression. The cylinder’s original valve is adapted so the air goes through a filter to reach a bifurcated nylon hose through which the air flows to the divers. The divers breathe through a mouthpiece connected to a valve, and this is used to regulate the air pressure necessary for breathing. In general, the capacity of the compressors is insufficient to maintain two divers working
simultaneously at greater depths. Other equipment includes fins, masks, weight belts and sometimes gloves to protect hands from lobster thorns.

Usually the equipment used is not adequate for the task; equipment is mainly improvised and most often used for much longer periods than is desirable to guarantee their quality. For the reasons previously outlined, hoses are probably the biggest cause of equipment accidents but, the lack of maintenance of motors, cylinders and compressors, as well as the time required to change filters, are also factors which contribute to increased risks. Due to its proximity to the compressor, there is a risk that carbon monoxide emitted by the boat’s motor through the exhaust pipe can enter into the air supply causing intoxication.

Working hours

The length of the fishing day varies according to the size of the boat. In general, the working week starts on Monday or Tuesday at 5-7am and finishes at 4-5pm each day. When news spreads that there are lobsters in other regions, it is common for the boats to travel for longer periods, which generally results in 5-7 days being spent at sea. Fishing always takes place during daytime.

Working schedules, compression and decompressions

One of the greatest risks for divers is accidents caused by direct and indirect effects of pressure. Barotraumas, traumatic clots caused by air, narcosis, CO and CO₂ intoxications and, loss of consciousness are the main decompression illnesses. Divers talk about decompression illnesses with the clarity of those who recognize such events as part of their day-to-day lives. They also point out the negative consequences of the excessive effort that occurs during diving and are very familiar with the effects of rapid returns to the surface without the necessary decompression. However, there are more urgent items on their agenda, namely competition for lobsters and the search for profit. Whenever a colony of lobsters is discovered, people fish until they are totally depleted. Faced with such powerful forces, fishermen do not even remotely consider safety awareness and common sense as goals.

The shortage of lobsters has contributed to pushing divers to go to ever greater depths. Even though the vast majority of them descend no further than 30-35 meters, it is becoming increasingly common to hear reports of dives of up to 80 meters, where only nitrogen is used. When diving with compressed air, the maximum depth should be around 30 meters. Because of the effects of narcosis, nitrogen should be substituted by helium mixed with oxygen (heliox) for dives of 50 meters or more.

The schedule of dives can increase the seriousness of the situation. Each diver should not go down more than once or twice a day, and all dives should be followed by adequate rest periods. In reality, we found that divers are doing more than 10 dives daily, driven by the need to catch lobsters, not by safety concerns. The ideal period for each dive is also exceeded. Time should be inversely proportional to depth, in other words, the higher the pressure at a particular depth the shorter the dive should last but, once again, the determining factor is the discovery of lobster populations and the glimmer of profit.
When a diver shows symptoms of the bends, he frequently returns to the depth he was at on an earlier dive and rises slowly, taking rest spells, to guarantee decompression. Sometimes, the diver is accompanied for part of the time by a second diver. The time spent to surface appears to be random and based upon notions acquired from decompression tables and individual experience. Various cases were described where such a procedure lasted into the night because an accident occurred in the late afternoon. All the divers who have gone through such an ordeal, talk of the fear they experienced when they were alone in the dark sea, lacking resources to protect themselves and with little notion of time. Communities respect this experience. While the technique described above has not been scientifically validated, it sometimes results in a reduction of the symptoms; however, it possibly does not reduce the cause of the symptoms.

Work relations and competition between divers

The day-to-day lives of fishermen are made up of comradeship, friendship and loyalty as well as lack of unity, disagreements and competition. The communities and other institutions that represent their interests, provide a portrait of the organizational difficulties and distrust that predominates.

Once at sea the situation worsens because the lobster fishing regions are well known and are public places so several boats frequently fish in the same area. Each boat observes the others and when signs suggest that lobsters have been found nearby, boats move to the same area, and their divers compete. On such occasions accidents can be caused by the knotting of air-hoses, by propellers cutting through hoses or through misunderstandings. The dynamics set into motion by the mere discovery of lobsters leads to the need for faster action and greater efforts by those who have made the discovery. In other words, the faster fishermen work to catch the lobsters, the less they leave for their competitors and the greater their total catch. The consequence of excessive effort over a short period of time, sometimes accompanied by the need for repeated dives, increases the risks, particularly due to the bends, (when divers return rapidly to the surface without respecting time limits), and exhaustion. In such circumstances, fatigue, respiratory difficulties and mental confusion occur. Fatalities also occur.

The combination of reduced stocks and increased fishing has led to more intense competition. New workers are motivated to become lobster fishermen because of the high market value of the product and because of the lack of work opportunities in these locations. It is a game of good luck, bad luck and illusion. Fifteen or twenty years ago a good catch could yield up to 300 or 400 kilograms of lobster. Today there are periods when a whole month is spent without catching anything or just 3-4 kilograms. "Good" catches, of 70-80 kilograms, are increasingly rare, but the fishermen continue to live for these times, spending the rest of the year in debt, without a stable income.

Risk perception

We interviewed a boat’s crew two days after a fatal accident, which occurred during a dive. All four remaining crew members were relatives of the victim but when asked about the accident and the risks of their work they said that car accidents kill many more people than diving accidents. They said they were aware of the risks but did not consider that these were very different to those of other jobs.
Through discussions with other divers we realized that risks are well known, but are minimized both individually and collectively. Divers also expressed no intention of delaying their return to the surface or of reducing the number of dives per day although such actions would serve as important safety measures. While they recognize the foolhardiness of deep dives, of rapid decompression, of excessive work and of daily diving, they see themselves as being protected because of their experience and their familiarity with the activity, factors considered more important than the risks. Divers also believe that serious accidents are never going to happen to them. During interviews, several former divers, no longer able to work because of irreversible injuries, spoke of how they were once impetuous and efficient divers.

**Work and the worker: The focus of the OSH inspectorate**

A major doubt that permeated the development of our preventive actions concerned the responsibilities of the Ministry of Labor’s OSH Inspectorate. Is it the responsibility of the OSH Inspectorate to intervene in a sector where craft and informal work predominate? Should this sector be a priority?

The line between formal and informal work appears to be tenuous in this activity so, questions arise as to whether incorporation of lobster fishermen into the formal sector should be a possibility worthy of discussion. Would incorporation solve or reduce the problems observed in this dangerous and illegal activity?

The OSH Inspectorate represents the state. The world is changing, and so are all types of workers and work. It is evident that the Ministry of Labor has been keeping up with these changes, for example, by proposals for new, innovative regulations for rural work which includes specific responsibilities for family-based agriculture. Brazilian society appears to favor this commitment and direction. During the CANPAT ("National Campaign for the Prevention of Work Accidents"), both formal and informal workers, particularly in rural areas, participated in activities and education. Recently settled rural workers as well as registered urban workers, have participated in campaign activities in Rio Grande do Norte with encouraging results. There is a direction which is becoming a priority, i.e. one which views the worker and their work as inseparable. This direction has been supported by leaders from a range of organizations and agencies, at various levels, throughout the period of interaction with the fishermen. Any actions and interventions conducted by the OSH Inspectorate should be analyzed within a specific context and social reality as certain realities cannot be excluded from planning and decision-making processes. The primary objective is to prevent death and accidents in all kinds of work, in both the formal and informal labor markets. The principal question is the establishment of priorities for safety and health.

**Conclusions**

At the beginning of 2001, during a meeting of the Rio Grande do Norte OSH Inspectorate, the fishermen, represented by the presidents of the communities, agreed to stop diving for lobsters using compressors. However, they wanted to have options for alternative sources of work and income. They suggested retraining and qualification programs and the development of finance programs to permit the purchase of larger boats and new equipment. In June 2002, during the
State Fisheries Committee meeting, the state’s Fishermen's Federation presented a list of demands that included the banning of lobster fishing with the compressors from December 2002 onwards. Their one condition was that special finance credits were to be made available. As an exceptional measure, they also suggested a year long ban on lobster fishing to allowing stocks to rebuild but wanted to receive unemployment insurance over the period as compensation.

A proposal was made to the fishing committee, principally by the state OSH Inspectorate and the Federal University (UFRN). The proposal included retraining and qualifying the fishermen, a policy for financing the purchase of new boats and equipment, and modification of the illegal techniques used currently. Initiatives such as these would have to be accompanied by the adoption of measures already being contemplated by the fishermen, i.e. limitation of the lobster fishing fleet, a temporary increase in the period during which fishing is prohibited, and a transfer of some fishermen to other activities.

Developing a solution for the problem is difficult and there are no quick and ready-made solutions. In Rio Grande do Norte state over 20,000 people and many communities are directly or indirectly involved. Any decisions must rely on both the participation of the diverse actors involved, and on the mobilization of civil society; a solution would also require the support of several public agencies. In addition, the rapid decline in lobster stocks over the last few years must be taken into account as this depletion has been caused by over-fishing. Presently the lobster boat fleet is larger than is necessary to ensure sustainable fishing which currently makes legally permitted fishing activities financially ruinous. The only certainty that exists is that something must be done as the fishing communities cannot continue to pay the price of divers' lives and health because of the omission of public authorities and wider society. The Labor Ministry's OSH Inspectorate is not the main protagonist in this story but it can have a role in revealing the seriousness of the situation, and can bring together all the actors involved in an effort to transform reality and prevent accidents and death at work.
For a long period workers' health was seen as a technical subject. While it was understood that occupational ill health was provoked by work in specific industries, there was also an idea that work was a healthy occupation that prevented depression because of its social function. This idea is true as work can re-socialize deviant people. While such notions were always accepted as common sense by researchers, it took a long time before it was acknowledged that work and workplace relations also make people ill. If the dynamics of collective life make people, ("collective subjects") ill, can these subjects, in turn, also change the dynamics of collective life? For research purposes, it is important to observe both the activity and the person performing the activity. This chapter reflects a number of ideas on employment systems, alliances and competition both among, and between, workers and employers, with special attention being paid to the analysis of activities and how they affect the collective of people who perform activities.

When we look at domestic work in Brazil, there is a general level of satisfaction about the progress of democracy over the last two decades which has resulted in better legal protection and salaries for this particular occupational category. Empirically, such a statement is backed up by evidence. However, some forms of social domination that can affect distinct aspects of workers health, still exist in the current labor market. While such effects on health have always existed, we could expect that they would have become less prevalent because of greater access to knowledge and due to the democratization process.

Changes promoted by economic demands have permitted rather than prevented the persistence of symbolic and physical violence specific to the working lives of domestic workers.

Since the days of slavery, domestic service has been a job where both extreme domination and a relationship of intimacy between worker and employer, co-exists simultaneously, i.e. the job itself involves both distance and proximity. This is a peculiar feature of work in the "domestic space", which is an intimate space. (Research has found that the name given to these workers has been transformed from 'servant' to 'home secretary' (Girard, 1993).) For example, while a maid moves in this space, she should be deaf, not listen to secrets, and have a discrete presence. She is also required to take on different roles such as raising the children of others, while being separated from her own children. Maids can also be forced to have sex with employers, or their sons, while being separated from their husbands or boyfriends, depending on favors to earn their freedom from slavery. (This situation was particularly true in former times, a situation often portrayed in literature and family histories.)

To a large extent the position we occupy in the social hierarchy defines our identity, in other words, who we are. According to various authors, capitalist development attempted to eliminate the identification of professional activity with hierarchy. Such a form of identification prevailed widely until the 18th century in Europe and the 19th century in Brazil. In the case we are examining here, professional activity and position in the social hierarchy have come to be seen as one and the same thing, a situation that is treated as though it were the natural state of affairs. The process of industrial development in the economically developed countries required people, who were not equals, to come together to work. This policy sought to reconcile the irreconcilable, i.e. for people to temporarily give up a situation...
of formal equality with others in the same profession and hierarchical position, in order to serve a national project which, when accomplished, would permit benefits to be redistributed. For more than a century until the 1970s (B. Lautier, 1999), the social struggles within democratic regimes moved to decrease the barriers between people imposed by hierarchy, to promote fundamental political rights and, where possible, to reduce various types of inequalities, especially those that closed the gap between rich and poor.

Protection of domestic servants came slowly in Brazil and it took until 1988 for them to gain a legal status closer to that of other female workers.

Our research data from contemporary Brasília confirms the fact that currently, and for many decades past, the majority of domestic servants are non-white, poorly educated women from northeastern Brazil, i.e. it is an occupation that absorbs a highly disadvantaged group and people at the beginning of their careers. The social and sexual division of labor functions by choosing people of certain regions, colors, and ages for its subordinate activities. This situation still occurs today, not only in Brazil, but all over the world (Soria and Girard, 1996).

All occupations have a "public face" that contributes to the formation of our image of the world which, in turn, makes the system of social relations work as imagined. The places workers come from might change but, in order to recruit people into harmful and subordinate jobs, vulnerability must continue as a feature of the labor market.

Maids working in the Federal District of Brasília

It is necessary to clarify the reason why female domestic servants are classified as belonging to the informal sector despite the fact that a good many of them are integrated into the formal sector. While 69% of them are integrated into the formal sector according to the legislation, in the Federal District only 48% have official, registered work papers. Our study is based on the observation that employment conditions are defined informally and we have attempted to understand how this kind of labor market works and to identify effects on workers' health. Health was not a specific focus when this research was designed but we address it because there were explicit manifestations of latent violence, (both symbolic and physical), in two of the occupational categories we researched, i.e. domestic workers and street sellers.

Features of the employment system

Almost 50% of those working in domestic service are employed by either middle class people living in the central part of Brasília (known as 'Pilot Plan'), or by upper middle class people living in the southern and northern lake areas. However, cities such as Taguatinga, Guará, Cruzeiro, and Sobradinho also employ many domestic workers even though they have lower average income levels. It was important to investigate working conditions in all of the above areas because there are distinct differences in work situations. Some domestic workers were even employed by other maids, which shows the heterogeneity of the activity. This situation was verified through examination of replies to the question about who cared for the children of maids. The profile of domestic workers shows that many live in an extremely precarious fashion and we were able to verify that 25% of these workers leave their own children alone in order to go to work. This is the first of a very long list of negative pressures that affects workers' roles as mothers and family guardians.
Another finding worthy of attention, is the fact that 20% of the maids live outside the Federal District (DF). This implies that maids face high transport costs and spend very long periods in public transport to get to and from work. Because the law requires employers to pay transport costs, it is a contentious issue in salary negotiations, and can lead to impoverishment. While it is said that maid's lives have improved because of salary increases and improved rights, it doesn't necessarily mean their living conditions have changed for the better. A high percentage of maids live in Ceilândia, Samambaia, Santa Maria and Planaltina which means large numbers of workers go to work in central Brasilia and the lake suburbs, via complicated transport arrangements.

A deeper analysis of the general characteristics of domestic workers shows that 50% of the maids in the DF were born in Northeastern Brazil in the states of Maranhão, Piauí, and Bahia, and 25% in the neighboring states of Minas Gerais and Goiás. This validates the idea that "interstate worker networks" exist, as already seen in other research (Girard, 1993). There is another interesting possibility revealed in this data, (subject to confirmation), about the way in which maids organize access to the employment market. Previously, female employers sent for maids from the Northeast, but this is no longer necessary as the maids themselves establish networks. "Chains of reciprocity" are established whereby maids receive benefits from those who they have helped during difficult times, e.g. in cases of absence due to illness or family obligations. Solidarity between maids is a necessity for effective networks.

It is important to highlight the fact that 91% of maids listed their last place of residence in a state outside of DF which led us to make a general observation that women born in the DF have other career paths open to them other than becoming maids. Networks formed outside of the DF dominate the local market. Regional identity defines not only a person's professional identity but position of subordination in the social hierarchy, in both the city and in the region. In terms of educational levels, maids are divided equally between those who have primary schooling and those with secondary schooling. An interesting phenomenon is that very tiring working conditions, (e.g. being available to employers beyond normal working hours) are accepted, independent of the person’s educational level. We also found that a higher educational level didn't affect employment conditions and terms. School qualifications are not considered to be a competence worthy of remuneration for domestic workers employed in private residences but, for example, a good cook with primary and/or secondary level education, working in a restaurant in a major city, will receive higher wages based on their level of education. In our view, this disregard for educational qualification occurs because these low paid workers fill gaps in public services, e.g. crèches, services that the State is unable to offer. A badly paid workforce also allows women from higher socio-economic groups to work. When thinking about work organization it is essential to consider a connection between status and the needs of those who enjoy a good standard of living because of their productive activities and their levels of consumption. It is not possible to engage in a complete discussion of this question but, for example, if we were to compare it with the contracting of a personal trainer, (who provides private physical education services for middle class clients even though such services are much more expensive than gyms), it would be enlightening for the purposes of comparative research. Many people internalize the view that education doesn't improve employment possibilities.

Maids are poorly paid and the job offers no possibilities for promotion. It is also very difficult for them to earn extra money beyond their salary. While many maids work eight hours per day, (from 07.00h to 16.00h on average, with a lunch break,), the distances they have to
travel, coupled with the poor quality of public transport, makes it impossible for most of them to improve their conditions of employment and income. Our research established that some additional income may be earned, e.g. by selling cosmetics from their own homes.

**Living conditions**

The lack of State protection for the children of domestic workers is a long standing and well-known problem. 25% of mothers leave their children alone at home and 11% pay someone else to look after their children.

Under the Fordist model adopted in industrialized countries, society was generally supposed to take responsibility for the risks experienced by workers, e.g. for workers who became sick or injured, for education, and for social protection in times of difficulty. Through intensified exploitation of labor, "Fordist" mass production was intended to offer workers a higher standard of living in exchange for their contribution to rising profits. Support for workers was seen as a just return of social goods that would decrease the effects of social stratification and inequality on the organization of production. Brazil was never completely Fordist, however, and informal work relations increasingly leave workers with little defense against misfortune forcing them to be entirely responsible for solving problems that are, in fact, impossible for individuals to resolve alone. The State and society needs to develop a system of production and work organization, i.e. through effective labor relations, that allows workers to be fully integrated into their society, a sphere which goes far beyond work itself. Durkheim (1991) postulated that the division of labor would allow more social cohesion through the creation of multiple social links, resulting in individualization and autonomy, but the opposite effect may be occurring in Brazil. Domestic employment, similar to other occupations in the informal sector, has never been viewed as participating in the social production of wealth. The informal sector contributes enormously to GDP, but the State does not feel obliged to redistribute the social goods earned by the productive system of the informal sector. Attempts to resolve this question through the partial formalization of employment are not enough. The protection of the law must reach into the maid's workplace otherwise these rights will only serve the avoidance of employer-employee conflicts. More than simply regulating work relations, labor law is a right that should permit access to "citizenship" in a much wider sense, as it does in the Fordist Welfare States. Because this question is unresolved, workers with low status in the social hierarchy, suffer violence at work, resulting in negative effects, including on health.

The vulnerability of domestic workers is largely hidden because they work in private residences. Research shows that tensions and conflicts are seen as "family problems" and resolved through decisions made within the family, whereas they should be seen as workplace and work-related problems. For example, in order to understand the internal relations of any company, it is always necessary to understand how the company fits within a wider social context. Employed domestic labor also facilitates production since it has enabled middle class women to become integrated into the labor market. Domestic workers live with "social violence" because they must live with unequal integration. Our data illustrates this reality, e.g. only 1.9% has access to crèches so, in order to work, they must organize childcare with older children or other family. These solutions cause tensions, particularly for mothers working as domestics, who see the privileges enjoyed by their employer's children, (e.g. private transport to school), on a daily basis. This is the reason why we insist that juridical regulation results in the protection of formal work. However, work activity is much more complex than the simple
idea of formal, regulated work. Despite demands for workers to reject this violence, the increasing state of abandonment they face as the economy and society changes, invites it back in. For this reason, we should now turn our thoughts to reflect on the nature of this lack of support. Our data shows that maids frequently head their households in terms of financial responsibility, including cases where husbands or partners are unemployed which makes it difficult for a man to command the family, (Sennett, 2000. Cattani, 1996) and can increase the woman's burden of responsibility. (By comparing the maid's income with the total family income we were able to verify that the majority of maids are heads of households). Their average income is 2.5 minimum wages (the minimum wage in Brazil is a national wage fixed annually by the government). At the time this article was written, 2.5 minimum wages corresponded to approximately $US200 per month. When we observe the number of children per family, their vulnerability is clear, as is the nature of their poverty. Families frequently survive only on the salary earned by their mother working as a maid.

Like many poor Brazilian workers, working life for maids starts before the age of 14 years, (with an important percentage starting under that age from 8 years on). But, there is a striking difference between maids and other workers as our research shows that once a maid, always a maid! In spite of the fact that many maids consider their domestic service job as a temporary one, they do not change activity. This shows the rigidity of the labor market and, above all, conflicts with the popular idea about the flexibility of the informal sector. Even though there appears to be no apparent barriers to maids moving into other low status jobs, we found that they do not change their occupation which suggests that, in terms of employment policies, it is necessary to improve existing conditions and not rely on the imagined dynamism of the informal market.

A couple of facts worth noting are that a large proportion of maids come from rural areas where they have little access to money, a factor that can complicate salary negotiations. In addition, 52% of maids start their work as maids in the DF, i.e. the DF is their entry point into the labor market. Considering the above facts, it is interesting to see that this particular part of the labor market opens up through relatives and friends as 85% of maids are linked into an informal but very well structured network. The profile of a "good maid" is that she must be reliable, and this characteristic is promoted via the network. A maid who has had previous professional activities is seen as someone who might abandon the job at the first opportunity so it appears that a maid without qualifications is more sought-after. It is more important for a maid to enter and remain in a job than to have skills or experience.

**Internal conditions of employment**

More than 50% of our sample accepted their employer's terms without negotiating anything. Only 40% of domestic workers put forward issues for negotiation which reinforces the idea that employers have an advantage in private negotiations. There appear to be a number of conflicts that stimulate staff to leave their jobs. Severances are provoked by conflicts linked to moral issues such as humiliation, mistreatment, arguments, intrigue, accusations of dishonesty, excessive demands and disrespect of maids. (This list is closely linked to the analysis of external job conditions, which shows that, in the maids’ view, the best job is one where they are valued in a moral sense.) Maids must often suffer employer attitudes that devalue her as person, not only as a professional. It is clear that low salaries are also one of the most frequently cited reasons why maids leave jobs, however, humiliation is cited as the reason for more than 50% of resignations while low pay only accounts for 19%.
Most maids could be characterized by the fact that they will “do a bit of everything” and are available to work at least six days out of seven. This has a very negative effect on the maid's family life which is sacrificed by excessive hours of availability for their jobs.

Considering the above situation, it should also be noted the recognition of maids' rights has led them to express a feeling that “friendship” with their employers has increased. This expression indicates that the perception of rights is also related to the fact that employers may provide assistance during difficult times; this is a relationship characterized by private ties between employer and employee.

Socialization into domestic service occurs within the maid's own home as the tasks they do in their own homes gives them the knowledge needed to be a maid. More than 85% of interviewees said that they teach themselves how to respond to the requests and demands of each household they work in.

More than 90% had not done any training, or searched for any training designed to improve their competence for their job. This is an extremely revealing fact because the aim of doing a course (for example, in cooking), would enable a maid to sell her services outside of the confines of her job but this observation reinforces our understanding that the acquisition of professional competence is not valued in this job.

We were able to see that the most valued knowledge related to the labor market, for all population groups, is computer-related skills. It seems that without such knowledge, individuals become outcasts, excluded from the world, even when such abilities are not directly used in work activities. Computer related skills are seen as the passport for an eventual change of job. 22% of maids attend computer courses, 17% sewing courses and 11% manicure courses. There is no doubt that the desire to change activity is very strong (Girard, 1993), but some maids do not look for courses because their jobs demand that they be available to their employers for considerable periods of time. Most often, it is the unmarried and youngest women, who live at their employer's house, who are able to attend these courses early in their careers. Course attendance becomes impossible for married women who live far from their work. The State has never offered professional courses to help improve the income of this population and 98% declare that they have never received State support. Professional courses offered by the official agency SINE receive very few enrolments.

We can also see that low union membership marks this largely private domain of work. 97% are not unionized, an expression of the difficulties of collectively forging occupational rules. Religious participation is high, 93% take part in church services without necessarily taking part in community activities.

**Conclusions**

In our view, when maids become more exposed to risks, in spite of their being subject to increased protection under the law, both potential and real violence occurs. We consider violence to occur because maids perform arduous work in situations inside their employers’ homes, where their so-called internal work relationships are not normally the object of legal intervention. Nobody knows how to minimize subordination in the private space, (i.e. a home), where the maid lives out her work relationships. Our research shows that it is
essentially the internal and external conditions and characteristics of domestic employment that shapes a work situation that we have defined as violent. Action is required to combat this.

Domestic employment is characterized by a high degree of subordination and social stigma, (maids are well aware of this because they choose not to mention their occupation in certain social situations). We should ask whether any greater symbolic violence exists than feeling ashamed about one's profession because "we are what we do". This is currently very significant as there is a profound crisis in relation to work.

Domestic employment has both internal and external characteristics that lead us to see it as characterized by violence, and especially by symbolic violence. Such violence is defined as an aggression via recourse to the symbolic system which is used to define the person’s social identity. It also manifests itself in other ways, e.g. through name calling, the attribution of negative characteristics to others (e.g. on the basis of their race, sex, status). Its key characteristic is that it imposes harm without injuring physically or mentally, it exercises ‘social’ damage in that it devalues one actor within a system of social relations in relation to other actors, and the actors participate in this process. The legal system cooperates when it proves unable to address issues that harm these workers. Domestic workers have accepted the fact that the type of subordinate position they occupy is permanent and has existed throughout history. Unless we enter into a more profound reflection about the history of domination and violence, it is impossible to understand the social dynamics that keep domestic workers trapped and stigmatized.

The stigma and conditions of domestic employment confirm that the violence involved in domestic work affects the way in which the worker constructs herself as a social being, or as what sociologists call a ‘social subject’. This particularly manifests itself in the difficulties domestic workers confront in trying to change their employment situation or the content of their jobs. The very activity of domestic employment is humiliating and results in a tendency for workers to build a “negative identity”. As can be found with many other subordinate jobs, domestic workers are not comfortable when answering questions about their occupation. During our interviews we perceived that workers see their job as temporary, even when they have been working in domestic service for their whole lives. Because maids always have to prove that they are reliable, they tend not to struggle to improve their job conditions and make very few demands on their employers. Maids principally quit their jobs because of conflicts related to humiliation. Our research leads us to believe that domestic workers will suffer psychological and physical health effects because they are ashamed of their professional identity and are frequently considered to be in the wrong. Health is not only the absence of disease and all humans need space to be able to be creative (Dejours, 1998. Gaulejac, 1997) in order to be healthy. All workers experience tension during work activities, e.g. when creative solutions for problems are required, tensions are relieved only when an acceptable solution is adopted, however, conditions that permit creativity are not always available. Maids tend to resolve conflicts by quitting their jobs but this also has negative consequences because the fact that they have had a string of jobs makes potential employers suspicious during negotiations for the next job. Negotiation is not perceived to be a part of the work relationship between maids and their employers. If negotiation is to be seen as a realistic possibility, it is necessary that the parties involved in the relationship are perceived to have equal rights. While this is a necessary condition, people of different social status, who are engaged in conflict, should all be able to negotiate regardless of their status. In our view, workers who carry out subordinate functions are crushed by the representations produced by and internalized by those functions - in the case of maids, a precarious social identity is produced
within their workplace social relationships. If this reality is not recognized, this means that there is an implicit acceptance that workers fall victim to physical or psychological diseases linked to their work. Workers themselves are blamed for such illnesses, (particularly for psychological problems), rather than it being seen as a societal problem. Domestic workers suffer from the construction of "coercive subjectivity" a term that means subjects cannot build their own social and moral autonomy through work.

Selling on the street

Because street commerce presented the greatest variety of the three activities covered by our original study, it must be specifically defined in functional terms. In general, a great deal of what is normally called “street commerce” is constituted through enterprises that have some degree of formality and legal recognition, i.e. they are commercial firms registered by the relevant state and municipal authorities, subject to some official inspection and/or organization. This is the case for commerce established in street markets and in special locations reserved by government. Such places can be considered to be somewhat “protected” because they are recognized and subject to government action. In practice, legal registration gives access to some government benefits, which differentiates these vendors from many other types of street vendors.

Our research focused on street commerce that doesn't have any kind of support and/or government protection. This segment is more susceptible to market and social network instability and works in an environment where competition, “alliances” and organizational structure define, (and redefine on a daily basis), the spaces and possibilities for commercial activity. Traditional street commerce is very heterogeneous, and permits the commercialization of an ever widening diversity of products.

The types of street commerce were classified into three groups:
- Fixed commerce (benches, kiosks or stalls);
- Traveling commerce (carts, vans or trucks);
- Street commerce with no facilities or equipment (hawkers).

Generally speaking, hawkers are in the weakest position and suffer persecution and/or violence as they work. 21.4% of those working in fixed or traveling commerce indicated they had been victims of persecution or violence, but in the case of hawkers, this percentage more than doubled to 43.7% of interviewees. The vast majority (85%) of hawkers said that this violence came from members of government organizations, reinforcing the idea that the government constantly engages in repressive action.

Another important dimension relates to access to saleable goods. In 90% of the cases we researched, hawkers directly purchase most goods from wholesalers, but some goods are homemade or bought on consignment. Street commerce represents the final link in a commercial supply chain from wholesalers to consumers. Both moderate and larger sized wholesalers routinely use street commerce in order to forge an alternative outlet for their stock. In general, a significant proportion of a wholesaler's stocks are sold by major store chains and supermarkets, which because of their size, are able to impose their own terms and forms of payment on wholesalers. In the 1980s, when Brazil had high inflation, supermarkets delayed payment to their suppliers for up to 90 days, which resulted in important losses for suppliers.
Wholesalers have adopted a strategy of selling a part of their stock via street commerce, an alliance that helps guarantee their continued activity. Hawkers differ from the members of the two other groups because half of them declared that they have only one supplier while most other interviewees said they had more than one supplier, (71% in the case of fixed commerce and 60% in the case of traveling commerce). This reinforces the vulnerability of this particular group of workers who are greatly dependent on their wholesaler. Wholesalers primarily use hawkers as alternative salespersons who appear to guarantee a higher markup than that which can be obtained through sales to established stores. Competition between established traders and street sellers has led the former to organize private militias in many cities to prevent hawkers operating in established commercial areas.

The data we collected not only shows the vulnerability of street-based commercial activity, as described above, but also shows that alternative work opportunities do not exist for these workers. The position of street commerce and hawkers in particular, appears to be guaranteed within the employment system serving as a vanguard for the wholesale trade! However, the wholesalers use this scheme sparingly because while their alliance with hawkers guarantees the existence of street commerce, it also undermines the competitive capacity of conventional commercial forces.

Conclusions

Examination of the labor market position of street hawkers reinforces our conclusions about the situation of maids - it is clear that it is very difficult for members of both these groups to escape the construction of a negative identity. Street hawkers and domestic workers are regarded as outlaws with no way of resolving conflicts (except by fleeing), when in fact both groups are serving the interests of more powerful actors who are never formally required to explain their roles. The situation is even worse when a profession is not subjected to legal regulation, because workers with no rights, who work in unregulated work, are more subject to violence. The modern democratic State legitimises its existence by serving as a guarantor of individual rights and by protecting citizens against violence. The fact that people work in the circumstances we have just analyzed is not only harmful to them individually and as subjects, but also harms the legitimacy of democratic rule.

Notes on the research methodology

This article focuses on two of the three types of work that we researched, i.e. domestic work and street commerce, both of which are considered to belong in the informal sector. Our research also included activities involving repairs and alterations to buildings but this activity is not covered here. These three activities employ a significant part of the labor force in the Federal District, approximately 110,000 workers, or about 15% of the EAP.

The research was originally developed to consider two themes: firstly, to establish a general theoretical reference to guide and unify the methodology used in all three case studies. The improvement and adaptation of the theoretical category ‘employment system’ proved to be a key element for this theme because using this as a basis made it possible to establish both the content and detail of each of the three studies, particularly when drawing up the questionnaires. For the second theme, we worked with the idea that the treatment given to
each of the three activities should incorporate, (beyond general and common aspects), specificities that are constitutive of each activity, i.e. the elements that defined and differentiated each category. The point of departure for our first attempt to fix the frontiers of the study, was to define what was specific to each group or category through examination of the three different studies. In the case of domestic work, we started with Christiane Girard’s (1993) study entitled “Citizenship and Culture. The universe of domestic servants in Brasília (1970-1990)”. Two studies were used for our examination of autonomous building activities: Theodoro’s (1987) “Informal Activities in Recife: The case of autonomous professionals in repair and/or renovation work in the building sector” and Theodoro, Quinamo, Araújo and Bezerra’s (2000) study on “Informal Activities: Evolution and present day conditioning factors. The case of autonomous workers in Recife.” Finally, for street commerce we used the work of Lubambo, Araújo, Nogueira e Bompastor (1993): “Operation Street Hawker: Intervention in street commerce in the center of Recife.”

The basic questionnaires were the fruit of a model originally developed more than a decade earlier, with the addition of some new elements. Even though we followed a standard basic formula, three separate questionnaires were prepared, each adapted to the specific features of the occupational category under investigation.

After a period of prior testing, final adjustments were made to the questionnaires and data collection began. As a result of calculations of samples sizes, a minimum number of questionnaires for each category were determined. The distribution of the sample population, among different administrative regions in the Federal District, was also taken into account. Quotas were calculated and the following numbers of questionnaires administered:

<table>
<thead>
<tr>
<th>Category</th>
<th>Planned Questionnaires</th>
<th>Administered Questionnaires</th>
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<tbody>
<tr>
<td>Maids</td>
<td>364</td>
<td>363</td>
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<tr>
<td>Building work</td>
<td>328</td>
<td>329</td>
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<tr>
<td>Street commerce</td>
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Jacqueline Muniz

VICTIMIZATION OF MILITARY POLICE IN RIO DE JANEIRO

In spite of the significant amount of research that has been conducted over the last decade into the complex question of public security, the general scientific knowledge base is still recent and quite modest. This is particularly clear when compared with the investments and advances in scientific knowledge in many other strategic areas. The numerous challenges faced by the sector are signs of a very deep crisis, one that goes back to the return to democratic rule in the 1980s, (if not earlier). A series of quite different realities compose the universe we call ‘public security’, (which may be more appropriately called ‘lack of public security’). Many of the realities of public security work are still little known and are sometimes difficult for researchers to access.

On a daily basis, events (from extremely grave to relatively banal), become unpreventable tragedies because of the absence of independent and thoughtful diagnoses, perspectives, and interventions. Over the past twenty years Brazil has experienced a sharp rise in violent crime and a deteriorating collective sense of security. In spite of this, structural questions confronting the criminal justice and public security systems, and the daily problems faced by citizens and law enforcement authorities, lack systematic and rigorous studies capable of critically identifying visions and alternatives for change. Finally, there is a lack of regular studies capable of lending rationality to the public debate and that can play a role in building and implementing public security policies appropriate for contemporary democracy.

Within the institutions that make up the formal system of public security, police organizations stand out as the principal target for criticisms and demands by citizens but, at the same time, these organizations are shrouded in mystery as little is known about them. For example, the press tells the public far more about the tragedies surrounding cases of corruption, violence and impunity involving law enforcement agents than they do about the causes, motivations, contexts, opportunities and consequences of such perverse acts; this type of knowledge would make it possible to design policies to control and prevent tragedies.

The roots of this question go back to the military dictatorship when the police were used by the regime for social and political control that led to a situation of ‘us’ versus ‘them’. As democratization occurred, the images of the past made it difficult for the police forces to recover their legitimacy. They felt threatened and frequently reacted by isolating themselves. It was in this context that the police started to be seen as a legitimate focus for social research. Their history, world view, identity, mandate, attributions, organizational architecture, command and control structures, management mechanisms, services offered, norms, procedures, recruitment policies, selection and training, doctrines about the use of force, etc., all form a rich research agenda. Both institutionalization and multi-disciplinary study was required.

This article draws on the wide spectrum of so called ‘police studies’ and primarily attempts to describe the problematic victimization that affects the military police in the state of Rio de Janeiro. It is an exploratory investigation intended not only to stimulate discussion and reflection about health and safety at work as an issue that affects police officers, but also to raise some possible interpretations of ‘victimization’. However, before examining the victimization of the police, it is necessary to briefly characterize the Military Police of the
state of Rio de Janeiro (MPSRJ) and to make some general observations about the role of the police and perceptions about the risks of policing.

The Brazilian Constitution, in article 144, defines the military police as ‘auxiliary forces and a reserve army’ under the command of the executive power of each state. They are state police forces, organized in a military fashion, under the control of civilian state governors. According to the existing legal system, their constitutional mission is to do ‘uniformed policing’ and ‘preserve public order’. The military police (MP) are therefore responsible for executing various types of visible and uniformed policing; the non-uniformed state civil police (CP) are responsible for ‘the functions of judicial police and investigation of criminal offenses’.

Generally speaking, the military police (MP) are the ‘before and during’ police, working on the streets to prevent, dissuade or repress violent and/or criminal events. The civil police (CP) act after a defined crime has occurred; they can be considered ‘the after’ police. It may be observed that the Brazilian police system, through the two police forces that operate in each state, works differently to systems observed in many other countries. Each police force, (both MP and CP), operates independently of each other, and only takes account of certain stages of police work.

In the year 2002, the MPSRJ had a total of 37,615 military police officers, of whom 96% were men and 4% women. These officers were distributed hierarchically in such a way that 91% of all police officers were considered to be ‘front-line’, ranked as ‘soldier’, ‘corporal’ and ‘sergeant’; their principal function was to carry out police work. About 90% of all military police officers in the state of Rio de Janeiro were aged less than 44 years, and 58% of the whole police force was concentrated in the age group from 18 to 34 years. The relative youth of the members of the MP is also clear when we examine their distribution by length of service. About a half of the police in the state (45%) have less than 5 years experience in the MP, and only 13% has been in the force for more than 20 years. When we examine the designation ‘skin color’ we find that, in 2002, about 60% of the police force was ‘black’ or ‘mixed race’. Afro descendents are overrepresented in the MPSRJ given that those classified as ‘black’ and ‘mixed race’ were only 37% of the state’s population according to the most recent census figures available. The educational level of the police reveals that a little over half of them had not completed secondary schooling (57%) and only 9% had university education. Among the front line police the percentage with university education is 1%. Surprisingly, 66% declared themselves to be unmarried, and 71% declared that they had no children. Gross monthly salaries varied from R$ 1,016 for soldiers (US$ 340), to R$ 6,050 (US$ 2,000) for colonels, the highest ranking officers.

From this very brief summary of data, we can characterize the police force as being predominantly made up of single men without children, who are black or of mixed race, have at maximum completed secondary school, and receive an average monthly salary of R$ 1,590 (US$ 530 at the time of writing) for a working week that frequently stretches beyond 40 hours. These are workers who come from the lower and lower middle class, and who see a civil service career, especially in the police or the army, as an opportunity for stable employment and social mobility.

Among the wide range of images which common sense attributes to the police, is the image that their work is indispensable to society. However, it is a thankless job because it not only has low social status and poor pay, it is also seen as ‘very risky’. The variety of tasks carried
out by the police, permits them to come into contact with a great diversity of social realities, (be they morally acceptable or not to the police officer). In the course of their working day, police meet with the tragic, dramatic, irrational, contingent, prosaic, banal, scary, unstoppable and accidental aspects of life on each street or street corner of our communities. The day-to-day routine of police work permits the collision between that which gratifies us and that which makes us frightened.

Because of the signification attributed to the place of police and to police action, police staff are given special permission to both enter and exit from all social and power groupings within society. By these means, police situate themselves in society and perform a balancing act on the frontier of social and power groups through their visions of the world, their interactions, litigations, etc. They have the capacity to move between various moral territories, to collide with distinct social actors, disposing of the powerful arm which is the legal and legitimate use of coercive power. Police place themselves, in unpredictable, undefined and unchangeable situations, (especially when emergencies arise), that stimulate the creation of mystique around police work. In turn, this mystique appears to not only feed upon the real dangers experienced by police officers and the expectations built up around such objective risks, but to the building of public representations, (often paradoxical), about these risks. We find a pluralistic and widened syntax about risks which police officers use in their dialogue with other segments of society.

In general terms, when police are asked to speak about their world, they normally talk of the real and potential dangers and risks associated with their work; these dangers and risks are often intentionally exaggerated and filled with drama. Reminiscent of the heroic stories of amateur fishermen, their narratives appear to be a strategy of discourse, which, through overestimation and exasperation, seeks to confer social and political visibility to the serious problem of police victimization.

With few exceptions, questions related to the victimization of police are unknown to society and are rarely a priority for police organizations or for the bodies in charge of public security. In the Brazilian case, the low level of attention paid to the occupational health and safety of police officers, appears to have contributed to important segments of the police believing that ‘human rights exist only for bandits, not for the police.’ OSH is frequently treated as ‘an internal and private matter’ for the police force, almost as a taboo which could ‘even further weaken the morale of the troops’, ‘encourage the bandits’ and ‘harm the image of the police in the society’, should the subject be taken into the public arena. This has led to the situation where victimization of the police is intentionally forgotten or treated as though it were a natural and normal occurrence. Running against the grain of contemporary forces and the widespread movement for the humanization of work, considerable weight is given by society to the idea that is that it is ‘normal’, (and therefore ‘natural’), for police officers to be killed or wounded while defending society, acting in ‘place of the innocent citizen.’ This understanding creates a dangerous trap because it irresponsibly hands the police an anti-republican, anti-democratic type of blank check - one that permits them to do almost anything in the ‘war against crime’. It should be noted that this perverse idea, shrouded in the sacred cloak of ‘fulfilling their duties’, allows police officers to justify their violation of the rights of both police and citizens as a response to political interests, despite repeated loss of life of both staff and citizens.

In the state of Rio de Janeiro, where the public security crisis has become especially critical, the theme of police victimization came to light through a debate about the victimization of
citizens resulting from police action. In the late 1990s a piece of investigative journalism in the *Jornal do Brasil* mapped the lethal nature of police action in the city of Rio de Janeiro. This article initiated a wide ranging debate about civilian and police ‘losses’ and, consequently, about the need for better knowledge about the question and the necessity to improve police practices and social and institutional control mechanisms. It was in this context that the first studies into the lethality of police action and of police victimization were produced (Cano, 1999) and (Muniz & Soares, 1998). The numbers from the research confirmed the public perception that both the lethal effects of police action on civilians and the victimization of police, had attained very high levels.

With respect to police victimization, over the period 1983-1998, 2,303 police officers were killed and 10,124 injured, (a total of 12,427 military police victims). In the same period the proportion of victims varied annually between 2% and 3% of the members of the MPSRJ, an annual equivalent of 777 victimized police officers.

Given the sheer numbers, it became necessary to distinguish the number of police officers who became victims during their regular police activities. Over the period in question (1983-1998), it was found that 370 fatal and 1,869 non-fatal injuries occurred whilst the police were on duty (a total of 2,239 victims or 18% of the total number of victims). By constructing a time series (1983-1998) of the proportion of police officers victimized, it is possible to see that victimization has been increasingly associated with regular police work, particularly in more recent years.

In line with the evidence presented in Graph 1, between 1995 and 1998 there was a considerable rise, to about 40%, in the number of police officers who were killed or injured whilst on duty when compared with earlier periods in the time series.

Graph 1. Proportion of victimized (fatalities and injuries) military police officers while in service (light yellow) or off duty (dark yellow), 1983-1998.

Source: PMERJ - PM1/APOM.

In spite of the fact that an increasing proportion of fatalities and injuries occur in the course of normal work, an examination of Graph 2 shows that over time the number of police officers affected varied between 175 and 303 over the 1983-1998 period, an average of 252 dead or injured per 10,000 staff per year.
The highest rate of victimization outside of regular work activities was 268 per 10,000 police officers in the year 1986, whereas the highest rate of victims on duty was 134 per 10,000 in 1996. The 1995-1998 period presented the highest rates of deaths and injuries on duty.

It is clear that the state government public security policies and consequent policing policies adopted by the police hierarchy, directly and/or indirectly influence front line activities. Forms of police action are restricted to some extent by the definition of organizational policies, allocation of budget, employment of human resources, policing priorities and strategies adopted. In other words, orders given by the head of the police force and his subordinates, influence the means employed by the police. The activities of the police force, and their administrative and operational results, reflect, in part at least, the political vision of decision makers.

It is important to mention that the period 1995-1998, when the numbers of victimized (dead or injured) on duty police officers rose, corresponded to Marcelo de Alencar’s period as state governor. His public security policy had repression as its general orientation and was designed to ‘combat and confront drug trafficking’. During this particular administration, the army general Nilton Cerqueira was responsible for public security. He put the political orientation towards a ‘war on organized crime’, into operation which meant the police were encouraged to engage in ‘armed confrontation’ with common criminals and gangs, and to carry out regular occupations of the favelas (shanty towns). A ‘far west’ prize, which tripled the salaries of police officers who were able to prove ‘acts of heroism in combat’, was one of the principal measures used to motivate the police to enter into conflict, in order to raise the number of arrests and to apprehend those carrying arms and drugs.

It should be noted that the Alencar administration, was called ‘hard line’ on public security, and sought to distinguish itself from the prior administration of Leonel Brizola. Brizola was seen by sectors of the political class and those responsible for forming public opinion, to lack ‘a firm hand’ and ‘condescend to crime’. By emphasizing that police action should be carried out with unconditional respect for human rights, this administration had ‘handcuffed the police’ hindering their ‘just reaction’ to ‘criminal provocations’ (Caldeira 1998), (Garotinho & Soares, 1998), (Cerqueira 1996 and 1998), (Soares 2002) and (Costa 2004).
The previous graphs demonstrate that during Brizola’s two terms in office, in 1983-1986 and 1991-1994, the lowest proportion of police were killed or injured while on duty. Even if the changes implemented during Brizola’s two periods of government do not explain these results, a number of political orientations regarding policing altered the context in which work was carried out. The first change was the containment of police violence, expressed by indiscriminate and (at times), arbitrary and excessive use of force. This led to the imposition of normative, administrative and operational restrictions on police actions involving ‘conflict’ and ‘occupation/invasion’ of favelas, situations characterized as “high-risk” interventions for both citizens and police officers. The second change was related to debates around legalizing ‘part-time jobs’ for police officers. This change led to more liberal and tolerance towards police officers taking a second job. This was a trend that had been growing among off duty police officers over a considerable time. A large number of police officers acted, and continue to act, as watchmen, private security guards and providers of alternative transportation services to the public. Sometimes they acted as informal employers and at other times as stop-gap or temporary workers. A significant number of them used their hours of rest and leisure to perform these part-time jobs, thereby increasing the total length of their working day or week. Because of this, we can infer that some of the victimizations that occur outside of normal working hours, are in fact ‘work accidents’ because they occur during informal work activities. (This point is discussed in more detail later in the article). In spite of changes in the policy directions of state governments, the rise in police victimizations on duty has altered little in recent years.

A point worthy of mention when seeking to understand the continued high number of police officer victims, particularly while on duty, is the indiscriminate use of firearms by both criminals and police officers. When armed criminals resort to violence, the use of repressive actions by police is heightened, raising the risks of both lethal and non-lethal injuries to police and citizens. It appears that the traditional ‘energetic response’ of the police to the so-called ‘armed actions’ and ‘unjust aggressions’ of criminals, (whether they be organized or not), have contributed to changes in the context of both police and civilian victimization. According to research carried out by ISER for the year 2001 (graph 3), firearms appear to be the main instrument of victimization in the majority of attempted and successful criminal homicides registered in Rio de Janeiro.

Graph 3. Victims of firearms in Rio de Janeiro related to age and sex (death registry of PAF, Municipality of Rio de Janeiro, 2001), among a population of 100,000. Source Data Sus Pesquisa do ISER/RJ.
The rates of fatalities due to ‘firearm projectiles’ (per 100,000 inhabitants), leave no doubt about the lethal effects of widespread use of firearms in conflicts between citizens, and between citizens and the police. It is plausible that this situation could be motivating a rise in the levels of resistance among criminals as well as increasing the degree of force used by the police, which would potentially contribute to increasing the overall risks of death and injury.

The rising number of arms confiscated by police officers in both the city and the state of Rio de Janeiro, indirectly indicates a rise and aggravation of the risks of victimization, due to the ease of access to firearms and their consequent use to resolve conflicts (be they criminal or not). According to Graph 4, in 1991 the Military Police confiscated one firearm for every 3,242 inhabitants. In the year 2003 a total of 15,616 illegal arms were confiscated, making a rate of 1 firearm for every 976 inhabitants.

Another question associated with the use of firearms, which can also encourage their indiscriminate use by police, is an informal practice where police use a ‘second arm’. This occurs because of a belief that such availability ‘increases the safety of the police officer’ guaranteeing him ‘armed superiority’ when faced with ‘crime’s armed power’. Partly because of this belief, the use of a personally owned firearm by front-line police officers, has become an informal but logical action not only on duty but also when they are working informally, carrying out ‘part-time work’ as private security guards and watchmen. A third idea can be added. Consistent and clear administrative policy on the legitimacy of the use of force, including lethal force, is weak or totally lacking. The low degree of institutionalization and the weakness of the regulations and procedures which regulate, for example, the use of firearms by police officers, has weakened the capacity of the organization to control use, thereby opening up loopholes for the excessive and intentional use of firearms, as well as for their exaggerated and accidental use in incidents involving the police (Klockars 1985), (Bittner 1990), (Muniz, Proença Júnior & Diniz, 1999) and (Muniz & Proença Júnior, 2003). The establishment of policy about the use of force by the police could contribute to reduced use of firearms, (for whatever motive), by police officers. Such policy would be subordinated to democratic and constitutional controls, and would establish regulations, procedures and methods of action that are both controllable and possible to administer. In other words, such a policy could reduce the chances of victimization of both police and civilians in ‘incidents’ and ‘accidents’, both on and off duty.

The most frequent opportunities for the use of excessive force by police officers, especially the use of firearms, occur during events categorized as ‘armed conflicts’ by the MPSRJ. This
category appears to include all situations where the police, whether their actions constitute a reaction or not, identify some level of ‘armed resistance’ or ‘armed action’ by their opponents. The breadth of this category permits a wide variety of incidents to be included, including events initiated by the police themselves; events that began when someone was classified as ‘suspect’ by the police and those when a person is committing an infraction. Clashes between police and citizens are categorized as ‘armed conflict’ - this is the defining element when each party uses firearms, including in situations when a police officer perceives that their opponents might use firearms. This categorization can be used for quite distinct events, different in nature and seriousness, be they provoked or ‘provocative’. Such events result in victims and may occur in the course of official work, off duty or during informal work. It is clear that the categorization of ‘armed conflict’ results in ambiguities and imprecision which makes it difficult to perform a precise analysis using disaggregated data to analyze events and circumstances surrounding such incidents. It is worthwhile to emphasize the widely differing nature of events that are categorized as armed conflict: shoot outs, gang wars, conventional and special police operations, police occupations, armed actions by individuals, offenses that are being committed, conventional patrolling, replies to emergencies, mass events, civil protests, violent crimes, etc. are all categorized the same way.

According to the statistics produced by the MPSRJ, it is principally the category of ‘armed conflict’ that has played a large role in the victimization of military police officers both on and off duty. As we can see in Graphs 5 to 8, between 1995 and 1998, the percentage of police who died in ‘armed confrontations’ is equal or more than 50% when compared with fatal victimization due to ‘other situations’. Over this same period, the percentage of police wounded in these situations is never less than 25% of the total number of non-fatal victims, on or off duty.
Analysis of a longer time series, that treated only police officers who were victims of ‘armed conflict’, more clearly shows the relevance of this category in relation to victimization.

Between 1995 and 2001, the number of MPSRJ police officers who were killed or wounded when carrying out their duties, was at least 40% of the total number of police victims in ‘armed conflicts’ (see Graph 9). 156 officers were killed or wounded in 2001 while on duty. Graph 10 shows that in this same year, (the last for which we have information), the percentage of officers victimized while on duty was 37% of the total officers killed or wounded.

Further exploration of the effects of ‘armed conflict’ led us to investigate what type of activity officers were engaged in when they were killed or injured. Graph 11 shows that over the 1995-2001 period, the rates of victimization due to ‘armed conflicts’ stayed quite high. In the year 2000, the lowest rate for officers on duty was equivalent to 40 officers victimized for every 10,000 officers. The lowest rate for officers off duty occurred in 2001, when 57 police officers in 10,000 were victims. Even though this is a high level, in the 2000 –2001 period, victimization due to armed conflicts improved.
It is possible to imagine that over the last few years in Rio de Janeiro, the expansion of both repressive police interventions and the actions of criminal gangs and bands, has provoked and inflated an overuse of the ‘armed conflict’ category for classifying cases of victimization of police and citizens. (The actions referred to above include false police controls, struggles for control of drug trafficking sales points, attacks and settling accounts with police). This categorization may make it easier for police victims and their families to obtain compensation, and to justify excessively ‘vigorous’ policing. Use of this category also permits political justification of the high numbers of civilian deaths due to ‘resisting police action’. The categorization of events changes according to both political and organizational forces, and such changes influence both the content and the criteria used to define a given category. However, we can presume that ‘armed conflict’ infers gunfire, a defining element that appears to be sufficient to indicate the risks of death in such circumstances. Since 1995, police and civilian victimization levels have been very high, including high levels of mortality.

Table 1. Levels of fatalities and injuries in “armed confrontation”, 1995-2001.
Source: PMERJ - PM/1-APOM.

<table>
<thead>
<tr>
<th>Year</th>
<th>Relation injured/dead officers</th>
<th>Relation dead civilians/officers</th>
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<tr>
<td></td>
<td>In service</td>
<td>Off duty</td>
</tr>
<tr>
<td>1995</td>
<td>7 injured/dead</td>
<td>2 injured/dead</td>
</tr>
<tr>
<td>1996</td>
<td>6 injured/dead</td>
<td>2 injured/dead</td>
</tr>
<tr>
<td>1997</td>
<td>8 injured/dead</td>
<td>2 injured/dead</td>
</tr>
<tr>
<td>1998</td>
<td>9 injured/dead</td>
<td>1 injured/dead</td>
</tr>
<tr>
<td>1999</td>
<td>5 injured/dead</td>
<td>2 injured/dead</td>
</tr>
<tr>
<td>2000</td>
<td>8 injured/dead</td>
<td>1 injured/dead</td>
</tr>
<tr>
<td>2001</td>
<td>8 injured/dead</td>
<td>2 injured/dead</td>
</tr>
</tbody>
</table>

Table 1 shows the levels of ‘lethality’ in situations of ‘armed conflict’ over the 1995-2001 period. High levels of lethality are to be found among police when they are both on and off duty. When on duty, for every police officer killed, seven others are wounded in armed
conflict situations. This corresponds to a 15% risk of a victim suffering a fatal injury. The relationship between risks and mortality deteriorates in situations of armed conflict for off duty officers where one police officer dies for every two that are wounded. This means that the risk of a police officer dying as a result of an armed action is unbelievably high at 41%.

In order to better understand the statistics that have been presented up until now it is necessary to situate the category of ‘work accidents’ within the police sphere. We have seen that police officers in Rio de Janeiro, especially front line officers, have a second or informal job beyond their regular workday and shifts. When off duty, they are employed as watchmen and private security guards for individuals, condominiums, companies, etc. In practice, the combination of formal and informal work, both of which include a reasonable degree of risk and stress, can result in accidental or intentional victimization due to the accumulated pressure and fatigue they experience. It is not uncommon for police officers who do a ‘second shift’ to use medicines and drugs to overcome sleepiness and the effects of tiredness. Interviews show that police officers also abuse alcohol and drugs in order to deal with work related fatigue and stress.

A second job is recognized as a part of life in the Rio de Janeiro police force, so it could be said that those work accidents which occur outside of formal police duties when they are ‘off duty’, includes a group of events that result in lethal or non-lethal victimization. It then becomes a problem, given the available information, to distinguish whether lethal and non-lethal victimizations should be seen as ‘work accidents’ even though they occur when officers are off duty.

The information produced by the MPSRJ about “off duty” victimization is of a much lower quality and less consistency than information relating to “on duty” victimization. This occurs partly because second jobs are legally prohibited, constituting a transgression of the regulations governing police work. However, there is a policy of tolerance by the MPSRJ about second jobs and punishments are rare. A “blind eye’ is turned with the aim of ‘not harming police officers’, but this also results in a blind eye being turned to the work accidents associated with second jobs. This is an informal reality which is well known and, because it is clandestine, not monitored by the MPSRJ. In spite of the difficulties in conducting detailed analysis of ‘work accidents’ involving off duty police officers, we can speculate with reasonable certainty, that the high level of mortality found among these victims, especially in those cases related to ‘armed conflict’, reflects risks inherent in the second job.

During informal, private security work, the police act ‘on their own behalf’, which means they do not use protective instruments for personal safety or operate according to norms and procedures that could help prevent and reduce opportunities for work accidents. The clandestine nature of these activities significantly reduces the possibility of such resources being employed. Most of the time police officers’providing security’ use their informal network of knowledge and their own work instruments, including weapons and ammunition. Even though they count on the support of ‘on duty’ colleagues in an emergency, they frequently work alone and in isolation, thereby increasing the risks of victimization.

These precarious working conditions become even worse in high risk situations such as robberies, kidnapping, invasions of property, etc. In these types of situations, police officers feel compelled to ‘react’ alone, even if it means going against their police training. What appears to happen in such cases, is that they adhere to the ‘police street culture’ which
functions in such a way that police officers are led to perceive crimes and criminals as a ‘personal question’. The mere existence of criminals is a ‘provocation’ to the ‘masculine morale’ of the police officer and cannot be left unanswered (Muniz, 1999).

The inclination to act and react alone in any situation and at any price, to not ‘flee from the crime’, helps us understand not only the frequency of ‘armed conflicts’ entered into by off duty officers but also the high levels of mortality associated with them. The descriptions of incidents involving off duty police victimization include, for example: robbery on a bus or vehicle in which an off duty policeman happens to be traveling - while the policeman is simply an observer (or victim), he reacts in spite of being conscious that such action is untimely, inadequate and even dangerous.

The data about situations of ‘armed conflict’, which turn police officers and civilians into victims, permits one to see an important element underlying the indiscriminate use of firearms and the somewhat heterodox police practices involving conflict. I am referring to the arbitrary and excessive use of force, which, beyond leading to violent reactions against police officers, produces victims among citizens. High levels of police victimization are accompanied by extremely high levels of victimization of civilians caused by the police. In the 1995-1998 period, a simple average shows that for every on duty police officer who died in ‘armed conflicts’, 28 civilians died. The violent and lethal nature of ‘armed conflicts’ has continued in more recent years. According to the statistics published by the Institute of Public Safety of the state of Rio de Janeiro, the high level of mortality of on duty police officers has changed very little: one police officer died for every 27 civilians in 2002 and one for every 28 in 2003 (http://www.novapolicia.rj.gov.br/).

Given these indicators of victimization of both police officers and civilians, mostly in ‘armed conflict’ situations, it can be said that the disproportional use of force, especially of lethal force, by the police has contributed dramatically to raising the levels of risk, principally the risks of fatal attacks for both parties. The continuous and uncritical adoption of ‘maximum force’ by the police, including during anticipation of situations, is supposedly aimed at thwarting possible armed actions by criminals or suspects. However, this type of action appears to favor a perverse remedy whereby ‘(state) violence is produced in order to combat violence.’ The continual history of ‘overly vigorous response’ by the police, appears to lead to a dangerous situation where ‘lethal force’ becomes banal and commonplace, simulating increasingly violent action and reaction by those who commit or intend to commit crimes. This appears to create a spiral of violence which is amplified without limits, producing the levels of mortality resulting from interactions between police and citizens, independent of whether the latter are criminals or not.

When the rates of fatal police victims in Brazil are compared with those of their USA counterparts, the seriousness of the rates in Rio de Janeiro become clear. Using available data drawn from the “Statistical Abstract of United States - 2003” by the U.S. Census Bureau and the FBI’s report “Law Enforcement Officers Killed and Assaulted - 2003”, it was possible to construct a time series of the rates of fatal victimization of police officers in the 1994-2003 period. These rates incorporate all the known cases in the USA in which police officers were killed on duty, including the federal police. The death rates for on duty policemen remain stable over the period in question, varying between 2 and 3 police officers killed for every 10,000 officers.
It is important to note that there is a discrepancy in the pattern of fatalities in the USA for the year 2001. The altogether exceptional rate observed in this year, 5 per 10,000 police officers, is due to the terrorist attack of September 11th, which resulted in the death of 72 members of the New York Police Force. We recognize the limits of establishing a narrow comparison between quite different territorial units, on one hand a whole country and on the other a particular state in a different country. What catches our attention in Graph 12 is that the rates found in Rio de Janeiro are far higher than those in the USA, being 4 times greater as in 2003 when the rate of mortality among on-duty police officers in Rio de Janeiro was 11 deaths per 10,000 officers. Taking the annual rates between 1994 and 2003, the annual average is 8 deaths in Rio de Janeiro for every 10,000 police officers.

According to statistics relating to the years 1995-1997, 94% of the victims were front line officers; the front line is made up of the lower ranks in the military police hierarchy in Brazil. Upon disaggregating the total percentage of officers wounded and killed during this period, 44% are soldiers, 38% corporals and 12% sergeants. (see Graph 13)
When we compare the distribution of police officers victimized over the same period, with the proportions each rank represents in the police force, we find that soldiers and corporals are over-represented among the victimized officers. They count for 29% and 33% of the police force and each rank has a proportionately higher rate of victimization, 44% and 38%, respectively.

Given that the majority of the members of the MPSRJ is made up of front line officers who patrol, it can be inferred that soldiers and corporals tend to be over-represented among those who are killed or wounded, whether they are on or off duty. This is the case in spite of possible variations in rates of victimization in more recent years which still needs to be researched.

The organization, procedures and rules of work, establish the limits and orient the activities of police officers, and form their institutional environment and working conditions. The constraints imposed on their work increase or decrease their OSH risks.

We have seen that over the last decades, police officers have lived with a high level of victimization, resulting in deaths and injuries affecting almost 3% of their members every year. When we exclude fatalities, other cases of injury are sent to the MPSRJ’s specialized health service, and this service produces very revealing statistics. Beyond pointing out the most common occupational illnesses, records are kept about medical leave ‘for health treatment’ and ‘certificates of partial physical incapacity’ that result in ‘temporary absence’ due to work accidents that have occurred while on or off duty.

In 1997, a year in which 242 police officers in each 10,000 were injured or killed, 50% of the leave taken for health treatment, and 43% of the certificates for ‘partial physical incapacity’, were given by the trauma clinic responsible for violent injuries resulting from external causes. These percentages are probably showing the impact of non-lethal attacks, on demands for ‘temporary leave’. According to the evidence in Graph 14, (excluding trauma), the medical specialties that are used most often for authorizing sick leave and certificates of partial physical incapacity were psychiatric, neurosurgery and general surgery (in 1997).

Graph 14. Leave for treatment (LTS) and certificates of partial physical incapacity (IFP) given by type of medical specialist by the MPSRJ, 1997. Specialties: cardiology, cardiovascular surgery, general surgery, neurosurgery, psychiatric, trauma and other specialities. Source: MPSRJ – APOM.

In the years 2000-2001, according to Graph 15, we found that cases of ‘temporary leave’ relating to the health of police officers, was responsible for 12% of all cases, 10% of which were related to ‘leave for health treatment’, 1% ‘leave for the treatment of partial physical incapacity’ and 1% ‘committed to hospital’ respectively. These cases of sick leave mix victimization and other causes so it is difficult to conduct a more detailed comparative
analysis given our limited access to the statistics. However, only two types of leave are more important than sick leave: leave to participate in courses or training (68%) and leave to work in other institutions (13%).

There are common complaints from police officers, especially front line staff, with respect to their working conditions, one of a number of difficulties they meet in the course of their duties. When they refer to poor working conditions, they are referring to the means and processes involved in their work, which increase the risks of victimization and of ‘contracting (certain) diseases’. A number of factors are frequently given as indicators of poor organization and management of police work which lack adequate vision and investment. These factors include contact with unhealthy environments both within and outside police buildings, tiring shift work, the lack of performance of police officers, tension and stress that result from both their duties and from political pressure to produce better, measurable and visible results (such as arrests or seizures).

With this particular context in mind, front line officers raise questions about their safety on the job and mention ‘health problems’ which they believe they are more exposed to than others. Their interviews mainly refer to a number of illnesses identified with ‘the heart’ and ‘originating in the central nervous system’. Cases of hypertension (high blood pressure), anxiety, paranoia, neurosis, loss of emotional control, gastritis, ulcers, mycoses, cramps, pain in the spine and muscles are frequently mentioned and largely correspond to the illnesses most commonly registered.

The most common illnesses among the military police of the Rio de Janeriro State in 2000-2001 were circulatory illnesses 24%, orthomolecular 20%, skin diseases 11%, mental disturbances 8%, digestive illnesses 8%, the nervous system 7%. Other illnesses totaled 14%, and 8% of the illnesses were badly defined.

Few military police organizations in Brazil have programs designed to reduce stress or for treating psychological problems. Even where these exist, (e.g. in the MPSRJ), many of the staff are reluctant to seek psychological help. The fear of stigmatization leads many police officers with mental or emotional problems to refuse specialist help. There is a fear that undergoing psychiatric or psychological treatment may result not only in discrimination by peers but also act as a strong argument for the temporary confiscation of the officer’s firearm, i.e. a temporary suspension from front line activities. Because of this, it is believed that numerous cases of ‘mental disturbances’ are not registered but sent to social workers who try to persuade the officers to conquer fear and seek specialist help, in the same way as cases of alcoholism or drug addiction are treated.
Having considered the available statistics about police victimization we can now formulate some interpretive hypotheses. Unfortunately the limited nature of the data brought together for this article does not permit statistical tests to be applied but we can speculate about some important issues:

- It is possible that the organizational structures and management models adopted by the police may favor high rates of police victimization. The current structures and models are inadequate for government administration, for the political regime, and for the present system of social control given the characteristics of the police role and functions in a complex society.

- Instruments of internal and external control of police forces. One ramification of the previous question is the inference that, in those police organizations which operate with weak or even non-existent legislation, regulations, procedures and tools of control, (both internal and external), there is a greater chance of producing incidents and work accidents which result in both civilian and police victims.

- Responsibility and accountability are also issues related to earlier questions. The weakness or absence of mechanisms to attribute political, administrative and operational responsibility, contribute to the creation of environments where the risks of victimization for both police and civilians can easily grow. The same can be said about the absence or weakness of instruments whereby the police account for their actions.

- The low degree of visibility of police work and decision making processes appears to favor the routine resort to arbitrary and violent policing practices, (both formal and informal), which pose risks for both police and civilians. Decision making processes inevitably involve a degree of discretion, particularly when they are disassociated from professional planning and management systems.

- Questions are raised about the legal and legitimate administration of the use of force. The weakness or nonexistence of policy as to what constitutes the appropriate use of force in a democratic state can stimulate the abuse of power by police. This abuse results in excessive, violent and arbitrary actions becoming established routines and, in turn, increases the risks of victimization for both police and citizens. Policy should be transformed into regulations, methods and practices which are seen as valid and consensual.

- Police organizations suffer low public confidence and credibility and consequently receive little acceptance and cooperation from citizens. As a result police tend to use higher levels of force in any actions they engage in, levels that would not be needed if they enjoyed greater public support. This vicious circle tends to favor violent police practices that feed high levels of police and civilian victimization.

- High levels of police corruption are disseminated throughout the command hierarchy. The public perception of the scale of corruption appears to increase both the risks and uncertainties involved in police actions, especially those of a repressive nature. Police corruption, be it major or minor, harms the police’s credibility in the eyes of the public, and credibility is a prerequisite for effective action. Large or small scale corruption relating to the internal working of the police force sabotages planning and interventions
that require secrecy. Both these matters appear to motivate victimization of police and civilians, either through the action of the police themselves, (e.g. ‘friendly fire’, ‘executions’, ‘elimination of witnesses’) or, by citizens who are seen as suspects or criminals.

- **Poor quality of training and education of police officers** can lead to standards of action that are inconsistent and inadequate, leading to intentional and non-intentional victimizations of police and citizens.

- Police organizations have been *politicized*, i.e. police resources have been used to attain ideological or electoral objectives and to influence particular ‘clients’. This process appears to increase uncertainties in decision making processes and the inconsistencies in the use of police resources has implications for standards which lead to increased risks in police actions.

This article concludes with some brief comments about official data on ‘work accidents’ in Brazil. Other articles in this journal have commented on the fact that the Ministry of Social Welfare provides an important data base relating to work accidents, that permits comparisons to be made over the whole country, over time and between sectors and professions. It is possible to build up comprehensive tables using the InfoLogo resource available on the internet (www.dataprev.gov.br/servicos/). Data on activities surrounding ‘Public security and order’ can be found under the classification of one of the 60 major groups referred to as ‘public administration, defence and social welfare’. I used the available data in the Ministry of Social Security’s statistics (Dataprev), separating the principal groups over the 1997-2003 period, which corresponds to 53% of the registered accidents.

The annual statistics (DATAPREV - INSS-CAT, 2003) shows that 2,710,874 ‘work accidents’ were registered in the country in 1997-2003. Of these only 48,321 (2%), were registered in the area of ‘public administration, defence and social welfare’, a group that includes nine activities other than policing. This indicates a very high level of under-registration of police data which negatively affects comparative analyses.

When attempting to distinguish registered work accidents in the area of ‘Public Security and Order’ within the wider group of ‘public administration, defence and social welfare’, we find that these correspond for only on average 3% of the total number of accidents in this group. Although, as we can see in Graph 16, there has been modest improvement in registration over time, it is still very low, particularly when we consider that in the smaller time period under examination (1997-2001), 1,783 police officers were victimized in Rio de Janeiro alone.

It appears perfectly reasonable to suppose that the production of information on work accidents in Brazil has a set of distinct bottlenecks which contribute to loss and under-registration of cases, (as apparently occurs with other sources of data). This is generally a consequence of the low degree of standardization of data collection instruments, the existence of distinct criteria for the selection and registration of cases, different flows in the production of information, different technical capabilities in the statistical agencies, unequal territorial coverage according to state and municipality, etc. The existence of a national endeavour (however limited), to harmonize data is fundamental to improve the quality, integrity, reliability, coverage and access to the data produced. This will certainly permit the development of more adequate research and diagnoses and lead to the formulation of better public policies.
Graph 16. Registered work accidents within ‘Public Security and Order’, 1997-2003. At bottom, the percentage of these accidents of the total number of accidents within ‘Public administration, defence and social welfare’ is noted. Source: DATAPREV/INSS - Anuário Estatístico de Acidentes de Trabalho, 2003.
Introduction

In Brazil the participation of the service sector has been important with respect to accidents occurring during travel to and from work and occupational illnesses. Activities related to transport and communication, (particularly transport), show an increasing participation within the service sector, following health and social services, retail sales and services principally carried out for companies. In 1999, 62% of the accidents during transport to and from work occurred in the service sector, in 2000 this figure was 60%. In relation to occupational illnesses the service sector was responsible for 49% and 50%, respectively. (For more information or comparisons, see Salim, 2001). However, the classification of company services is not only the most important category for work accidents in the service sector. This category also includes a number of activities related to urban transport, mainly in the big cities, where drivers and other relevant workers are subcontracted.

Drivers are generally subject to a high number of adverse and stressful phenomena which expose them to increased risks of work accidents, e.g. drivers work on roads, and are exposed to violence and urban problems. These are intrinsic risks which have cumulative effects. Of all the occupational groups in Brazil, drivers are the group most highly exposed to traffic accidents, one of the principal causes of workplace accidents in the country.

Professional drivers perform a highly stressful task. Several factors affect the health and safety of these workers, such as the length of the working day, low salaries, noise levels both inside and outside their vehicles, high temperatures, heavy traffic, traffic jams, the need to deal with the public and customers, and urban violence. Such factors increase the risk of traffic accidents and occupational illnesses. In addition to the fact that drivers belong to the occupational group which suffers the most fatal work accidents, Waldvogel (2002) found that between 1997 and 1999, they suffered 20% of all work related deaths occurring in the state of São Paulo (see also Waldvogel 1993).

Faced with the lack of wide-ranging population based research on OHS conditions at work, studies which seek to analyze and identify work accidents occurring in different occupational groups, (or to workers in general), are normally based on administrative records or on case studies. Bearing in mind that the rate of work accidents registered by the Brazilian National Institute for Social Security (INSS) was 2 accidents per 100 workers in the 1997 - 1998 period, we can deduce that the difficulties and costs involved in carrying out adequate sample survey research in people’s homes, eliminates this method as a means to quantify and characterize such accidents. Administrative records serve as the principal source of data as they are based on the documents used to legally register work accidents. (This type of registration has been compulsory since 1991). In this case the administrative records used are called ‘Work Accident Communication Form’ (CAT). CATs are managed by the INSS, attached to the Ministry of Social Welfare and Assistance (MSW). There are also other ‘systems’ at a Federal government level which also register work accidents. For example, within the Ministry of Labor and Employment (MLE), there is the Annual Report of Social Information (RAIS), the Ministry of Health (MH) has the System of Information from Hospitals (SIH) and the System of Information concerning Mortality (SIM). However, among
these systems and keeping in mind the degree of coverage or under-registration, the most inclusive data base on work accidents is the one which is based on the CAT (see Salim, 2000).

When an accident is categorized as work related, a CAT is completed and then filed with the INSS agency. This starts an administrative process for the victim, in which all the documents describing the details of the accident are brought together. Such administrative processes are designed to establish the causal connection between the accident and work, and to open the way for the payment of any compensation which the worker is entitled to. The victim’s employer usually fills out the CAT but, when this doesn't occur, a union, the health service, the victim or his/her dependents, or a government official can complete and file a CAT with the INSS. The principal objective of the INSS work accident information system is to process compensation payments to the victims or dependents of accidents or occupational illnesses.

Researchers who wish to conduct more detailed analyses about work accidents and illnesses, face a number of several limitations on the information provided by this system: it contains only aggregate data, reporting is based on the formal labor market, and it does not reveal details about the circumstances of accidents, e.g. what parts of the body were affected, a description of the situation which caused the accident or disease, the causal agent, a description of the nature of the injury, or the probable diagnosis. Access to such information is important since it permits a more detailed description of the accident or illness, and may identify necessary safety measures or alternative preventive actions. Historically, one disadvantage in using the work accident data published in the Social Welfare Statistical Yearbook was that the year in which the accident was registered was that in which the administrative process is finalized and not the year in which the accident occurred. The municipality where the accident was registered was considered to be that where it was reported and not that where it occurred. Recently, these problems were reduced with the publication, beginning in 2000, of the Annual Statistical Yearbook of Work Accidents, involving a partnership between the Ministries of Labor and Employment and Social Welfare.

This chapter gives a deeper analysis of work accidents in the transport sector employing databases developed during two research projects carried out by Fundacentro, (in partnership with the Seade Foundation, the statistics bureau of the state of São Paulo), and in cooperation with the National Road Transportation Department of the Ministry of Justice (MJ), and the Ministry of Labor and Employment (MLE).

These projects covered all work accidents for transport sector workers, registered with the INSS in the São Paulo and Belo Horizonte metropolitan regions at the end of the 1990s. Data relating to both drivers and fare collectors was collected. The research required that the registers for each work accident involving a transport worker had to be found among all of the accidents registered in every agency and office of the INSS in the two regions. The research was based on a thorough examination of the detailed information contained in each CAT and accompanying documents, (e.g. official police reports). The detailed description of the work accident was classified into one of three categories: workplace accidents; those occurring during transport to and from work; illnesses. This task was done manually through tracking down each individual case on the basis of an examination of all work accident records.

Certain demographic, socioeconomic and epidemiological variables were selected, making it possible to measure diverse relevant characteristics of the accidents that occurred. The selected variables included marital status, consequences of accident or illness, (e.g. temporary disability, death or permanent disability), period off work, classification of the accident, age
Drivers involved in work accidents

In all of the INSS agencies visited, 9,379 cases (6,537 in the SPMR and 2,842 cases in the BHMR), involving professionals in the transport sector were found. They were classified as drivers, rail vehicle drivers and fare collectors.

A first observation is that an overwhelming number of victims (99%), in both regions were males, (this particular occupational category is overwhelmingly male dominated). Over 60% of observed cases were married and it should be noted that the high level of married victims has negative effects on family life, destabilizing many families which lose the father and husband or, who end up having to live with a family member who is ill or invalid (Waldvogel, 2002).

For the age distribution, a younger group of victims was found in the BHMR than in the SPMR. In the BHMR victims were concentrated between 20 and 49 years in 91% of cases, while this same age group had 85% of the accidents in the SPMR. In the BHMR the median age of victims was located in the interval composed by people five years younger than in the SPMR: 30 - 34 years and 35 - 39 years respectively.

Work accidents

Work accidents are classified by accident legislation into three categories. Under the definition used by the Ministry of Social Welfare (MSW) ‘workplace accidents’ are defined as being the result of the workers’ activities whilst exercising their occupation. ‘Transport accidents’ are defined as occurring whilst traveling between one’s residence and the workplace and during meal breaks. ‘Work illnesses’ are defined as any type of illness specifically associated with a determined type of work activity.

For those working in the transport sector, workplace accidents predominate. They are called ‘typical accidents’ in Brazil and occur in the course of normal working activity, mostly on public roads, and constitute 72% of all accidents in the SPMR and 86% in BHMR. Work illness is more prevalent in the SPMR (8%), than in the BHMR (4%). Transport accidents affect all professional groups, regardless of their activity, but a greater proportion was registered in the SPMR. Table 1 presents this distribution.
Table 1. Work accidents to those employed in the transport sector by type of accident in São Paulo and Belo Horizonte Metropolitan Regions. Source: Seade Foundation; INSS; Fundacentro/MLE; Denatran/MJ

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<tbody>
<tr>
<td></td>
<td>No. cases</td>
<td>%</td>
</tr>
<tr>
<td>Workplace accident</td>
<td>4,734</td>
<td>72</td>
</tr>
<tr>
<td>Transport</td>
<td>1,010</td>
<td>15</td>
</tr>
<tr>
<td>Work-related illness</td>
<td>488</td>
<td>8</td>
</tr>
<tr>
<td>Unknown</td>
<td>305</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,537</strong></td>
<td><strong>100</strong></td>
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At least three important differences in the age structure of victims are found when the accident classifications are considered. Firstly, among older workers in relation to work-related illnesses compared with workplace and transport accidents. Secondly, illnesses are concentrated in different age groups when the two regions are compared with workers in Belo Horizonte in a cohort five years younger than in São Paulo. Finally, the distribution of workplace accidents differs between regions. In São Paulo these are concentrated in the 25 to 39 year age range, whereas in Belo Horizonte an important peak occurs in the 25 to 29 year age range. In the group aged over 50 years, São Paulo workers suffer a much greater proportion of accidents than their counterparts in Belo Horizonte, 11% and 7% respectively.

When we analyze the consequences of work accidents in the two regions, we find that 96% of the cases resulted in temporary disability and a small proportion in permanent disability. However, when we consider the most serious consequence on a worker's health, i.e. loss of life, a greater impact was found among victims in SPMR (4%), than in BHMR (3%). Table 2 presents this data.

Table 2. Work accidents occurring to transport workers, by consequences, in São Paulo and Belo Horizonte Metropolitan Regions. Source: Seade Foundation; INSS; Fundacentro/MLE; Denatran/MJ.

<table>
<thead>
<tr>
<th>Consequences</th>
<th>SPMR 1997/1999</th>
<th>%</th>
<th>BHMR 1998/2000</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>No. of cases</td>
<td></td>
<td>No. of cases</td>
<td></td>
</tr>
<tr>
<td>Temporary disability</td>
<td>6,253</td>
<td>96</td>
<td>2,738</td>
<td>96</td>
</tr>
<tr>
<td>Death</td>
<td>263</td>
<td>4</td>
<td>85</td>
<td>3</td>
</tr>
<tr>
<td>Permanent disability</td>
<td>21</td>
<td>0.3</td>
<td>19</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,537</strong></td>
<td>100</td>
<td><strong>2,842</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

It was also possible to see important differences between the two metropolitan regions with regards the length of time off work due to an accident (see Graph 1). In BHMR, the period off work was less than 15 days, whereas in SPMR it was between 15 days and 1 month.
Graph 1. Work accidents of drivers and fare collectors, according to the length of time lost from work. Percentages of all accidents. Sources: Seade Foundation; INSS; Fundacentro/MTE; Denatran/MJ.

Filled columns: São Paulo Metropolitan Region; empty columns: Belo Horizonte Metropolitan Region. A = Without lost time. B = Less than 15 days lost time. C = 15 days-two months. D = two months. E = three months. F = four months. G = 5 months. H = six months. I = 7-12 months, and J = two years lost time.

Table 3 presents accidents classified by the category of vehicle being used by the victim. Most accidents involved the use of four wheeled land vehicles, followed by two wheeled vehicles. However, four wheeled vehicle accidents are relatively more common in the SPMR, and two wheeled accidents in the BHMR.

Table 3. Work accidents occurring to transport workers according to the type of vehicle used, in São Paulo and Belo Horizonte Metropolitan Regions. Source: Seade Foundation; INSS; Fundacentro/MLE; Denatran/MJ.

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<tbody>
<tr>
<td></td>
<td>No. of cases</td>
<td>%</td>
</tr>
<tr>
<td>4 wheeled land vehicle</td>
<td>5,280</td>
<td>81</td>
</tr>
<tr>
<td>2 wheeled vehicle</td>
<td>1,161</td>
<td>18</td>
</tr>
<tr>
<td>Vehicle on tracks (metro &amp; train)</td>
<td>91</td>
<td>1</td>
</tr>
<tr>
<td>Air transport</td>
<td>4</td>
<td>0.1</td>
</tr>
<tr>
<td>Water transport</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Unidentified</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,537</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
It should be noted that the research in the two metropolitan regions was carried out in slightly different periods, (SPMR, 1997 to 1999, BHMR, 1998 to 2000). The riding of motorcycles for work is a recent phenomena and there is reason to believe that some of the regional difference observed could be the result of the differences in the two periods researched. However, this belief should not minimize the relative importance of motorcycle accidents in the BHMR.

Truck drivers are the most affected occupational group in the two regions, but their relative participation is more important in the SPMR. Professional motorcycle riders in the BHMR and bus drivers in the SPMR are in second place. Even if the earlier hypothesis with respect to the reason for the greater presence of motorcycle riders in the RMBH accidents, the data suggests the need for further focused studies. These figures might be an underestimate, due to the fact that workers who are part of the informal labor market are not counted.

Some drivers were unable to be classified into a specific disaggregated occupational category, since the records were imprecise. We tried to reduce the numbers classified as ‘unspecified drivers’ by checking their occupation against the National Code of Economic Activity (CNAE) and while this permitted some workers to be classified, a significant number remained ‘unspecified’.

Table 4 presents the distribution of work accidents by occupational category.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases</td>
<td>%</td>
<td>No. of cases</td>
</tr>
<tr>
<td>Truck drivers &amp; akin</td>
<td>2,427</td>
<td>37</td>
</tr>
<tr>
<td>Bus drivers</td>
<td>1,177</td>
<td>18</td>
</tr>
<tr>
<td>Motorcycle riders</td>
<td>1,161</td>
<td>18</td>
</tr>
<tr>
<td>Fare collectors on buses</td>
<td>549</td>
<td>8</td>
</tr>
<tr>
<td>Unspecified drivers</td>
<td>453</td>
<td>7</td>
</tr>
<tr>
<td>Drivers of armoured cars/delivery vans</td>
<td>267</td>
<td>4</td>
</tr>
<tr>
<td>Drivers of private and passenger cars</td>
<td>220</td>
<td>3</td>
</tr>
<tr>
<td>Drivers of rail passenger transport</td>
<td>90</td>
<td>1</td>
</tr>
<tr>
<td>Production &amp; test drivers</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>193</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>6,537</td>
<td>100</td>
</tr>
</tbody>
</table>
Characteristics of workplace accidents

The frequency of workplace accidents, (defined as those occurring when a worker is in the service of their company), are distributed quite differently according to the time of occurrence in the two regions which indicates that the periods of greater risk are a consequence of work routines and/or traffic flows and that these differ systematically throughout the day.

Graph 2 shows two peaks of higher frequency in the SPMR: between 9 am and 11 am and between 3pm and 4pm. In the BHMR, there is an important peak at 5 am. Three other periods also show high percentages: 6 am; between 4 pm and 6 pm and between 10 pm and 11 pm.

The number of hours worked prior to an accident is another variable that was analyzed. Graph 3 shows, once again, that a greater number of work accidents occur the first two hours of work, and that these decrease after eight hours. This pattern is more readily observable in São Paulo, whereas in Belo Horizonte, the greater peak occurs in the early working hours followed by the eighth hour.
When we evaluate the causal agents associated with workplace accidents, a similar distribution can be observed in the two metropolitan regions, (see Graph 4). The means of locomotion, (the vehicles used for work), are associated with 42% of workplace accidents in the SPMR and with 53% in the BHMR. The second major causes are falls and objects hitting workers as they drive. In fourth position, assault and battery is associated with 5% of the workplace accidents in the SPMR and 4% of cases in the BHMR.

The nature of the job performed by transport sector workers means they are exposed to intense traffic in the big cities that increases their exposure to the risks of accidents as they go about their work, as demonstrated by the large percentage of accidents in which the means of locomotion is defined as the main cause. On the other hand, since they work in public spaces, and many of them transport valuable merchandise or cash, they are also subject to assaults and theft, which in extreme cases can lead to death.

These factors contribute to the high position of transport sector workers among the occupational groups subject to high accident risks.
Characteristics of work-related illness among transport workers

Work-related illnesses are less likely to be registered than accidents and it is not always possible to establish a causal connection between work and the appearance of an illness. Unfortunately, this situation is a general one that goes beyond the confines of this sector and constitutes an important challenge for researchers into work accidents and illness in Brazil. In spite of these difficulties, 488 cases of work-related illness were registered among transport sector workers in the SPMR and 108 in the BHMR.

As mentioned earlier, work-related illnesses affect older workers more than their younger counterparts. The biggest concentration in SPMR occurs in the 40 to 44 age group, while in the BHMR the peak appears between 45 and 49 years of age. It is worth noting that these age groups report 21% of work-related illnesses in each region.

The two major types of work-related illness that affect this group are hearing and/or deafness problems and repetitive strain and posture related injuries (see Graph 5). In SPMR, the rates of these two types of illness are similar, but in the BHMR 75% of the work-related illnesses registered are due to hearing problems and/or deafness. Such differences justify more focused research and different preventive strategies in each region.
Characteristics of transport accidents

Transport accidents affect the whole working population, regardless of their occupation. When any worker goes to and from their residence to work, or travels during meal times, occupational status has no relevance. Any worker runs the same risks of suffering a transport accident as the rest of the population, whether they are working or not.

Table 5 shows that evaluation of the characteristics of transport accidents reveals that the pattern is similar in both regions. The greatest frequency is found when workers go from their residence to the workplace, followed by accidents during their return home. At mealtimes there are few accidents, probably because workers stay close to the workplace or only travel small distances to eat, and therefore reduce their exposure to risks, both temporally and spatially.

Table 5. Transport accidents occurring to transport sector workers according to circumstances, in São Paulo and Belo Horizonte Metropolitan Regions. Source: Seade Foundation; INSS; FundacentroMLE; Denatran/MJ.
When we analyze the causal agents we see that the means of transport plays a very important role, causing more than 50% of accidents in each region. The next most important causal agents are falls and assaults. Assault accidents indicate that the increasing rates of violence in the major metropolitan regions produce victims among workers who not directly involved but simply traveling to and from work. In Table 6, transport accidents in the sector are distributed according to causal agent.

<table>
<thead>
<tr>
<th>Cause</th>
<th>SPMR 1997/1999</th>
<th>%</th>
<th>BHMR 1998/2000</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means of locomotion</td>
<td>526</td>
<td>52</td>
<td>177</td>
<td>59</td>
</tr>
<tr>
<td>Fall/slip</td>
<td>145</td>
<td>15</td>
<td>39</td>
<td>13</td>
</tr>
<tr>
<td>Assault</td>
<td>54</td>
<td>5</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Sprains/strains</td>
<td>44</td>
<td>5</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>Animals, plants, insects</td>
<td>38</td>
<td>4</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Objects</td>
<td>34</td>
<td>3</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Chemical products/gases</td>
<td>13</td>
<td>1</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td>33</td>
<td>3</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Unspecified</td>
<td>123</td>
<td>12</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1,010</td>
<td>100</td>
<td>299</td>
<td>100</td>
</tr>
</tbody>
</table>

**Final considerations**

Our data gathering process, which used INSS accident and work-related illness records and associated documentation, made it possible to structure and organize a database about registered occurrences involving transport sector workers.

This research may be considered innovative and pioneering because of its extent and geographical diversity. The focus on the São Paulo and Belo Horizonte Metropolitan Regions permits regional comparisons to be made. The time period covered (3 years) when data was gathered, reduces the influence of random factors on the indicators. The fact that the study examined cases for a specific occupational category, (transport workers), is another innovative feature. The information collected was not available in the INSS’s computerized files, so the information was much more detailed than that found in most studies. The cross tabulations permitted important general insights to be established relating to the question of accidents, even though the study was focused on a single sector.

The release by the IBGE of the final and complete data from the 2000 Demographic Census, opens up important possibilities for the construction of relevant indicators essential for a thorough and detailed interpretation of accidents that affect transport workers. Initially, a detailed analysis of work accidents, (similar to that described in this chapter), can be seen as essential for development of a more complete explanation and comprehension of the phenomenon. Without doubt, this type of research can be extended to other sectors or branches of activity, which would broaden the knowledge and possibilities for effective interventions.
It is necessary to complement this research with estimates of mortality and morbidity rates, associating registered accidents with data on the size of the exposed working population. Measurement of this population presents a great challenge, because only demographic censuses record population data disaggregated by sectors of activity. If better understanding and effective interventions are to be achieved, it is necessary that the subgroup of the population be defined correctly, to avoid errors which can give a mistaken idea of reality.

While the identification of regional differences in work accidents refer only to a particular occupational group or sector of economic activity, they make an important contribution for the formulation of safety measures and preventive OSH policies. The need for adequate knowledge about all aspects of this phenomenon becomes even more urgent when we consider that drivers are the occupational group with the greatest risk of death due to work accidents, this occurs because they work on public roads and places where the intrinsic problems of any work process are aggravated by urban problems and violence.
This chapter resulted from a demand to investigate the quantity and diversity of the studies and research conducted in Brazil on repetitive strain injuries/work-related musculoskeletal disorders (RSI/WRMSD).\(^8\) The terms RSI and WRMSD refer to the same general set of functional and/or organic problems (a loose group of conditions) that affect the musculoskeletal system, mostly the neck and upper limbs, as a result of work (Maeno, 2003; MS, 2001a).

This research is based on the Lattes database registered with the Brazilian National Council for the Development of Scientific and Technical Research (CNPq), one of the most complete databases in Brazil. We searched for all records that contained the keywords RSI and/or WRMSD. 685 records were found in a search made on June 7\(^{th}\), 2002, but the volume of cases grew rapidly as 768 records were found on August 7\(^{th}\) 2002. The products of scientific research registered in this database include articles in refereed journals, book chapters, masters and doctoral theses, some undergraduate research, specialization courses and written presentations for lectures and seminars. This article analyses records relating to a) doctoral theses; b) masters theses; c) monographs written for specialist courses and d) research reports written for undergraduate degrees.

An analysis of the database confirms that the subject of RSI/WRMSD is being taken up by a variety of academic disciplines in both pure and applied research. It also reveals that research and teaching institutions in the different regions of the country are researching the question.

In order to deal with the complexity of data that resulted from the searches, (i.e. data drawn from multiple disciplines employing different research techniques and methodological approaches), we opted to aggregate the records, classifying them according to a series of wide-ranging themes. We have tried to build a synthesized description of the records without introducing our professional bias or personal interests as ergonomists which could lead to certain areas of study being highlighted in preference to others because we found them easier to comprehend.

The categories formulated for classifying the material discovered are as follows:

- Physio-pathological mechanisms involved in the onset and evolution of RSI/WRMSD
- Studies of clinical cases, which involve diagnostic, therapeutic and preventive investigations
- Therapeutic interventions which employ medicine, physiotherapy, acupuncture, occupational therapy and psychotherapy

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\(^8\) ‘RSI’ – ‘Repetitive Strain Injuries’ is called ‘LER’ meaning ‘Lesões por Esforços Repetitivos’ in Brazil, whereas ‘WRSMD’ stands for ‘work-related musculoskeletal disorders’ and in Brazil is translated as ‘DORT’ which stands for ‘disfunções músculo-esqueléticas relacionadas ao trabalho’.
Epidemiological approaches which seek to identify occupational and individual risk factors involved in the onset and evolution of RSI/WRMSD
Ergonomic approaches which seek to identify the occupational components involved in the onset and evolution of RSI/WRMSD
Psychological and sociological approaches which attempt to explain work-related psycho-social factors
Biomechanical and posture studies
A psycho-social approach to analyze the discrimination of RSI/WRMSD victims at work
Preventive interventions designed to eliminate, minimize and monitor the occupational components involved in the onset and evolution of RSI/WRMSD
Studies on work-related causes of RSI/WRMSD
Studies of the legal aspects of RSI/WRMSD as a work-related illness
Studies of the representations that RSI/WRMSD victims have about their work and RSI/WRMSD
Studies about the types of rehabilitation for victims and their return and adaptation to work
Preventive approaches through health education
Research on the impact of gymnastics as a preventive measure against RSI/WRMSD.

The occupations of victims was analyzed and then related to the sector of the economy in which they worked. (However, not all studies/research mentioned or described the work carried out by victims as often this information was not relevant to the scientific question posed in the studies.)

**Occupational categories in the industrial sector:**
Food processing and abattoirs;
Shoe manufacture;
Construction;
Printing;
Manufacturing;
Metalworking, electrical and electronic goods manufacture;
Chemicals, paper and cardboard manufacture;
Textiles and clothing manufacture;
Glass manufacture.

**Occupational categories in the service sector (both public and private):**
Restaurants (industrial kitchens);
Banking;
Commerce employees (supermarkets);
Hospital and health occupations;
Judicial (the Law Courts);
Teachers and other educational workers;
Data Processing;
Telecommunications.
Occupational categories in the agricultural sector:
Milkers;
Rural workers in the sugarcane industry;
Workers in poultry slaughterhouses.

Other occupational categories – employees, autonomous workers and professionals:
Dentists;
Electricians;
Sportspeople;
Musicians.

These preliminary results allow some observations on the RSI/WRMSD problem in Brazil, which can explain both the number and diversity of studies and research conducted.

RSI/WRMSD has become a field of activity and study primarily because of its etiological and pathological characteristics, because it is closely related to work activity, and because of its numerous human, social, political and economic repercussions. It is also an interesting subject from a strictly scientific viewpoint since practices and scientific paradigms are dynamic and subject to revision (Sato, 2001). Understanding the multiple dimensions and types of actions required to study RSI/WRMSD leads to challenges that are both inter and trans-disciplinary. There are implications for the human, social and biological sciences, in both basic and applied dimensions of research. For example, chronic, recurrent pain is difficult to treat and frequently results in temporary or permanent incapacity that affects not only work but also day-to-day living, however, such pain is the main ‘invisible’ physical sign that a serious pathology is developing (Maeno, 2003). In addition to the pain and physical limitations that affect work and home life, victims may fear that they will lose their jobs. As a consequence of a lack of professional security, victims also suffer from isolation, discrimination and prejudice because their symptoms are ‘invisible’ to others (colleagues, friends, family) and to society (MS, 2001b). Moreover, a great number of workers with RSI/WRMSD have mental health problems such as anxiety, depression and conflicts related to their personal, professional and social identity (Sato, 2003; MS, 2001b).

Work-related musculoskeletal problems have been considered to be an important public health problem in a number of countries, with some major social and economic impacts, due to their increasing prevalence as a cause of occupational illness and because these problems indiscriminately attack workers in all sectors of the economy: agriculture, industry, services and professionals. These problems also affect people in different hierarchical and socioeconomic positions (Maeno, 2003; Salim, 2002; MS, 2001a; Assunção and Rocha, 1993). The above factors have become the subject of attention from state, the scientific community and wider society in Brazil.

Social recognition of the RSI/WRMSD phenomenon in Brazil

In Brazil, scientific recognition of musculoskeletal work-related illnesses initially occurred at the beginning of the 1970s. In 1973, an article was published about “Occupational Tenosynovitis among Washerwomen, Cleaners, and Ironers” (Assunção and Rocha, 1993). The term “RSI” was introduced officially into São Paulo State
regulations in 1992, and was later confirmed in regulations drawn up in other Brazilian states and the 1993 Ministry of Social Welfare’s Technical Regulation on the Evaluation of Incapacity due to RSI (MS, 2001a). The same ministry introduced the term “WRMSD” in 1998 when the Technical Regulation was revised (Maeno, 2003; MS, 2001a).

In the 1980s, in response to social demands, principally coming from one occupational group, i.e. data entry clerks, Brazilian workers and scientists started uncovering the working conditions associated with the development of these ailments. They were accompanying technical and scientific developments being made in other parts of the world at that time (Barreira, 2000; Assunção and Rocha, 1993; Rocha, 1989).

However, the social and political struggle around RSI/WRMSD achieved some meaningful victories at the end of the 1980s together with a wider social movement, including trade unions, organizing around OHS issues. The trade union movement and OHS technicians and professionals forged new partnerships that constituted landmarks in the history of the Brazilian trade union movement’s action in relation to workers’ health. Among their achievements was the inclusion of clauses in collective labor contracts which recognized the necessity for rest breaks (seen as a means of preventing RSI/WRMSD); reduction of the formal working day for data-entry clerks to 6 hours, and the social and formal recognition of tenosynovitis among data-entry clerks through the Ministry of Social Welfare’s Administrative Order (no. 4062, of 6th of August, 1987) (Barreira, 2000; Rocha, 1989).

In the 1990s, the social movement for the recognition and prevention of RSI/WRMSD increased in importance as rates of musculoskeletal disturbances grew among diverse occupational groups. At the same time, there was increased publicity, awareness and understanding of the problem. Together with this social and political process, in 1990 the Brazilian state promoted improved regulatory provisions for the identification, prevention and compensation of RSI/WRMSD with a new Ergonomics Regulation (NR17). This regulation widened coverage of a number of working and organizational conditions associated with the development of RSI/WRMSD and restricted the use of financial incentives designed to increase productivity. New state government regulations in 1992, and the Ministry of Social Welfare’s regulations in 1993, (mentioned above), also resulted in increased recognition and possibilities of compensation for RSI/WRMSD victims.

Besides the social process which resulted in greater visibility and increasing knowledge relating to both the diagnosis and prevention, economic conditions produced changes in workplaces which led to the appearance and development of some musculoskeletal disorders, accompanied by work-related mental and emotional disturbances (Sato, 2003; Wooding and Kuhn, 1997b; Levenstein, Wooding and Rosemberg, 1995; Penney, 1995). Work was organized in new ways, and these new forms of organization were related to the increasing prevalence of both RSI/WRMSD and mental disturbances in contemporary work (Salim, 2002; Barreira, 2000; Mattos, Porto and Freitas, 1997; Lima, Araújo and Lima, 1997).

The introduction of new technologies and management techniques have been related to increased risks (or “invisible risks”, as some authors call them). The most common risks experienced today are due to: the acceleration of work rhythms; increase of managerial control over productivity quotas and rest breaks which reduces down time and increases
productivity; increased workloads associated with the ‘intensification of work’; incentives
designed to encourage working beyond the normal working day in order to compensate
for reduced purchasing power; incentives designed to increase competitiveness between
workers through differentiated remuneration or in order to avoid punishment; the
reduction in the level of control or influence exercised by workers over the content,
rhythm and final product of their work, (often determined and monitored by computerized
systems).

The restructuring process in Brazil intensified and disseminated itself throughout various
productive sectors from the moment that Brazil’s internal market was opened up to
international competition in the 1990s. This was associated with the introduction of
technology and new managerial techniques that demanded greater productivity, an
acceleration of work rhythms, intensification of work and a reduction in labor costs (the
same situation occurred in industrialized countries). The reduction of labor costs
amplified the instability of working conditions within the sectors where it occurred.

These new models of production (neo-Taylorism, neo-Fordism, Toyotism) of industrial
goods and services, whether globalized or implemented in Brazilian style, result in the
modern coexisting with older forms of production. This has been called ‘conservative
modernization” by Leite (1994), or described as a ‘Brazilianized version” of the Japanese
model by Salerno (1990) and “Taylorized-just-in-time” by Humphrey (1990). All these
authors discuss the subject from differing viewpoints, but it is agreed that work
intensification and casualization result in “true epidemics” of RSI/WRMSDs (Mattos,
Porto and Freitas, 1997). Other authors speak of the push for flexibility and the
deregulation of workers’ rights which have weakened representative trade union power
(Antunes, 1997), and of the casualization of work and the weakening of the collective
organization of workers which results in the “worsening of working conditions and the
rise in the degree of informality in the labor market” (Ramalho, 1997).

The evidence therefore indicates that the RSI/WRMSD question in Brazil, in common
with the rest of the world, will continue to promote impasses both for science and for the
organization of production practices in contemporary Brazilian workplaces.
Introduction

The United Nations Conference on Environment and Development (UNCED) was held in the Rio de Janeiro (Brazil) in 1992. One of the objectives of UNCED was to establish common commitments by nations that would guide the sustainable development of the global community; the result was Agenda 21, (CNUMAD, 1992). Agenda 21 recognized the necessity for significant steps to strengthen national and international initiatives to reach the established goals and to fulfill the proposals for action because the countries that face the greatest challenges to sustainability are countries with the least institutional and financial capacity. Initiatives included the industrialized countries exercising their responsibilities in cooperation with industrializing countries in seeking to resolve problems related to the environment and sustainability. Careful revision of priorities and budgets must be undertaken with a view to gradually incorporating the costs of environmental protection into local economic calculations (CGG, 1995. Finkelman, 1996).

It is precisely in this context that chemical safety (CS) is inserted into Agenda 21. Chemical safety is understood to be a series of strategies for the control and prevention of adverse effects for humans and the environment resulting from the extraction, production, storage, transport, handling and disposal of chemical substances. CS is recognized as one of many serious and fundamental problems that need a global approach. It is necessary to widen collaborative efforts with governments, as well as with other non-governmental actors, e.g. industry, unions, consumers, non-governmental organizations (NGOs), citizens’ groups, professional associations and scientific institutions. The problem of governability is seen as a problem confined to the role of states and governments, but needs to be transformed into one of good governance at national and international levels.

In October 2000, Brazil took on an international leadership role on CS when it assumed the presidency of the Intergovernmental Forum on Chemical Safety, (the mandate ran until the end of 2003). This role demanded that a wide range of sectors work together to formulate wide-ranging and effective proposals for dealing with the problems of chemical pollution. These sectors included health, work and the environment, as well as representatives of government, and social actors such as workers, businesspeople, communities and consumers exposed to chemical risks. Remaining challenges include the development of integrated methodologies specifically related to the context of the problems and which are participative in nature. More transparent and democratic decision-making processes are also needed. While important challenges lie ahead, capacities seem to be limited, particularly with respect to industrial accidents with major consequences; such accidents reveal the limits of current control and prevention strategies as well as the destructive potential of industrial society.

Chemical safety as a subject of international concern

Chemical safety appeared as an international concern at the 1972 United Nations Conference on the Human Environment (UNCHE) held in Stockholm. Recommendations from this conference led to the establishment (in 1980), of the International Programme on Chemical
Safety (IPCS) a joint program of the World Health Organisation (WHO), the International Labour Organisation (ILO), and the United Nations Environment Programme (UNEP) Arcuri et al., 1998; Plestina et al., 1996). The initial goal of IPCS was to provide an internationally recognized scientific base in order to permit different countries to develop their own chemical safety measures. (Plestina et al., 1996).

Twenty years after the Stockholm Conference, the 1992 UNCED approved Agenda 21, where chapter 19 is entirely dedicated to chemical safety. Chapter 19 points out the problems of large scale chemical pollution, (both present and future), and recognizes that the most serious situation occurs in the industrializing countries due to: 1) the lack of scientific data to evaluate the risks inherent in the utilization of numerous chemical products, and 2) the lack of resources to evaluate the chemical products for which data is already available (CUNCED, 1992).

Among the set of international strategies laid out in chapter 19, six program areas were established: A) Expansion and acceleration of the international evaluation of chemical risks; B) Standardization of the classification and labeling of chemical products; C) Exchange of information about toxic chemical products and chemical risks; D) Implementation of risk reduction programs; E) Strengthening of national capacities and power for handling chemical products; F) Prevention of illegal international trade in toxic and dangerous products. Furthermore, the International Forum on Chemical Safety was created in 1994, with the aim of constituting new cooperative arrangements between governments to promote the evaluation of the risks of chemical substances and their administration on an ecologically rational basis, seeking to integrate and unify national and international efforts and, simultaneously, to avoid duplication of activities and spending (IFCS, 1997). Although this is an intergovernmental forum, it is recognized that matters relative to chemical safety, particularly the six program areas defined in Chapter 19, cannot be implemented only by government actions. It is necessary to have the participation of industry, inter-governmental and scientific organizations and of different interest groups representing communities and workers exposed to risks.

All these international initiatives must be understood in context. As observed by the Commission on Global Governance (CGG, 1995), the growth in the production of chemical products has resulted in pollution levels that are altering the chemical composition of water, soil, the atmosphere and biological systems, changes that endanger not only well-being but the survival of the planet.

From World War II onwards, technological development in industrial chemical processes, propelled by competition among capitalist companies and the development of a global economy, has resulted in the worldwide expansion of production, storage, circulation and the consumption of chemical products. Global sales of organic substances provide an example, rising from 7 million tons in 1950 to 63 million in 1970, 250 million in 1985 and more than 300 million at the beginning of the 1990s (Korte et al., 1994).

According to IPCS, there are more than 750,000 known chemical elements, compounds or mixtures in the environment, either of natural origin or as the result of human activity (IPCS, 1992). About 70,000 are used on a daily basis, 40,000 of which are used in significant commercial quantities (IPCS and IRPTC, 1992). Of this total (40,000), it is calculated that only 6,000 substances have undergone a minimally adequate evaluation of their risks to human health and the environment. Added to this dramatic picture is the capacity of
technological innovation in the chemical industry, which puts between 1,000 and 2,000 new substances onto the market every year.

The growth of the chemical industry is closely related to the development of a highly interdependent and unequal global economy, in which production, trade and investments are consolidating into an international division of labor where risks and benefits are internationally distributed. While about 20% of the world population, situated mainly in the industrialized countries, consumes about 80%, of the goods produced, the other 80%, situated principally in the industrializing countries, consumes just 20% (MacNeill et al., 1992). In India, for example, where the worst major industrial accident in world history occurred in Bhopal in 1984, (more than 2,500 instant deaths), the annual consumption of products from chemical technology was 1kg per capita, while consumption in the industrialized countries was between 30 to 40kg per capita (Murti, 1991). In 1984, both Brazil and Mexico each suffered their most serious major industrial accident in the post World War II period. Faced with the complexity and expansion of the problems caused by chemical pollution of the environment, chemical safety has become an issue of global governance. Chemical safety has increasingly challenged governments' capacities to guarantee health and safety of their citizens, particularly in the industrialized countries. Our common future depends not only on economic growth, but also on the improvement of the quality of living, particularly for the poorest populations, based on principles of universality, solidarity and equity, principles which should be kept in mind and guide decisions and actions related to chemical safety at both the global and local levels (CGG, 1995. Finkelman, 1996).

Chemical Safety and Governance in the Context of Complexity and Vulnerability

The report of the Commission on Global Governance (CGG, 1995), affirms that a great challenge for our generation is the collective mobilization of people so that life in the 21st century will be more democratic, more sustainable, and safer. As this should occur in an equitable manner, there is an implication that both nations and the world community must take greater collective responsibility regarding these intrinsically interrelated matters. Safety is no longer to be seen as a matter for states, but must become a priority for people. However, this vision should be relativized, especially in the poorer countries where levels of democratization and social welfare are low. In the current context of globalization, which reduces the capacity of Nation States to implement public policies in an autonomous manner, the situation is deteriorating, a situation that accentuates the vulnerability of countries, particularly in Latin America, Asia and Africa.

Chemical safety is understood to be one of many important dimensions related to safety, involving health, life and environmental protection, (both current and future). Seen in this context, chemical safety is a matter for governance at both global and local levels, not restricted to governments and the relationships between governments. It constitutes an important challenge in countries such as Brazil, where questions relative to democracy, safety, sustainability and equity, (all fundamental for good governance), are still relatively unresolved and receive incipient treatment. The above questions should be integrated with chemical safety issues.

The drawing up of policies related to chemical safety in industrializing countries like Brazil should face up to the complexities and uncertainties surrounding the problem. These problems are magnified by the diversity and precarious nature of conditions in industrializing countries. In other words, it is fundamental to consider elements related to different modalities and levels of vulnerability, in searching to build more contextualized and participative knowledge
and decision-making processes, at both the local and global levels, as basic prerequisites for governance.

When the notion of complexity is applied to problems related to chemical pollution, it implies that analysis cannot be reduced to that of isolated components, as is done in traditional scientific approaches. This would lead to both important losses of knowledge about the problems, thereby increasing uncertainties, and limit the formulation of prevention and risk control strategies (Funtowicz and Ravetz, 1993). Funtowicz and Ravetz (1993) distinguish three levels of uncertainty. Technical uncertainties are related to inaccuracies in data or analyses, and can be managed through adequate standardized routines as developed in individual scientific fields. Methodological uncertainties are related to the unreliability of data and involve complex and important questions relating to the information gathered, such as values and reliability. Finally, epistemological uncertainties are related to the margins of ignorance of scientific knowledge itself. This level is involved whenever irreparable uncertainties are at the centre of the problem (Porto and Freitas, 2003).

To face up to the inherent uncertainties in our current scientific ways of evaluating problems which arise from chemicals, and to understand the problem in a wide ranging and systemic manner, involves integrating multiple and simultaneous dimensions of different natures. In this perspective, global and local standards of production, transportation, commercialization, storage, disposal and safety, as well as the directions taken by the development of chemical technologies, interact simultaneously and inextricably with emissions of chemical substances which reach soil, water, the atmosphere and the food chain. Such emissions are mediated by chemical reactions and by social, cultural, economic and power relations. Emissions result in different levels of contamination of human beings and of the ecosystem. There are also differences in capacities for social responses to the problem which implies that decision-making involving chemical risks cannot be carried out solely on the basis of limited technical or scientific predictions. It is necessary for the wider issues outlined, to be included and for reference to be made to the values and interests involved, and that, in the name of governance, these complement aspects normally involved when treating public policy (Funtowicz and Ravetz, 1993). Marchi et al. (1999) observe that many new risks, such as those that originate with chemicals, combine high levels of uncertainty with the possibility of extensive and irreversible damage, and therefore require new decision making processes.

For new approaches and decision-making processes to be minimally viable, particularly in the context of industrializing countries, we should consider the concept of social vulnerability as it relates to technological risks (Horlick-Jones, 1993. Porto and Freitas, 2003). In our view social vulnerability should be subdivided into two distinct but interrelated areas. The first is population vulnerability (Morrow, 1999). This relates to the existence of population groups most at risk, due to characteristics relating to their social, political and economic status, (their ethnicity, gender, disability, age, etc), and which are a function of various forms and levels of their social exclusion. The second is institutional vulnerability (Barrenechea, 1998), that relates to the way in which a society operates in terms of the public policies, decision-making processes and institutional mechanisms which affect structural conditions or pressures in ways that favor or worsen risk-related situations and events. In Brazil, we believe that much still needs to be done to improve the interface between government and industry to guarantee chemical safety, especially considering that the State has been run down over recent times and has become unable to prevent chemical related problems, (an example of institutional vulnerability). This picture is worsened by the fact that certain social groups are exposed to
chemical substances in situations that are socially and environmentally risky, (an example of population vulnerability).

From this perspective, good governance can only flourish when it is founded on a strong commitment to the principles of equity and democracy and grounded in civil society. The principles of governance are compatible with the perspectives developed within the ‘collective health’ system in Brazil, and these should guide decisions and actions for the health-care sector, particularly when they involve environmental matters involving a broad range of actors and interests. The concept of good governance is linked to environmental justice, i.e. a series of principles and practices designed to guarantee that no social group, be it ethnic, racial, class or gender based, “supports a disproportionate share of the negative environmental consequences of economic activities, policy decisions or of federal, state or local programs, nor the lack of or omission of such policies”. In this way, both just and equitable access to a country’s environmental resources will be guaranteed. In addition, all groups will have access to relevant information about their own lives which favors the building of collective subjects and social movements that are capable of contributing to the establishment of alternative and democratic models of development (Phase et al., 2001).

Chemical safety and governance – the Brazilian case

Brazil, (in a similar manner to a number of other industrializing countries, e.g. India and Mexico), underwent a process of accelerated economic growth between the 1960s and the 1980s, partially financed by greatly increased foreign debt. Brazil became one of the most indebted developing nations as during this period, multinational corporations increasingly invested in the industrializing process and state investment and intervention in the economy increased. In 1990 the chemical industry represented about 19 % of the total production value of Brazil’s industrial sector. According to the Brazilian State Statistical Institute’s (IBGE) Annual Research of the Industrial Sector in 1997, the chemical industry was responsible for about 22% of net sales of the Brazilian industrial sector, (IBGE, 1997). Presently it is the eighth largest chemical sector in the world.

The economic development model adopted in Brazil was sustained by the absence of a democratic political system, particularly between the mid 1960s and the mid 1980s. Important transformations in the whole of society also occurred during this period and, as a result, the country suffered a process of fast and disorderly industrialization, which combined concentration of capital, exploitation of the labor force, and disregard or omission by public authorities with regards to the control and prevention of chemical risks. At the same time there was an intense process of uncontrolled urbanization, accompanied by major migratory flows principally from the countryside and poorer regions to the more important urban centers. Social, human and environmental problems were relegated to a secondary position (Becker et al., 1993). One consequence of this process was that some of these poor migrants, with low educational and skill levels, who had moved to seek better living and working conditions, settled on the outskirts of the major cities, living under precarious conditions, without access to basic goods and services like sanitation, health and education. A similar situation, in terms of precarious living and working conditions, existed for those who stayed in the rural areas. This resulted in inferior standards of safety, health and environmental protection, not only when compared with industrialized countries but also in comparison with some other developing economies. In this manner, healthy and safe areas became increasingly separated from unhealthy and unsafe ones (Guilherme, 1987; Towers, 1993; Barbosa, 1992).
In the rural areas, cases of workers and their families being contaminated by agricultural pesticides are well known. Inhabitants of neighboring areas are also exposed to agricultural pesticides through environmental contamination of water, air and soil and through the food chain, in a complex circuit of chemical and social interactions. Structural problems have their origins in the development models adopted in the country, the absence of land reform policy and the lack of stable rural jobs that contributed to migratory flows from the countryside not only to cities but to mining activities, (e.g. gold prospecting in the Amazon region). While gold mining activities provide the single most important source of jobs in this region (10.7%), they coexist with unsatisfactory sanitary conditions and endemic diseases such as malaria and leishmaniasis. These activities also result in important environmental degradation, profound disorganization and social marginalization (MMA, 1995). These activities are frequently illegal and involve a labor force that is unstable, unqualified, mobile and without legal rights. In some cases there is even slave labor, organized in small centers around the mines, which then establishes relations between company run, mechanized mining and manual craft mining. In the main, the techniques adopted are very rudimentary so large quantities of mercury (Hg) are used resulting in high levels of pollution to the air, mine tailings and river water. Craft miners, and the premises where gold is extracted from the ore, are also contaminated. Town populations living close to the mines and extraction premises, as well as populations that live by riversides, also end up with methyl mercury contamination because of direct or indirect interactions with the environment (MMA, 1995. Camara et al., 1993).

The complex social fabric surrounding gold mining activities combines with the environmental complexity associated with the biotransformation of mercury into its more toxic form, i.e. methyl mercury. This is aggravated by uncertainties that arise due to the lack of scientific data about the behavior of methyl mercury in tropical environments. There may also be problems in the ecological chain due to the possibility that global climate change may contribute to enrich the recycling process of this chemical agent so it becomes subject to bioaccumulation. This would result in an increase in the risks of exposure due to the evaporation of this agent, which would convert into chemical time bombs (Nriagu, 1999).

In the major urban centers, chemical problems manifest themselves in a number of ways, from production-related problems in small workshops, (e.g. in car battery factories or re-conditioners) to major industries in the chemical sector, (e.g. chemical, petrochemical and petroleum industries) that have wide-ranging effects, including at the final destination of chemical residues. One of the best known cases of environmental contamination from dangerous residues, that involved a combination of both institutional and population vulnerability, occurred in Cidade dos Meninos, in the Duque de Caxias municipal district in the state of Rio de Janeiro. When a factory belonging to the Health Ministry was shut down in 1954, about 700 tons of residues from the production of HCH, (used to fight malaria), were abandoned. Today about 1,500 people live in the area and extremely high levels of residues have been found in the environment, in the inhabitants and in the local biota (Oliveira et al., 1995).

Another serious problem occurs in small factories, (many of which operate in peoples’ backyards), which use chemicals. The vast majority of car battery re-conditioners (mentioned above), are located in residential and commercial areas where low income populations live. These factories generally employ around 10 workers, characterized by low educational levels, lack of training and lacking in appropriate information about risks and safe behavior. Conditions in the workplaces are inadequate and antiquated processes are frequently employed. Not only workers are contaminated by lead, but also the surrounding areas and the neighboring population (Silva and Mattos, 1999). These workplaces have high marginal costs
and do not qualify for official subsidies granted by environmental improvement programs. These workplaces are rarely targets of government inspections which, if they were effective, could worsen the current unemployment crisis because dangerous factories would be shut down.

**Major industrial accidents and good governance**

In contrast to the previous examples, cases of chronic pollution and accidents in large-scale industries have frequently involved chemical industry workers. Such workers have high levels of technical qualifications, formal education and capacity to organize themselves both in the workplace through unions and nationally, so consequently such workers have a greater capacity to mobilize and exert social pressure. In spite of limitations, a number of events in the 1990s demonstrated that the mobilization capacity of these workers resulted in collective agreements and in the setting up of national commissions involving both industry and government representatives. Some of the most important cases include the benzene agreement, the boiler regulations and the building up of a national legislative framework relating to major industrial accidents. Such experiences demonstrate that it is possible to have more democratic decision-making processes as well adopting a perspective of good governance. The World Bank's sees this perspective as involving predictable, transparent and scientifically oriented policy formulation, and a civil service which acts professionally with the aim to promote the public good, transparency, the rule of law and the participation of civil society.

The regulation of major industrial accidents serves as an example through which the possibilities and the limits of good governance can be explored. In the 1970s and 1980s Brazil was already the scene of several major industrial accidents, most of them involving the petroleum sector. In 1972, the explosion of a LPG tank at REDUC, in Duque de Caxias (state of Rio de Janeiro), resulted in the death of 38 workers. In 1981, a hydrosulphuric acid leak at REVAP, in São José of the Campos (state of São Paulo), killed 13 workers. In 1984, a leak in a pipeline administered by RPBC resulted in a fire that led to the deaths of more than 500 slum dwellers in Vila Socó (Cubatão, state of São Paulo). In the Campos offshore oil field (state of Rio de Janeiro), an explosion and fire on the Enchova platform resulted in the deaths of 37 workers and 19 injuries. We would like to remind readers that all these accidents occurred in a country that had not been able to democratically choose its government since the military coup d’état of 1964 so government institutions were not subject to democratic control. During the military period the growth and enlargement of industrial capacity, including petroleum production, was a key element of the national development strategy. It was only in the 1990s, with the consolidation of democracy in the country that a series of events occurred which contributed to a better system of control and prevention of major industrial accidents. In 1991, seven years after the pipeline break and explosion that resulted in over 500 deaths, the “Risk Prevention System for Major Accidents” (SIPRAM), was created in Cubatão. In 1994, ten years after the Bhopal accident, a number of important meetings were held. The “National Seminar on the Prevention of Major Industrial Accidents” was organized by the MLE in the state of Bahia; the “Tripartite Latin American Seminar on Major Industrial Accidents” was organized in the state of São Paulo by the ILO, and the Seminar “Ten Years after Bhopal – The Major Accident Question” was organized by the Center for Worker Health and Human Ecology Studies of FIOCRUZ in the city of Rio de Janeiro. In the following year, 1995, the National Confederation of Chemical Workers, (affiliated to the Unified Labor Confederation (CUT)), organized the “National Seminar on
Major Accident Risks” in Atibaia (state of São Paulo). A formal session was held at FIOCRUZ where the CUT formally requested the Workers’ Party (PT), to move forward with the ratification process for ILO Convention 174, (on major industrial accidents), in the National Congress. In the first half of the 1990s, there was a series of movements, mainly involving government bodies, international organizations, research institutes and the representatives of chemical industry workers that raised the issue of chemical safety and initiated the first strategies to control and prevent major industrial accidents.

A more general move towards the institutionalization of these strategies was made only in the second half of the decade, particularly from 1998 onwards. This move resulted from high media attention paid to a number of industrial accidents and the mobilization of workers, mainly organized through the National Confederation of Chemical Workers, (linked to the CUT), allied with technicians employed in government bodies, (especially the MLE), and research institutes, (particularly FIOCRUZ). In 1998, three important accidents occurred: an explosion at Nitroquímica, (a petrochemicals company in the state of São Paulo), resulted in one death and the prolonged paralysis of a large industrial complex dependent on this factory; a fire in REGAP (state of Minas Gerais), killed 6 workers, and an explosion in an illegal fireworks factory in Santo Antônio de Jesus (Bahia state), where unregistered and underage workers were employed, resulted in 64 deaths and 5 injured workers. 1998 was a symbolic year in dialectical terms, bringing positive developments as well as exposing the limitations of governance of industrial risks. At the same time as the incapacities of major companies, (such as PETROBRAS and NITROQUÍMICA), to prevent and control major accident risks, was again highlighted. The most serious accident ever experienced in Brazil occurred (measured by the number of workers who died instantly in a single event) in an illegal factory which employed unregistered and underage workers. However, it is interesting to note that, in spite of the seriousness of the accident, it was given relatively small coverage in the media because the victims were poor, politically powerless and lived in an isolated region. This fact reveals another facet of social vulnerability - the trivialization of the tragedy and its social invisibility. In 1998, the Minister of Labor and Employment signed Administrative Order number 11 creating a Tripartite Commission to analyze ILO Convention 174 and ILO Recommendation 181, on the prevention of major industrial accidents. In the following year this commission forwarded both the Convention and the Recommendation to Congress.

Finally, after much pressure, a Tripartite Study Group was set up in 2000 to investigate the implementation of Convention 174 in Brazil. In this same year, pressure was applied by the CUT and the National Confederation of Chemical Workers allied with government technicians, and a strategy was also implemented to make the theme more visible. This strategy received an unplanned but significant boost from the giant state controlled petroleum company PETROBRAS, when two accidents occurred within a short space of time and had important repercussions in the media. These accidents demonstrated both population and institutional vulnerability and complexity, leading to demands for more effective regulatory strategies in order to guarantee control and prevention. Two pipelines broke. One at REDUC, in the state of Rio de Janeiro, resulted in 1.3 million liters of oil leaking into Guanabara Bay, provoking a large-scale environmental disaster. The second was at REPAR in Paraná state and resulted in 4 million liters of oil leaking into the Barigui and Iguacu rivers. At the end of this same year, the third session of the Intergovernmental Forum on Chemical Safety was held in Salvador in Bahia state. “Priorities for Action after 2000” were established within Agenda 21’s program area D, (implementation of risk reduction programs), with the implementation of control systems and the prevention of major industrial accidents planned in at least 70 countries by 2002. In spite of these events it was only in 2001, (six months after the gas leak
and explosion on the PETROBRAS marine Platform P-36 had resulted in the deaths of 11 workers), that Convention 174 was approved by Congress (Legislative Decree 246, of 28th of June 2001) and ratified by the ILO. The Convention was promulgated by the President of Brazil in Decree 4085, on the 15th of January 2002.

The ratification of ILO Convention 174 is an important marker in the process of increasing institutionalization of control and prevention of industrial accidents with potentially major consequences, a process that reveals both the possibilities and the limits of governance relating to the risks of industrial accidents in countries such as Brazil. On one hand, it is important to remember the value of participation of workers in the chemical and petroleum industries. These workers are well qualified technically, have a high level of formal education and a capacity for organizing themselves on a local and national basis through their unions. Consequently, these workers have the power and capacity to apply social pressure, in alliance with government technicians and academic researchers. However, during the 1990s, a process of industrial restructuring resulted in increased disorganization of work and of workers. This disorganization then increased the externalization of risks, a process which meant subcontracted or informal sector workers became the main victims of fatal accidents. Parallel to this, a strategy was implemented to reduce the strength of the organized union movement, (particularly during the two presidential mandates of the Brazilian Social Democratic Party (PSDB), when the country was governed by Fernando Henrique Cardoso), and consequently the power of the Federation of Petrol Workers was reduced. The state’s role in control and preventive actions was also weakened because resources were limited, replacement of staff was slow and insufficient and, in addition, activities were restructured.

The strategy to weaken organized labor was associated with a rising number of workers in insecure positions in the labor market, i.e. workers lacking in organizational capabilities, especially subcontracted or informal sector workers who worked in dangerous industrial activities. These workers became more vulnerable and hindered the possibilities of governance of major industrial accidents even though a process of institutionalization of control and prevention mechanisms occurred throughout the whole decade. It must also be stressed that this process of reducing the role of the state was also associated with sporadic and fragmented action, (characteristic of the operation of the Brazilian state), that contributed to a situation where important ministries were unable to function satisfactorily. For example, the Environment Ministry has so far played only a very small role in inter-sectoral commissions in spite of the important role that various bodies within the national environmental system have in the prevention and control of major industrial accidents. This reveals one of the limitations on a broad and inclusive strategy for the governance of industrial risks. However, much progress has been due to the persistence of action by organized workers which demonstrates that the democratic content of decision-making processes can improve governance.

Conclusions

Using the above cases as reference points, (particularly for major industrial accidents) it is clear that there has been growth in problems related to chemical safety in Brazil, and this growth has been greater than the country’s capacity to cope. In this context, the recognized complexity of Brazil’s socio-environmental system, associated with social vulnerabilities (population or institutional), has stimulated the indiscriminate use and contamination of natural resources over decades. This process has occurred because archaic production systems
coexist with advanced technology, resulting in different forms and levels of social inclusion and chemical pollution.

The current government administration of chemical safety in Brazil, (federal, state or municipal), is inefficient and there is little integration among the various sectors and social groups involved. There are jurisdictional conflicts between different government bodies, omissions and failures in the mobilization of existing human and technical resources, particularly in relation to the protection of health and the environment. Although the available legal framework can be considered to be relatively complete, in practice there is a lack of operational capacity due to the continuous restructuring of government agencies, discontinuities in public policies and a lack of financial resources, particularly in the environment and health areas.

In the current context, self-regulatory policies, such as certification by the ISO 14,000 standard, or voluntary programs such as the “Responsible Performance in the Chemical Industry” program, run the risk of inappropriately replacing absent public policies. This is even more likely when consideration is given to the relative economic stagnation which has occurred over the last two decades, allied to the structural unemployment which is part and parcel of the current model of economic development. Social marginalization has been growing and this reduces the capacity of society to exert pressure for meaningful change. Industrial workers are an important pressure group for improved chemical safety and played a fundamental role in some of the cases examined in pressuring for good governance.

The Brazilian state, (as in some other industrializing countries), has been involved in a serious and dangerous process of deterioration, increasingly alienated from and indifferent to the population’s needs and demands. In such a context, Finkelman (1996) sees a necessity to redefine the role and actions of the state at all level, in relation to chemical safety. This redefinition is particularly needed in the areas where the state has direct responsibilities, as is the case of those institutions which deal directly with the population’s health and those which are responsible for protecting and monitoring the environment.

Chemical safety is one of the serious problems faced by countries like Brazil, a problem which raises the need and the challenge to build new social arrangements at the global, national, regional and local levels which will provide a model of sustainable development based on principles of equity and democracy. Another challenge is the need for an approach to science that is more deeply embedded in the context of our reality, based on integrated and participatory approaches. Such approaches would include the analysis of chemical, physical and biological affects combined with analyses of social, political, cultural, ethical and moral processes, thereby contributing to the search for more widespread and durable solutions. Chemical safety is a subject which has a specific context in today’s world where most of the planet’s population is excluded from the benefits of modernization and globalization. The excluded population suffers from the risks of a development model and international division of labor that is naturally and dynamically iniquitous. Few attempts have been made in recent years to correct this situation. Although many indicators of social progress (e.g. infant mortality, education, nutrition levels and life expectancy), have improved significantly at a global level, millions of people exposed to chemical pollution still live without adequate drinking water and sanitary facilities (CGG, 1995).
The first laws aiming to control occupational exposure to benzene in Brazil were passed in 1928 (Carvalho, et al, 1995). However, in the past 50 years, almost all the actions related to benzene have been of a legislative nature, (e.g. the establishment of an exposure limit by the Ministry of Labor’s Regulatory Norm 15), or related to scientific research (Wakamatsu, 1976; Morrone & Andrade, 1974).

At the beginning of the 1980s, action on the question of benzene changed direction as a consequence of renewed trade union mobilization following the discovery of a "benzene epidemic" by the Santos Metalworkers' Union in the state of São Paulo. Several cases of leucopenia, caused by exposure to benzene, were found among workers in the São Paulo Steelmaking Company (COSIPA) in the city of Cubatão. Following this discovery, the Construction Workers’ Union in Santos also proved cases of benzene intoxication among maintenance workers and machine fitters in the same company.

The accusations had nationwide repercussions and new cases were detected in company after company where benzene was likely to be found, including steelworks, petrochemical plants, chemical industries, petroleum refineries, and anhydrous alcohol manufacturing plants. Most of the action spread throughout cities where steelworks were to be found, (i.e. Cubatão; Volta Redonda in the state of Rio de Janeiro; Ipatinga and Ouro Branco in the state of Minas Gerais, Serra in the state of Espírito Santo) and also to regions where there were petrochemical plants, (i.e. Cubatão and the Greater ABC region in the state of São Paulo; Camaçari in the state of Bahia; Triunfo in the state of Rio Grande do Sul). In this period over 3,000 workers were placed on sick leave because of benzene intoxication.

These events led to various union, employer and government actions.

The problem of occupational exposure to this agent led a FUNDACENTRO researcher, Tereza Carlota Pires Novaes, to conduct research into the presence of benzene in commercial products. (Novaes et al, 1981). (This researcher was also involved in government actions relating to exposure to benzene in the steelmaking industry.) This research was one of driving forces for the publication of the 1982 Inter-ministerial Administrative Order no. 3, issued by the Labor and Health Ministries, which prohibited the manufacture of products containing benzene and limited its presence to a maximum of 1 % by volume, as an impurity. In effect, this was first important action to control exposure to this agent in Brazil. The Administrative order principally affected those who worked with solvents, inks, glues, varnishes, etc. Table 1 shows some of the results that were discovered and gives an idea of the seriousness of the situation.
Table 1. The origin and percentage of benzene in commercial samples, analyzed before 1981.

<table>
<thead>
<tr>
<th>Product</th>
<th>State of origin of the sample</th>
<th>% of benzene in sample (by volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner extra</td>
<td>São Paulo</td>
<td>10.40</td>
</tr>
<tr>
<td>Thinner</td>
<td>São Paulo</td>
<td>5.20</td>
</tr>
<tr>
<td>Restoring agent for a printing press cylinder</td>
<td>São Paulo</td>
<td>Above 90 (analysis carried out on the volatile part)</td>
</tr>
<tr>
<td>Toluene for use in steelmaking</td>
<td>São Paulo</td>
<td>1.51</td>
</tr>
<tr>
<td>Thinner</td>
<td>Minas Gerais</td>
<td>17.41</td>
</tr>
<tr>
<td>Thinner</td>
<td>Pernambuco</td>
<td>6.70</td>
</tr>
<tr>
<td>Thinner</td>
<td>Espírito Santo</td>
<td>20.03</td>
</tr>
<tr>
<td>Thinner</td>
<td>Espírito Santo</td>
<td>73.58</td>
</tr>
<tr>
<td>Thinner</td>
<td>Brasília</td>
<td>3.91</td>
</tr>
<tr>
<td>Thinner</td>
<td>Rio de Janeiro</td>
<td>16.00</td>
</tr>
<tr>
<td>Thinner</td>
<td>Rio de Janeiro</td>
<td>17.17</td>
</tr>
</tbody>
</table>

At this time Soto and Novaes (1983), drew up a list which elucidated various uses of benzene and this list became a reference for those seeking to control occupational exposure from both the union movement and the public sector. For example, the list indicated that benzene was being used to produce anhydrous alcohol, in spite this process being forbidden by legislation.

In the 1980s, several trade unions took action (Carvalho et al, 1995). In 1985, the Volta Redonda Metalworkers’ Union in the state of Rio de Janeiro denounced the existence of 50 leucopenia cases at the National Steelworks Company (CSN). The Chemical and Petrochemical Industries Union of the ABC region in the state of São Paulo verified that a half of the workforce in the powerful Matarazzo group’s BHC factory, a total of 60 workers, had leucopenia, including an acute case of medullar leukaemia, (the worker, Pedro Mangueira Filho, died in 1984). This particular case was historically important because it resulted in the first closure of a factory by the state of São Paulo’s branch of the Ministry of Labor (DRT/SP). In 1986, the factory was permanently closed down in spite of the fact that the company had made all the improvements it deemed necessary, reducing its benzene concentration from levels as high as 1,000 ppm, to the still unacceptable level of 200 ppm.

In 1985 DRT/SP set up and coordinated an Inter institutional Commission to both demand control measures for benzene exposure, to be evaluated by the major steel making company COSIPA.

In 1986, after sick leave had been granted to a large number of workers, Circular no. 297, "Criteria for characterizing leucopenia", was issued by INAMPS through the Regional Secretariat of Social Medicine in São Paulo. This circular established criterion for the legal recognition of cases of leucopenia due to benzene exposure and was originally restricted to the industrial city of Cubatão but subsequently used in the whole state of São Paulo. At that time, the main haematological alteration that was investigated to verify benzene intoxication was leucopenia (decreased leucocytes in the blood).
In 1986, the São Paulo state government's Health Secretariat included haematological alterations due to benzene exposure in its epidemiological monitoring system for occupational diseases.

Due to the early detection of benzene related cases in Volta Redonda, and the resulting trade union action, the Regional Secretariat of Social Medicine in the state of Rio de Janeiro temporarily adopted the criteria established by São Paulo's INAMPS in 1987.

Two big campaigns, focused on the benzene issue, were organized by the workers’ movement. One was launched in 1988 by the Inter Union Department for the Study and Research of Health and the Working Environment (DIESAT) by a seminar entitled "Leucopenia: Slow Death". Another campaign, called "Operation Hunt Benzene" was launched in 1991. Coordinated by the National Institute of Work Health associated with the Unified Labor Confederation (CUT), this campaign involved unions representing several categories of workers in various regions.

Three important technical and scientific events also occurred in the 1980s. The "Seminar on the Toxicology of Benzene - Risks and Means of Control", was organized as a part of the 42nd anniversary commemorations of the Brazilian Accident Prevention Association in May 1983. A "Symposium on Leucopenia" was held in 1987 in the town of São Roque, in the state of São Paulo, organized by the Brazilian Haematology Society, the Brazilian College of Haematology and the Social Service of Industry (SESI). Finally, in 1988 the "National Seminar on Benzene Exposure", was promoted in São Paulo city by FUNDACENTRO.

All these actions in the 1980s marked a change of focus on questions related to occupational exposure to benzene and to workers' health more generally. Three major changes can be identified: increased awareness among workers and the technical community as to the importance of problems caused by benzene; the mobilization of social movements around the problem; administrative and political action by the state on compensation for victims and prevention strategies. These changes coincided with the end of the military dictatorship and the beginning of the return to democracy in Brazil when autonomous social actors who identified with the trade union movement developed and greater freedom of action for government agencies was allowed, as exemplified by the setting up of several inter-institutional commissions.

At the beginning of the 1990s, this trend consolidated. Inter-institutional actions occurred in several states: São Paulo, Minas Gerais, Bahia, Rio Grande do Sul and Espirito Santo (Carvalho et alii, 1995). In Bahia, two fatalities caused by benzene were diagnosed, (a work doctor died from aplastic anaemia and a petrochemical industry operator died from leukaemia), which led to the creation of an Inter-institutional group in this state. In 1991 this group organized a seminar at which a Protocol of “Intentions for the Control of Benzene related illness and other Occupational Diseases in the Petrochemical Complex at Camaçari” was approved. In 1991 a "State Committee on Benzene" was formed in Rio Grande do Sul.

In 1992, an important initiative occurred as fruition of all the previous mobilizations. Dr. Francisco Lacaz, head of the Sanitary Monitoring Service of the São Paulo State Health Secretariat, had one of the most important doctors involved with the benzene question, Dr. Lia Giraldo Augusto, as a member of his advisory team. This team created a tripartite group which drew up a state regulation specifically to deal with benzene, in terms of medical treatment and specialist diagnosis for social welfare purposes and exposure prevention. This
was the first "tripartite" experience in establishing technical rules relating to workers’ safety and health in Brazil and reflected the accumulation of technical experience of all those involved with the question over the previous decade. The text of the technical regulation, (Resolution SS-184), was adopted on the 8 June 1993, and officially published on the following day.

The main aspects of the technical regulation are:

- The recognition that benzene is a product that causes cancer (a carcinogen) which means that no occupational exposure should be permitted if damage is to be prevented;

- With respect to haematological changes, the regulation breaks away from a reliance only on narrow numerical criteria, it enlarges criteria to include qualitative dimensions, incorporating a new manner of using hemograms in the examinations that lead to the diagnoses made by the Social Welfare Ministry’s specialists. Until this point, leucopenia had been one of the only changes considered, to the extent that haematological alteration was practically taken as a synonym for benzene related illness;

- It affirms that the reversal of a marginal haematological state of a worker diagnosed with benzene related illness (due to alterations in blood cell count), back to values considered to be "normal", does not imply "a state of cure". The regulation considers the possibility that the health status of those with benzene related illness could deteriorate later in life with the development of delayed malignant blood diseases;

- The regulation clearly indicated that in addition to cytogenetical alterations, the effects of benzene on the endocrinological, immunological and central nervous systems should be considered in clinical examinations;

- The standardization of social welfare practices and criteria;

- In relation to social welfare benefits, the regulation defines that the causal connection between alterations to workers’ health due to benzene exposure should be presumed where working environments and activities undertaken are characterized by some degree of presence of the agent, and that this should be interpreted in accordance with the existing legislation;

- The regulation declared that the idea of establishing an ‘Environmental Tolerance Limit’ was not valid for prevention purposes because benzene's carcinogenic effect was recognized;

- Benzene use was restricted for all purposes unrelated to its role in chemical synthesis. The regulation prohibits the use of benzene in the production of anhydrous alcohol;

- Clear and precise criteria for the implementation of Programs for the Prevention of Benzene Exposure were defined. (This occurred at a time when the very idea of building prevention programs was incipient);
- It recognized that urinary phenol is a poor indicator of benzene exposure and its use was not recommended;

- Quantitative environmental evaluations were defined as having the specific goal of indicating levels of benzene related environmental contamination and would no longer be used to compare measured levels with "tolerance limits";

- It was established that Benzene Exposure Prevention Programs should be able to be evaluated by government inspectorates and workers' representatives.

There can be no doubt that this regulation served as an important reference for the current legislation on benzene, especially as several people who helped elaborate it also contributed to the writing of this legislation.

In March 1993, the "National Seminar on Exposure to Benzene and other Myelotoxic Substances" was held in Belo Horizonte and recommended that the legislation on benzene be revised at ministerial level. The first result of this recommendation was the National Social Security Institute’s (INSS) 1993 "Technical Regulation on Benzene Intoxication" Which incorporated all the recommendations of Resolution SS-184. However, the regulation provoked employer reaction and critical documents from the sector’s employers’ union SINPROQUIM (1993) and the Tubarão Steel Company (CST, 1993), were sent to the Minister of Social Welfare. For example, the documents criticised the following definition of 'exposed worker':

"Occupational exposure; [means the] presence of workers in areas where there are negative agents in concentrations or environmental levels that are above 50% of the tolerance level. This concept does not consider the fact that carcinogenic substances have no safe exposure limits and ignores the possibility of accidents or leaks."

The Benzene Agreement

Due to a recommendation made at the Belo Horizonte seminar, the Ministry of Labor initiated a process of revision and update of the Regulation NR 15 in 1993. This process led to the current agreement and legislation on benzene.

In this same year, the Ministry of Labor created a Technical Working Group to propose new legislation. After collecting information, the group wrote a document "Benzene - Technical Support to OHS Secretariat" for the Ministry of Labor, which brought together data on the Brazilian situation and proposed several measures for controlling exposure.

In 1994, on the eve of a presidential election, there was the possibility of both ministerial change and change in the Safety and Health at Work Secretariat (SSST), (the latter actually occurred, when the Minister Walter Barelli left office as did the Ministry’s head OHS officer, Raquel Rigotto). Faced with the need to keep the discussion about benzene alive, a new regulation was promulgated (Decree No.3 MLE of March 10th, 1994). This decree included benzene in a list of carcinogenic substances in the 13th annex to NR15. A major merit of this regulation was that benzene was recognized as a carcinogenic substance and therefore no exposure should be permitted and could only be used in a totally sealed system. The decree
was presented at the FUNDACENTRO on March 11th 1994, with the Minister of Labor and the national OHS secretary present. The "Project for the Control of the Occupational Exposure to Benzene" was also presented.

This decree mobilized employers’ groups linked to steelworks and petrochemical industries, (as can be seen clearly in the publication ‘Informativo SINPROQUIM’ (SINPROQUIM, 1994), subtitled "SINPROQUIM Starts a National Employers’ Mobilization"). One of the main reasons for the mobilization of employers was that they considered it was no longer possible to use benzene because use was restricted to hermetically sealed systems, with no possibilities of leakage. Companies alleged that this implied an environmental concentration of benzene of ‘zero’, and that was not possible in practice. However, this was the employers’ interpretation and it didn’t correspond to the text of the regulation.

The companies succeeded in postponing the implementation of the administrative order for six months, and a tripartite technical group was constituted to reformulate it. This tripartite group was formed in consultation with the new Minister of Labor and included professionals who were nominated in an unrepresentative manner. Because of this, sectors of the trade union movement and technicians employed by government mobilized and demanded that membership of the group be changed because they did not consider the group to be genuinely tripartite. Their principal objection was that some government nominees strongly identified with employer positions. At the group’s first meeting on September 2nd 1994, a busload of union representatives arrived to FUNDACENTRO and distributed a “Manifesto in Favor of ethics”.

A new commission was established by Administrative Order no. 10 issued on 08/09/94, composed of government representatives (Ministry of Labor, FUNDACENTRO, Ministry of Health, Social Welfare Department), workers’ representatives (CNTI - National Confederation of Industrial Workers, CNTM - National Confederation of Metallurgical Workers, CUT – Unique Labor Confederation) and employers (IBS – Brazilian Steelworks Institute, ABIQUIM - Brazilian Chemical Industry Association, CNI - National Industrial Confederation and SIMPROQUIM – Union of Chemical Products Industries for industrial objectives and of Petrochemicals in the state of São Paulo). Each party relied on the support of three advisory staff and four technical advisers seconded to the commission.

The "Tripartite Working Group on Benzene" began work on September 28th 1994, and a proposal for the group’s work was agreed upon and as were issues such as the locations of future meetings, the nature of administrative support, limits of access to meeting rooms, the form of meeting minutes, prohibition of tape recording, the manner in which the meetings’ minutes would be released to the press, the principle that consensus should be sought on decisions, the modus operandi of the technical advisers, the sharing of technical knowledge among all parties, and the order of the day and date of the following meeting.

One of the first points to be agreed upon related to the technical question of the levels (values) of benzene concentration that were considered technically attainable but which did not preclude risks to health. "In this way, from a practical viewpoint, protection measures and improvements should be adopted so as to achieve ever smaller concentrations." (Meeting minutes, 31/10/94). In the group’s final document this concept was referred to as a "technological reference value". It had been agreed that the regulation to be adopted would classify areas of a company according to varying degrees of risk. However, consensus was
never developed on this subject and the final agreement instead favoured the monitoring of individual exposure levels.

Sub-commissions were constituted to discuss medical monitoring which required in-depth debate due to the conflicting interests around many points: quantitative environmental evaluation, acceptable levels of concentration, average exposure limits over time and possible maximum exposure limits. Agreement was not reached on these points.

It was agreed that workers should participate in follow up on the benzene agreement and a group representing benzene workers (GTB), was set up.

With regards to fixing threshold values, the employers suggested 5 ppm for the environmental concentration of benzene. This was not accepted by the other two parties and after a great deal of debate, a meeting in May 1995 agreed on the concept of a “Technological Reference Value” (VRT). Tripartite negotiations defined the concentration of benzene in the air which was considered feasible from a technical viewpoint, however, this level should be considered only as a reference for programs which seek to improve the working environment. The reaching of the VRT is compulsory and does not eliminate health risks.

VRT-MTP values were defined as “technological reference values for average level of concentration weighted over time, for an 8 hour working day, to be obtained in the respiratory zone”. The established values were 2.5 ppm in steel manufacturing industries and 1.0 ppm for other companies covered by the agreement. The values are different because these two types of industry are in different stages of technological development. Steelmaking companies use processes that are more difficult to control and for this reason were able to justify a higher value for the VRT in negotiations.

These values and concept of VRT were inspired by German legislation which also establishes a concept of VRTs for carcinogenic substances and proposes similar values for steelmaking and other industries.

Gradually agreements were made and some questions were left aside with recommendations that they be treated in subsequent agreements, as in the following list:

- Definition of Indicators of Biological Exposure;
- An International Seminar on benzene;
- Discussion of activities that lie outside the scope of the agreement, such as the use of benzene in fuels such as gasoline;
- Reduction of benzene concentration in manufactured products;
- Substitution of benzene in the production of anhydrous alcohol, and in other fields where there is a technically viable possibility and need for substitution.

Some questions were never agreed upon, for example the rights of those laid off work because of benzene poisoning or the establishment of a technological reference value for short-term exposure.

In September 1995, the technical group handed their report to the Ministry of Labor. This report was made up of four documents: the Benzene Agreement, an Administrative Order to be included in the 13th Appendix to the Ministry of Labor’s Regulation no. 15 (Appendix 13 A), and two regulatory instructions ("Evaluation of Benzene Concentrations in Workplaces")
and "Monitoring of Worker Health aimed at the Prevention of Occupational Exposure to Benzene"). The Administrative Order was published on December 20th 1995 (FUNDACENTRO, 1995).

The main points of the agreement are as follows:

- The establishment of jurisdictions for those involved (Ministry of Labor, FUNDACENTRO, Ministry of Health), companies and workers.

- The creation of a “Permanent National Commission on Benzene” (CNPB), a tripartite body formed to discuss, negotiate and monitor the agreement. Its main responsibilities are to complement the agreement in relation to questions relating to alterations in workers' health status, and to propose and monitor studies, research, scientific events and changes in legal instruments.

- The creation of groups representing benzene workers (GTBs) in companies, with at least two elected workers who should receive special training and keep up to date with all actions in the company related to the prevention of occupational exposure to benzene.

- The establishment of time limits for companies to adapt to the new environmental concentration values.

- The creation of certification for the controlled use of benzene.

- The establishment of penalties for those who do not adhere to the agreement.

Administrative Order No. 14 alters the item “Carcinogenic Substances” in Appendix No.13 of the NR15 - Activities and Operations in Unhealthy Conditions - of the Ministry of Labor by including appendix 13A. This appendix includes the following main points:

- The regulation of actions, responsibilities and procedures to prevent occupational exposure to benzene.

- Defines application of the Administrative Order to: those companies that produce, transport, store, use or handle benzene and liquid containing 1% or more benzene by volume, and to those hired by such companies and to others as may be relevant.

- Prohibits the use of benzene, (as of 1/1/97), except in industries or laboratories that: produce it, use it in chemical synthesis processes, employ it in fuels derived from petroleum, employ it in laboratories for analysis and research, in conditions where its substitution is not possible, employ it as an azeotrope for making anhydrous alcohol, until the definition of a date for its substitution (the proposed date was 31/12/96).

- Obliges companies covered by the Appendix to register.

- Sets a period of 180 days after the publication of the Appendix, for the presentation of a program for the prevention of occupational exposure to benzene.

- Establishes the contents of the above program.
- Establishes the concept of VRT (Technological Reference Value)
- Defines VRT-MTP, as the technological reference values for average level of concentration weighted over time, for an 8 hour working day, to be obtained in the respiratory zone
- Establishes VRT-MTP values
- Establishes indications for signposting areas where benzene is used and labelling /all products containing benzene
- Establishes requirements for emergency situations.

The Permanent National Commission on Benzene was installed on March 26th, 1996 and has met periodically since then and conducted company visits.

**Implementation and progress**

The actions on benzene that emerged in Brazil have resulted as a consequence of important social mobilization and an intense negotiation process involving various social actors, especially representatives of workers and employers in those companies using benzene.

Among the actions and progress which occurred from 1995 onwards the following can be highlighted:

- The setting up of the Permanent National Commission on Benzene which served as a model for negotiations that were later carried out in several other areas, and which still meets and exercises a role;
- Effective legislation prohibiting the use of benzene in the production of anhydrous alcohol was passed. This measure prevented the exposure of thousands of workers, and avoided benzene being transported by hundreds of tanker lorries on the highways. This measure came into effect in May 2000;
- A biological indicator of benzene exposure was established through testing of muconic acid levels. This was established as an indicator for the first time following academic research (which resulted in doctoral and masters theses and in three workshops);
- The reduction of benzene in gasoline to a maximum of 1%. This changed the National Petroleum Agency’s previous administrative order which permitted up to 2 %;
- The writing of a technical note explaining the coverage of the agreement and legislation, including coverage of petroleum platforms and terminals;
- An agreement to decrease the benzene content in manufactured products to a maximum of 0.1% by the year 2007;
- The establishment of a regulation by the Ministry of Health for the monitoring of exposed workers, with the development of clear criteria for diagnosis, sick leave, etc;

- The development of a “System for Monitoring Populations Exposed to Chemical products produced with Benzene” (SIMPEAQ);

- The organization of courses, lectures, and seminars including an international seminar;

- The production of videos;

- The presentation of scientific and technical papers in national and international congresses and publications;

- The publication of material for training members of GTBs;

- The organization of regional benzene commissions. Currently there are commissions in the following states: Bahia, Espirito Santo, Rio de Janeiro, Minas Gerais, Paraná, Rio Grande do Sul and São Paulo. In São Paulo there are two regional commissions, one in the area of Santos and the other in the industrial municipalities of São Paulo City’s metropolitan area known as the Greater ABC;

- The organization of national meetings of the regional benzene commissions;

- The organization of meetings of GTBs;

- The organization of a workshop to discuss and make proposals on working conditions in the steelmaking industry;

- The organization of a workshop to discuss and make proposals on working conditions in the petrochemical industries;

- A recommendation to create centres for the diagnosis of benzene related illness, with the participation of the Ministries of Labor, of Health and of Social Welfare as well as with Haematology Centres;

- The establishment of criteria for workers to return to work after they have obtained a medical discharge after being on sickness leave due to benzene related illness;

- The provision of incentives for petrochemical companies to invest in controls that collectively protect workers from risks;

- The encouragement of steelmaking companies to invest in controlling leaks;


- Numerous visits to steelmaking, chemical and petrochemical plants and refineries where benzene is used in the production process.
These improvements have resulted from a great deal of social mobilization, mostly by trade unions, and the actions of government bodies concerned with the prevention of benzene-related illnesses. Companies have also made more efforts to control exposure, although there is still a lot to be done in this respect. All of this work has an inter-institutional and multidisciplinary character, and has been built up in a dynamic manner. It has always been necessary to adapt the approach to the regions where recommendations are to be implemented and to manage the difficulties revealed during the implementation. We believe that this effort exemplifies the need for a complex approach which brings together many institutions and scientific disciplines if sustainable development is to be achieved.

We can summarize some fields where monitoring has been consolidated by this particular experience with benzene (Machado, 2003):

1. Technological monitoring, risk reduction and elimination. This has occurred through the implementation of replacement technologies, hermetic sealing, the elimination of emissions into the atmosphere, and the removal of benzene from several products. Recommended procedures have been established for activities involved in transport and in laboratories (principally in the washing process). Procedures for collecting samples and draining lines have been developed along with projects designed to reduce emissions in water-oil separators. Old equipment has been replaced and better procedures developed for line and equipment maintenance used in processes that use benzene.

2. Epidemiological monitoring and evaluation of the effects and forms of exposure. Information on past cases has been organized. There is time series of workers exposed to risk situations, and records also the adaptation of health services of companies, of the public health system and of INSS diagnosis specialists to identify and monitor cases of benzene related illness. Processes have been introduced for monitoring the morbidity and mortality of workers exposed to benzene, establishing cases of benzene related illness and monitoring possible cases among members of exposed occupational groups. A flow of information, vital for the public health system, has been established as a result of the information that is communicated between companies and other organizations as a result of the implementation of SIMPEAQ.

3. Environmental monitoring of exposure, incorporating participative methodologies and industrial hygiene. Systematic monitoring in workplaces, with the participation of workers, has been developed (Oddone, 1986). Symbolic of this approach are discussions within companies held by the GTBs (groups representing benzene workers), on the control of atmospheric emissions of benzene, the establishment of feasible technological exposure limits and technical indices, and the need to consider the existing technological base in each sector.

Monitoring of the national benzene agreement in workplaces still requires the development of a methodology for interpretation of the results of environmental evaluations. A number of revisions are also required including: the types of sampling procedures adopted; processes used to validate the results of laboratory tests; the establishment of quality control programs between laboratories through the organization of reference networks. It is also necessary to revise the methodology and identification of biases involved in selecting homogeneously exposed groups.
The benzene agreement is considered to be a national and international benchmark, as was evident when both the agreement and the legislation were presented at a recent meeting of the Ministers of Labor of the Organization of American States.

Leny Sato

STRUGGLES TO CONTROL WORK: CASES FROM THE FORMAL SECTOR

Introduction

This chapter is based on case studies which illustrate the various ways that workers in the formal sector, (industry and services), regularly challenge work demands that potentially cause health problems. These health problems include repetitive strain injuries, work accidents, mental health and psychosomatic problems. Research has already demonstrated that daily life in the workplace is dependent on the way work processes are organized, largely configured by contexts which restrict the ways of working, of relating to others, of dealing with time, with space and with equipment known to be dangerous to health (Seligmann-Silva, 1986 and 1994; Borges, 1997; Silva Filho and Jardim, 1997; Kalimo et al., 1987; Vezina, 1998; Kristensen, 1995; Karasek et al., 1981). In addition, other research has demonstrated that an adequate strategy to prevent problems related to work organization depends on the appropriate planning of work processes in order for a wide range of problems to be anticipated and prevented before they occur. (Gardell, 1982a e 1982b; Spink, 1991b).

We know that questions about workers’ health are strongly influenced by the relative power of capital and labor, and the distance between managerial and workers’ interests in specific historical, political and social contexts. Beyond the application of conventional hazard prevention techniques, workers’ health depends on the way in which various social actors are able to deal with the contradictory, different and antagonistic interests that organize and motivate their day-to-day activities in the workplace.

Work relations in Brazil

Some characteristics of work relations in Brazil are outlined to enhance understanding of the limits and possibilities of negotiating changes in the organization of work processes and of the significance of conflict and the development of countervailing powers in the formal sector.

“Modern Brazil appears to be a kaleidoscope of many periods, forms of life and work, ways of being and of thinking” because “the capitalist present, which is industrialized, urbanized, co-exists along with various bygone moments. Quite different forms of life and work come together in a remarkable totality. Simple monetary circulation, commercial and capitalist circulation come together in a whole in which the amplified reproduction of capital commands the show, on an international scale.” (Octavio Ianni, 1994, 60-61)

In this historical journey, negotiation is an instrument which is little used to resolve disputes between labor and management. This fact should be understood in the light of a number of factors which mark the history of work relations, and political, economic and social inequalities in Brazil. According to Ianni (1994), these factors include, firstly, our colonial history, and secondly, the existence of several centuries of slavery that determined social, political and cultural life. “The centuries of slave labor produced a whole universe of values, standards, ideas, doctrines, ways of being, thinking and acting” (1994, 57-58) A third factor was the ‘combined and unequal development’ of the economy which was dominated by quite specific products (gold, sugar, coffee, rubber etc.), one product succeeding the other in its
dominant role. In this way a complex social structure emerged, a structure that accumulated a number of diverse and contradictory forms of work and living conditions.

Even after the abolition of slavery, (only a little over a century ago), European migrants were treated as white slaves. This situation demonstrates how a culture is influenced by the position filled by work and workers, (and continue to fill), in society.

Beyond this, values of citizenship in Brazil were built up and lived out in a tension between two opposed but complementary codes – the moralizing and the impersonal. Within this context, the word citizen is imbued with values that emphasize inequalities rather than referring to equality of rights between people (Damatta, 1985).

For example, the word ‘citizen’ is always used in negative situations in Brazil, to denote the position of someone at a disadvantage or in an inferior position. When someone says “the car belongs to that citizen…”, one knows that universalizing and impersonal treatment is being used in order to leave the problem unsolved or even to make the resolution of the problem more difficult” (Damatta, 1985, 67).

Allied to the inheritance described above, the more recent history of years of military dictatorship stifled the general development of social movements, especially trade unions, and also hindered the action of unions in workplaces, culminating in the following situation described by Leôncio Martins Rodrigues.

“Brazilian unions don’t have any significant influence within companies. They are not consulted by employers or heard when technological or other changes are planned in workplaces. In the absence of ‘factory commissions’, where union delegates discuss problems relating to personnel (firing, holidays, professional classifications, etc.) with management, the liberty for action by Brazilian employers is limited only by labor legislation. The general procedure adopted by employers is to take decisions and to wait; if they (the decisions) don’t please the employees, let them send their complaints to the Labor Court” (Rodrigues, 1974, p. 90).

Even though Rodrigues is referring to a reality which existed prior to the democratization process, and the public mobilization of urban workers and unions which occurred at the beginning of the 1980s, the pattern he outlines still remains. Negotiations around questions involving workers’ health and and the organization of work occur only in isolated situations (Bonciani, 1996). They occur only where significant progress has been achieved due to union action. This can be seen by the creation of an inter-union organization in this area, DIESAT, (Inter-union Department for Study and Research into Health and Working Environment) and action directed towards worker interests by state organizations such as public services which pay attention to these questions (Sato, 1992; Lacaz, 1996; Sato, Lacaz and Bernardo, 2004).

It is understandable that given this historical journey, freely constituted worker committees, organized in workplaces are much more the exception than the rule. (Rodrigues, 1991 and 1994) Health and safety committees (CIPAs), while compulsory by law, have many difficulties in developing effective and critical action.

In this context, it is uncontestable that the strong presence of legal regulations serves as a guide to daily practices related to health in workplaces, as Lacaz (1996) and Dwyer (2000)
have shown. These authors argue, however, that such a presence does not necessarily lead to improvements in working and health conditions.

Indeed, it proves difficult to bring about changes in work processes through organized action with regards to health issues. It is pertinent to observe that, (in a similar manner to that seen in other dimensions of daily life in Brazil), those who do not represent dominant interests, have to deal with a situation of asymmetric power relations and individual and collective control over their work. They seek to have their subjective limits respected (Sato, 1993), and to make other organizational choices and re-plan their own work (Trist, 1976; Murray, 1970; Orstman, 1984). In this way they can go beyond the limits of those historically constructed obstacles that are so concrete and powerful.

Please note that the cases examined in this chapter occurred in firms in São Paulo City, headquarters to the most important urban-industrial complex in the Southern Hemisphere and which has historically had important and active urban trade union movements, before, during and after the period of military dictatorship.

The dynamics of micro politics in workplaces

Studies using qualitative approaches, from a social psychology perspective, observe how conflicts occur and how countervailing power develops. (The construction of countervailing power in work situations is described by Elton Mayo (informal groups) (Brown, 1979), by researchers associated with the Sociotechnical School (Orstmann, 1984; Kelly, 1978; Cherns, 1976), and by Frederico (1979), Linhart (1980) and Dwyer (1991), among others.)

In the cases referred to here, the study of micro politics, (i.e. the politics in and of daily living), came from a comprehension of the images produced through language and practices, (interaction and tasks), used by workers on a day-to-day basis. In both cases, we started from the observation that workers were seeking to avoid arduous work which, (from an inter-subjective perspective), is characterized by a work context which generates suffering, lack of comfort and requires extreme physical and mental effort, in situations where workers do not have control (Sato, 1993).

Recognizing that power is a key element for the exercise of control and that power depends on organizational structure and dynamics, it becomes clear that the degree of democracy in the workplace is intimately related to arduousness.

Two different methods of constructing countervailing power will be presented. The first is characterized by a secret conflict and the unilateral building of strategies to avoid suffering - “adaptive actions” (Sato, 1993). The second is characterized by processes of micro-negotiation developed in daily work (Sato, 1997 and 2002).

Unseen conflict and the unilateral construction of countervailing power - “adaptive actions”

In the first case, urban bus drivers in the city of São Paulo, (at the time of the study, employed by a company owned by the municipality), observed that the city had intense traffic and that its 10 million inhabitants were poorly served by the public transport system. We can
understand the meaning of arduous work and how it is dealt with through the eyes of these workers.

Adaptive actions frequently occur in the shape of provisional and unilateral attempts to resolve problems, actions consciously adopted and performed by workers in order to avoid suffering. During interviews these adaptive actions were verbalized and their rationality explained.

Adaptive actions do not resolve the question of lack of control because, in reality, they change the relation of forces between the primary group and those who plan their activities. On the contrary, such actions work around problems, and show the difference between prescribed and “real work”, (as defined by ergonomics), (Daniellou, Laville and Teiger, 1989). Because adaptive changes remain confined to the private sphere, (they are silent, hidden forms which often lead to small transgressions), managerial planning provides motives for the maintenance of two organizational realities - one conceived by management and one invented by the drivers. Adaptive actions are not the subject of dialogue between planners/managers and operators (drivers and fare collectors).

Operators become familiar with all aspects of their job as they accumulate experience, so they identify other possible rationalities and organizational choices as they search to transform work and its environment (to the extent that this is possible), into a single livable space. In this manner, the work post (i.e. the drivers’ area), often reflects the characteristics of the driver, e.g. colored curtains are hung in the space separating the driver’s seat from passengers or small decorative objects are hung on the support for the internal mirror, etc. It is not unusual for drivers to carry a toolkit so they can make ergonomic adjustments to their seat; a small bottle of homemade cleaner to remove mist from windows and mirrors; a dust cloth; an extension to the gear stick to reduce the effort involved in changing gear; a seat cover and curtain. The search by drivers to inhabit and transform the company bus into their ‘own bus’ was also supported by observations of practices such as a driver washing the floor of ‘his’ bus daily, and another who installed a small sound system.

The statement of one driver deserves special attention. After a period off work because of health problems, (of an emotional nature), he justified the installation of a small sound system and of the objects described above, as a way through which he could tolerate the physical and psychological efforts that were part and parcel of his working day.

Ultimately, we are talking about practices which aim to personalize the environment to make it function to meet personal needs, which can be seen in part as a method of reducing the effort, discomfort and suffering caused by work.

The language that drivers create appears to be another important instrument through which they seek control because, even when viewed by the public, drivers and fare collectors are able to maintain their private space. Although they speak Portuguese (like the rest of the population), these workers construct and label realities specific to their lives, the significance of which can only be understood by these workers in their particular context. The language employed is characterized by the use of words and expressions which gain significance locally and specifically permit the utterance of incomplete and codified sentences made up of a whole series of implicit ideas and “etceteras”. These sentences come together with a specific intonation, glances and gestures, and serve as indicators of ‘practical sociological knowledge’, (see Garfinkel (1994)). In this way, workers permit themselves to refer to themes that only
they can understand and to maintain such interchanges in secret even when in the presence of passengers.

These examples combine to demonstrate how functional the ‘culture’ of this occupational group is when examined from the viewpoint of worker health, since it seeks to preserve or to build an environment which respects the workers’ subjective limits (Sato, 1993).

In addition, a series of small aberrations (adaptive actions) by drivers can be observed, which together make a difference to their working conditions. Such changes include small modifications to defined routes, disobedience of traffic rules, performing dangerous procedures when driving, (cutting off other vehicles, sudden braking, fast accelerations, etc.), and installation of devices which reduce the sound of the signal used by passengers to indicate they wish to descend. In such cases, adaptive actions are recreated on a daily basis because the same problems of excessive suffering, effort and discomfort continue. It is a secret struggle that expresses a search for control over externally imposed dimensions of work.

When we spent time with the operators we could see the reasons why they took these actions. They had developed a ‘common sense epidemiology’ by assembling their own impressions and discussing them with colleagues. Drivers list occupational morbidity factors, which (importantly) include identification and repetition of situations that produce ‘jumpiness’ in drivers, resulting in osteoarticular, gastrointestinal and cardiovascular problems. These factors are associated with the context in which operators work and their adaptive actions aim at reducing the harmful effects of work.

Secret conflict and modifications to daily work life: Tactical and astute micro-negotiations

The second type of conflictual interaction leads to modifications in work routines through micro-negotiations, a situation observed in the study of an important food-processing factory in São Paulo City. We accompanied shop floor workers for about 8 months, observing and talking with them about their work (Sato, 1998 and 2002). We observed that the primary group, motivated and activated by common people with no role in representing collective interests, was able to negotiate reorganization of work processes despite the largely asymmetric distribution of power and the presence of arduous work. The company we researched employed 350 manual workers who worked a rotating roster of three shifts, (8 hours per day from Monday to Saturday). The factory manufactured a great variety of products and totally manual processes were mixed with automated processes. The majority of activities such as packaging, preparation and transport of materials, did not require high levels of schooling and were carried out by production hands. These jobs are generally repetitive and monotonous, which explains the high rate of repetitive strain injuries.

Micro-negotiations are both tactical and astute (Certeau, 1994), almost invisible, and only observed and recognized when an attentive and trained eye focuses on events, and their signification, occurring in the workplace. Even in a factory where work is planned so that repetitive and monotonous activities must be performed, the day-to-day work in the factory is shaped by unpredictable and unusual events. During these events, problems are solved. The resolution of problems is not limited to those defined by management, (e.g. relating to productivity, product and manufacturing process quality), but also to problems which affect the interests of workers, (e.g. excessive exertion, pain, suffering, interpersonal conflicts, etc).
Taking advantage of the quality discourse

The first type of day-to-day negotiation develops through the tactical and astute capturing of managerial discourse, in this case, the discourse about “quality”, diffused widely throughout the company.

The workers know what type discourse is permitted, i.e. the quality discourse introduced by management. Workers use this discourse to open up symbolic spaces that allows them to demand changes that favor their interests, such as changes in the definition of production lines, improvement in hygiene and health conditions, reductions of physical and mental exertion through the reduction of machine speed and increasing the number of workers on production lines.

When we first arrived at the factory and saw how the word ‘quality’ was used, it seemed as if they had a totally effective organizational ideology in place because everyone referred to the necessity for quality at work. However, a deeper understanding of what “quality” meant to each person, permitted us to see that there were multiple meanings which allowed a range of arguments and defenses to be based on the word, by widely diverse and (even) opposite interests. For example, when management is dealing with ‘quality’, it may mean the adoption of a series of control procedures during production, such as statistical control of a process. However, at the shop floor level, work on ‘quality’ may mean they want management to respect bearable limits on workload, such as reduced speed of work speeds or additional staff.

The astuteness of the workers lies in their capacity to develop tactics which result in their interests being ‘heard’ without conflicts of interests being made explicit. This is done by workers using ‘quality’ as an argument, as illustrated by the following example. A production manager requests that the speed of work on a line be increased but the machine operator concerned argues that while machinery could be speeded up, this action will hurt quality! With this reply, the operator can avoid the intensification of work and all the problems that flow from it, (complaints from packing staff, frequent stops to adjust the machine, greater exertion, suffering and tiredness). In this way the asymmetrical power relationships in the workplace are bypassed and workers’ interests end up being valued, at least minimally. While it is not unreasonable to assume that an increase of work speed may have led to some deterioration in product quality, this was not the main result that the worker sought to avoid. Rather, he sought to avoid results that would have an impact on his interests and on those of his colleagues on the production line.

Taking advantage of circumstances in order to develop countervailing powers

The second example has a storeroom worker (Paulo), as the protagonist. Paulo is dissatisfied with the general work environment, (space, drinking fountain, ventilation, equipment, layout, etc.), and his dissatisfaction is shared by a number of his colleagues who work in the same space (around 30 to 40).

Although this dissatisfaction has been felt for some time, the opportunity to negotiate with management to improve the situation occurs when Paulo discovers that inspectors will soon be visiting the factory. When he sees how management and supervisory staff are concerned to
prepare the company for the visit, (preparing reports, standardizing procedures, etc.), Paulo begins his research on how to marry his personal interests with managerial ones.

While “simulating submissive behavior in order to hide his insubordination” (Thompson, 1998), Paulo also recognizes that it is impossible for him to explain his reasons and interests in the managerial discourse by saying “Here in the company everybody speaks the same language!” Following this, Paulo employs a euphemism. Instead of making demands, Paulo makes “suggestions for improvements”, “ideas”, and tries to “find solutions”, and also tries to “collaborate”. In this way, by using fashionable words that are a part of managerial discourse, he ensures that his demands are heard, and everyone working in the factory knows that the firm, within its program of empowerment, wants to “discuss ideas because we have got too many problems, and they [management] want you to suggest possible solutions.” This language, and manner of publicly presenting proposals, sidelines conflicts but, it is through them that negotiations, (called “conversations” by the workers), develop.

In this manner Paulo discreetly contacted a manager and "suggested" where drinking fountains should be located, spaces for traffic flow widened, ventilators installed and other solutions that would result in greater comfort for workers. The argument that Paulo used when making his suggestions was that if the environmental conditions were improved, this would greatly improve the image of production management in the eyes of the inspectors. Accepting the arguments, the manager supported the suggestions and made appropriate moves for resources to implement the suggested improvements.

Paulo recognized that, in order to develop countervailing power, it was necessary to be submissive and to hide his insubordination. When I asked him if workers are free to talk about inadequacies in the firm, he replied; “I am going to speak? Going to speak for what? I’m not crazy!” and concluded:

“A lot is said about autonomy, initiative, creativity…. but hierarchy, my dear Leny, has to be followed, because they say, and it will always be true, the chain always breaks at its weakest link, that in this case, means us. We work here… as I said before, I defend the firm, it’s just that for me, in my mind, I am certain that one day I could leave here without being in any way valued, you know what I mean?...conscious that the firm is not ours.”

While it is possible to develop these countervailing powers, Paulo’s statement also teaches us about the limits found in capitalist production relations.

These two examples show that, in spite of the fact that power and control clearly favor management and capital; workers are astute in creating mechanisms that have an effect on negotiations. In this way, even though a reality in which ‘communicative action’ exists but was not observed, we are not talking of a context of radical democracy (Habermas, 1987). It is through ‘dramaturgical action’ (Goffman, 1985) that the parties develop arguments which take into account the world of things, the world of norms and both their own subjective world and that of others. In what can be seen as analagous to a ‘public space’ in the workplace, a range of opinions are compared and, extracted from the ‘private space’ where they had been confined in silence. However, the formation of a ‘public space’ is neither made explicit, nor can it be seen as something that has been permanently conquered. It should be clear that given this discussion, there are limits to what can be achieved through such negotiations. There are possibilities for agreement, but we recognize that such agreements have considerable implications, especially from the workers’ point of view from within the workplace, in
contrast to our own, outside position as critical spectators, who desire important and immediately visible changes throughout the whole organization.

A synthesis

Many other cases we observed could have been examined in this chapter to explain how countervailing powers are developed as a way of dealing with conflicts, particularly conflicts that cannot always be talked about or that become the object of open negotiations or open conflict.

Three points from the above cases should be considered. Firstly, each of these cases can initially appear to be simplistic, easy to understand, and to lack political significance. Secondly, they appear similar to classic cases from long ago which show that multiple rationalities and multiple ‘organizations’, (i.e. the informal groups in the Human Relations School, the detailed descriptions in ergonomics theory and of the Sociotechnical School), are not specific to Brazilian reality. Thirdly, it is possible to question the influence of such practices in the area of prevention of workers’ health problems.

Even though the phenomena of adaptive action and micro-negotiations may not be new, this type of struggle to bargain for the control of the workplace has significance for Brazil. Given the specific context and the dynamics of work relations in Brazil, adaptive actions and micro-negotiations offer the only possible means of reaching some level of prevention of health problems related to work organization in many cases. Moreover, growing unemployment tends to undermine the emergence of conflicts that could become explicit. Thus, in order to deal with asymmetric power and control over the workplace, workers must resort to astute tactics, profiting from the openings offered by managerial planning, the opportunities that emerge and the ambiguity of situations. It is in these gaps that we can see both conformity and resistance and workers expressing their subjectivity (Chaui, 1993).

As researchers we should not have a naïve view which considers that all the problems of planning and modifications of work organization can be solved through these daily negotiations. Nor should we adopt an arrogant view, which only sees changes where researchers consider they have occurred. In the same way, some types of adaptive action have costs for workers, notably when those actions go in the same direction as the safety rules. The difference between adaptive actions and micro-negotiations is that the latter seek to affect the public sphere, to the extent that they seek to have an issue negotiated between parties, even if such dialogue occurs in a “pre-capitalist” manner (Thompson, 1993). Both cohabit and express the limits and possible conditions for the adoption of, (in one way or another), the development of countervailing powers.

Following in the line of Gardell (1982b), we understand that the modification of work, aimed at improving health, should be conducted at various levels, with the central trade union organizations, the unions, workplace organizations, workplace health and safety committees and the shop floor workers, benefiting from the strengths of each organization. The importance of considering the day-to-day practices described above, is also based on the fact that any change involving agents and, which is decided at other levels, must always refer back to daily life where it is founded in the practices and knowledge constructed by the primary group.
The above examples reaffirm that, in spite of management conceiving, planning and designing activities and procedures of a strictly technical nature, to be conducted unilaterally by management itself, people on the factory floor modify work in order to carry it out. They do this through their knowledge, built up through practice, in order to reduce the expenditure of effort, to show political resistance to managerial control and power or, to make it possible to carry out activities planned by someone else. The evidence all comes together to reaffirm that daily life on the shop floor is created and recreated. It is the place where people give meaning to their doings, oriented by practical methods, denominated as ‘practical sociological reasoning’, giving shape to organizational and micro political processes (Garfinkel, 1994).
Tom Dwyer

CONCLUSIONS

The modern OSH paradigm, with its modes of prevention and compensation, was born in England and Germany and exported throughout the world. OSH interventions were created in an attempt to control the politically disastrous consequences of the excesses of industrial capitalist development; they transformed political problems into administrative problems. Safety and compensation issues were the subject of struggle between employers and employees until they became institutionalized as they were increasingly administered by governments and professional bodies. Initially, only a very limited set of problems were addressed through measures designed to protect mineworkers, industrial and construction workers from ill health and accidents. In many countries the preventive approach was developed in harmony with measures designed to reduce compensation costs, complemented by rehabilitation measures. In this way, high compensation payouts made to a company, sector or industry typically resulted in pressure for prevention and rehabilitation as a means to reduce the financial consequences of injuries and ill health.

Over time, the focus of interventions expanded in two ways. Firstly, formal sector workplaces including those in the service and agricultural sectors were covered. Secondly, a number of countries included injuries occurring on the way to or from work as work accidents, and an increasing number of physiological and psychological illnesses were also covered.

While this model has spread around the world, coverage is still very limited in many developing countries. In Brazil, it applies to less than a half of the working population, essentially private sector registered workers. A further contingent - principally made up of government employees - is not covered by national work safety legislation but receives compensation and rehabilitation. The rest of the working population (with some exceptions), both urban and rural, receive no benefit from OSH protective, compensation or rehabilitation measures.

Over recent years political actors in Brazil have moved on two fronts – firstly, to extend coverage to an increasing proportion of the workforce, and secondly, to include new illnesses and conditions for treatment. However, opposition has emerged from economic interest groups who blame the need to guarantee competitive labor costs for their recourse to an increasing variety of ‘innovative’ contractual arrangements which results in large contingents of workers working informally. In addition, government austerity measures have motivated efforts to reduce social security payouts including limiting compensation for ill health and accidents, and accelerating rehabilitation processes.

These contradictory pressures have resulted in fierce arguments within Brazil as to whether or not accident and illness rates are rising or falling. This argument is politically polarized. Those who use statistical evidence to claim that rates are falling are accused of being on the political right. On the other hand, those who say that the state of OSH is worsening, place themselves on the left, justifying their stance largely by ignoring available statistics and by referring to the observable under registration of injury and ill health. This ideological debate
and the associated controversies over the imprecision of statistics, affects the quality of scientific analysis carried out in the country; many researchers resort to rhetoric, (as can be seen in this journal issue in fact). Some authors imply that OSH status is worsening while at the same time others mobilize similar data to demonstrate improvement. We have seen that statistics about illegal and informal sector workers are not readily available so it is very difficult to have any systematic understanding of what is happening to these workers. However, research included here has shown that some extremely high mortality rates exist among certain groups of unregistered workers.

**Formal sector registered workers**

Statistical evidence relating to fatal accident rates permits us to conclude that the situation of registered Brazilian workers has improved significantly over time. To the extent that international statistics permit comparisons, registered workers in Brazil appear to suffer from a higher probability of fatal accidents than their counterparts in the industrialized countries but appear to have a similar profile to that found in some other industrializing countries. With respect to the question of work related illness and disease, the overall picture is far less clear.

The work performed by registered workers has been the subject of attention by the state through the compilation of official statistics and the establishment of a whole structure of legal provisions that regulate many aspects of working life including OSH. The article by Bernadette Cunha Waldvogel and Celso Amorim Salim indicated the high numbers of fatal accidents suffered by registered transportation workers and found that there is insufficient knowledge about the causes and circumstances of these accidents to permit the development of adequate prevention policies and interventions. Leny Sato’s research has shown how registered transportation sector workers seek comfort and better working conditions through personal initiatives to change their working environment. When read together, these articles appear to address opposing views on the same question; however, both articles highlight the importance of transport accidents in Brazil, and the lack of quality research on them. Such studies could play an important role in setting a specific research agenda.

**Formal sector workers who are unregistered**

The dominant approaches to prevention and research have mainly concentrated on registered workers found principally in the private sector. When attention is turned to other categories of formal sector workers, namely those who are unregistered and therefore not subject to the CLL, we find that very little is known about their health and safety status. A significant number of such workers are employed by the state, but civil servants (or their dependents in the case of death), who are injured, fall ill or die as a result of their work typically receive compensation. Employers of workers covered by the CLL may be required to pay increased compensation insurance premiums if their workers suffer high rates of work related mortality or morbidity, however, no such feedback mechanism exists in the state sector. This type of mechanism could only be implemented if adequate statistics existed and if a levy system was developed in order to provide incentives for good performance or to impose higher levies.
when necessary. The absence of such a mechanism undoubtedly contributes to the continued high rates of morality/morbidity found among on-duty police officers in Rio de Janeiro, for example.

Extreme caution must be exercised when generalizations are made on the basis of one case, but it is important to ask about the fate of the rest of Brazil’s 400,000 police officers and to question the extent to which the analysis developed in Rio de Janeiro is valid nationwide. We know that many other categories of civil servants suffer risks, (physiological, psychological or symbolic), yet frequently there is neither statistical information nor feedback mechanisms capable of producing knowledge and stimulating preventive activities.

The Rio de Janeiro study also shows that police work results in the death and injury of many innocent civilians, and implies that compensation is only paid to their families in exceptional circumstances. As a result, many families not only lose loved ones but are impoverished. Julita Lemgruber wrote in the newspaper “O Globo” on 24/07/2001: “The improvement of internal and external controls on the police is an urgent matter. However, I am convinced that the most efficient strategy for combating police violence is that which hurts in the wallet. Should governments have to divert resources to pay for huge settlements with victims of police violence, maybe things will change in this country.” If this suggestion was implemented, it could result in prevention being accorded far higher priority.

The third element of the OSH system, i.e. rehabilitation services, exists under a special structure for civil servants. Specifically, we saw that psychologists and other specialists operate in the Rio de Janeiro military police force in both preventive and rehabilitative roles. The variety of work carried out by Brazil’s many civil servants employed at the municipal, state and federal levels, suggests that immediate priority should be given to preventive efforts in those professions which are likely to have the highest mortality rates, and to those whose work results in high mortality rates of citizens.

The empirical realities of OSH that were revealed in every one of the articles in this journal inspire new reflections. In the Introduction of this volume, I talked of traditional work, formal sector work, partially regulated and unregulated work, and of new and promising OSH initiatives. Our studies of both traditional and urban work reveal that this classification was not entirely adequate. I suggest in this conclusion that it is possibly more useful to reclassify the urban occupations into three types, defined by the relationship between the worker and the state: 1) formal sector divided into those who are subject to OSH regulations and those who are not subject to such regulations; 2) illegal work; 3) informal work that is not illegal. The question of illegal work has proved to be particularly relevant in a number of articles in this journal issue, and is certainly an issue that lies outside conventional OSH practices.

**Illegal work**

To my knowledge, illegal work is not considered worthy of investigation from an OSH viewpoint anywhere in the world. Social science literature in Brazil commonly refers to the
gap between ‘legal Brazil’ and ‘real Brazil’ as an enduring feature of the country. From an OSH viewpoint, it is clear that illegal activities have a huge impact on the life chances of many who work illegally or who become victims of homicide on their way to and from work and also in the course of their work activity as informal or formal members of the workforce.

Jacqueline Muniz’s study shows that the state’s monopoly over the legitimate use of violence, employed in an effort to prevent and bring to justice those engaged in illegal activities, may not be adequately circumscribed. As a consequence, police action can become much more violent than what would be considered necessary by independent specialists; such action may result in death and injury to both criminals and non-criminals.

However, police officers are not the only state employees who resort to the use of violence when carrying out their duties. Christiane Girard Ferreira Nunes and Mário Theodoro’s article showed that street hawkers who work illegally (but not necessarily criminally), suffer a major risk to their health and safety from repression of their activities by state agents. Thus, the state uses its coercive power not only to protect registered workers from harm, especially through the operation of OSH laws and inspectorates, but also employs force which results in injury and death not only of workers and lawbreakers but frequently of law abiding citizens. Jacqueline Muniz hypothesizes that the excessive use of force by state agents provokes excessive reactions by adversaries, which also results in considerable death and suffering among the state agents themselves. This can turn into a spiral of vendettas. A stark illustration of this drew headlines the world over, in May 2006. Alleging that the São Paulo state government prison system did not obey legal limits placed on the use of coercion of prisoners, members of a large criminal gang engaged in a press gang mobilization of their debtors, who then embarked on a campaign of killing police officers and prison wardens. The unprecedented scale of these killings led to an extremely violent reaction by the police, this occurred principally in poor areas considered to be dominated by the gang and resulted in deaths of innocent civilians. A conventional preventive approach would suggest a number of changes could be made in order to reduce the lethality of Military Police operations, including the development of training programs to confine the use of force within its legal limits, the more frequent use of non-lethal weapons, greater individual protection, adoption of operating procedures designed to protect civilians and better communication and organization of interdependent law enforcement groups. A dialogue between OSH prevention specialists and those responsible for prevention of illness and injury to civil servants, whose duties require the use of force, has the potential to produce beneficial effects.

As in many other developing countries, Brazilian laws are adopted in an effort to change the social structure towards the legislators’ “ideal model”. This results in a considerable gap between what large numbers of people actually do and what is considered legal for them to do – the gap ‘between real Brazil and legal Brazil’. However, where illegal activity is not actually defined as criminal activity, it is frequently tolerated, although such tolerance may be fragile and subject to changing circumstances. This issue of OSH & Development includes at least four distinct examples of illegal work: off-duty policemen carrying out private security work, lobster fishermen who use compressed air, street hawkers and criminals. Systematic statistics are not kept about rates of death or injuries in these activities but estimates appear to indicate extremely high fatality rates.
In Oliveira & Mendes (1997) study in Porto Alegre (cited by Myrian Matsuo Affonso Beltrão), five of the total of 31 deaths classified as work accidents (19%), occurred while the victims were engaged in criminal activity (a further death was associated with prostitution). Hennington, Cordeiro & Moreira Filho’s study (2004), showed that nearly a half of the 27 fatalities classified as work accidents involved firearms, and of these 3 victims died during police investigations and 6 during acts of theft. In other words, 33% of all fatal ‘work accidents’ observed in the study occurred during the course of criminal activity! These two studies indicate the risks involved in criminal activities. The Brazilian media constantly reports on the very short life span of young drug traffickers. While we have been unable to estimate mortality rates of criminals due to the lack of an estimate of the number of people engaged in such activities, the price of crime is frequently loss of life.

If we exclude the cases of the street hawkers who are injured in confrontation with agents of the state, the other cases of illegal work examined appear to have very high fatality rates. (Street hawkers are rarely killed by state agents although in isolated cases conflicts among street sellers involve homicide). Jacqueline Muniz’s study shows very high fatality rates among off duty police officers working illegally in second jobs. Francisco Reis comments that with respect to lobster fishing. “The various public agencies involved with this illegal activity do little or nothing to change this reality in spite of widespread public awareness of the problem that has led to articles in the press. Divers continue to be at risk as public officials continue to perpetuate negligence and omission and the public watches on passively. While accidents and deaths in this predominantly craft activity continue to proliferate, the figures are excluded from official statistics.” State intervention, when it occurs, is normally seen by fishermen as being purely punitive. The annual mortality rate was found to be between 3 and 13 per 1,000 divers. These rates are between 7 and 30 times those of workers in the state of Rio Grande do Norte’s construction sector. Whereas no specific information was provided about the question of compensation in relation to off duty policemen and their families, Francisco Reis’ study found that injured fishermen became dependent on their families and communities for survival.

Some jurists see a ban on illegal work as the solution to the problem. In recent years, the Brazilian government has had considerable success in eliminating slave labor, partly due to the formation of the ‘Executive Group for the Repression of Forced Labor’ in 1995. However, it cannot be said that slave labor has been eliminated, and there is some circumstantial evidence that it is appearing in the large metropolitan areas where the debt slavery of illegal foreign immigrants is involved. Statistics show that the government has been successful in reducing child labor as a result of a two-pronged strategy of repressive actions in tandem with an income support program that awards scholarships to poor families whose children attend school.

The fact is that there is so much illegal (non-criminal) work in contemporary Brazil that the state frequently turns a blind eye. Within the MLE in Rio Grande do Norte we saw that there were debates as to whether the Ministry had jurisdiction over the illegal work of lobster fishermen. The MLE embarked on a prevention strategy which sought to set up a framework to reduce the worst risks through a negotiation process. In the case of off duty police officers
who work as private security guards, it will only be possible to find a solution to their woes once the issues surrounding their work are officially recognized as a serious problem. The recognition that illegal work produces many indirect victims when families lose breadwinners, or injured breadwinners become dependent on family members for survival, raises the question of compensation. Should the costs of compensation be socialized (instead of individualized as they are at present), this would provide a powerful incentive for prevention.

**Informal work**

In this conclusion, ‘informal work’ covers all types of work that are not formal (whether registered or not), or illegal.

There are at least two reasons why social problems relating to OSH in informal work are not transformed into political problems. Firstly, there is no organized system of statistics to provide data around which militants, technicians and others can organize. Secondly, victims are isolated from one another and lack trade union or other forms of representation for their political interests; therefore the search for individual solutions acquires greater priority than social or political action. Informal work is haunted by a double bind - on the one hand, its invisibility results in inadequate attention from the political and administrative systems, while on the other hand there is frequently an unmet need for the adoption of adequate OSH measures.

The issue of statistics is examined in the next section of this conclusion. The question about what specific OSH measures should be applied is a complex one. Informal work is unlikely to involve compensation payouts for injury, and family units usually end up assuming responsibility. For example, we saw that the community in the Amazon forest assumes a role in supporting injured or ill victims and their families.

Many workplaces that employ workers in “informal” jobs, have counterparts in companies that register their workers, e.g. in scrap yards, craftwork and backyard factories, clandestine construction sites, etc. Such workplaces could adopt conventional prevention practices, similar to those applied to registered workers in the formal sector; however, these workplaces are not normally subject to OSH management principles or to government inspection. While this type of informal work may result in greater risks to health and safety, it also potentially gives such workplaces a competitive advantage.

Outside of urban settings, many millions of people depend on informal work for their livelihood especially in ‘traditional economic activities’ such as fishing, farming and mining. The journal article on the case study of rubber tappers revealed many of the issues facing these workers. From a contemporary OSH perspective, there are three principal issues to be addressed. Firstly, it is important to investigate ways in which modern techniques and knowledge might be used to reduce OSH problems found among traditional workers. Gold miners poison themselves, their families and the ecological system through the use of mercury. Agricultural chemicals poison farm workers, many of whom are illiterate and
therefore unable to read safety instructions, or are too poor to buy adequate personal protection. Such factors mean that traditional workers and their families run greater risks than their counterparts who have adequate knowledge and financial resources to be able to use greater levels of protection. However, some progress can be found as illustrated by the case of the national agreement which has led to the protection of chain saws which means that these dangerous machines have become much safer.

The second issue is compensation. Case studies show that individual families or communities must bear the costs of victims injured in the course of informal or illegal work, particularly when in the majority of cases where uninsured workers are injured or die at work or as a result of road accidents or violence. From an economic viewpoint, this means that the financial costs of compensation for injury and illness are borne privately and individually by victims themselves, a situation which inhibits the use of economic mechanisms as incentives for the development of rational prevention activities. Depending on personal circumstances, victims and their dependents are exposed to greater or lesser levels of indigence which is clearly iniquitous.

The third issue is rehabilitation. The majority of victims from urban areas who work in the informal sector and suffer non-fatal accidents and ill health are taken to public hospitals for treatment. While this helps to reduce the possible consequences of illness and injury, their treatment doesn’t include the same level of specialist rehabilitation received by some injured or ill registered workers. In rural areas people frequently have to travel great distances to seek adequate medical care which frequently aggravates the consequences of accidents and illness. While this factor influences the care received by both registered and unregistered workers, registered or formal sector workers generally have greater access to resources than their counterparts in informal work. The study of rubber tappers pointed to a heterodox process whereby scientific and traditional techniques are combined to treat victims of snakebites and other types of misfortune. Barbin and Martini identified the important role played by superstition (so termed by scientific, urban researchers), with reference to (seemingly) non-scientific ideas of causes, prevention and rehabilitation techniques. Anthropologists by training, the researchers point out that a combination of scientific and traditional approaches permits the preservation of the cultural identity of their subjects, while at the same time permits them to enjoy the benefits of science, transformed into prevention and rehabilitation techniques. The researchers indicate the importance of the notion of “ethnoprevention”. Since the invention of the Davy lamp it has been known that the crushing of traditional knowledge in the name of progress produces disorientation and loss of identity and can also be associated with the production of new problems (Dwyer, 1991). Rehabilitation in the form of medical services has arrived only recently in the area inhabited by the rubber tappers, so accident and illness victims now have a greater chance of recovery than previously. The opportunity for rehabilitation for those in rural areas increases as medical care becomes available.
Statistics

The articles in this journal give an overwhelming impression that there is a very weak statistical base on OSH issues in Brazil with the exception of statistics on registered workers. This means there is a very poor foundation for authoritative statements and rational preventive actions on OSH.

Some of the case studies included in this journal reveal that those who suffer the highest accident rates are excluded from official statistics. In three case studies, attempts were made to measure and compare the risks associated with unregistered, informal or illegal work. Rubber tappers were not found to be at greater risk than the general population in the area studied. Lobster fishermen and police officers, (both on and off duty), were found to be at great risk of fatal injuries. An important step would be to integrate these and similar groups of workers into the official OSH statistical databases and, on the basis of observed rates of injuries and illnesses, define these as groups meriting special attention. The current situation means strong interests continue to perpetuate the tragic OSH status of these workers and this lack of social and political pressure is fundamental to maintenance of this iniquitous state of affairs.

Moving beyond the limits imposed by case studies, Myrian Matsuo Affonso Beltrão extrapolated “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…. 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%”. Does such an extrapolation reflect reality? I sincerely doubt that it does, however, this is a personal judgment based on personal opinion rather than systematic analysis of data - the real figures are unknown. While Thaís Helena de Carvalho Barreira’s article referred to hundreds of studies conducted into WRMSD (a non-fatal condition), it is extremely difficulty to locate studies that discuss the mortality and morbidity of informal and illegal workers, a state of affairs that reflects a clear inequity in the knowledge production process. If the above extrapolation was confirmed in national research, Brazilian workplaces could be rated as some of the most dangerous in the world. Such an evaluation would complement rather than contradict the data in Ivone Corgosinho Baumecker and Mário Parreiras de Faria’s study, where they found that considerable improvements have occurred among registered workers.

Myrian Matsuo Affonso Beltrão’s article refers to the above situation and contains an underlying suggestion of the urgent need for a new model of compiling statistics that goes far beyond the use of official accident registration forms for registered formal sector workers (CAT). It is necessary to collect information about the risks of illegal and informal work with an eye to establishing preventive programs, especially where the risks are high. Conceição, Cerqueira, Nascimento and Oliveira (2003) provide one example by using data from admissions to emergency departments. Such a practice would complement official statistics and give a clearer picture as to where intervention is necessary. In order to improve equity, it
could be suggested that those workplaces, professions and areas which suffer the highest rates of mortality and morbidity, be given priority for prevention and research.

Compensation, rehabilitation and prevention

In the formal sector the government insurer (INSS) has resorted to both reductions in premiums and ‘recessive actions’ through the courts to recuperate compensation payouts judged to be excessive. Both these measures provide an economic incentive for preventive OSH measures. Where accidents potentially have high financial and/or political costs, a number of important preventive measures have been taken, as in the case of the chemical safety initiatives analyzed by Carlos M. de Freitas et al.

However, in other dangerous activities such as lobster fishing and police work, the costs of compensation or rehabilitation appear to be absorbed privately by communities and families, or by the state pension and payroll system. In both cases there are no direct economic incentives for preventive activities.

Accidents and illness may have effects that go beyond the workers directly involved, as exemplified in police shootings of civilians or the ecological consequences of chemical accidents. Economic theory predicts that when those responsible for death, injury, illness or damage to the economic system are forced to pay the full costs of both compensation and rehabilitation, (or recovery in the case of the ecological system), this factor becomes a powerful incentive for prevention.

The limits of the dominant OSH paradigm

The dominant OSH paradigm is a child of the industrial revolution. It was developed on the idea that it was necessary to have a series of uniformly applied rules and regulations that would require equivalent investments into working conditions by all employers in order to improve the conditions of safety in all workplaces. Factories and mines were at the centre of the paradigm. Safety engineering, industrial medicine and psychology, coupled with state or insurer regulations, were used to prevent ill health and accidents caused by work activities. Two further elements were integrated into the paradigm. Firstly, the notion that compensation, provided by a form of insurance, should be awarded to the victims of injury and ill health, and secondly, that rehabilitation activities would help to reduce the consequences of injury or illness. In many places compensation levies would increase as a function of increasing incidences of accidents and ill health. In turn this would provide an economic stimulus for increased investment in prevention.

In the Brazilian workplaces examined, two limits to this approach were seen. The first is a consequence of the fact that in the main centers urban problems have become more important than problems internal to the workplace as a source of damage to worker health and integrity. The second limit is the emergence of new illnesses and sources of injury. Physical violence and traffic accidents are two particular urban problems that have been shown to have a major
impact. Both require solutions that currently lie outside the dominant OSH paradigm which means that these questions must be incorporated into the current OSH paradigm or that a new paradigm must be developed. For example, consider the case of the military police whose work is to prevent crime. They are required not only to place themselves at risk when undertaking their jobs, but they also produce risks for civilian populations and for those suspected of criminal activity (their adversaries). A number of operational principles could be imported into police work from the OSH paradigm, and it is also necessary to study and evaluate the OSH risks of police force operating procedures in other parts of the world. Waldvogel and Amorin’s study shows that transport accidents also require further in-depth research and a creative approach to prevention.

Throughout this journal authors have observed the rise of new risks and sources of ill health. Victor Wünsch Filho alerted readers to the fact that an ageing working population will bring new problems requiring the development of different policies to those used up until now. Freitas et al showed that chemical safety issues, frequently associated with highly complex production systems, currently affect not only workers but the ecological system and may potentially affect civilian populations and future generations. Thais Barreira showed that the problem of WRMSD/RSI produces human suffering and has generated a large amount of research even though the problem emerged less than two decades ago. Girard and Theodoro discussed dimensions of the health of maids, such as symbolic violence, harassment and humiliation, which are all subjects that are entirely absent from current literature. We also saw that police officers suffer from psychiatric problems and stress. It appears that emergent problems will come to swamp the old ones, a possibility which raises questions about as to what priorities are to be pursued and about the conduct of rational planning.

The currently dominant OSH model appears to work reasonably well for registered workers, especially if death and injuries resulting from transportation or violence are excluded. However, the model appears to work very badly for those involved in informal or illegal work as well as for unregistered workers in the formal sector, (exemplified by the case of Rio de Janeiro’s military police).

A perspective drawn from the ‘sociology of knowledge’ helps illuminate current priorities. In the context of “redemocratization” in Brazil, a massive effort was made to combat the benzene problem, a problem that had been demonstrated to affect a very small number of workers. We also saw that WRMSD/RSI a condition that initially affected white collar registered workers, led to a major research effort despite the fact it does not kill. At the same time lobster fishermen, police officers (both off and on duty), and transport sector workers receive far less attention from researchers and prevention organizations and specialists. My hypothesis is that compared with other victims, these groups lack the power and ability to define research agendas, and this results in their suffering being ignored (e.g. in the case of lobster fishermen), or considered “normal” (in the case of police officers).

A further preoccupation is that while many workers already suffer from relatively unknown risks, totally new risks seem to be emerging. There is little available knowledge about these risks thus creating a “knowledge gap” that appears to impact most seriously on those with the least political power. This gap appears to prevent the establishment of preventive policies and
interventions on the basis of need because without adequate knowledge about the risks, needs are unknown and it is difficult to establish priorities. Politics becomes the base of policy setting rather than need and this reinforces the OSH status of “legal Brazil” to the detriment of “real Brazil”.

Emerging signs of a new approach

I stated in the first paragraph of the introduction to this journal that the objectives of the ICOH seminar (where these articles were originally presented), was to introduce foreign researchers to Brazil and to show how a number of important occupational safety and health (OSH) questions are treated. The second objective was to mark a process of reflection on the subject within Brazil, given that the OSH area has changed greatly over the last twenty years. There is a perception in the country that there is a need for a profound renewal in thinking about interventions made in the name of safety and health at work.

With regards to the first objective I shall be brief.

1) Those in other developing countries should take the opportunity to use the articles in this journal to reflect on the situation in their own countries.

2) Those involved in multinational corporations or international trade can ask to what extent do those in their import or export supply chains employ forms of work that are lethal? What can they usefully do to stimulate suppliers or buyers to improve the situation?

3) International agreements and the exchange of scientific knowledge are fundamental to the progress of human knowledge. It is clearly important to produce understanding of workplace OSH that reflects problems as they are lived out in each country. Articles in this journal have revealed that the current dominant paradigm used to understand OSH is partly blind to numerous questions central to the situation in Brazil, and that this is probably the case in many other developing countries.

4) The emergence of a new and more complete scientific paradigm will require the cooperation of researchers in both industrialized and developing countries. To some extent, increasing global trade and interdependence means it can be said that the blood of Brazilian fishermen taints the lobster eaten in New York or São Paulo. Rethinking the role of power, global markets and local ‘regulation’ of market oriented activity and its alternatives, may well become an essential element of future thinking about OSH. The journal ‘OSH & Development’ can make a valuable contribution in this direction.

With regards to the second objective, more needs to be said. There is a ‘profound renewal’ already underway in Brazil, especially in relation to democratic processes and where those people directly involved are assuming greater responsibilities for their own health and working conditions. This renewal is visible at both an institutional level (as seen in the tripartite negotiations and agreements analyzed by Arline Sydneia Abel Arcuri et al), and at the level of individual workplaces and workers (as shown by Leny Sato).
The question of participative approaches appears to be playing a fledgling role in the creation of a new paradigm. An initial part of the process of renewal is to define accidents and ill health as direct results of social relations in workplaces and as such, capable of transformation by human action. The articles by Leny Sato and Hélio Barbin Júnior and Andréa Martini are pertinent in this respect. Aware workers, acting autonomously with relative freedom from outside constraints, are capable of directing their own activities to avoid the risks of their jobs. Bus drivers and rubber tappers were seen to make efforts to adapt their jobs and relationship with their working environment to make them more healthy and comfortable.

Time and again we were able to see that lack of training, poor work organization, inadequate safety equipment, long working hours and the pressures for survival in a milieu dominated by sheer poverty, were factors that led workers to take risks. These and other factors are essential elements of systems of work relations (ways in which peoples’ relationships to their work are managed) and thereby play a role in producing ill health and accidents. To guarantee a broad treatment of the realities of OSH in Brazil, the articles in this journal did not set out to make an in-depth exploration of the role of social relations of work but many articles referred to them. It is in this context that the role played by social relations of work is recognized - it is possible to treat workplace participation and tripartite negotiations as a basis for a possible new scientific paradigm of causation. This possibility opens up numerous opportunities for the formulation of accident reports and adds new considerations that are currently ignored in prevention strategies.

A key structural dimension of contemporary Brazil has been the close connection between political and economic powers, a connection used to benefit only a small part of the population; Brazil is one of the most economically unequal countries in the world. Moves towards participative action are present in many parts of national life, including the area of OSH, and seek to reverse this inequity. A number of articles refer to participatory approaches to prevention and their role in making institutions and companies more responsive to OSH needs. Participatory approaches can be found at many levels from individual workplaces to national consultative committees. It is interesting to ask where these approaches originated from, and what do they signify? Arline Arcuri et al demonstrated that initially, the appearance of these approaches coincided with the end of the military dictatorship when state agents sought to incorporate the voices of those who previously had no input into decision making processes about their own health and safety. Members of legally sanctioned workplace health and safety committees, which provide mandatory coverage of registered workers in the larger and more dangerous workplaces, are granted stability in their employment with the aim of permitting meaningful criticism by worker representatives - employer representatives are forced to listen. In many parts of ‘legal Brazil’, participation is seen as a solution to numerous structural problems. While limited in scope, state agents who seek to free the state from its dependence on market forces, defend participation as a means to control market forces.

It is important not to be idealistic and to imagine that great prospects for advancement can be made through participative processes because in practice they may prove to be slow, costly
and time consuming. There is also the risk that such processes will be taken over by union and/or state bureaucracies, who adopt them to accumulate or preserve power; participation can become synonymous with manipulation. In the long run the success of participation will be judged by its capacity to form a new culture, including in OSH, and to redefine power.

A short term response to inequity

These articles have shown that there are a number of very serious problems of inequity that should be addressed in the short term. The current situation is inequitable because some workers face great risks but receive little attention from the state, while others, who run far less risk, receive much greater attention. In a country such as Brazil, where social inclusion and citizenship are said to be political priorities, such a situation cannot continue. The identification and monitoring of a) situations and processes which involve people exposed to extreme risks, and b) the identification of workers and pathologies that are invisible and ignored, should be followed by the allocation of resources and use of established prevention techniques and feedback mechanisms in order to combat exposure to extreme risks.

A perspective based on equity demands that priority must be given to interventions that prevent high risk activities. Even when very little is known about risks but there are reasonable grounds to suspect that the risks are high, research should be undertaken in order to provide robust data and to permit the establishment of equitable policies. Francisco Reis established an important general principle of equity when he urged that we “see all work as the same”. In other words, illegal, informal and formal non-registered work should all be treated in the same way as formal registered work. From the OSH viewpoint, priority should be given to intervening in the most dangerous and unhealthy workplaces.
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ABBREVIATIONS

AEAT – Annual Statistical Yearbook of Work Accidents (Anuário Estatístico de Acidentes de Trabalho)
AJER - Alto Juruá Extractive Reserve
ARTFAJER - Association of Rubber Tappers and Farmers of the Alto Juruá Extractive Reserve
BHMR - Belo Horizonte Metropolitan Region
CANPAT - National Campaign for the Prevention of Work Accidents
CAT – Work Accident Communication Form (for registered workers)
CIPA – OHS workplace committees, mandatory in organizations exceeding a specific size with particular risk factors (Comissão interna de prevenção de acidentes)
CLL - Consolidated Labor Laws (Consolidação da Legislação Trabalhista - CLT)
CP – Civil Police
CS - Chemical safety
CUT - Unified Labor Confederation (Central Única dos Trabalhadores)
DRT - Regional Work Delegation (of the MLE)
DOHS - Department of Occupational Safety and Health (DSST of the MLE)
EAP – Economically Active Population
FIOCRUZ – Oswaldo Cruz Foundation, associated with the National School of Public Health
FUNDACENTRO – The Ministry of Labor and Employment OHS Research and Training Institute (Fundação Jorge Duprat Figueiredo de Segurança, Higiene e Medicina do Trabalho)
IBGE – The Brazilian National Statistical Institute (Instituto Brasileiro de Geografia e Estatística)
ILO - International Labour Organisation
IFCS - International Forum on Chemical Safety
INAMPS - National Institute of Medical Assistance of the Ministry of Social Welfare (dissolved on July 27th 1993 and incorporated into other programs)
INSS – Institute of National Social Security
IPCS - International Programme on Chemical Safety
MLE – Ministry of Labor and Employment (Ministério de Trabalho e Emprego - MTE)
MP - Military Police
MH – Ministry of Health
MPSRJ – Military Police of the state of Rio de Janeiro
MSW – Ministry of Social Welfare and Assistance
NGO - Non-governmental organization
OHS - Occupational health and safety
OSH - Occupational safety and health
OSHMS - Occupational safety and health management systems
PNAD – National Household Sample Survey (Pesquisa Nacional de Amostragem por Domicílio)
PSDB - Brazilian Social Democratic Party (Partido da Social Democracia Brasileira)
PT – Workers’ Party (Partido dos Trabalhadores)
RAIS - A statistical data base of employment information (Relação Anual de Informações Sociais)
RSI – Repetitive Strain Injury (Lesões por Esforços Repetitivos, LER)
SFIT - Federal Work Inspection System of the Ministry of Labor and Employment
SIPRAM - System for Prevention of Risks of Major Accidents
SIH – System of Information from Hospitals
SIM – System of Information concerning Mortality
SPMR - São Paulo Metropolitan Region
SUS – Unified Health System (Sistema Único de Saúde)
UNCHC - Nations Conference on the Human Environment (held in 1972 in Stockholm)
UNEP - United Nations Environment Programme
VRT - Technological Reference Value
WHO - World Health Organisation
WRMSD - Work-related musculoskeletal disorders (Disfunções músculo-esqueléticas ao trabalho, DORT)
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